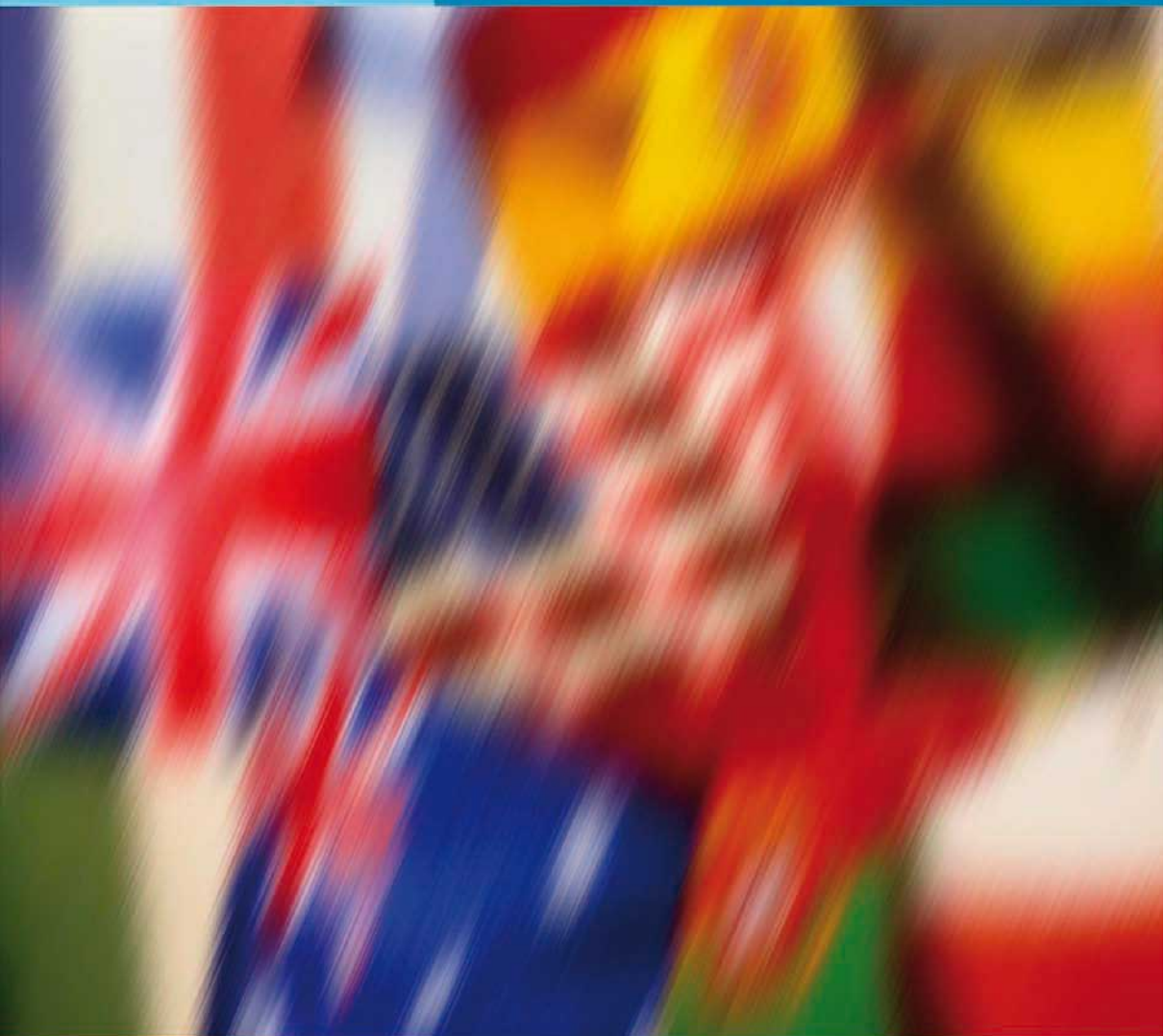




# Day Surgery

## Development and Practice

Editors | Paulo Lemos | Paul Jarrett | Beverly Philip



International Association for Ambulatory Surgery



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## Development and Practice

Edited by:

**Paulo Lemos, MD**

**Paul Jarrett, MA, FRCS**

**Beverly Philip, MD**

**DAY SURGERY | DEVELOPMENT AND PRACTICE.**

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Reprint of the First International Edition 2006

ISBN: 989-20-0234-2

ISBN (13 digitos): 978-989-20-0234-7

Legal Deposit: 241449/06

The authors and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accord with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in governmental regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed drug.



In memory of:-

**Dr Caterina Ramón**

ASECMA (Spain)

**Dr Domingos Marques**

APCA (Portugal)

**Prof. Marc Claude Marti**

SAS (Switzerland)



# Contributors

**Imad T Awad, MB CHB, FCARCSI**, Clinical Fellow, Department of Anaesthesia, Toronto Western Hospital, Toronto, Canada.

**Jaques A Baart, DDS**, Senior Lecturer, Consultant Oral and Maxillofacial Surgeon, Vrije Universiteit Medical Center and Academic Center Dentistry Amsterdam (ACTA), Amsterdam, The Netherlands.

**Ugo Baccaglioni, MD**, President of the International Association for Ambulatory Surgery (IAAS), Assistant Professor, Consultant Surgeon, Medical Director of the Day Surgery Unit of the Padova University Hospital, Padova, Italy.

**Hugh Bartholomeusz, RFD, MB, BS, FRACS**, Chief Executive Officer, Consultant Plastic Surgeon, Tri Rhosen Day Hospital, Ipswich, Queensland, Australia.

**Jost Brökelmann, MD**, Honorary President of the Bundesverband für Ambulantes Operieren e. V. (BAO), Professor of Gynaecology, Gynaecology Day Clinic, Bonn, Germany.

**Kathy Bryant, JD**, President of the Federated Ambulatory Surgery Association, Alexandria, United States of America.

**Filadelfo Bustos, MD**, President of the Spanish Association of Ambulatory Surgery (ASECMA), Staff Anaesthetist, Complejo Hospitalario de Toledo, Toledo, Spain.

**Carlo Castoro, MD**, Education Officer of the International Association for Ambulatory Surgery (IAAS), Assistant Professor of Surgery, Consultant Surgeon, Department of Medical and Surgical Sciences, University of Padova, Padova, Italy.

**Frances Chung, FRCPC**, Professor of Anaesthesia and Medical Director, Combined Surgical Unit and Ambulatory Surgical Unit, Department of Anaesthesia, Toronto Western Hospital, University of Toronto, Toronto, Canada.

**Christina A Drace**, Scientific Communication Consultant, Padova, Italy.

**Seine Ekkelkamp, MD**, Consultant Paediatric Surgeon, Department of Paediatric Surgery, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Arthur de Gast, MD, PhD**, Assistant Professor, Consultant Orthopaedic Surgeon, Department of Orthopaedic Surgery, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Manuel Giner, MD, PhD**, Associate Professor of Surgery, Universidad Complutense de Madrid, Staff Surgeon, Hospital Clinico San Carlos, Madrid, Spain.

**Veera Gudimetla, MD, FRCA**, Specialist Anaesthetic Registrar, North Staffordshire Hospital, Stoke-on-Trent, Staffordshire, United Kingdom.

**Anil Gupta MD, FRCA, PhD**, Associate Professor, Department of Anesthesiology and Intensive Care, Institution for Clinical Medicine, University Hospital, Örebro, Sweden.

**Raafat Hannallah, MD**, Professor of Anesthesiology and Pediatrics, The George Washington University Medical Center, Division of Anesthesiology, Children's National Medical Center, Washington DC, United States of America.

**Ype Henry, MD**, Consultant Ophthalmologist, Department of Ophthalmology, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Chantal M A M van der Horst, MD, PhD**, Professor and Chairman, Department of Plastic, Reconstructive and Hand Surgery, Academic Medical Center, Amsterdam, The Netherlands.

**Saskia Imhof, MD, PhD**, Consultant Ophthalmologist, Department of Ophthalmology, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Paul E M Jarrett, MA, FRCS**, Past President of the International Association for Ambulatory Surgery (IAAS), Professor of Day Surgery, Kingston University, Consultant Surgeon, The New Victoria Hospital, Kingston-Upon-Thames, Surrey, United Kingdom.

**Dick De Jong, MD, PhD**, Past President of the International Association for Ambulatory Surgery (IAAS), Assistant Professor, Vrije Universiteit Medical Center, Consultant Surgeon and Medical Director, Division of Ambulatory Surgery and Short Stay Surgery, Department of Surgery, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Paul J M van Kesteren, MD, PhD**, Consultant Gynaecologist, Department of Gynaecology and Obstetrics, Onze Lieve Vrouwe Gasthuis, Amsterdam, The Netherlands.

**Maria Pilar Rivas Lacarte, MD**, Research Manager at the Hospital de Viladecans, Coordinator of Otorhinolaryngology Department, Hospital de Viladecans, Barcelona, Spain.

**Paulo Lemos, MD**, President of the Portuguese Association of Ambulatory Surgery (APCA), Consultant Anaesthetist, Department of Anaesthesiology, Hospital Geral de Santo António, Porto, Portugal.

**Servando López, MD**, Member of the Executive Committee of the Spanish Association of Ambulatory Surgery (ASECMA), Staff Anaesthetist, Complejo Hospitalario Juan Canalejo, A Coruña, Spain.

**Juan Marin, MD**, Consultant Surgeon, Hospital Universitario Valme, Seville, Spain.

**Tom W Ogg, MA, FRCA**, Past President of the International Association for Ambulatory Surgery (IAAS) and Past President British Association of Day Surgery (BADS). Formerly Medical Director, National Demonstration Day Surgery Unit, Addenbrookes Hospital, Cambridge, United Kingdom.

**G rard Parmentier, PhD (econ.)**, Past-Treasurer of the International Association for Ambulatory Surgery (IAAS), Past-Vice-President of the French Association of Ambulatory Surgery (AFCA), National Secretary of the National Union of Private Hospitals for Oncology (UNHPC), Pontoise, France.

**M. Pilar Laguna Pes, MD, PhD**, Consultant Urologist and Director Laparoscopic Urologic Surgery Unit, Academic Medical Center, Amsterdam, The Netherlands.

**Beverly K Philip, MD**, Professor of Anesthesia, Harvard Medical School, Director, Day Surgery Unit, Brigham and Women's Hospital, Boston, United States of America.

**Johan Raeder, MD, PhD**, President of the Norwegian Association of Ambulatory Surgery, Professor in Anaesthesiology, University of Oslo, Director of Ambulatory Anaesthesia, Ullevaal University Hospital, Oslo, Norway.

**Rui Rangel, MD**, Consultant Neurosurgeon, Department of Neurosurgery, Hospital Geral de Santo Ant nio, Porto, Portugal.

**Rico N P M Rinkel, MD**, Consultant Ear, Nose and Throat Surgeon, Laryngologist and Speech-Language Pathologist, Department of Ear, Nose and Throat Surgery, Vrije Universiteit Medical Center, Amsterdam, The Netherlands.

**Ana Margarida Regalado, MD**, Consultant Anaesthetist, Department of Anaesthesiology, Hospital Geral de Santo Ant nio, Porto, Portugal.

**Jacky Reydelet, MD**, Treasurer of the International Association for Ambulatory Surgery (IAAS), Surgeon and Chairman of a Freestanding Unit of Surgery in Kornwestheim, Director of GZM Company, Ludwigsburg, Germany.

**Lindsay Roberts, MD, FRACS**, Past President of the International Association for Ambulatory Surgery (IAAS), Australian Day Surgery Council, Consultant Surgeon, Sydney, Australia.

**Jean J M C H de la Rosette, MD, PhD**, Professor and Chairman, Department of Urology, Academic Medical Center, Amsterdam, The Netherlands.



**Candy Semeraro, MD**, Staff Surgeon, Hospitals Vall d'Hebron, Barcelona, Spain.

**Ian Smith, BSc, MD, FRCA**, Senior Lecturer, Consultant Anaesthetist, North Staffordshire Hospital, Stoke-on-Trent, Staffordshire, United Kingdom.

**Andrzej Staniszewski, MD, PhD**, Lecturer, Consultant Surgeon, Department of Family Medicine, Wroclaw Medical University, Wroclaw, Poland.

**Claus Toftgaard, MD, MPM**, Past President of the Danish Association of Day Surgery, Chief Medical Officer, County of South Jutland, Aabenraa, Denmark.

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Planning and design are essential for the functional and financial viability of a day surgery unit, which must deliver procedural services of the highest standards of quality and safety. There is no preferred model. Units may be located on a hospital site or freestanding. Hospital based units are best located in a dedicated area physically and functionally separate from the inpatient section. Day units may be multidisciplinary or unidisciplinary and, having regard to variations in site, size and patient volume, design flexibility is essential. Terminology, planning and design options are discussed. Extended recovery, limited care accommodation and mobile surgical units are models that will stimulate the further expansion of day surgery.

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Improvements in surgery have played an important role in the exponential growth of ambulatory surgery in the last few decades. New operative techniques such as endoscopic surgery and other types of minimally invasive surgery have been developed and surgeons have become increasingly aware of important issues such as patient and procedure selection and proper peri-operative care in ambulatory surgery. A knowledge and understanding of the problems and challenges of different procedures in a number of specialties are discussed in order to guarantee success. Suitable procedures are recommended and patient selection taken into account.

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The selection of suitable patients for day surgery, patient information, assessment and preparation are essentials for the achievement of successful outcomes of care. A protocol of pre-operative assessment should be agreed and implemented in any day unit. All the staff should be fully aware of this process and dedicated care pathways should be available in order to facilitate patient selection and preparation for day care. In a day surgery environment, contact with patients is brief and intense. Also, patients are in charge of their pre-operative preparation and recovery takes place at home. This makes information provision a challenge for day surgery. An effective information provision policy aims to improve patient satisfaction with the overall day surgery experience and aid anxiety reduction.

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*Johan Raeder*

The choice of anaesthetic technique for ambulatory surgery based on considerations of the best safety, quality and cost effectiveness for the individual patient in the actual setting to be used are discussed in this chapter. Attention should be to post-operative side effects such as pain, nausea, vomiting and fatigue. Loco-regional techniques provide superior pain control, but may be more time consuming and require more expertise. Propofol based intravenous anaesthesia has less post-operative nausea and vomiting but slightly slower immediate emergence when compared with inhalational anaesthesia.

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*Filadelfo Bustos, Candy Semeraro, Servando Lopez, Manuel Giner*

Post-operative nausea and vomiting (PONV), together with pain, are frequent complications in ambulatory surgery, causing delay in recovery and unanticipated admissions. Studies report varying incidences of PONV before patient discharge. Various predisposing factors, depending on the patient, the type of anaesthesia and the surgical procedure, have been identified and will be addressed in this chapter. The patient's risk index for PONV can be determined from these factors and prophylaxis can be administered following a multimodal protocol (general measures plus anti-emetic drugs). In cases of PONV, despite prophylaxis, treatment should be given with different drugs.

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The continued advances in surgical (e.g. minimally invasive surgery) and anaesthetic techniques (regional anaesthesia, ultra short acting drugs) will allow larger numbers of patients to take advantage of ambulatory surgery. It is pivotal to ensure safe discharge home of patients by adhering to validated discharge criteria such as the Post Anesthesia Discharge Scoring System (PADS). Patients having general or spinal anaesthesia who are in a category of low risk for urinary retention can be discharged home without voiding. It is unsafe to drive 2 hours pre-operatively and up to 24 hours post-operatively. Fast track is a new and exciting concept that needs to be more validated with scientific research to ensure patient safety and worthy time and cost savings.

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*Paulo Lemos, Ana Margarida Regalado*

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# Foreword

Developments in anaesthesia and surgery have allowed an impressive worldwide growth in ambulatory surgery over the last decade. Ambulatory surgery has the potential to improve quality of care with low patient morbidity, and in a more demanding society where cost has an important role, ambulatory surgery has the potential to be the key in providing efficient surgical services. However, ambulatory surgery must be at least as safe and of the same quality as inpatient surgery. At no time should quality of care be subsumed to economic benefit.

With the purpose of promoting the development of high quality day surgery programmes many national associations joined together in 1995 to create an international body called the International Association for Ambulatory Surgery (IAAS). Its goals are:

- To stimulate the formation of National Associations for Ambulatory Surgery.
- To promote education and to publish an international journal, called “Ambulatory Surgery”.
- To form a database of information on ambulatory surgery and anaesthesia.
- To organise seminars and conferences.
- To encourage research into ambulatory surgery and to publish the results.

The IAAS has just celebrated its 10<sup>th</sup> anniversary. This special occasion seemed an opportune time to produce an international book containing basic and pragmatic recommendations on the practice of ambulatory surgery. The authors for this book have been drawn from many countries around the world and they are all experts in this field. They have given freely of their time with the aim of promoting the spread of high quality ambulatory surgery. The editors are grateful for their enthusiastic contributions.

Finally, the editors, on behalf of the IAAS, would like to thank Bristol-Myers Squibb for their financial support in publishing this book.

Paulo Lemos  
Paul Jarrett  
Beverly Philip



# Preface

As a co-founder of the International Association of Ambulatory Surgery (IAAS) in 1995 I strongly support the concept of this book. Over the past 20 years the expansion of global day surgery has revolutionised the delivery of healthcare by surgeons, anaesthetists, nurses and managers alike.

This book marks the tenth anniversary of the IAAS. The initial objectives of this Association were to encourage the development and expansion of high quality day surgery and to promote education and research in the subject. It also offered to act as an advisory body to all interested parties for the development and maintenance of high standards of patient care in ambulatory surgery facilities. However, advances in this field will only be forthcoming if further attention is paid to the collection of accurate data and the introduction of relevant educational programmes. Indeed it is not surprising that day surgery still fails to flourish in many countries possibly because this important subject does not appear in the curriculum of most undergraduate medical schools. Hopefully the publication of this IAAS book may help to alter this unacceptable situation.

The editor has invited an impressive array of international experts on day surgery. Many of the contributors have first hand practical knowledge on the subject and they are only too aware of the problems encountered by medical and nursing staff seeking to implement day surgery in their own hospitals. A major success of the IAAS to date has been its fostering of a multidisciplinary approach to the subject and as a direct result there has been a steady global expansion of day surgery. Here is one area of healthcare where people from different professional backgrounds may co-operate to provide a first class patient service. In short it would appear that everyone benefits from the introduction of an organised approach to day surgery.

Let me propose an international definition of a day case that should be considered wherever ambulatory surgery programmes are being developed: "A surgical day case is a patient who is admitted for investigation or operation on a planned non-resident basis and who none the less requires facilities for recovery. The whole procedure should not require an overnight stay in a hospital bed." Unfortunately many countries simply ignore this basic definition and several variants have crept into the practice of day surgery with the development of 23 hour surgery and patient hotels to name but a few. The message is a simple one for all health personnel wishing to develop day surgery, start with a simple basket of 10 cases before developing a programme of major surgery which may eventually lead to 23 hour hospital stays.

Ambulatory (day) surgery is not a new concept. However, despite its slow development in many European countries the past 20 years has seen day surgery become established practice. This is in no small measure due to the formation of the IAAS. Long waiting lists, low staffing levels and shortage of financial resources have all decreased the elective or non-emergency surgery performed in many countries. It is acknowledged that most



governments are in the business of providing cost effective care and so day surgery has proved popular with healthcare professionals. In addition the recent developments in minimally invasive surgery, anaesthesia, analgesia and equipment manufacture have all fuelled the expansion of day surgery.

Initially in many countries the barriers to the development of day surgery came from different methods of medical insurance payments combined with the apathy from central governments, hospital managers and doctors. The IAAS has done much to overcome these obstacles with planned programmes of research, education and the regular exchange of ideas by surgeons, anaesthetists, nurses and managers from over 30 countries at International Conferences hosted by the IAAS in Brussels, London, Venice, Geneva, Boston and Seville. In my opinion day surgery should be developed on its own merits and the advantages to be gained include high volume patient throughput, low post-operative morbidity and minimal infection rates. Surgical waiting lists may also be reduced and economic benefits may accrue especially if inpatient beds are simultaneously reduced. It is acknowledged that the main opposition to the implementation of the latter proposal usually comes from the medical establishment.

The first chapter is written by Professor Paul Jarrett (UK), a pioneer of day surgery. He outlines the historical aspect of the subject and the challenges to be overcome if any successful programme of day surgery is to be implemented.

In Chapter 2 Mr Gerard Parmentier (France) has attempted to unravel the terminologies relating to ambulatory/ day surgery. People are understandably confused by the conflicting jargon on this subject and his section seeks to clarify the various terminologies.

In Chapter 3 the importance of appropriate planning and design for a new day unit or centre has been addressed. Many people have different opinions on this matter but certain basic principles apply. Briefly there is absolutely no reason why the wheel should be reinvented whether planning a day unit in Australia, Europe or America. The sound advice given in this chapter should smooth any difficulties encountered in establishing the majority of day units elsewhere. So far the IAAS has proceeded cautiously on the office-based surgery front. Experienced practitioners acknowledge that major and minor complications may arise after ambulatory surgery performed in the best of units. In my humble opinion office surgery is a potential time bomb waiting to explode.

The selection of suitable day procedures is examined by Dr Dick De Jong (Netherlands) et al. in Chapter 4. Day surgery is not confined to minor procedures and there are now hundreds of operations which lend themselves for treatment on a day basis. The important message here for all healthcare professionals is to start your new programme of day surgery with suitable low risk cases and to build on your experience before introducing longer and more challenging surgery such as laparoscopic cholecystectomies. Every year

more operative procedures are recommended for day surgery and healthcare professionals should resist pressures from governments, industry and insurance companies to perform inappropriate complex surgery in the ambulatory setting. Vigilance is required.

Ideal pre-operative patient selection (Chapter 5) is sensibly debated by Dr Ian Smith (UK) and is, in my opinion, the key to success for any day surgical venture. In this field medical and nursing colleagues have combined to produce guidelines, which if followed, will guarantee safe, efficient and quality day care. Indeed so successful has day case selection been in several countries that the majority of non-emergency (elective) inpatient surgical cases are now screened using the methods employed in most day units. Briefly pre-operative assessment decisions should be based on physical status, invasiveness of the surgical operation and also on where the procedure will be performed eg a free-standing day unit or an isolated physician's office. Regardless of the type of facility the underlying goal should always be to maintain safety and quality.

Over the years the IAAS has been fortunate to have had the support of Dr Raafat Hannallah, a Past President of SAMBA. In chapter 8 he discusses the paediatric issues relating to ambulatory surgery. There can be no doubt that most children prefer day care to inpatient hospitalisation and Dr Hannallah's advice is a model of clarity and should be studied carefully by anyone wishing to establish a successful paediatric ambulatory service.

As in any other field information and education are fundamental for guaranteed success. Dr Carlo Castoro (Italy) outlines the essentials for good practice in Chapter 7. Day patients and their carers appreciate good information and the nursing profession has masterminded the introduction of patient information leaflets, pre-operative questionnaires and post-operative audit via telephone calls to name but a few. Any successful day unit should pay attention to this most important aspect of day care. Furthermore there is still a belief in teaching hospitals that surgery and anaesthesia should not be taught in day units. In my opinion most medical students would not only benefit from the wide diversity of cases seen in any day unit but also from the multidisciplinary teaching they would receive.

Anaesthetic advances over the last 20 years have fuelled the expansion of day surgery and Professor Johan Raeder (Norway) discusses a variety of anaesthetic techniques in Chapter 8. He is an acknowledged expert in his speciality and he indicates that there is still much debate as regards the best day case anaesthetic technique. Nothing stands still in medical practice and Professor Raeder succinctly outlines his thoughts on the future anaesthetic advances for day surgery.

Day patients clearly require excellent post-operative analgesia and Dr Anil Gupta (Sweden) in Chapter 9 addresses the basis for successful pain management. There can be no excuse for allowing patients to suffer pain following day surgery given the vast array of analgesics and local anaesthetic agents available to surgeons and anaesthetists these days.

Pain and post-operative nausea and vomiting following day surgery are major problems in many day units and their treatment should be energetically pursued. Dr Bustos (Spain) in Chapter 10 outlines the treatment and prevention of post-operative nausea and vomiting. Clear practical guidelines for its treatment have been issued and all medical and nursing personnel involved in day surgery should seriously implement these in their own units.

Over the years early patient discharge from day units has produced relatively minor post-operative morbidity. Professor Frances Chung (Canada) has a wealth of research experience on this subject and in Chapter 11 she discusses the fast track concept, discharge criteria and post-operative instructions. All these aspects of day surgery should be carefully considered and the guidelines from Professor Chung should be implemented in every ambulatory setting. In the USA by the year 2005 it is predicted that 82% of all surgery will be performed on a day basis and of that number 24% will be managed in office settings. Recovery facilities will have to develop to meet this challenge and 23- hour recovery facilities, hospital hotels, home healthcare and free-standing recovery centres all have their advocates. Sensible innovation should be encouraged but there is a need for outcome studies that assess safety, quality and cost.

Chapter 12 written by Dr Paulo Lemos (Portugal) considers aspects of quality assurance. The fundamental concept underlying modern ambulatory surgery is that the care delivered to the day patient should be of the highest quality and equal, if not superior, to inpatient treatment. Why has the implementation of quality assurance been so slow? Firstly, problems relating to the methods of data collection remain to be solved and secondly what actually constitutes an indicator of quality needs to be defined. The development of appropriate indicators for day surgery should be an ongoing process. Above all quality assurance should not be confused with research.

In my opinion all those involved in day surgery including the IAAS still have a promotional job to do. The undoubted benefits of day surgery should be discussed with the Health Ministers of all countries, the World Health Organisation and the European Economic Commission. The move to day surgery will require constant promotion for some years to come. If the IAAS wishes to remain a vibrant association in the field of ambulatory surgery then ventures such as this book are to be recommended to global health authorities. One of the criticisms raised by several countries opposed to the IAAS, namely the formation of an international talking shop with no teeth, will be answered by the publication of this book and CD series. Certainly this publication deserves to be studied by both supporters and non-supporters of day surgery alike. Perhaps 100 years after the introduction of day surgery by Nicoll in Glasgow the subject may now be regarded seriously by all personnel involved in the training of future nurses, doctors and managers. At the very least day surgery with all its ramifications should be included in medical undergraduate curricula for after all day surgery is not only the surgery of today but the surgery of the future.

Education and relevant data collection are essential prerequisites for the expansion of day care. The IAAS would be failing in its duty if the above programmes were not implemented internationally. The Association should encourage doctors from every country to improve their efficiency and to monitor the outcome of their day programmes. Safety and quality factors will determine the further expansion of day facilities. Essentially day surgery is an organisational exercise and any expansion should be planned on the basis of programmes of audit, research and education.

Paulo Lemos is to be congratulated for gathering together such an excellent group of experts in day surgery. The contents of this worthwhile book will definitely highlight the importance of the IAAS in the further development of the subject. I warmly congratulate the IAAS in this initiative and this book is a most suitable way of marking ten years of international co-operation in day surgery.

Tom W Ogg



# The development of ambulatory surgery and future challenges

Paul E M Jarrett, MA, FRCS and Andrzej Staniszewski, MD, PhD

## Introduction

To understand history is to begin to understand the future. This chapter explores the beginnings of modern day surgery and via its growth and advantages looks at how it can develop in the future. But, as in the past, barriers exist to its expansion and these are examined. Many of the subjects touched upon are discussed more fully in later chapters.

It is worth making clear at the outset that the terms ‘day surgery’ and ‘ambulatory surgery’ are synonymous. ‘Outpatient surgery’ equates to these two terms in some countries, but in others is used in a totally different context. Terminology is fully explained in Chapter 2.

## History

At the turn of the 20<sup>th</sup> century, the foundations for modern day surgery were laid by James Nicoll (1864 – 1921) [1] with his work at the Sick Children’s Hospital and Dispensary in Glasgow, Scotland. He operated on a large number of children for conditions such as hernias, phimosis, mastoid disease, cleft palate, talipes equinus and spina bifida on a day basis. In 1909 he reported, in the British Medical Journal, the overall success of day surgery treatment in 8,988 paediatric cases [2].

Following this, little or no immediate progress was made in day surgery in the UK due to the attitude of the medical establishment. This was reflected in an editorial in the British Medical Journal in 1948 [3] which stated that ‘any surgeon who allows a patient to leave hospital within 14 days of an abdominal operation (this would include hernia repair) would be in a difficult position should complications occur’. Progress was made in 1955 when Farquharson, working in Edinburgh, promoted early ambulation and reported the results of adult day case hernia repair in the Lancet [4].

In the 1950s and early 1960s some individuals around the world undertook day surgery. But Nicoll’s concept of a purpose designed day unit was not taken up until 1962 with the development of a hospital based ambulatory surgery unit at the University of California at Los Angeles, USA [5]. Other units in the USA were opened in 1966 at George Washington University [6] and in 1968 in Providence, Rhode Island. The freestanding nature of Nicoll’s unit was not replicated until Reed and Ford opened their Surgicenter™ in Phoenix, Arizona in 1969 [7].

A gradually increasing number of day units, particularly in the USA, Canada, the UK and Australia, were opened in the 1970s and 1980s. These spawned a series of papers in medical journals on the benefits of day surgery, the range of procedures it could encompass and how it should be undertaken. Prompted by these, various national studies on day surgery were published. Varyingly, they looked at the quality, cost effectiveness and safety of day surgery, standard setting and the organisation and implementation of day surgery. Early publications include those by the Orkand Corporation in the USA [8], the Royal College of Surgeons of England [9] and the Audit Commission [10, 11] in the UK and the Royal Australasian College of Surgeons in Australia [12]. Such publications continue today. The latest ones in the UK concentrate on good practice and increasing the amount of day surgery [13, 14, 15, 16].

With the growth of day surgery, groups of enthusiasts came together to form associations to promote quality standards, expansion, education and research in this field. The first of these was the Society for the Advancement of Freestanding Ambulatory Surgery Centers (FASC), now known as the Federated Ambulatory Surgery Association (FASA), which was founded in the USA in 1974. In 1995, 12 national associations agreed to form and become members of the International Association for Ambulatory Surgery (IAAS). This association now has members from 24 countries and 1 international member (SAMBA). The IAAS is a multidisciplinary association involving surgeons, anaesthetists, nurses and managers and a similar approach is taken by most of its member associations. The view is that team working is essential for the greatest success in day surgery. Some early national and international day surgery associations are listed in Table 1.

## Day surgery growth

Over the last 25 years day surgery rates have steadily increased in many countries. From 1985 to 1994 the percentage of elective surgery undertaken on a day basis in the USA increased from 34% to 61% and in the UK from 1989 to 2003 from 15% to 70%. In Andalusia, Spain there was a six and a half times increase in the number of day case procedures between 1993 and 2003. Total day case figures, however, cannot be taken at face value or easily compared as some include 23 hour stays (e.g. USA) and others include some office procedures (e.g. UK). It is better to look at the changes in day surgery rates for individual procedures or groups of procedures. In Denmark for the IAAS basket of cases (see Chapter 2) day case rates have increased from 41% in 1994 to 79% in 2005. Another indicator of day surgery growth is to look at the increase in the number of day units. Freestanding ambulatory surgery centres have increased in the USA from 67 in 1976 to over 4,000 in 2004 and in Australia from 83 in 1993 to 234 in 2002 (see Chapter 13).

Table 1 Day (Ambulatory) Surgery Associations

Country	Name	Formed	Website
USA	Federated Ambulatory Surgery Association (FASA)	1974	www.fasa.org
USA	Society for Ambulatory Anesthesia (SAMBA)	1984	www.sambahq.org
UK	British Association of Day Surgery (BADs)	1990	www.bads.co.uk
Germany	Bundesverband für Ambulantes Operieren e.V. (BAO)	1992	www.operieren.de
France	Association Française de Chirurgie Ambulatoire (AFCA)	1994	www.afca-iaas.org
Spain	Asociación Española de Cirugía Mayor Ambulatoria (ASECMA)	1994	www.asecma.org
Netherlands	Nederlandse Vereniging voor Dagbehandeling en Kort verblijf (NVDK)	1994	www.nvdk.org
Australia	Australian Day Surgery Nurses Association (ADSNA)	1995	www.adsna.info
International	International Association for Ambulatory Surgery (IAAS)	1995	www.iaas-med.org
Australia	Australian Day Surgery Council (Committee from 1989 – 1996)	1996	www.surgeons.org/wedo
Belgium	Belgium Association of Ambulatory Surgery (BAAS)	1996	www.baas.be
Denmark	Dansk Selskab for Dak-Kirurgi (DSDK)	1996	www.dsd.dk
Italy	Federazione Italiana Day Surgery (FIDS)	1996	
Portugal	Associação Portuguesa de Cirurgia Ambulatória (APCA)	1998	www.apca.com.pt
Poland	Polskie Towarzystwo Medycyny i Chirurgii Ambulatoryjnej	1999	
Sweden	Swedish Day Surgery Association	1999	www.dagkir.nu
Hong Kong	The Hong Kong Association of Day Surgery	1999	



The growth in day surgery has occurred as the benefits of this form of treatment have been increasingly perceived by the medical profession, politicians, healthcare funders and patients. The process has been facilitated by developments in surgery (e.g. less invasive procedures), anaesthesia (e.g. the laryngeal mask, propofol, new halogenated gases) and analgesia (e.g. non-steroidal anti-inflammatory drugs). The increase in day surgery has been uneven. There are large variations in day surgery activity between countries (see Chapter 2) and in countries between hospitals. An example of the latter is that in 2003 – 2004 the overall rate for day case inguinal hernia repair in England and Wales was 42% but activity in individual hospitals ranged from 5% to over 90%.

## Advantages of day surgery

Day surgery has many advantages for patients and their families, hospitals and the healthcare system as a whole [17, 18, 19, 20, 21].

### Advantages for patients

Day surgery is particularly suited to providing patient centred treatment [22]. In a self contained day unit, the day surgery patient is the centre of attention and receives more personalised care than if an inpatient and amongst more seriously ill patients [23]. Patients operated on in well managed day surgery units (see Chapters 7 and 11) receive treatment that is better suited to their needs allowing them to return home on the day of surgery and recover in a familiar home environment [22]. They can continue with their routine medication as before surgery, avoiding problems that may arise from prolonged hospitalisation (e.g. diabetic inpatients are often unnecessarily switched from their oral drugs to insulin or drug doses may be missed, delayed or duplicated by hospital staff) [24].

Day surgery is not associated with complication rates in excess of those encountered following inpatient surgery. Readmission rates [20, 25] and contacts with the primary and community healthcare teams [26] are no greater than for the same procedures undertaken as an inpatient. There is less post-operative pain and also a reduction in the risk of thromboembolism associated with early ambulation [12]. Hospitalisation poses the risk of exposure to infections and may also keep patients bedridden longer than is necessary. Day surgery, on the contrary, reduces the risk of cross-infection simply because day cases are separated from sicker patients, spend less time in hospital and recover in their own home [17, 27]. The incidence of post-operative wound infection in day surgery patients is generally very low. Methicillin resistant staphylococcus aureus (MRSA) infections are an increasing problem in inpatient surgery but in day surgery even if infection does occur, it usually responds rapidly to antibiotics [19]. Day surgery outcomes are at least as good as those for inpatient surgery (see Chapter 12).

Day surgery is less stressful for patients than inpatient surgery. This is especially true for children who are separated from their parents for as short a time as possible [28]. The European Charter of Children's Rights states that 'children should be admitted to hospital only if the care they require cannot be equally well provided at home or on a day basis' [29]. The elderly who are more prone to disorientation when removed from their familiar home environment for any length of time also benefit from day surgery [30]. Apart from less anxiety for patients, there is also less stress for their relatives. For example, parental satisfaction following paediatric day surgery is particularly high [11, 31, 32].

Patient satisfaction rates following day surgery are high [11, 33, 34, 35, 36, 37, 38] and the vast majority of those who have had the same procedure both as an inpatient and a day case prefer the latter form of treatment [39]. Most people would rather recover from surgery in the comfort of their own homes than in hospital.

With increasing centralisation of inpatient secondary care, day surgery facilities are often closer to patients' homes making treatment in these more convenient. For patients' relatives, a saving in time, travel and sometimes in accommodation needed to visit a patient in hospital are obvious benefits [12].

Scheduling for ambulatory surgery is easier and registration less complicated. Day surgery patients can choose a firm time and date for their operation in the knowledge that it will not be cancelled at the last minute due to unexpected emergency admissions as may happen with inpatient surgery. Thus, day surgery provides the least possible disruption to patients' lives. The recovery following day surgery has been shown to be quicker than following inpatient surgery allowing patients to return to normal activities, family life and work sooner [40, 41, 42].

## **Advantages for hospitals**

Because the risk of last minute cancellations is minimal in dedicated day surgery facilities, hospitals can manage elective surgery more efficiently. This allows more accurate scheduling than for inpatient work and makes more effective use of staff and facilities alike. In nationalised healthcare systems particularly, this facilitates the implementation of booking systems and greater patient choice [43].

In North America and many Western European countries there is a shortage of qualified nurses. Moreover, the average age of registered nurses is increasing being 45 years in the USA in 2000 and 41 years in the UK in 2003. The lack of the need for night and weekend nursing cover makes work in the day unit attractive to nurses with families and, perhaps more importantly, results in greater surgical productivity per nurse. The day unit with its

fixed schedules and hours is also an ideal place for part time nurses to work. Day surgery nurse retention is better than that for inpatient nurses.

By moving work to a self contained day unit, inpatient beds can be released for new more major surgical cases or other medical usage, or they can be closed with consequent savings [43].

Day surgery is cost effective compared with inpatient surgery as hospitalisation time is reduced, night and weekend staffing is not required, the hotel element of treatment is removed and capital facilities and staff are used more intensively and effectively. Dependent on the particular procedure and its inpatient and day care management, average unit cost savings of between 10% and 70% have been documented when day care is substituted for inpatient care [9, 10, 36, 41, 44, 45, 46, 47].

Secondary care providers with self contained day units can improve patient throughput [43], reduce waiting lists [48] and provide an enhanced patient service in a cost effective manner.

## **Advantages for healthcare funders**

All healthcare budgets are under pressure due to increasing patient demands, the introduction of new treatments and an ageing population. Day surgery allows purchasers (governments, insurers, health authorities or individual patients) a way of containing costs whilst obtaining high quality, accessible and effective treatment.

## **The future**

The benefits of day surgery expounded in the previous section are strong arguments for an increase in day surgery rates in the future. How can this be achieved? Perhaps the most obvious way is for all countries and all hospitals in each country to achieve the activity rates of the present top quartile of performers. To attain this requires pressure from the purchasers of surgical treatment either in the form of targets for activity or in setting appropriate tariffs for procedures. In the UK, in the public healthcare sector, the Department of Health has set a target of 75% of all elective operations to be undertaken on a day basis by 2008 [49]. They are aware that this percentage should only include 'true day surgery' procedures and not outpatient procedures [43]. In 2005, the Department of Health introduced national tariff rates for procedures which, where relevant, are set between the cost of inpatient and day care treatment [43]. In the USA, insurers will only provide reimbursement for certain procedures at day case rates unless inpatient treatment is well justified.

Advances in techniques and methods will allow more surgical conditions to be treated on a day basis in the future. Laser prostatectomy [50] and plasma kinetic vaporisation of the prostate [51] are examples of new techniques used in an established procedure that facilitate day treatment.

The introduction of minimally invasive surgical procedures resulting in less tissue damage and post-operative pain has increased the potential for day surgery. Laparoscopic procedures are a good example. The gynaecologists introduced these to the day unit undertaking first diagnostic laparoscopy [52] and then other laparoscopic procedures such as tubal ligation, adhesiolysis, salpingostomy, ovarian cystectomy and laser ablation of endometriosis. In general surgery, laparoscopic cholecystectomy is becoming a standard day case procedure [53, 54, 55]. Other day case general surgery endoscopic procedures include hiatus hernia repair [56], inguinal hernia repair [57] and splenectomy [58]. Of course, endoscopic and minimally invasive are not synonymous. Operations undertaken through small incisions are also minimally invasive. For example, mini-lap cholecystectomy has been undertaken on a day basis [59]. More recently total hip replacement using a new technique and small incisions is beginning to become a day case [60] as are procedures for female urinary incontinence [61].

Some totally new approaches to surgical problems have facilitated a move to day treatment. For example, day case angioplasty with or without stenting has replaced many inpatient open arterial procedures. In the future elective stenting of some abdominal aortic aneurysms may well be possible in the day unit.

The move from inpatient to day surgery may not require any change in technique but rather a change in attitude of surgeons. There is, for instance, no reason why patients should not return home with a catheter or drain in situ. Modern catheters are less irritating than in the past and modern small plastic vacuum drains cause little inconvenience [62]. By changing attitudes many more urology procedures can become day cases [51]. Equally, day case parotidectomy [63] and thyroidectomy [64] are possible even if the surgeon wishes to leave a drain in position.

The surgical horizons for day procedures are ever widening, but the move from inpatient work to day surgery should not be the only aim. Benefit also accrues to health provider and patient alike by moving day surgery work to the outpatient department. For example, diagnostic arthroscopy has increasingly been replaced by magnetic resonance imaging in recent years. The number of day case arthroscopies in England and Wales fell by 30% from 1994 to 2004. Similarly, hysteroscopy, originally undertaken in the day unit is now more commonly performed in the outpatient department [65]. There is little doubt that diagnostic colonoscopy will be replaced by outpatient computed tomographic and magnetic resonance imaging in the next few years [66, 67, 68]. So, day surgery will lose some of its procedures to the outpatient department and gain others from the inpatient department.

New approaches and developments in anaesthesia and analgesia will, as they have in the past, allow a greater range of patients to be treated on a day basis. The increasing use of local anaesthesia both as infiltration and as blocks, has not only improved analgesia for the first postoperative hours, but has also allowed some American Society of Anesthesiologists (ASA) grade III and IV patients to be treated in the day unit. Carotid endarterectomy, inguinal hernia repair [33], subacromial decompression [69] and cataract surgery [70] are just a few examples of procedures routinely carried out under local anaesthetic as day cases when only a few years ago many would routinely have been performed under general anaesthetic as an inpatient. By using suitable selection procedures and protocols, experienced day case anaesthetists will treat on a day basis many patients with intercurrent chronic conditions such as asthma and insulin dependent diabetes. Increasingly, because of the different skills required, anaesthetists are specialising in day surgery anaesthesia. Such specialised day surgery anaesthetists are critical to the expansion of day surgery in the future.

But no single group can work in isolation. To be successful and to grow, day surgery requires team working between all those involved – surgeons, anaesthetists, nurses, managers, technical staff and clerical staff. Unity in selection, patient advice, discharge protocols and general management are essential if patients are to feel confident and relaxed. Conflicting advice or information from different members of staff to individual patients leads to disaster.

The full future potential for day surgery will only be realised if adequate facilities are provided for its practice. The ideal day unit in terms of throughput, cost effectiveness and quality of treatment is one that is self contained [8, 10]. That is, it has in one defined area, its own operating theatres, ward area, consulting rooms, waiting area, reception, office space and entrance as well as its own dedicated nursing and management staff. Such units may be on the site of a secondary care hospital or freestanding away from a hospital site (see Chapters 3 and 13). Recently, sophisticated mobile operating theatres and wards on lorries have been developed in the UK by Vanguard Healthcare and been used in the UK and Australia. They can bolster permanent day units at times of peak demand and bring day surgery on a part time basis to outlying areas. The flexibility of these units together with their mobility allows a maximum return on investment and will further boost day surgery growth in years to come.

Hospital hotels, common in Scandinavia and the USA, allow patients excluded from day surgery because they live a distance from the day unit, they live alone or they live in inadequate housing to avoid inpatient surgery and have their surgery on a day basis. Post-operatively they recover in the warm and friendly non-nursed environment of the hotel where they are cared for by a surrogate relative. To the healthcare funder this approach is cost effective compared to inpatient care [71] and it makes day surgery available to more patients.

The day unit in the future will not be solely surgical: it will also undertake medical day care such as stabilising diabetes, intensive investigation, chemotherapy, venesection, blood transfusion, pain control, invasive radiology, etc. In reality few medical patients require, or get as an inpatient, active nursing or medical treatment during the evening or at night. What is more, there is a downside for medical inpatients. The elderly become disorientated, there is a risk of acquiring MRSA infection and drug stabilisation in hospital does not equate to what is required for a normal life in the community. They would benefit, where possible, from being day patients. As their non-medical management requirements are the same as those for surgical day patients it makes sense to combine medical and surgical facilities to form a day hospital. In the future, secondary care will, and indeed should, be divided into three ring fenced sections namely day care, elective inpatient care and emergency care (inpatient and emergency room).

The developments mentioned will greatly increase the potential for day surgery growth in the future. Most will be discussed in greater detail in later chapters.

## **Barriers to day surgery growth**

Despite the future possibilities for day surgery, there remain many barriers to its growth.

Historically, the attitude of consultants has slowed day surgery development. This remains a major problem in some countries. Despite the evidence in the literature [8, 20, 25] some believe that day surgery is unsafe. Others are not prepared to undertake the extra work and responsibility involved in the management of day surgery patients: the easy option is to treat patients on an inpatient basis. In many cases, consultants fear the loss of the inpatient beds they control regarding this as a loss of their power base. Primary care teams may fear a growth in day surgery believing it will increase their workload though this is unfounded [26]. With education and the correct financial strategies these attitudinal problems can be minimised.

Unfortunately, many countries have inappropriate healthcare funding. Some do not encourage day surgery growth and others actually discourage it. Block funding of hospitals, unrelated to the number of patients treated and the number and type of procedures undertaken (common in nationalised healthcare systems 20 years ago and still persisting to a greater or lesser extent in some countries today) does not stimulate change. The old, and to a degree persisting, system in central and eastern Europe of funding according to the number of beds a hospital has or the number of bed days patients stay in hospital positively discourages day surgery development. Indeed, the latter system actually encourages prolonged inpatient stays! In some countries the reimbursement for procedures undertaken on a day basis is so low compared to inpatient treatment that day surgery leads to financial loss. This is the position in Germany where

day surgery procedures fell from 3,836,656 in 1999 to 3,744,430 in 2000. Payment for listed procedures only at day surgery rates unless inpatient treatment can be justified (the USA system) or at rates between those for day surgery and inpatient surgery set to account for accepted day surgery percentages (the new UK system) are two ways to remove financial barriers to day surgery.

In most countries, to affect day surgery growth there needs to be political will. Some governments fear that a move to day surgery will lose them votes stating that patients expect a stay in hospital following surgery. They are unwilling to put the effort into educating patients into the benefits of day treatment. Pressure from hospital managers and doctors to maintain the status quo is a potent political force in some countries. Managers benefit financially from controlling large inpatient hospitals with large budgets. Doctors may benefit in one of two ways. Firstly, some believe that they gain prestige and power from being in charge of large inpatient units. Secondly, in some countries doctors and other staff are poorly paid and they rely on black market incomes where cash is passed to them for treatment received – ‘envelope system’ [72]. A move to day surgery would adversely affect this hidden income. Here, the solution would seem to be to increase the pay of healthcare workers. But this would increase the costs to the healthcare funder possibly eating up the savings from a move to day surgery. The resulting benefit would thus be one of governance and legality rather than financial.

Lack of adequate facilities in which to perform day surgery can also be a barrier to its growth. In Spain, for example, only 15% of hospitals have autonomous day units.

In a number of countries (e.g. Serbia, the Slovak Republic, Egypt) where negligible day surgery is undertaken in the public sector and there are funding or other barriers to its development, day surgery is growing in the private sector where patients pay for their treatment. This should prove to governments in these countries that day surgery is cost effective and act as a stimulus for funders to re-think their attitudes to day surgery. An example is in Bratislava, the Slovak Republic, where there are three thriving private, speciality freestanding day units dealing with ophthalmology, orthopaedics and gynaecology yet no day unit in government hospitals. However, some progressive senior civil servants and doctors are looking at these as models to be replicated in government hospitals. Indeed, a little government insured work is now being placed with these private units.

## Conclusion

The advantages of day surgery are clear and well documented. With notable exceptions (e.g. Germany, Japan) it has steadily and significantly grown, albeit at different rates, over the last 25 years in the G8 countries and other countries with established stable economies (e.g. Australia, Denmark, Spain). Countries with strong emerging economies

such as China (excepting Hong Kong) and India, old Eastern Bloc countries, countries with weak economies in Africa, Asia and South America and Middle Eastern countries have yet to grasp the benefits that day surgery can bring to their healthcare systems. The reasons for this include political ignorance and weakness, corruption [73] and medical conservatism and protectionism. However, in the longer term there is no doubt that no country, rich or poor, will be able to resist a move to day surgery because of the economic benefits combined with quality treatment that accrues from this approach. In the not too distant future, the question will not be ‘Can this patient be treated on a day basis?’ but ‘Why cannot this patient be treated as a day case?’ Day surgery rather than inpatient surgery will become the norm for elective surgery.

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# International Terminology in Ambulatory Surgery and its Worldwide Practice

Claus Toftgaard, MD, MPM and Gerard Parmentier, PhD (Econ.)

## Suggested international terminology and definitions

### Why is there a need for internationally recognized terminology and who should define it?

The International Association for Ambulatory Surgery (IAAS) has members originating from some twenty different countries and gathers participants from some fifty countries at its International Congresses.

At the inception of the Association in 1995, founding members defined in their “Opening Statement of the Founding Members” the “specific character of the concept of ambulatory surgery”:

*«...ambulatory surgery refers to surgical or diagnostic interventions, currently performed with traditional hospitalisation, that could, in most cases, be accomplished with complete confidence without a night of hospitalisation. Among other things, these procedures require the same technically sophisticated facilities as when done on an inpatient basis, rigorous pre-operative selection procedures and post-operative follow-up of several hours.*

*Terms used to express the concept are: ambulatory surgery, major ambulatory surgery, day surgery, ambulatory anaesthesia.*

*Modern day surgery is not simply a shortened hospital stay or an architectural model. Rather, it is a complex, multifaceted concept involving institutional, organizational, medical, economic and qualitative considerations.»*

Except for the requirement of “post-operative follow-up of several hours”, this opening statement has not lost any of its value, nor has the emphasis placed, since the beginning, on the specificity of its concept. During the 1990s many countries developed their own definitions and terminology for ambulatory surgery. For three main reasons the IAAS believed that consistent internationally accepted terminology should be developed. These reasons are:

- Potential benefits from ambulatory surgery are so important that we have to ensure proper conditions for its development. Because of its innovating character, progress

in ambulatory surgery takes a long time and is vulnerable. Understanding and defining the concept is a key to success.

- The need to compare practices, the upcoming of evidence based medicine, the wish of countries to make quality healthcare available to all, make it highly desirable to have benchmarking tools. The first condition for doing so is for everyone to give the same meaning to the same words.
- Specific audiences need standard definitions for their work and are asking for rationalization. Only an international organization can bring together the necessary expertise from a number of countries to achieve this.

*"Providing affordable, accessible, and quality health care is one of the greatest challenges to society"* was also mentioned in the IAAS opening statement. Ambulatory surgery is not an invention, it is an innovation, and experience shows us that this is an essential difference. Whatever its benefits, an innovation can perish, its survival and development dependent on respecting the conditions of its implementation. This is what makes it distinct from an invention. An invention asserts itself by its own merits, and creates naturally, if need be, its own organisations, its own terminology and its own conditions of production. An innovation is at its beginning challenged and even denied its specificity. For example, until the end of the 1990s, ambulatory surgery was prohibited in the public hospitals in Germany. In France it was necessary that the National Insurance Company (CNAM) publish the results of an enormous investigation into 35.000 cases to prove that ambulatory surgery had the same advantages as found everywhere else. All the pioneers ran up against the same difficulties in their hospitals. Wallace Reed said in 1970, he had founded his freestanding centre in Phoenix, Arizona to escape from the "hospital bureaucracy" which prevented innovation. Innovation consists of a new way of doing things. Therefore it must make sure that the words that characterise it are well understood. Hence the importance of international agreement on the content of its concept and thus on the vocabulary used. The distinction invention-innovation is not only semantic. A good understanding of the innovative nature of ambulatory surgery justifies the implementation of specific policies with proper incentives and is a necessary condition for the adequacy and efficiency of these policies. Conversely it makes it possible to explain the failures of measures which health authorities believed to be stimulating and which proved to be ineffective. It is a fact that to focus the organization of hospitals on patients rather than on professionals is a true change of paradigm. This change is difficult. The cost of change in hospitals is felt by many as greater than the cost of inefficiency. The quality of attention given to patients and the competence of professionals cannot compensate for the deficiencies of the organization. The fundamental change mentioned here results in different organizations in accordance with local contexts, but it is bringing significant progress everywhere. The effort put into clarification is thus justified everywhere.

Many countries worked on their own definitions of ambulatory surgery which were influenced by local practices. Some supplemented the name with adjectives which to them could not be dissociated. The Spanish speak of “major” ambulatory surgery, the French of “qualified and substitute” ambulatory surgery, of “alternative to hospitalization”. Many had their terminology ratified by consensus conferences. There were various approaches, but all countries and all professionals devoted to developing ambulatory surgery wished to define the concept precisely with a view of making it distinct from others.

However, the national definitions and terminologies were not always compatible one with the other and thus not always interchangeable. This led to confusion in the literature and errors in interpretation. To compare practices in different countries international homogenisation of definitions and terms was required. The Organisation for Economic Co-operation and Development (OECD) asked the IAAS to do this in the 1990s and later these two organisations worked together on international comparisons of ambulatory surgery activity [1,2]. Clarity of meaning was also required by translators and interpreters as well as health policy makers in individual countries. As in many fields, a country's policy makers are often convinced more by foreign examples than by enthusiasts in their own country. Of course, the prioritisation of the benefits of ambulatory surgery varies between countries but a meaningful interpretation of these cannot be undertaken without internationally agreed and unified definitions of the terms in this approach of treatment.

The first proposal for unifying international terminology was put forward by Roberts and Warden in 1998 [3]. This was placed before the IAAS members in the same year for comment and modification. Retaining as the standard the definitions in English, each member was asked not only to translate these into their own language, but also to match their national terminology to that of the standard English version. The associations of 10 countries (Denmark, France, Germany, Hong Kong, Italy, The Netherlands, Norway, Poland, Portugal and Spain) completed this work and the document in 11 languages was agreed by the IAAS at the end of 1999.

The document defines 17 words/phrases together with synonyms. The English version is shown in Appendix A. Versions in the other languages may be obtained from the IAAS. Work still needs to be done to incorporate translations and commentaries in other languages and to sub-define the translations in any one language. For instance, the terminology in English is not identical in the United Kingdom (UK), the United States of America (USA), and Australia or in French in France, Belgium, Switzerland and Quebec.

The definitions are the result of international negotiation between the member organisations of the IAAS and thus the fruit of compromises which took a long time to be agreed. However, it was agreed that the terms already in established use should be kept despite the fact that some were ambiguous and, as words, did not precisely describe the activity they were attached to. For example, “ambulatory” has a Latin origin from “to walk” or

“promenade” and “day” can mean 24 hours or “the period when it is light” whereas both are used with “surgery” to describe the concept of a patient being admitted, operated on and discharged during the space of one working day. The term “outpatient” was the most problematic, meaning many different things in different countries. For instance, in the USA outpatient surgery can be synonymous with ambulatory surgery but in the UK this is not the case and an outpatient procedure is one undertaken in a doctor’s consulting room or office without the need for an operating theatre. Work still needs to be done on finally agreeing interchangeable meanings for “outpatient” between countries.

Short stay was included in the definitions though it was recognised that it does not differ in organisation or professional culture from that of an inpatient stay whereas ambulatory surgery changes both of these and is therefore fundamentally distinct from both inpatient and short stay surgery. The short stay concept is basically one for statistical reporting by health authorities.

Office-based surgery (OBS) was included in the definitions. However, it should be understood in the context of two opinions. One was expressed by the IAAS Executive Committee in 1999 and stated that:

*«The IAAS is aware of an increase in office-based surgery and it will advise its members and others who may seek its advice that suitable national safety guidelines should be in place before they embark on any OBS programme. Furthermore the IAAS wishes to highlight the trend of escalating medical litigation and it aims to disassociate itself from any doctor, dentist, nurse or manager who may perform OBS without recourse to nationally agreed regulations.»*

The other was very clearly expressed in an editorial in “Ambulatory Surgery”, by three IAAS former Presidents under the title *«The time has come to promote true day surgery »*: *«an office facility ought to be equipped and staffed to the level of a day unit. Then de facto it becomes a freestanding day unit.»* [4].

This first attempt at international definitions should be of use to all who work in ambulatory surgery and it will facilitate international comparisons. It will need refining and updating in the future but hopefully, even in its present form, it will allow a more widespread understanding and development of ambulatory surgery.

## Worldwide practice of ambulatory surgery

### Introduction

In many developed countries, increasing the rate of ambulatory surgery is an important objective in order to maximise the utilisation of limited economic resources whilst still

providing high quality care for patients. In undeveloped countries, ambulatory surgery may be the only feasible treatment for a large number of surgical patients.

Thus, it is of interest for health authorities and health professionals to measure the rate of day surgery (as a percentage of all surgery and / or as a percentage of all elective surgery) in their country and to compare this with day surgery activity in other countries. Starting in 1994, the International Association for Ambulatory Surgery (IAAS) has gathered information on day surgery activity in individual countries. These figures can be used to demonstrate the changes in day surgery activity in individual countries and to make comparisons between countries [1].

Organisation and reimbursement systems have an influence on the behaviour of both patients and professionals in each country. Incentives may be very different and have an impact on the rate of day surgery. It is therefore important to understand the organisation and reimbursement systems in each country.

### **How to compare**

Ambulatory surgery covers a wide spectrum of surgical procedures, from minor procedures under local anaesthesia to major procedures under general anaesthesia, and embraces all surgical specialties.

It is undertaken in various settings in different countries. Procedures done in a hospital in one country may be done in a surgeon's office in another. Countries vary in the need to report all procedures undertaken in all types of facility.

Therefore, there are difficulties in comparing general data about ambulatory surgery between countries. In order to be able to identify trends, some typical procedures from each specialty have been deemed "index procedures" in order to benchmark the day surgery activity in one country against other countries and to monitor the changes over time within the different countries.

There are some problems doing this. One is the different coding systems used in different countries that make it difficult to be sure that comparisons of exactly the same procedures are made. Another problem can be the uniformity of nomenclature and the coding of procedures by surgeons, where there may be differences between surgeons even within one country. In order to make the data from different countries as uniform as possible, the usual surgical naming of a procedure has been combined with the international ICD9CM and the Nordic NCSP coding systems. Local coding systems could be used for clarification of the procedures.

IAAS international surveys have been conducted since 1994, by C. De Lathouwer in 1994-95 [1] and in 1996-97 [2], and by C. Toftgaard in 2004.



### **Selection of procedures**

In the first survey in 1994-95, 20 index procedures were chosen and the same procedures were surveyed in 1996-97. The number has been increased to 37 in the latest survey, since some procedures in the intervening seven years have become commoner as day surgery cases. In the first survey the central health authorities in 29 OECD countries were contacted for data retrieval but there were validity problems with the data, and not all OECD countries answered the questionnaire. Therefore, since the 1997 survey the IAAS representatives have been chosen to be the main source for data from each country on the basis that their professional knowledge and networks will be the best guarantee of valid data.

The procedures chosen for the 2004 international survey are mainly those that have been done in large numbers for a long time in day surgery together with some that are increasingly being undertaken on a day basis and “on the edge” in the development of ambulatory surgery (Table 1).

### **Organisation and reimbursement**

As a part of the questionnaire sent to all member countries in 2004, questions were asked about organisation and reimbursement as well as the source and completeness of the data (Table 2).

### **Results**

The survey data sheet was sent to the members of the IAAS in Australia, Belgium, Denmark, England, France, Germany, Hong Kong, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden and the USA, as well as to interested professionals in Finland, Iceland, Canada and Scotland.

Answers were obtained from all member countries (from Spain 6 individual regions) and from Finland, the province of Alberta in Canada and Scotland. The data from each country varied from very specific surgery numbers for each procedure to more overall numbers for day surgery. There was great variation in the details obtained about organisation and reimbursement. Therefore, the knowledge about organisation and reimbursement systems in different countries is not complete.

### **Details**

For each country or region details for day surgery were delivered. In Tables 3 to 20 the characteristic percentages drawn from the number of procedures from each country are illustrated. The complete data will be published in a paper in “Ambulatory Surgery”. The data shown here are the percentage of day surgery procedures for each procedure in the data sheet. Each of the procedures refers to the classification codes in the data sheet.

**Table 1** The data sheet for ambulatory surgery procedures

Cases	ICD9CM Coding	NCSP Coding	Number of ambulatory cases	Number of inpatient cases
Cataract	13.1 – 13.7	CJB – CJE		
Squint	15.0 – 15.9	CEB – CEW		
Myringotomy with tube insertion	20.01	DCA 20		
Tonsillectomy	28.2 – 28.3	EMB 10 – 20		
Rhinoplasty	21.8	DJ, DL		
Broncho-Mediastinoscopy	33.22 33.24, 34.22	UGC, GEA		
Surgical removal of tooth	23.1	EBA 10		
Endoscopic female sterilisation	66.2	LGA		
Legal abortion	69.51, 69.01	LCH00, LCH03		
Dilatation and curettage of uterus	69.02, 69.09	LDA00, LDA10, LCA10, LCA13, MBA00, MBA03		
Hysterectomy (LAVH)	68.51	LCD11		
Repair of cysto- and rectocele	70.5	LEF		
Knee arthroscopy	80.26	NGA11		
Arthroscopic meniscus	80.6	NGD01, NGD11		
Removal of bone implants	78.6	NBU, NCU, NDU, NFU, NGU, NHU		
Repair of deform. on foot	77.51 – 77.59	NH		
Carpal tunnel release	04.43	NDM09, NDM19		
Baker's cyst	83.39	NGM39		
Dupuytren's contracture	82.35	NDF02, NDF12		
Cruciate ligament repair	81.43, 81.45	NGE35, NGE36, NGE45, NGE46		
Disc operations	80.5	ABC		
Local excision of breast	85.21	HAB00, HAB10 HAB40, HAB99		
Mastectomy	85.4	HAC		
Laparoscopic cholecystectomy	51.23	JKA21		
Laparoscopic antireflux	44.64 – 44.66	JBC01		
Haemorrhoidectomy	49.43 – 49.46	JHB		
Inguinal hernia	53.0 – 53.1	JAB		
Circumcision	64.0	KGH10, KGH80		
Orchidectomy + -pexy	62.3 – 62.5	KFH00, KFH10, KFC		
Male sterilisation	63.7	KFD43, KFD46		
TURP	60.2	KED22		
Colonoscopy w/wo biopsy	45.23, 45.25	UJF32, UJF35		
Removal of colon polyps	45.42	JFA15, JFA17		
Varicose veins	38.5	PHB10 – PHB14, PHD10 – PHD15		
Bilat: breast reduction	85.32	HAD30, HAD35		
Abdominoplasty	86.83	QBJ30		
Pilonidal cyst	86.21	QBE10		

**Table 2 The complementary data sheet**

Data source:  
 Completeness of data:  
 Total number of surgical procedures in your country/region:  
 Total number of planned surgical procedures in your country/region:  
 Total number of emergency surgical procedures in your country/region:  
 Total number of day surgery procedures in your country/region:  
 How is the day surgery organised in your country/region:  
 How is the day surgery reimbursed in your country/region:  
 Your coding system:

**Table 3 Australia**

40.5 % of all surgery done as day surgery. 50 % of planned surgery.  
 74 % of the procedures in the survey "basket" done as day surgery.  
**Eye surgery:** 80% (squint), 89% (cataract)  
**ENT:** 4% (tonsillectomy), 48% (broncho/mediastinoscopy)  
**Gynaecology:** 0.1% (LAVH), 1.5% (cystocele), 86% (sterilisation), 89% (abortion)  
**Orthopaedics:** 2.1% (disc operations), 19% (foot operations), 81% (meniscus), 86% (carpal tunnel)  
**Surgery:** 0.3% (reflux), 2% (lap.chol.), 22.6% (hernia), 29.7% (pilonidal cyst), 62% (haemorrhoids)  
**Urology:** 1% (TURP), 95% (sterilisation)  
**Plastic surgery:** 8.8% (breast reduction), 9.8% (abdominoplasty)  
**Vascular surgery:** 20.5% (varicose veins)  
**Organisation:** Many freestanding ambulatory surgery centres. Day surgery units in both private and public hospitals. National list of procedures accepted as day surgery procedures.  
**Reimbursement:** Medicare (national health coverage system) and private insurance

**Table 4 Belgium**

30 % of all surgery done as day surgery. 43 % of planned surgery.  
 69 % of the procedures in the basket done as day surgery  
**Eye surgery:** 81 % (squint), 87% (cataract)  
**ENT :** 93.6 %(tonsillectomy), 24.9% (broncho/mediastinoscopy), 94.6 %(myringotomy)  
**Gynaecology.** 0.2% (LAVH), 79% (curettagage), 67.2% (sterilisation), 5.1 %(cystocele)  
**Orthopaedics:** 1.9% (disc operations), 79% (meniscus), 40.9% (foot operations), 93% (carpal tunnel), 14.7 % (cruciate ligament repair)  
**Surgery:** 0.1% (reflux), 1.2% (lap.chol.), 19.9 % (hernia), 29.1% (haemorrhoids), 33.6% (pilonidal cyst)  
**Urology:** 0.6 % (TURP), 97% (sterilisation), 88 % (circumcision)  
**Plastic surgery:** 0.9% (breast reduction), 4 % (abdominoplasty)  
**Vascular surgery:** 66% (varicose veins)  
**Organisation:** No freestanding units (except for eye surgery), all surgery within hospitals.  
**Reimbursement:** All reimbursement is public according to a coded rate. Rate for ambulatory surgery is equal to the rate for in patient surgery.

**Table 5** Canada (Province of Alberta only)

87 % of all surgery done as day surgery
83.8 % of the procedures in the basket done as day surgery
<b>Eye surgery:</b> 99.1% (squint), 99.4% (cataract)
<b>ENT:</b> 66.8% (tonsillectomy), 67.4% (broncho/mediastinoscopy), 99% (myringotomy)
<b>Gynaecology:</b> 0% (LAVH), 3.7% (cystocele), 99.3% (sterilisation), 99.8% (abortion), 80.6% (curettage)
<b>Orthopaedics:</b> 10.2% (disc operations), 72% (foot operations), 97.7% (meniscus), 99.5% (carpal tunnel)
<b>Surgery:</b> 1.3% (reflux), 43.9% (lap.chol.), 71.2% (hernia), 77.4% (pilonidal cyst) , 78% (haemorrhoids)
<b>Urology:</b> 1.2% (TURP), 58.3% (circumcision), 99.8% (sterilisation)
<b>Plastic surgery:</b> 50.8% (breast reduction), 39.9% (abdominoplasty)
<b>Vascular surgery:</b> 82% (varicose veins)
<b>Organisation:</b> Almost 100 % publicly delivered with only few private surgical facilities.
<b>Reimbursement:</b> Paid by the public via the tax and premium system.

**Table 6** Denmark

55.3 % of all surgery done as day surgery. 61 % of planned surgery.
79.3 % of the procedures in the basket done as day surgery
<b>Eye surgery:</b> 65% (squint), 98% (cataract)
<b>ENT:</b> 30% (tonsillectomy), 67% (broncho/mediastinoscopy), 81 (myringotomy)
<b>Gynaecology:</b> 3.1% (LAVH), 7.3% (cystocele), 90% (sterilisation), 97% (abortion)
<b>Orthopaedics:</b> 1.6% (disc operation), 72% (foot operations), 91% (meniscus), 78% (carpal tunnel)
<b>Surgery:</b> 6.1% (reflux), 18.8% (lap.chol.), 73% (hernia), 91% (pilonidal cyst), 82% (haemorrhoids)
<b>Urology:</b> 1.3% (TURP), 92.9% (circumcision), 99.8% (sterilisation)
<b>Plastic surgery:</b> 5.4% (breast reduction), 6.3% (abdominoplasty)
<b>Vascular surgery:</b> 89.3% (varicose veins)
<b>Organisation:</b> Almost all surgery done in public hospitals, but the private sector is growing. Some hospitals have separate day surgery units, others have day surgery incorporated in central OR's.
<b>Reimbursement:</b> Public according to a DRG system. Inducement by the growing number of procedures where the rate is the same for inpatients and day cases. Waiting time guarantee meaning that the payment goes to a private clinic if the waiting time in the public system is more than 2 months.

**Table 7**    **England**

62.5 % of the procedures in the basket done as day surgery
<b>Eye surgery:</b> 80% (squint), 90% (cataract)
<b>ENT:</b> 3.5 % (broncho/mediastinoscopy), 7% (tonsillectomy), 17% (rhinoplasty), 82% (myringotomy)
<b>Gynaecology:</b> 0.2% (LAVH), 1 % (cystocele), 70% (curettage), 84% (sterilisation)
<b>Orthopaedics:</b> 1% (disc operations), 28% (foot operations), 70% (meniscus), 88% (carpal tunnel)
<b>Surgery:</b> 3% (lap.chol.), 42% (hernia), 34% (pilonidal cyst), 18% (haemorrhoids), 86 % (colonoscopy)
<b>Urology:</b> 1% (TURP), 74% (circumcision), 97% (sterilisation)
<b>Plastic surgery:</b> 1% (breast reduction)
<b>Vascular surgery:</b> 54 % (varicose veins)
<b>Organisation:</b> National Health Service covering most of the work, but a growing private sector.
<b>Reimbursement:</b> Either via taxation in the public system or private insurance / self pay in the private sector.

**Table 8**    **Finland**

35 % of all surgery done as day surgery. 43 % of planned surgery
62.4 % of the procedures in the basket done as day surgery
<b>Eye surgery:</b> 91.5% (cataract)
<b>ENT:</b> 24% (tonsillectomy)
<b>Gynaecology:</b> 89% (sterilisation)
<b>Orthopaedics:</b> 50.8 (foot operations), 74% (arthroscopy), 81% (carpal tunnel)
<b>Surgery:</b> 10.3% (lap.chol.), 46% (hernia), 14.7% (haemorrhoids), 16.5% (breast excisions.)
<b>Urology:</b> 1.9% (TURP), 75% (circumcision)
<b>Vascular surgery:</b> 56.7% (varicose veins)
<b>Organisation:</b> Public responsibility (municipalities). Only a few private clinics. Most day surgery done within hospitals either as dedicated centres or integrated in inpatient units.
<b>Reimbursement:</b> The hospital is paid a fixed budget; private clinics are paid 60 % from a fixed limit. Patients themselves pay a small price per visit, per day (inpatient) or per day surgery.

**Table 9**    **France**

44.9 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 19% (squint), 45% (cataract)
<b>ENT:</b> 20% (tonsillectomy), 32% (broncho/mediastinoscopy), 90% (myringotomy)
<b>Gynaecology:</b> 0% (LAVH), 0% (cystocele), 5% (sterilisation), 87% (abortion), 45% (curettage)
<b>Orthopaedics.</b> 0% (disc operations), 2% (foot operations), 36% (meniscus), 79% (carpal tunnel)
<b>Surgery:</b> 0% (reflux), 0% (lap.chol.), 8% (hernia), 10% (pilonidal cyst), 6% (haemorrhoids)
<b>Urology:</b> 0% (TURP), 82% (circumcision.), 0% (sterilisation)
<b>Plastic surgery:</b> 1% (breast reduction), 1% (abdominoplasty)
<b>Vascular surgery:</b> 17% (varicose veins)
<b>Organisation:</b> Public within hospitals and private clinics (about 50 % each)
<b>Reimbursement:</b> The public pay all procedures according to a DRG system

**Table 10** Germany

37% of all surgery done as day surgery
60.7 % of the procedures in the basket done as day surgery
<b>Eye surgery:</b> 46% (squint), 42% (cataract)
<b>ENT:</b> 85.8% (broncho/mediastinoscopy), 18% (tonsillectomy), 61.4% (myringotomy)
<b>Gynaecology:</b> 1.3% (LAVH), 19.1 % (cystocele), 40% (curettage), 41.5% (sterilisation)
<b>Orthopaedics:</b> 4.2% (disc operations), 42.5% (foot operations), 32.5% (meniscus), 62.5% (carpal tunnel)
<b>Surgery:</b> 0.5% (lap.chol.), 6% (hernia), 99% (pilonidal cyst), 19.5% (haemorrhoids)
<b>Urology:</b> 3.2% (TURP), 53.6% (circumcision), 84.8% (sterilisation)
<b>Plastic surgery:</b> 3% (breast reduction), 40% (abdominoplasty)
<b>Vascular surgery:</b> 30.5% (varicose veins)
<b>Organisation:</b> Most day surgery done in private clinics. No inducement for the public hospitals to do day surgery.
<b>Reimbursement:</b> Payment by public insurance system. Very different payment in different regions.

**Table 11** Hong Kong

42.5 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 31% (squint), 53.5% (cataract)
<b>ENT:</b> 14.5% (broncho/mediastinoscopy), 0.7% (tonsillectomy), 60.7% (myringotomy)
<b>Gynaecology:</b> 14% (curettage), 51.8% (abortion.)
<b>Orthopaedics:</b> 6.8% (meniscus), 70.5% (carpal tunnel), 14.6% (arthroscopy)
<b>Surgery:</b> 5% (lap.chol.), 24.6% (hernia), 22% (pilonidal cyst), 38% (haemorrhoids)
<b>Urology:</b> 0.3% (TURP), 72% (circumcision), 17.6% (testis operations)
<b>Vascular surgery:</b> 4.8% (varicose veins)
<b>Organisation:</b> Mostly integrated in hospitals.
<b>Reimbursement:</b> Mostly paid by the government.

**Table 12** Italy

29 % of all surgery done as day surgery.
41 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 21% (squint), 62% (cataract)
<b>ENT:</b> 22% (broncho/mediastinoscopy), 15.7% (tonsillectomy), 50% (myringotomy)
<b>Gynaecology:</b> 1 % (cystocele), 33.5% (curettage), 22% (sterilisation)
<b>Orthopaedics:</b> 2.5% (disc operations), 20.5% (foot operations), 28.7% (meniscus), 73.5% (carpal tunnel)
<b>Surgery:</b> 1.6% (lap.chol.), 29.6% (hernia), 64% (pilonidal cyst), 16.6% (haemorrhoids)
<b>Urology:</b> 0.4% (TURP), 56% (circumcision), 58% (sterilisation)
<b>Plastic surgery:</b> 2.1% (breast reduction), 17.8% (abdominoplasty)
<b>Vascular surgery:</b> 40% (varicose veins)
<b>Organisation:</b> Most units integrated in hospitals, larger hospitals have dedicated units.
<b>Reimbursement:</b> Reimbursed per case using a DRG system. Same rate for inpatient and day cases for the same procedure. Each region can decide their own rate.

**Table 13 Netherlands**

49.6 % of all surgery done as day surgery. 58 % of planned surgery  
 69.8 of the procedures in the basket done as day surgery.

**Eye surgery:** 90% (squint), 92% (cataract)

**ENT:** 56% (broncho/mediastinoscopy), 64% (tonsillectomy), 98% (myringotomy)

**Gynaecology:** 0.5 % (cystocele), 69% (curettage), 93% (sterilisation)

**Orthopaedics:** 0.4% (disc operations), 27% (foot operations), 92% (meniscus), 95% (carpal tunnel)

**Surgery:** 2% (lap.chol.), 38% (hernia), 14% (pilonidal cyst), 53% (haemorrhoids)

**Urology:** 0.7% (TURP), 96% (circumcision), 97.5% (sterilisation)

**Plastica surgery:** 0.3% (breast reduction), 15% (abdominoplasty)

**Vascular surgery:** 69% (varicose veins)

**Organisation:** Day surgery is done in all hospitals including small private ones. In some public hospitals there are dedicated units, in others the activity is integrated.

**Reimbursement:** A budget system, where inpatient procedures are reimbursed 3-4 times higher than day surgery.

**Table 14 Norway**

48 % of all surgery done as day surgery. 60 % of planned surgery  
 68 % of the procedures in the basket done as day surgery.

**Eye surgery:** 50% (squint), 93% (cataract)

**ENT:** 27% (broncho/mediastinoscopy), 28% (tonsillectomy), 87% (myringotomy)

**Gynaecology:** 4 % (cystocele), 73% (curettage), 52% (sterilisation.)

**Orthopaedics:** 6% (disc operations), 61% (foot operations), 88% (meniscus), 83% (carpal tunnel)

**Surgery:** 12% (lap.chol.), 63% (hernia), 87% (pilonidal cyst), 73% (haemorrhoids), 6% (reflux)

**Urology:** 86% (circumcision), 99 (sterilisation), 38% (testis operations)

**Plastic surgery:** 54% (breast reduction), 53% (abdominoplasty)

**Vascular surgery:** 79% (varicose veins)

**Organisation:** Mostly integrated in public hospitals – in some as dedicated units. A few private clinics.

**Reimbursement:** Fee per case according to a DRG system paid by the national health service. The patients pay themselves a small fee for each procedure.

**Table 15 Poland**

Currently approximately 2% of all surgical procedures are performed on an outpatient basis.

**Eye surgery:** 4.7%

**ENT:** 0.9%

**Gynaecology:** 0.8 %

**Orthopaedics:** 0.56%

**Surgery:** 2.2%

**Urology:** 4.6%

**Organisation:** Mostly in hospital based units (18% in non-public hospitals, 82% in a public sector).

**Reimbursement:** The National Health Fund reimburses certain ambulatory surgery procedures, but it continues to offer financing that is limited and still insufficient. The possibility of providing additional (i.e. private) health insurance for individuals is being discussed.

**Table 16 Portugal**

10.7 % of all surgery done as day surgery. 14.6 % of planned surgery
18.5 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 29% (squint), 31% (cataract)
<b>ENT:</b> 9.2% (tonsillectomy), 15% (myringotomy)
<b>Gynaecology:</b> 34.8% (curettage), 23.5% (sterilisation)
<b>Orthopaedics:</b> 0.8% (disc operations), 1.8% (meniscus), 39% (carpal tunnel)
<b>Surgery:</b> 1.2% (lap.chol.), 14.9% (hernia), 28.8% (pilonidal cyst), 12.5% (haemorrhoids)
<b>Urology:</b> 41.9% (circumcision)
<b>Vascular surgery:</b> 13.3% (varicose veins)
<b>Organisation:</b> Only in public hospitals. Most of hospitals with integrated function, a few dedicated units. Only limited types of surgery may be done as day surgery.
<b>Reimbursement:</b> Based on a DRG system with substantially less payment for day cases than for the same inpatient procedures.

**Table 17 Scotland**

39 % of all surgery done as day surgery. 60 % of planned surgery
62 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 46% (squint), 42% (cataract)
<b>ENT:</b> 85.8% (broncho/mediastinoscopy), 18% (tonsillectomy), 61.4% (myringotomy)
<b>Gynaecology:</b> 1.3% (LAVH), 19.1 % (cystocele), 40% (curettage), 41.5% (sterilisation)
<b>Orthopaedics:</b> 4.2% (disc operations), 42.5% (foot operations), 32.5% (meniscus), 62.5% (carpal tunnel)
<b>Surgery:</b> 0.5% (lap.chol.), 6% (hernia), 99% (pilonidal cyst), 19.5% (haemorrhoids)
<b>Urology:</b> 3.2% (TURP), 53.6% (circumcision), 84.8% (sterilisation)
<b>Plastic surgery:</b> 3% (breast reduction), 40% (abdominoplasty)
<b>Vascular surgery:</b> 30.5% (varicose veins)
<b>Organisation and Reimbursement:</b> The same as mentioned under England.

**Table 18 Spain (6 regions: Andalucia, Aragon, Cataluna, Extramadura, Navarra, Pais Vasco)**

28% - 44 % of all surgery done as day surgery.
54 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 2.5%-69% (squint), 42%-90% (cataract)
<b>ENT:</b> 1%-42% (tonsillectomy), 1%-10% (broncho/mediastinoscopy), 0%-78% (myringotomy)
<b>Gynaecology:</b> 6%-50% (cystocele), 0%-73% (sterilisation), 0%-2.2% (abortion)
<b>Orthopaedics:</b> 0%-0.6% (disc operations), 3%-59% (foot operations), 6.5%-53.5% (meniscus), 13.5%-88% (carpal tunnel)
<b>Surgery:</b> 0%-11% (reflux), 0%-10.3% (lap.chol.), 6%-51.8% (hernia), 2.2%-42% (haemorrhoids)
<b>Urology:</b> 34%-94% (circumcision), 50%-98.9% (sterilisation)
<b>Plastic surgery:</b> 0%-1.8% (breast reduction), 0%-15% (abdominoplasty)
<b>Vascular surgery:</b> 19%-51.9% (varicose veins)
<b>Organisation:</b> Mostly integrated in public hospitals, some have dedicated units.
<b>Reimbursement:</b> Combination of general budget and payment per case.



**Table 19 Sweden**

50 % of all surgery done as day surgery
66.7 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 65% (squint), 97% (cataract)
<b>ENT:</b> 14.3% (tonsillectomy), 48% (broncho/mediastinoscopy), 80% (myringotomy)
<b>Gynaecology:</b> 1.4% (LAVH), 1.7% (cystocele), 80.6% (sterilisation), 92% (abortion), 60.2% (curettage)
<b>Orthopaedics:</b> 0.6% (disc operations), 45% (foot operations), 93% (meniscus), 79% (carpal tunnel)
<b>Surgery:</b> 0.9% (reflux), 11% (lap.chol.), 68.9% (hernia), 92 % (pilonidal cyst), 79.6% (haemorrhoids)
<b>Urology:</b> 1.3% (TURP), 89% (circumcision), 98.7% (sterilisation)
<b>Plastic surgery:</b> 4.2% (breast reuction), 5.5% (abdominoplasty)
<b>Vascular surgery:</b> 80.8% (varicose veins)
<b>Organisation:</b> Almost exclusively public hospitals with integrated or dedicated units.
<b>Reimbursement:</b> As in Finland and Norway patients pay a minor amount of money to attend. The rest is paid by the public tax system according to a DRG system.

**Table 20 USA (Medicare)**

83.5 % of the procedures in the basket done as day surgery.
<b>Eye surgery:</b> 85% (squint), 99.7% (cataract)
<b>ENT:</b> 89.2% (tonsillectomy), 34% (broncho/mediastinoscopy), 98.6% (myringotomy)
<b>Gynaecology:</b> 19.5% (LAVH), 20.5% (cystocele), 90.2% (sterilisation), 82.5% (abortion), 85% (curettage)
<b>Orthopaedics:</b> 5.7% (disc operations), 95.2% (foot operations), 96.7% (meniscus), 97.3% (carpal tunnel)
<b>Surgery:</b> 31% (reflux), 49.8% (lap.chol.), 84.1% (hernia), 91.6% (pilonidal cyst), 95.8% (haemorrhoids)
<b>Urology:</b> 23.1% (TURP), 88.5% (circumcision), 94.8% (sterilisation)
<b>Plastic surgery:</b> 80.6% (breast reduction), 24.1% (abdominoplasty)
<b>Vascular surgery:</b> 88.2% (varicose veins)
<b>Organisation:</b> A large number of private, freestanding units. Public hospitals doing a smaller amount of day surgery.
<b>Reimbursement:</b> The data represents only Medicare data, which is a private insurance system paying a fixed rate based on a DRG system for each procedure. People who are not able to be insured have a public payment system.

### Other countries

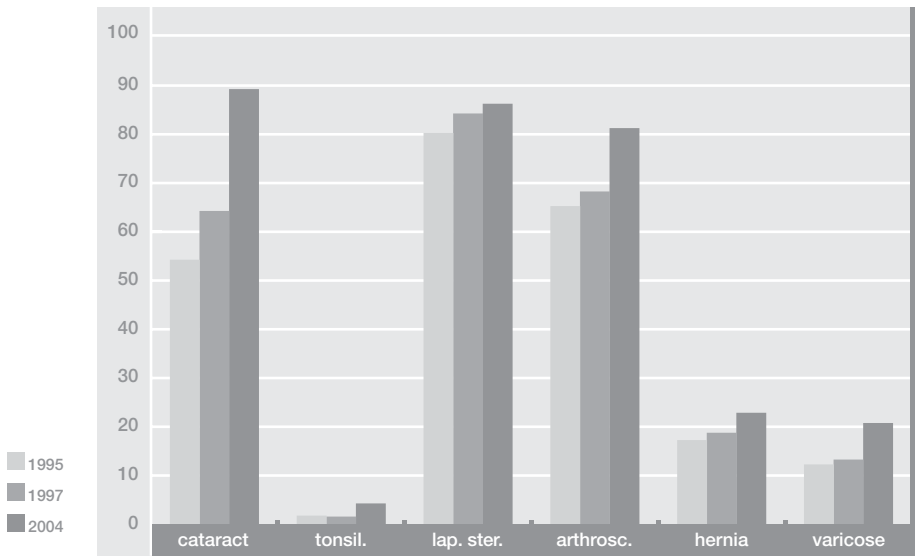
Day surgery is undertaken to some extent everywhere, but there is very little information about the level of day surgery in countries other than the member countries of the IAAS.

### What is the trend?

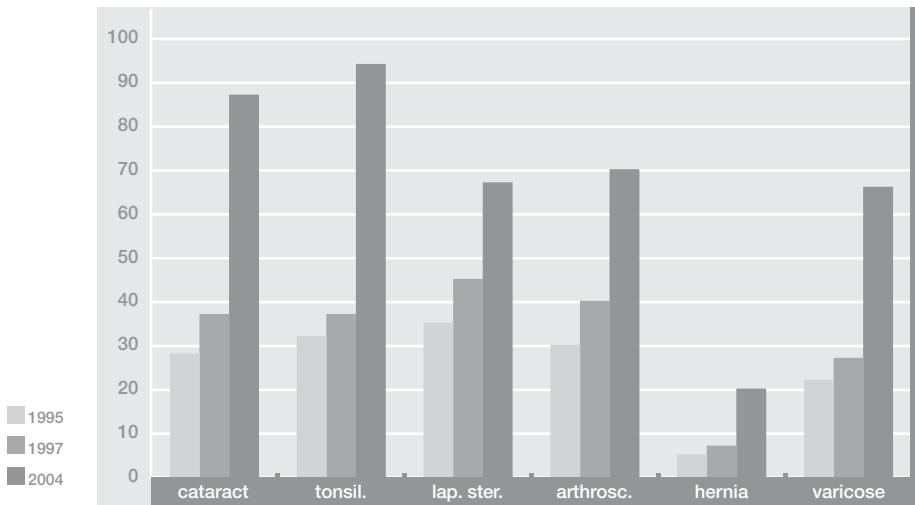
In almost all the countries surveyed, the percentage of day surgery has grown significantly over the time the surveys have been undertaken. The trends from the countries that have data in the three surveys are illustrated in the Figures 1 to 11.

It may be noticed that the USA had a high proportion of day surgery in 1995 and 1997 while most other countries have developed their day surgery during the period. On the other hand it looks as if the USA has reached the ceiling for many procedures since the increase has been rather small or even a decrease has occurred in the period. For most other countries only an increase has been seen for almost all procedures.

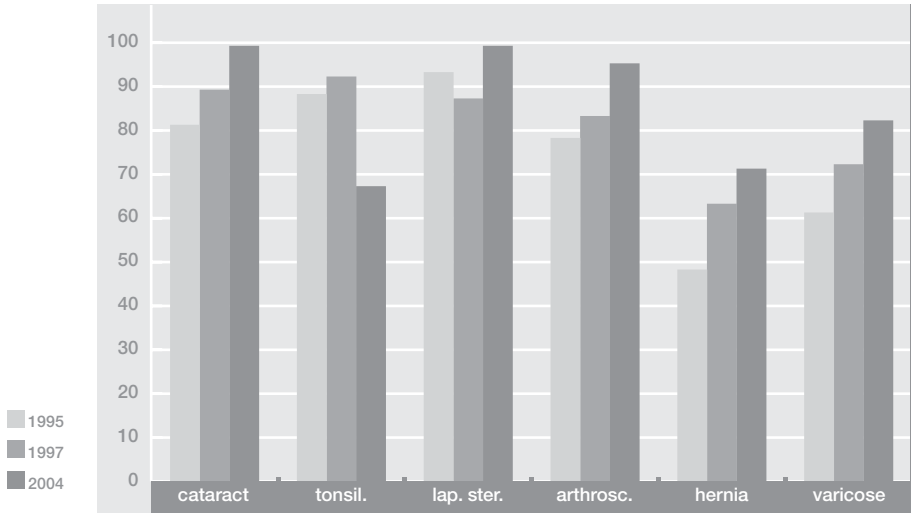
**Figure 1 Australia**



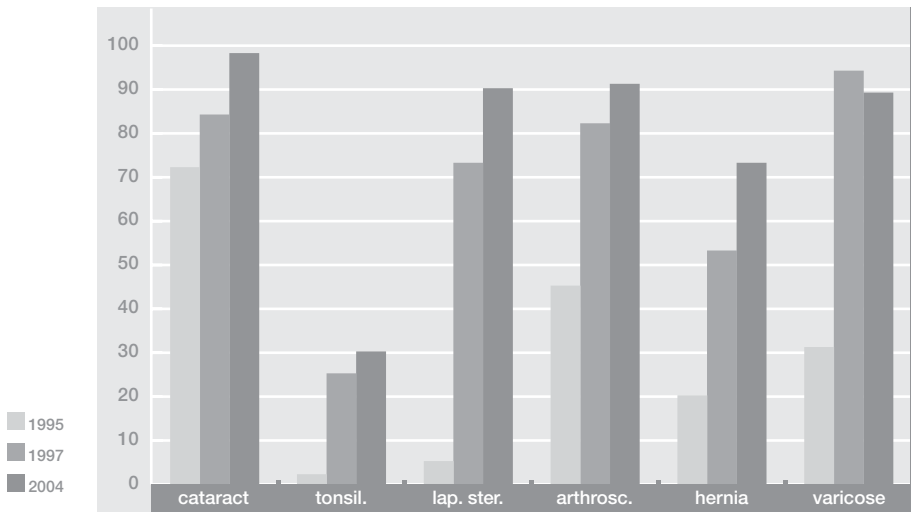
**Figure 2 Belgium**



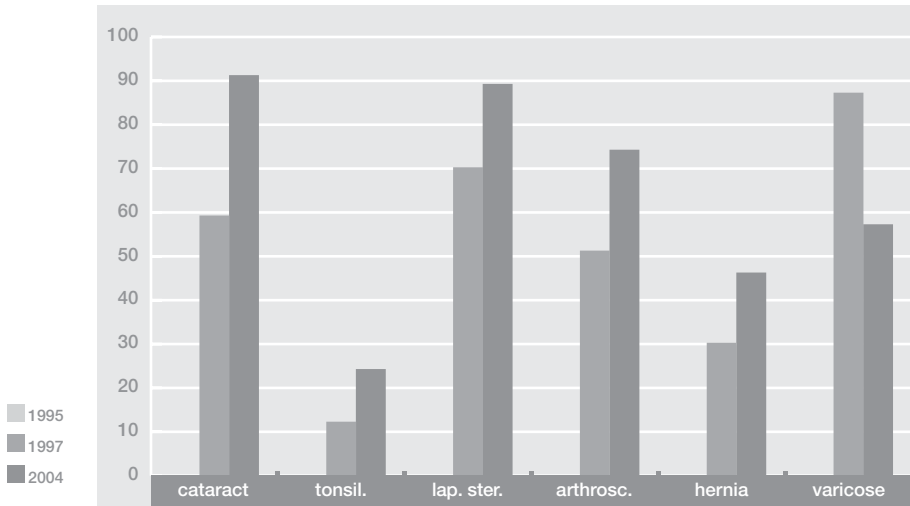
**Figure 3** Canada (Quebec 1995 and 1997), (Alberta 2004)



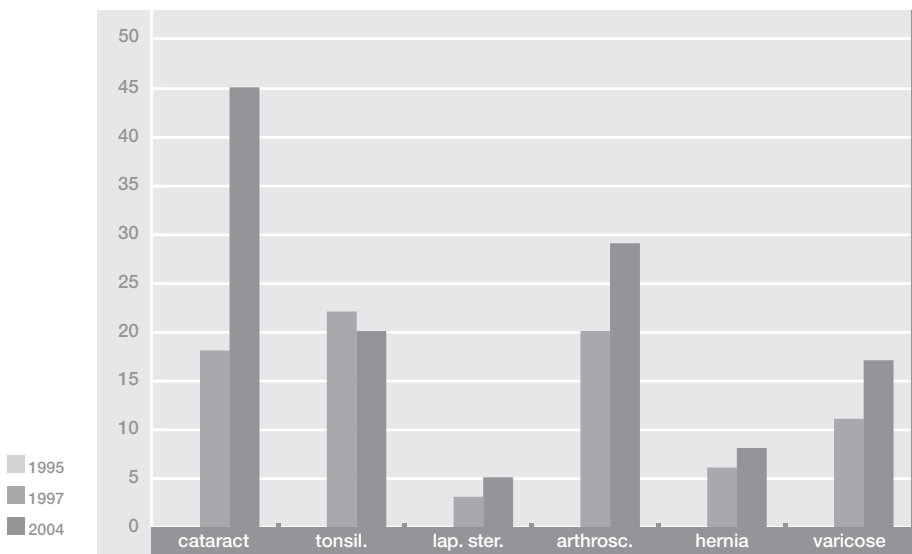
**Figure 4** Denmark



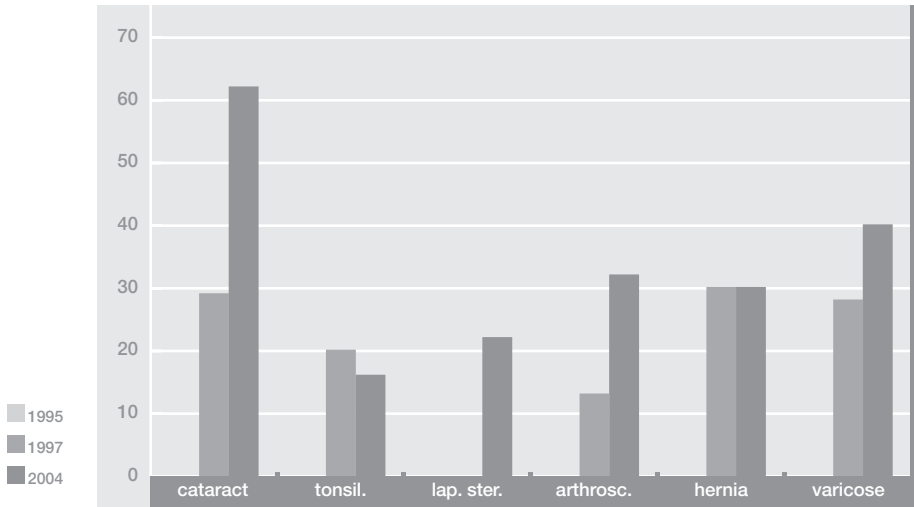
**Figure 5 Finland**



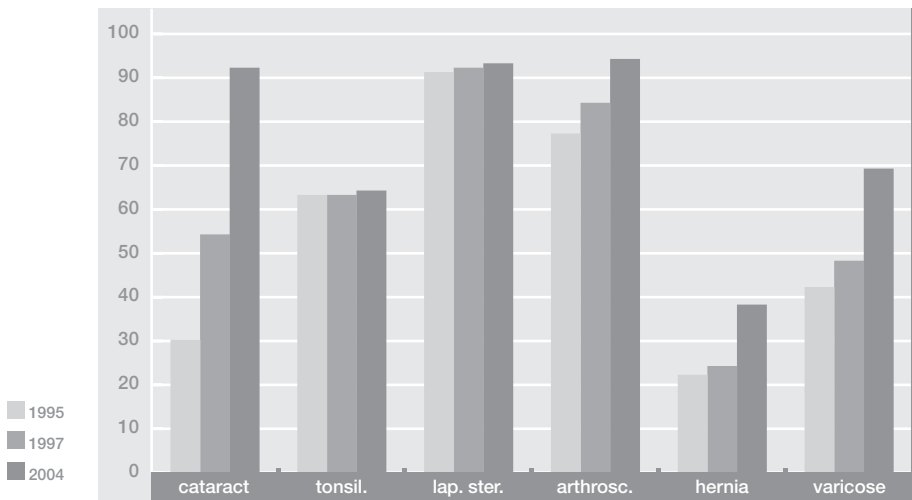
**Figure 6 France**



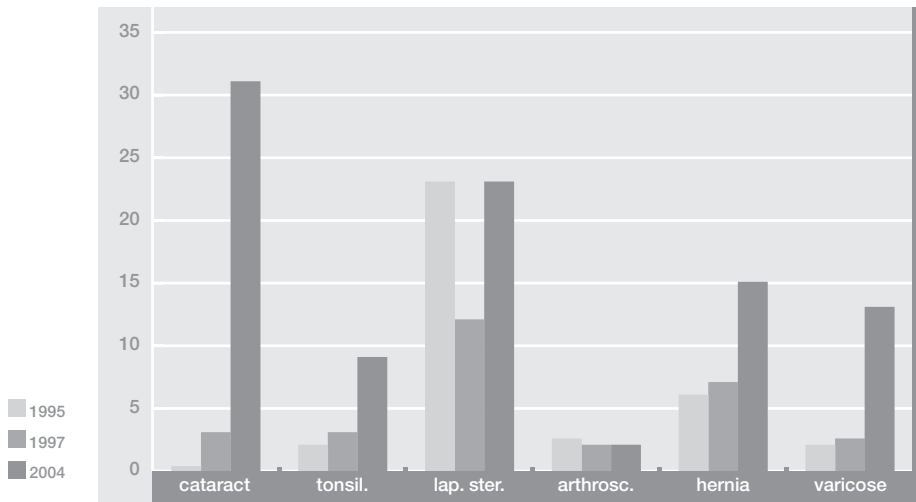
**Figure 7** Italy



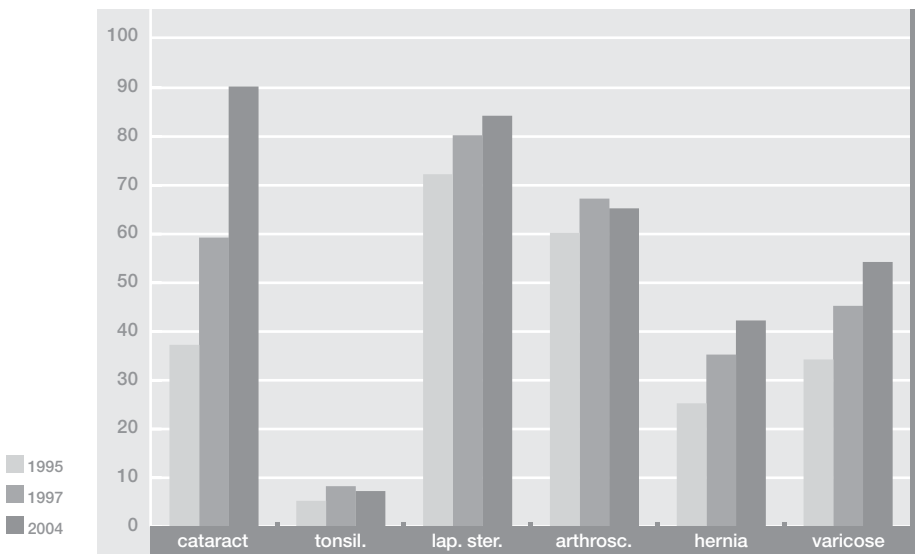
**Figure 8** Netherlands



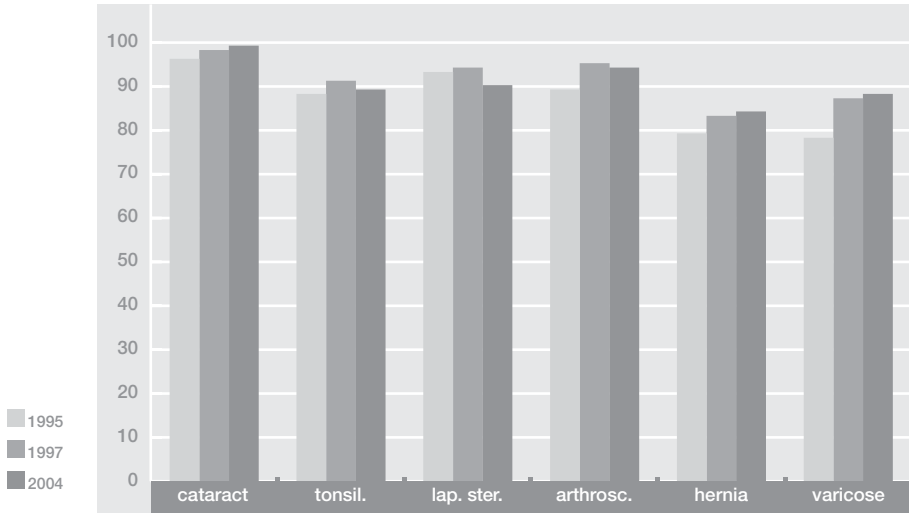
**Figure 9** Portugal



**Figure 10** England



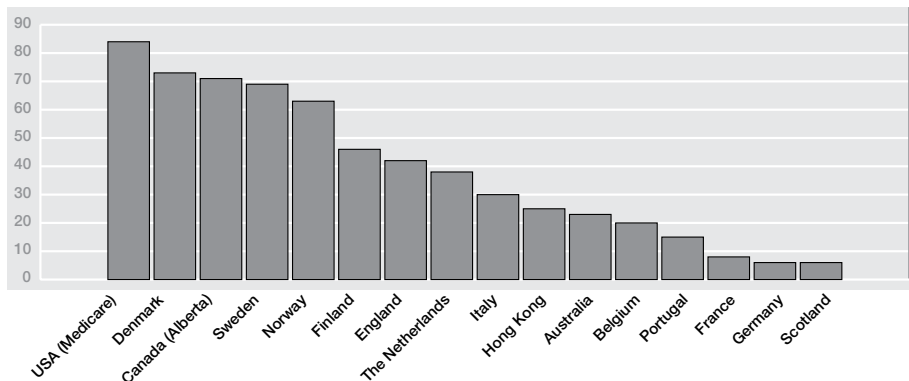
**Figure 11 USA (Medicare)**



## Discussion

Day surgery activity varies a lot between countries. This can clearly be seen from the different day case rates for inguinal hernia repair (Figure 12).

**Figure 12 Inguinal hernia repair (2004)**



Day surgery activity also varies a lot within countries. Danish [5,6] and English [7] figures and personal communications from Norway, Sweden, The Netherlands and Belgium highlight day surgery activity variations between hospitals and regions in individual countries.

However, overall in countries there has been a steady increase over the years in the share of surgical procedures undertaken on a day basis, albeit more in some countries than in others.

The data cannot be taken as the complete truth. Data completeness varies since the data sources are very different from one country to another. In some countries – e.g. the Scandinavian countries - there are central databases, where all surgical procedures are registered, and these data are very reliable. In other countries there are decentralised registers, or only some procedures are registered.

Therefore, the most important way of using the data from many countries is to observe trends. Trends are rather precise both within individual countries and overall. In this way the data may be used as examples for health authorities in countries where the number of ambulatory cases is still low.

The number of ambulatory procedures may be looked at as a percentage of the total number of surgical procedures or as a percentage of planned (elective) surgery. Again the data from some countries is missing and therefore it can be argued that the most useful data are the percentage of the total number of procedures, since the size of waiting lists, cultural differences and traditions may influence the split between planned and emergency surgery. Of course this point may be disputed since day surgery almost always is planned.

The number of procedures may be registered in different ways in different countries – is it the main procedure that is registered or are all procedures undertaken on the same patient registered?

The most important observation is the movement towards day surgery and the internal evaluation of the figures in each country.

Why are there such big differences in day surgery activity between and within countries? There are several explanations as well as possible data incompleteness. One that is very important is the level of economic reimbursement, where there may be more or less incentive built into the system. It is obvious, for instance, that in Denmark or Italy, where the pay for day procedures in many cases is the same as for procedures undertaken on an inpatient basis, the incentive is higher than for instance in Portugal or Germany, where the payment is significantly less for day cases.



More diffuse differences may be caused by tradition among surgeons and anaesthetists. This will often be the case, when differences are within a country. Further blocks to the development of day surgery are outlined in Chapter 1.

## Conclusion

The international surveys may be used as indices for the development of day surgery within countries and benchmarking between countries. The data may be used for discussion between surgeons, anaesthetists and health authorities and act as an incentive for the development of day surgery.

The exchange of data and experience between healthcare professionals is the most effective way to move forward into the future in a measured way.

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## Appendix A: Suggested International Terminology and Definitions for Ambulatory Surgery proposed by the IAAS

### *Terminology*

### *Precisions*

#### - 1 - SYNONYMS AND TIME FRAMES

<b>Ambulatory</b>	<ul style="list-style-type: none"> <li>• Synonyms: Day. Same day. Day only.</li> <li>• Time frame: working day - no overnight stay.</li> </ul>
<b>Ambulatory Surgery Centre (facility)</b>	<ul style="list-style-type: none"> <li>• Synonyms: Day Clinic. Day Surgery Centre / Unit. Ambulatory Surgery Unit.</li> </ul>
<b>Extended Recovery</b>	<ul style="list-style-type: none"> <li>• Synonyms: 23 hr. Overnight stay. Single night.</li> <li>• Time frame: under 24 hours</li> </ul>
<b>Short stay</b>	<ul style="list-style-type: none"> <li>• Time frame: 24 - 72 hours</li> </ul>

#### - 2 - DEFINITIONS - GENERAL

<b>Surgery / Office</b>	A medical practitioner's professional premises.
<b>Outpatient Department</b>	Section(s) of a hospital or a free standing ambulatory surgery centre, public or private, for the management of outpatients.
<b>Outpatient</b>	A patient treated solely in the outpatient department, including such services as ambulatory procedure, interventional radiology, radiotherapy, oncology, renal dialysis, etc....
<b>Inpatient</b>	A patient admitted into a hospital, public or private, for a stay of 24 hr or more.

### - 3 - DEFINITIONS - SURGERY / OFFICE OR OUTPATIENT

<b>Surgery / Office Procedure</b>	An operation or procedure carried out in a medical practitioner's professional premises which provides an appropriately designed, equipped and serviced room(s) for its safe performance.
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<b>Outpatient Procedure</b>	An operation or procedure carried out in the outpatient department of a hospital, public or private.
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### - 4 - DEFINITIONS - AMBULATORY SURGERY

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<b>Ambulatory Surgery / Procedure</b>	An operation/procedure, excluding an office/surgery or outpatient operation/procedure, where the patient is discharged on the same working day.
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<b>Ambulatory Surgery / Procedure Patient</b>	A patient having an operation, procedure excluding an office / surgery or outpatient operation/procedure, who is admitted and discharged on the same working day.
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<b>Ambulatory Surgery Centre (Facility)</b>	A centre (facility) designed for the optimum management of an ambulatory surgery/procedure patient.
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<b>Ambulatory Surgery / Procedure -Extended Recovery Patient</b>	A patient treated in ambulatory surgery/procedure centre/unit, freestanding or hospital based, who requires extended recovery including overnight stay, before discharge the following day.
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<b>Ambulatory Surgery / Procedure - Extended Recovery Centre / Unit</b>	Purpose constructed / modified patient accommodation, freestanding or within an ambulatory surgery centre or hospital, specifically designed for the extended recovery of ambulatory surgery / procedure patients.
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**Limited care accommodation**

Hotel / hostel accommodation for ambulatory surgery / procedure patients where professional healthcare is available on an on-call basis.

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**Hotel / Hostel Accommodation**

Accommodation without professional healthcare required by patients for domestic, social or travel reasons following ambulatory surgery / procedures.



Paul E M Jarrett, MA, FRCS and Lindsay M Roberts, FRACS

## Introduction

To be successful a day (ambulatory) unit (centre) must fulfil two fundamental criteria:

- It must provide operative services of high standards of quality and safety at least equal to those of inpatient care.
- It must be both patient and cost efficient such that it provides high levels of patient satisfaction and is financially sustainable.

As day surgery has developed from inpatient surgery, various types of facility for its delivery have evolved. The nomenclature to describe these varies from country to country and even within countries despite attempts at unifying terminology [1]. There are four main categories of facility:

**1 Hospital integrated facility.** In such facilities day surgery patients are managed, in total or in part, through inpatient facilities. Inpatient beds and operating theatres may be used. Alternatively, pre- and post-operative care may be undertaken in a segregated day ward with surgery undertaken in the inpatient operating theatres. Neither model is ideal in terms of quality of care or cost effectiveness though the day ward approach is better than placing day patients in inpatient wards.

**2 Self contained unit on hospital site.** Such units are dedicated to day surgery and functionally separate from the inpatient sections of a hospital. They have their own operating theatres, 'ward' area, entrance, reception, staff, management, etc. Self contained units are ideal in terms of cost effectiveness and quality of treatment [2, 3].

**3 Freestanding self contained unit.** These are identical to self contained units on hospital sites but are not on a hospital site. For various accounting and economic reasons, they may be more cost effective than self contained units on hospital sites. Freestanding units have the potential to provide day surgery nearer to where patients live. (See Chapter 13)

**4 Physician's office-based unit.** These are small, self contained operation annexes to surgeons consulting rooms. (See Chapter 14)

The planning and design of a day surgery centre is very important for the achievement of a successful, high standard surgical service to patients and to ensure its overall viability.

There is no best model and the necessity for design flexibility, having regard to size, site and range of services is emphasised. However, certain factors need to be taken into account when planning and designing a facility.

## Planning

Planning includes the initial logistic and professional decisions which are essential to ensure that a day surgery unit will be financially viable and capable of providing acceptable standards of procedural services to patients. Amongst the most important aspects to be considered for a self contained unit are the following:

- **Unit concept.** Three initial questions need to be answered. Firstly, is the unit to be on a hospital site or freestanding? Different planning and registration regulations may apply. A unit on a hospital site may be able to be smaller as less storage and back up space is required. Secondly, is the unit to be multidisciplinary ie: provide services for a wide range of operations in various surgical specialities or unidisciplinary providing for only one speciality or procedure eg: ophthalmic surgery, plastic surgery, hernia repair. Most day surgery centres are multidisciplinary as there is a larger potential market. Unidisciplinary centres can be smaller while remaining financially viable as long as they serve a sufficiently large population and undertake common procedures. They have the advantage of concentrating expertise and expensive high technology equipment in the one unit, the continuous use of which not only improves the overall cost efficiency but also lowers the individual cost to patients or healthcare funders. The third question is whether the unit is to deal with private or government funded patients. Centres undertaking private practice generally need to be larger to accommodate the flexibility in operating times required by visiting surgeons and their patients. Scheduling in government units can be controlled more tightly as patients have less choice of timing and consultants are employed on a fixed sessional basis. The units are used more intensively and thus can be smaller.
- **Marketresearch.** It is essential to determine the demand for a day unit identifying the number of potential patients and the case mix together with any competitive day surgery facilities. These factors are vital in deciding on the size and financial viability of a unit. In the private sector, it is also important to have in depth consultations with medical professionals to determine their support for the projected unit. Likewise, enquiries must be made of all the healthcare funders (private insurers or government agencies) as to their attitude to supporting the unit once it is up and running. In different countries there are different health and hospital regulatory authorities. Early on, it is important to hold discussions with those that are relevant in order to obtain assurances that if their regulations are met that they would have no objections to licensing or registering the unit once it is built.

- **Location of the unit.** A demographic survey is important in order to locate potential sites for the unit in a community which has a large enough population to support it. The final choice of site will be determined by the cost of the land, accessibility and the ability to gain planning permission. For freestanding day units, an acute secondary care hospital should be within a reasonable distance (less than one hour's drive) of the site of the unit to allow ready transfer of patients in case of emergency.
- **Medical education.** Day surgery centres are destined to play an increasing role in the teaching of clinical skills, both undergraduate and postgraduate. A decision on whether to undertake this in the unit will depend on interest and funding from the educational authorities and should be considered by those planning large freestanding day units or units on secondary care hospital sites. A minimum requirement would be a conference room with all modern teaching devices.
- **Business plan.** With the knowledge of the above an outline business plan should be drawn up. This will project the caseload and case mix for the unit and thus its size and outline configuration together with capital costs and income and expenditure projected for five years. If the plan appears financially viable and is acceptable to investors then progress can be made to the initial design stage bearing in mind that the business plan may need to be altered as the project progresses.

## Design

The design of a day surgery centre is critically important for both its functional and financial success. To achieve the best possible design to suit the particular needs of a new day unit a project team consisting of at least a surgeon and an anaesthetist who are experienced in and enthusiastic about day surgery and who will be working in the unit, the nurse manager of the new unit and a general manager should be formed. Prior to starting the outline design of their unit, the project team should visit as many and as varied day units as they can. They should also study any available literature on the design of day units [4, 5, 6, 7, 8, 9, 10]. The number of operating theatres, the 'ward' size and the nature and size of the other facilities should then be determined and an outline design produced. Generally it is better to reach this stage before involving an architect. Ideally an architect with experience in designing day units should be engaged. However, it must be born in mind that most architects are not familiar with the design of day units and the way they function. An outline design and flow chart is a useful part of the brief for an architect.

Before proceeding to the interior design features a number of issues need to be considered. The site needs to be large enough to accommodate the unit, with room for extension if necessary, together with ample car parking space and easy access for service vehicles.



The ideal site from both the point of view of cost and functionality is one that is flat and large enough to accommodate a single storey unit. However, if land costs are high or the site is sloping it may be more cost effective to build a two storey unit, with the second storey being used as the service section of the building ie: offices, storage, services, staff changing and the ground floor for patient treatment. The two levels can be connected relatively cheaply using a hydraulic service lift.

A further issue that needs to be decided at an early meeting with the architect is the type of build to be undertaken. The choice lies between a traditional build and a timber or steel frame factory build. Quality and cost will be determining factors. Overall factory builds provide predictable quality and can be erected on site more quickly, but they can be more expensive. There is a similar choice to be made when it comes to operating theatres. Most builders have very limited if any experience in building operating theatres. Factory built modular theatres which fit in the frame of the building are of a predictable high quality. They also have the advantage from a financial viewpoint of being a moveable asset which can help in the funding of a unit.

When converting the outline design into the final design, it is important to realise that roof beams come in standard spans. Large open spaces without pillars and with non-standard length spans can be expensive and should be avoided.

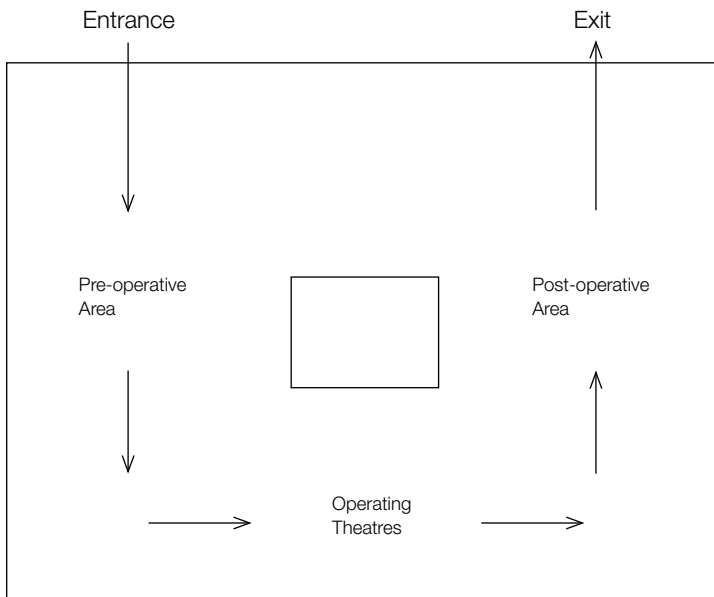
Consideration during design must not only be given to normal building regulations but also to local and national health facility regulations. For example, some countries insist on natural light being present in all areas where patients are awake.

Not all day units can be built on a new site. Some are located in multi-storey buildings. Here it is important in planning to ensure that the floor to ceiling height in the space allocated for the operating theatres is sufficient to accommodate the necessary ducting and the operating lights. Units in such buildings must have a dedicated lift, large enough to accommodate a patient trolley, to the ground floor. As in all units, adequate car parking and ambulance access must be provided.

There is no 'best model' for a day unit. The size, shape and design of the unit will vary depending on the site and the volume and types of operations to be undertaken. However, there are two basic models for the design of a day unit, namely 'racetrack' and 'non-racetrack' (Figures 1 and 2). In the 'racetrack' model there is a uni-directional flow path for the patient through admission, the pre-operative area, the operating theatre, stage 1 and 2 recovery areas to discharge. The advantages of this design are that pre- and post-operative patients are not mixed and there is no potential congestion at points where patients' paths are crossing or flowing in opposite directions. The disadvantages are that both pre- and post-operative areas are required making the footprint of the building larger than that of a 'non-racetrack' unit to accommodate the same number of

patients. In both these areas, at times in the day there will be unutilised space. More nursing staff are required for a 'racetrack' model as there always has to be a nurse in the pre- and post-operative areas even if only one patient is present in either. In the 'non-racetrack' model, with mixed pre- and post-operative patients, except possibly at the end of the day, a nurse will always be looking after more than one patient. Thus, a decision on which basic design to use as an outline model will require a judgement to decide whether the increased revenue and capital costs of a 'racetrack' design warrant the potential gain in the quality of treatment.

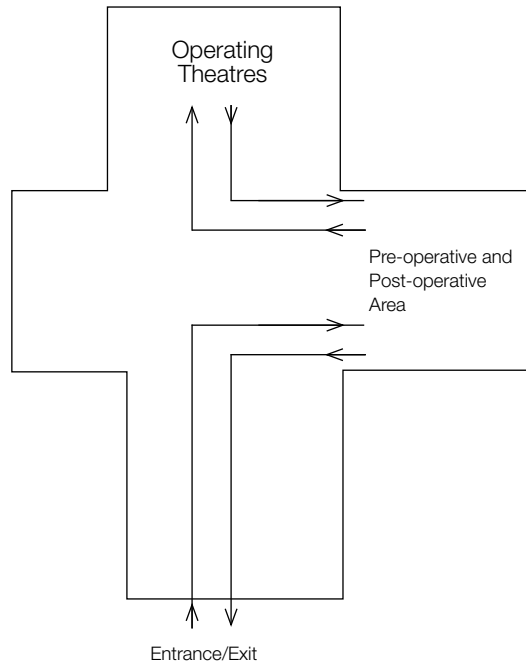
**Figure 1 Racetrack Design**



Arrows indicate patient flow

It is not possible in one chapter to describe the detailed design of every area in a day unit (listed in Appendix A). Other texts should be referred to for this information [5, 6]. Only some points and options for certain areas can be presented.

Figure 2 Non-racetrack Design



Arrows indicate patient flow

**Admission/discharge area.** These may be separate or combined depending on the design of the day unit. The reception desk must be of adequate size to accommodate all the essential modern electronic office equipment and have a lowered section for wheelchair users. It should connect with the clerical and patient record office. The waiting area should be designed to hotel standards and be spacious with comfortable seating, divided into sections by small partitions, pot plants, etc to provide some privacy. A separate children's area is ideal in units providing paediatric services. The overall interior décor should be carefully designed to minimise anxiety and a carpeted floor, in colder climates, creates a feeling of warmth and reduces noise.

**Consulting rooms.** These are useful for pre-assessment of patients when they book in for their surgery. They can also be used for particular checks on the day of operation.

**Patients' changing.** There are three alternative ways to handle patients changing and the storage of their clothes:

- 1 Particularly applicable to the 'racetrack' model of unit, patients may change from their outside clothes into operating theatre apparel in changing cubicles in the pre-operative area. Their outside clothes are stored in a container which travels with them on their journey through the unit. Cubicles for changing back into outside clothes are provided at the discharge point.
- 2 The provision of male and female changing rooms with lockers is applicable to any design of day unit. Patients change in these rooms pre- and post-operatively and their outside clothes are stored in lockers during their sojourn in the day unit. A disadvantage of this approach may be seen to be the mixing of pre- and post-operative patients.
- 3 In units where pre- and post-operative care is provided in a unified 'ward' area, patients can change in their partitioned trolley bay and place their clothes in a locked cupboard in this space. Post-operatively they return to the same bay on their trolley and when recovered change back into their outside clothes.

**Pre-operative care.** This may be undertaken in a pre-operative area in a 'racetrack' model or in a 'ward' area in a 'non-racetrack' unit. In either case, chairs should be provided in which the patients can sit pre-operatively. Depending on the individual patient, the procedure being undertaken and the operational policy of the unit, patients may walk or be taken on a trolley from the pre-operative area to the operating theatre. Where there is a dedicated pre-operative area the split between the number of chairs and the number of trolleys will be determined by the above.

**Trolleys, beds and operating tables.** Hospital beds have no place in the management of true day surgery cases as they are cumbersome to move and, being wider, take up more space than trolleys. Equally, for the majority of surgical procedures, traditional operating tables should not be used. Modern comfortable operating trolleys combine the mobility of a trolley with all the attributes of an operating table. They can tilt both ways, be raised and lowered, have attachments such as stirrups and arm boards fitted, have radiolucent sections and are stable. Most are suitable for a wide range of procedures but particular trolleys are made for certain specialities eg: ultra stable trolleys for ophthalmic surgery. Trolleys have the advantage that patients are anaesthetised, operated on and recover on them. This reduces patient movement for the operating room staff and saves time.

**Operating suite.** The operating room complex of a day surgery unit is no different in design or function from that of an inpatient hospital. The number of operating theatres required, like the size of all areas in a day unit, will depend on the projected number of patients to be treated, the case mix and whether the unit is serving private or government funded patients.

Operating theatres should be square and, in a modern day unit, because endoscopic stacks, x-ray machines and ultrasound machines may have to be accommodated, ideally be 40 square metres in size. In future these major day unit theatres may have to be larger to accommodate robotic and semi-robotic equipment. For local anaesthetic surgery and endoscopy a theatre of 30 square metres is satisfactory. Scrub up areas of 10 square metres are attached to each theatre.

Anaesthetic rooms attached to theatres are traditional in some countries. These are not necessary for most day surgery as patients are anaesthetised in the operating theatre. However, in units where major regional block, spinal or epidural anaesthesia is to be used, an anaesthetic room is essential to maintain turnover rates in the operating theatre. One anaesthetic room (15 square metres) might be considered to be satisfactory to serve two operating theatres. Anaesthetic rooms also provide useful storage space.

All theatres require clean preparation and dirty utility rooms together with storage areas for equipment, disposables and prostheses.

**First stage recovery (post-anaesthetic care unit – PACU).** This is located adjacent to the operating theatres. It is equipped identically to an inpatient unit with monitoring equipment, piped oxygen and suction and a fully stocked emergency cardio-pulmonary trolley. The number of patient trolley spaces required will depend on the case mix and the mix of general and local anaesthetic cases. Units vary in the number of stage 1 recovery spaces they have per theatre from two to four. The trolleys are separated by curtains and there must be good circulation space around each.

A nurses' station should be strategically located in this area with clear visibility to all patients and provided with an adequate work desk, storage shelves, cupboards and a locked drug cupboard. Appropriate staffing is very important. For recovering unconscious patients the nurse/patient ratio should be one to one.

Some centres are reducing the size of stage 1 recovery areas and adopting a fast track approach where, by modification of the anaesthetic technique, patients rapidly recover consciousness in the operating theatre allowing them to return directly to the stage 2 recovery area after surgery [11].

**Sterilisation of instruments.** Sterilisation of instruments and other medical devices may be undertaken in the day unit itself or outsourced (to the hospital's central sterilisation department by self contained units on a hospital site or to specialist service providers in the case of freestanding units)

Sterilising facilities in a day unit should be adjacent to the operating theatre suite and include the following with an appropriate flow path:

- Reception area for used instruments
- Washing and drying facilities
- Sorting and packing benches
- Steam autoclave
- Cooling and storage benches/shelves.

When central or outsourced sterilisation services are used more instruments and instrument sets are required and larger stocks of sterilised instruments need to be kept in the day unit. Thus, a substantial storage area adjacent to the operating theatres is required.

The need for sterilisation services can be reduced by using pre-sterilised disposable instruments, particularly in laparoscopic work. The choice between disposable and non-disposable must also be made for theatre clothes, gowns and drapes. A cost analysis is needed to determine the appropriate choice.

Units undertaking endoscopy must provide facilities for cleaning scopes, specialised sterilising machines and hanging racks adjacent to endoscopy rooms.

The overall efficiency of a day surgery centre is very dependent on the “turn around time” between operations and the efficient provision of sterile instruments is one of the crucial factors in reducing the time between operations.

More details on sterilisation can be found in Appendix D.

**Second stage recovery.** The patients are transferred here following recovery to consciousness either in the stage 1 recovery area (PACU) or in the theatre if fast tracking is being used. In ‘racetrack’ designed units this area is separate from the pre-operative area, but in ‘non-racetrack’ designs it serves as pre- and post-operative areas. Here, patients recover on their trolleys and reclining chairs until fit for discharge home. Trolleys in this area are separated from each other by curtains or a combination of curtains and solid partitions (semi-partitioned bays). Some units may have one or more single rooms in this area to treat private patients, the occasional paediatric case or noisy patients. It must be borne in mind that single rooms occupy more space and more staff are required to nurse patients in them than patients looked after in a large area divided into bays.

Each trolley bay (room) should have piped oxygen and suction (essential if fast tracking), an equipment bar to hold any monitoring equipment that might be required, an examination light, an emergency call button, an armchair/reclining chair and in ‘non-racetrack’ designs a locker.

A centrally placed nurses station, much as in the stage 1 recovery area, is necessary. The nurse/patient ratio in this area is in the range one to three to one to five.

When local anaesthesia alone is being used eg: cataract surgery, an area with reclining chairs may be used pre- and post-operatively, the patient not passing through stage 1 recovery.

**Toilet facilities.** Washrooms with toilets and hand basins for able bodied (ideally male and female) and wheelchair users must be provided in all patient changing areas, the stage 2 recovery area and waiting rooms. Adequate toilet facilities including a shower should be provided in the male and female staff changing areas.

As well as in the operating theatre suite, sluice rooms are needed in the stage 1 and stage 2 recovery areas.

**Education facilities.** With the increasing focus on continuing education and audit, all but the smallest day units should have a seminar room. Those undertaking more formal teaching of undergraduates and postgraduates or those who run regular courses for doctors or nurses should have a larger conference room which, together with the normal teaching equipment, has closed circuit television links to the operating theatres. Satellite links to other units and educational centres are ideal in large teaching units. Educational facilities may be located in any convenient non-sterile area of the unit.

**Child facilities.** Units undertaking paediatric surgery should have separate waiting and pre- and post-operative areas for children. These should be decorated appropriately and provide play areas with toys and possibly a video player showing cartoons or other children's programmes.

**General points.** Whatever the patient flow pattern ideally this should be separated from the flows of staff and supplies in and out of the unit. To achieve this, separate entrances/exits are required for patients, staff, and supplies and waste. Wheelchair access is essential. There should be an exit from the post-operative area to an ambulance bay to facilitate any emergency transfer of patients. In the theatre suite, the theatres are ideally serviced from the opposite side to which patients enter and leave.

To allow free flow, all corridors in patient areas should be wide enough to allow two trolleys to pass comfortably (minimum 2 metres). Service corridors need to be wide enough to accommodate the larger trolleys used to deliver supplies and remove waste.

It is essential to provide adequate storage areas. These need to be larger in freestanding units than those on hospital sites as back up supplies are more distant. As the range of day surgery increases the amount of large equipment such as endoscopic stacks, lasers, x-ray and ultrasound machines and microscopes increase. These occupy a considerable amount of storage space when not in use. Space to store wheelchairs is often forgotten.

Not only the operating theatres and stage 1 recovery area should be air conditioned, but also the pre- and post-operative areas. As a cost saving, waiting rooms, offices and consulting rooms may have air exchange, but ideally they too should be air conditioned.

The theatre suite (operating theatres, utility rooms, scrub up, circulating area and stage 1 recovery area) together with storage areas and service corridors should be floored in smooth surfaces that can be washed down easily eg: terrazzo, vinyl. Waiting areas, the pre-operative area and the stage 2 recovery area benefit from being floored with a modern type of carpet, such as that in airports, which is hard wearing and can be machine washed. Carpeting dampens noise and helps to give a warmer friendlier feel.

As with all surgical units, the day centre must have an emergency electric generator which switches in automatically should a mains power failure occur. This must be sufficiently powerful to at least supply full power to the operating theatres and stage 1 recovery area together with power to other essential lighting, equipment and power points in the day unit.

A section of the unit must be set aside for the medical gas supply/cylinders, air compressor and vacuum pump to supply the piped system to the patient treatment areas.

The number of fully equipped and stocked cardio-pulmonary resuscitation trolleys required will depend on the size of the unit, but at least one should be in each of the stage 1 and stage 2 recovery areas. A blood fridge must be provided in the theatre suite and in freestanding units undertaking laparoscopic and certain gynaecological procedures it is sensible to have O negative blood available in it.

Day units should have a suitably protected pharmacy store/cupboard. Pre-packed supplies of commonly used post-operative drugs to be given to patients on discharge are kept there together with a supply of other drugs needed in the unit.

The size and type of patient catering facilities in a unit will vary according to local needs. A minimum requirement is a small kitchen providing hot and cold beverages, biscuits and, possibly, sandwiches.

With the ever increasing volumes of day surgery, it is prudent, where possible within site constraints, to design a day unit with the potential for expansion in theatre and 'ward' areas (Figure 5).

As stated earlier, there is no one design as far as size, number of theatres, number of trolley spaces, number of reclining chair spaces, etc that suits all situations. Case mix, speciality mix, site constraints and cost constraints all have a bearing. Therefore, the examples of day unit designs shown in Figures 3 to 6 are for information and to stimulate thought rather than to be followed in detail.



**Figure 3** Model Day Surgery Centre with Extended Recovery and Medi-Motel (Roberts LM [15, 17]) 'Racetrack' design

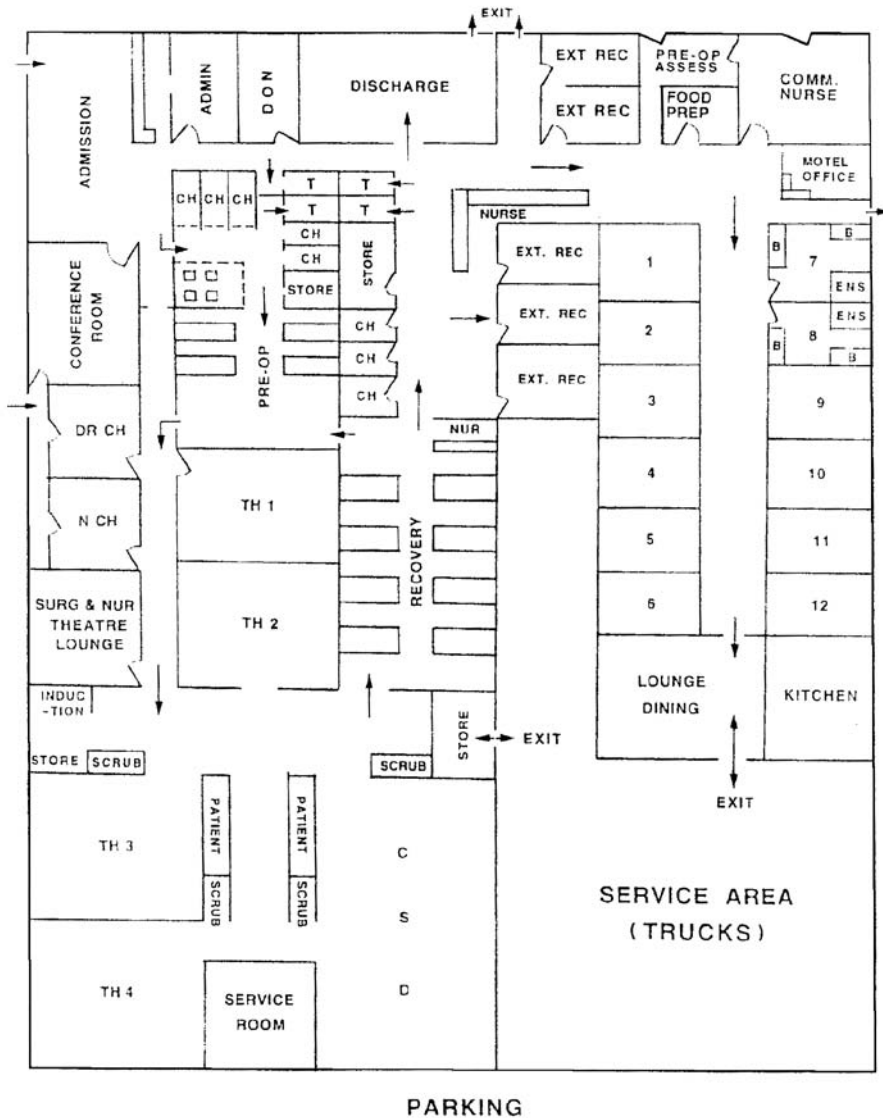
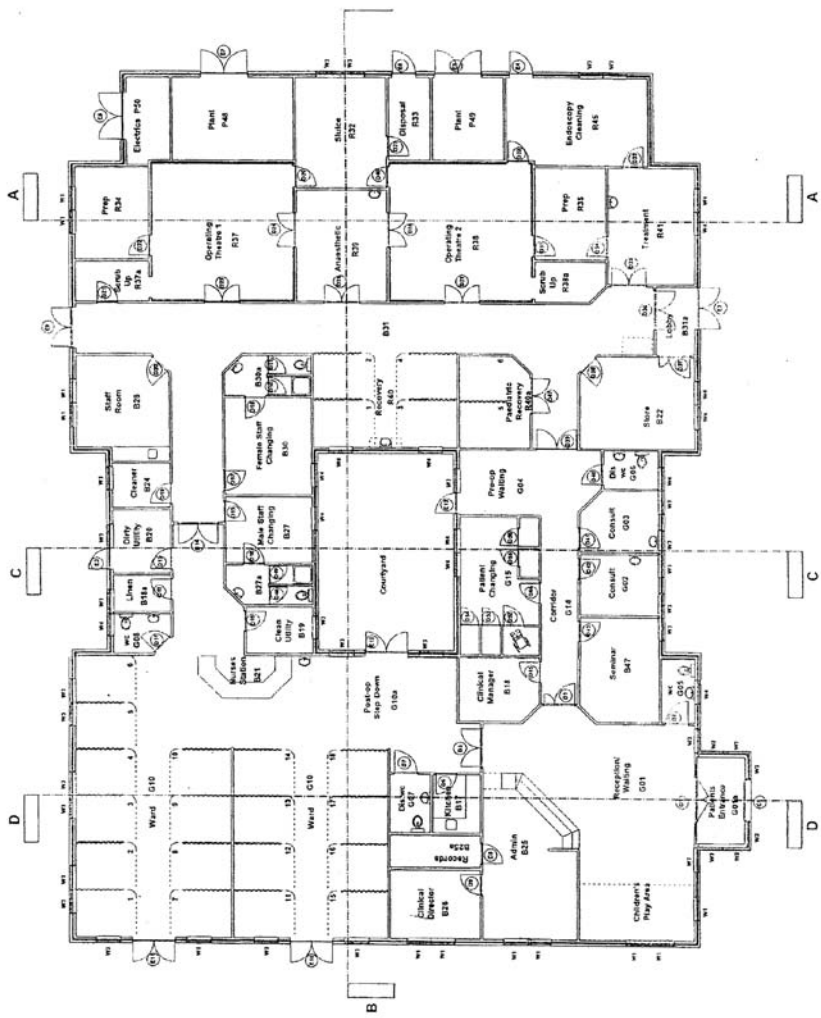


Figure 4 Surgical Day Unit – NHS, UK (Jarrett PEM) 'Racetrack' design



**Figure 5** Surgical Day Unit – NHS, UK (Jarrett PEM) 'Non-racetrack' design

Theatre and ward areas can be extended.  
 Extended recovery and limited care accommodation can be attached.

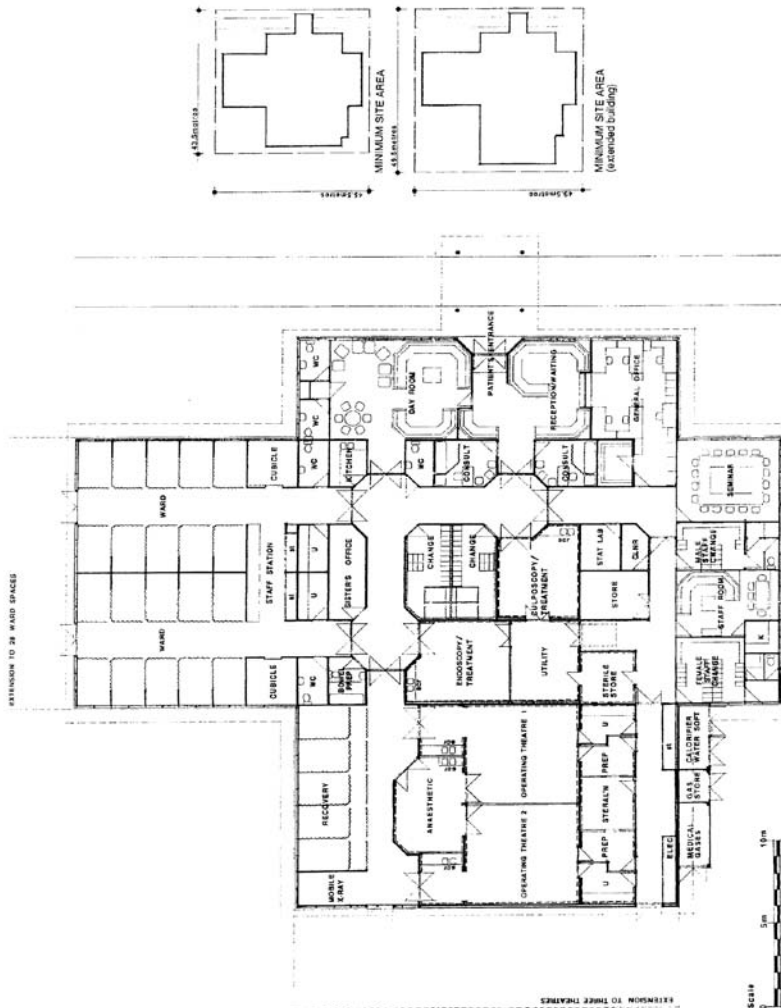
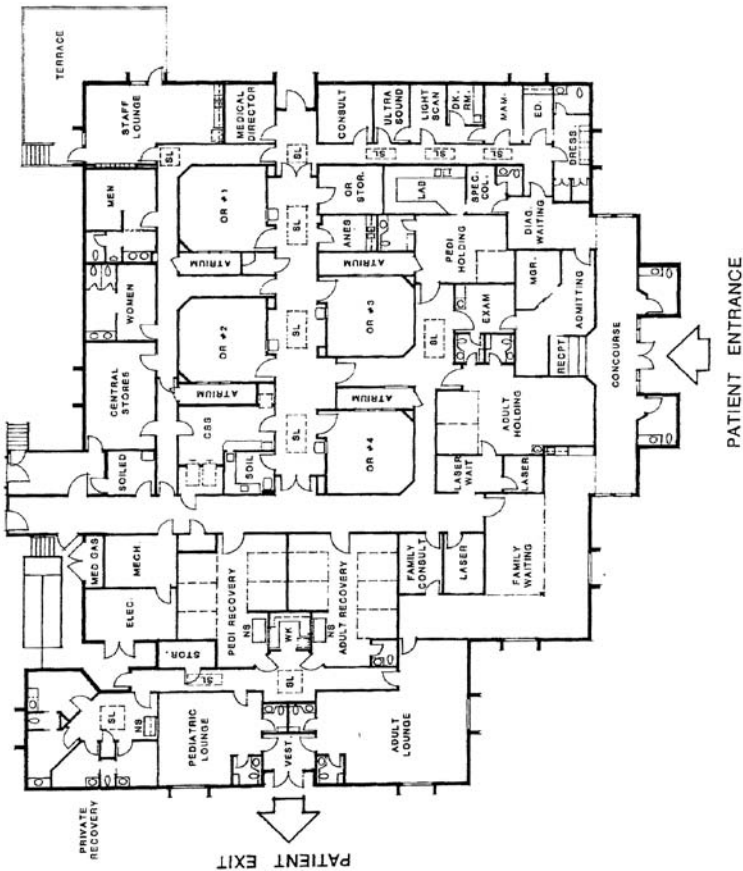


Figure 6 Freestanding Ambulatory Surgery Facility (Apfelbaum JL, Schreider BD [16])



## Extended recovery

Day surgery with extended recovery is also known as 23-hour surgery or day surgery with overnight stay. The recovery period of the day case patient is extended overnight before discharge the next morning. Introduced to increase the range of more major surgery undertaken in freestanding day units, it can also be used as a confidence gaining stage in the transfer of cases from the inpatient setting to the true day case setting. The danger of extended recovery is that it may delay the development of or even reverse the move to true day surgery [9]. Only large multidisciplinary units should consider providing this service.

Extended recovery facilities may be built into a day unit adjacent to the stage 2 recovery area (Figure 3). Ideally patients should be nursed on beds as most trolleys lack the comfort required for a prolonged stay. Two nurses are required at all times and thus staffing costs may be higher than a normal inpatient ward if there are less than ten occupied beds in this area. Facilities providing extended recovery need more extensive catering and washroom facilities than a simple day unit. Standards for extended recovery in day surgery units prepared by the Australian Day Surgery Council are listed in Appendix B.

## Limited care accommodation

Limited care accommodation also goes by the names medi-motel and hospital hotel. Facilities are of hotel quality and they are staffed by non-professionals who act in place of caring relatives. Professional healthcare is available on an on-call basis. Limited care accommodation is designed for patients who would be unsuitable for day surgery because they live a long distance from the day unit or they are socially stressed eg: elderly, live alone, disabled, etc. Such patients may spend one or more day's convalescence in the limited care accommodation before returning home. Thus, these patients can have their treatment on a day basis rather than being admitted as an inpatient. The bed day costs are much lower for limited care accommodation than for hospital inpatient accommodation – approximately one third [12].

A limited care accommodation facility may be an extension of a day surgery centre (Figure 3), may be freestanding or may be part of an acute secondary care hospital (where it can also facilitate inpatient discharge).

Standards for limited care accommodation prepared by the Australian Day Surgery Council are listed in Appendix C.

## Innovations

An innovation in the provision of day surgery services has been the development of mobile operating theatres, mobile endoscopy units and mobile wards. These can deliver

day surgery to more remote areas on a regular basis and can also be used to bolster the facilities of established day units at times of peak demand. The operating theatre units have an operating theatre at the centre with all the essential facilities and services including air conditioning, medical gases, a full range of anaesthetic/ resuscitation equipment and an auxiliary power unit. Sterilised pre-packed instruments, are carried on the unit which is parked at a hospital or other suitable building which provides the main power supply. One designed by Mobile Surgical Services in New Zealand [13] is a large semi-trailer which as well as an operating theatre, has an admission/change area at its front and a small recovery/discharge area at its rear (Figure 7). In this model patients having a general anaesthetic need to recover in a building adjacent to where it is parked. Another model developed by Vanguard Healthcare in the UK [14] has an anaesthetic room at one side of the operating theatre and a stage 1 recovery area on the other (Figure 8). This unit is transported on a low loader and when positioned stands on hydraulic legs. Its sides open in a concertina fashion thus enlarging the unit. As well as the possibility of using an adjacent building as a stage 2 recovery area, this theatre unit can be linked to a mobile 'ward' thus forming a small self contained day unit.

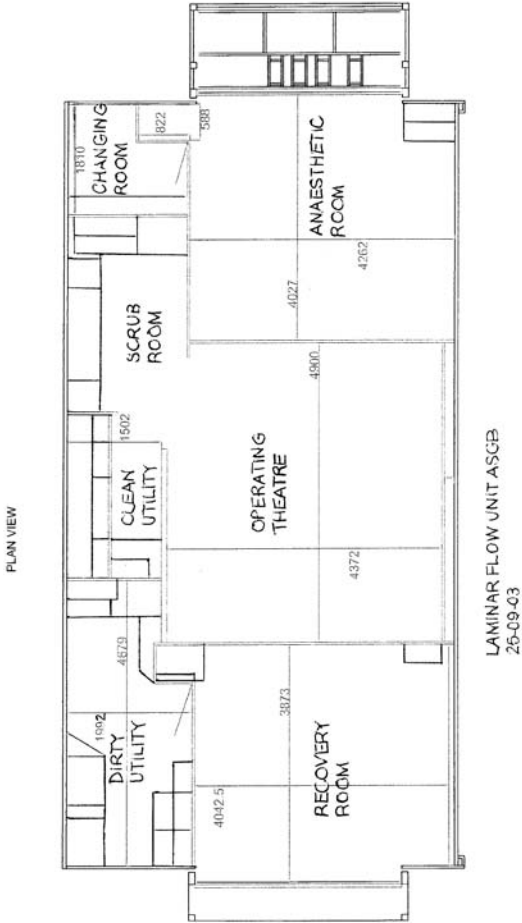
Depending on local needs, self contained day units can be linked to consulting room suites and diagnostic facilities to form diagnostic and treatment centres. A day surgery unit may also be combined with a medical day unit thus creating a day hospital.

## Conclusion

Much needs to be considered when designing a day surgery unit. Each project has particular needs and thus particular design solutions. Time spent at the outset on planning and design is time well spent as it increases the potential for the unit to provide high quality and cost effective treatment.



**Figure 8** Plan of Mobile Operating Theatre (Vanguard Healthcare [14])





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## Appendix A: Major Infrastructure Requirements for a Self Contained Day Unit

Reception  
Administrative office  
Patient record store  
Nurse Manager's office  
Doctors' office  
Consulting rooms  
Waiting area (adult and children's)  
Pre-operative area (adult and children's)  
Anaesthetic room(s)  
Operating theatre(s)  
Dirty and clean utility rooms  
Stage 1 recovery area  
Stage 2 recovery area (adult and children's)  
Patient changing facilities (male and female)  
Staff changing facilities (male and female)  
Staff rest room  
Nurse station each major area  
Store rooms (equipment, instruments, disposables, prostheses, etc)  
Food and beverage area  
Pharmacy store  
Seminar/conference room  
Stations for cardio-pulmonary resuscitation trolleys  
Toilets including disabled  
Patient entrance/exit – covered  
Staff entrance/exit  
Supplies entrance and waste exit  
Emergency transfer (ambulance) exit – covered  
Emergency fire exits (+ fire equipment)  
Emergency auxiliary power unit  
Medical gas and suction supply  
Air conditioning  
Information technology – network, computer stations  
Security equipment and arrangements

## Appendix B: Standards for Extended Recovery in Day Surgery Centres/Units

### 1. *Extended Day Surgery/Procedure Recovery Centre/Unit*

- \* Definition: Purpose constructed/modified patient accommodation, within a registered day surgery centre or hospital, specifically designed for the extended recovery of day surgery/procedure patients

### 2. *Location*

- \* Extension of the Recovery area of the day surgery centre (facility).  
Separate rooms may be provided.

### 3. *General services*

- \* All services as per the usual day surgery centre (facility)
- \* Patients may be nursed on trolleys or transferred to beds. Call bells available.

### 4. *Meals*

- \* Centres (facilities) should meet the needs of the patients.

### 5. *Medical/Nursing Services*

- \* Minimum of 2 Registered Nurses present at all times.
- \* Nurse/patient ratios will depend on the acuity of the patients, but should not exceed 1:5.
- \* The surgeon, the anaesthetist or a designated medical practitioner must be contactable at all times, and able to attend the centre (facility) if needed.
- \* All emergency equipment and procedures should be in place as per usual day surgery centre (facility).
- \* Clinical protocols should be in place for channelling and selecting patients for this service.  
Extended recovery may be planned or unplanned.  
Planned: Patients purpose booked for extended recovery.  
Unplanned: Patients selected for extended recovery as clinically indicated after admission to the day surgery centre/unit.
- \* Discharge protocols should be in place, and should include nurse initiated discharge protocol.
- \* Special arrangements must be in place for:  
Transferring patients to an acute care facility  
Emergency codes overnight

### 6. *Security*

- \* Arrangements must be made to secure the building at night. For example: security firm visiting regularly; duress alarms linked to security firm/police.

## Appendix C: Standards for Limited Care Accommodation Facilities

### 1. **Definition**

Hotel/hostel accommodation for day surgery/procedure patients where professional health care is available on an on-call basis.

It is the responsibility of the attending medical practitioner to refer appropriate patients to a Limited Care Accommodation Facility.

### 2. **Location**

- Freestanding Facility  
Connected to a Day Surgery Centre.  
Separate, stand alone facility to which day surgery patients are regularly transferred, with ground floor access or lift/ramp access.
- Hospital Located Facility – public or private  
Separate or connected freestanding facility on the campus of a hospital.  
Dedicated section of a hospital.

### 3. **General Services**

- Administration Office
- Store room eg. linen, records etc.
- Cleaners room/service
- Linen/laundry service
- Contract for disposal of contaminated waste and linen.

Note: Some or all of the above would not be essential for facilities located within a hospital or attached to a freestanding day surgery centre.

### 4. **Accommodation**

Each unit (room) would provide the following:

- Patient bed (or cot)
- One extra bed for partner/carer
- One comfortable lounge chair
- En-suite with shower, basin and toilet
- Simple cupboard and drawers
- Air conditioning/heating
- Tea/coffee, toast making equipment
- Refrigerator
- Television
- Telephone
- Wheelchair accessibility

### 5. *Lounge*

A comfortable lounge room for patients and relatives/carers, including a suitable separate area for children and parents.

### 6. *Meals/Dining*

- Freestanding facilities - meals would be provided by one of the following:
  - External catering by private contract
  - Kitchen within the facility providing room service
  - Kitchen/dining room within the facility

Note: each unit would provide simple food preparation equipment for light meals/snacks with hot and cold beverages.

- Integrated accommodation within a hospital – meals would be provided by the hospital catering service.

Note: In freestanding facilities a combined lounge/dining area might be provided.

### 7. *Medical/Nursing Services*

A limited care accommodation facility must provide the following:

- An immediately available manager/attendant who may be a nurse or a person trained in cardio-pulmonary resuscitation.
- An emergency 24-hour call system in each room.

The emergency call system would be linked to the hospital or day surgery nurse emergency call system where the limited care accommodation is located within an acute bed hospital or attached to a freestanding day surgery centre with extended recovery services, which includes on-site 24-hour nursing service.

The emergency call system would be connected to the office of the on-site manager/attendant, who may be a nurse or a person trained in cardio-pulmonary resuscitation, where the limited accommodation facility is either a separate stand alone facility or is attached to a same day freestanding day surgery centre.

- An emergency cardio-pulmonary resuscitation trolley with an extra self-inflating bag suitable for artificial ventilation for every 10 rooms.
- An appropriately equipped medical utility room with hand wash basin and disposal container for sharps and contaminated dressings etc, for the use of medical practitioners and nurses, including infection control guidelines.
- A telephone in each room and on-site manager/attendant office for contact with the attending surgeon, anaesthetists, general practitioner and ambulance.
- There must be an arrangement for the transfer of patients to an acute care facility for the on-going treatment of a medical emergency.

### 8. *Medication*

Patients' medication is the responsibility of the patient or relative/carer.

### **9. Records**

Records to be maintained including details of patient, resident relative/carer, attending medical practitioner, time and date of admission-discharge and details of any patient incidents.

Important note: Nations may have variations in their health care standards regarding room/area size, nursing personnel etc, in day surgery (and other procedural) centres/units.

## Appendix D: Processing of re-usable medical devices (J. Reydelet)

The aim of standardised processing is to provide medical devices which are safe to use in terms of hygienic state and function. Quality assurance in reprocessing serves to protect both patients and medical staff from the risk of infection and to preserve the serviceability of medical devices.

Sterilisation may be undertaken in a day unit or the processing outsourced to a specialised service provider.

For processing, suitable infrastructure, equipment, employee(s), procedures, capacity of storage are required. The cleaning, disinfection, and sterilisation procedures applied for the processing of medical devices which have to be sterile or with a low microbial burden upon usage must be validated. The successful completion of these procedures has to be documented and archived.

➤ **Infrastructure – minimal requirement**

At least one separate room is necessary for the processing with

- A disinfecting and cleaning area
- A packaging area
- A sterilisation area

and adequate room for the storage of the material.

➤ **Equipment – minimal requirement**

For disinfecting and cleaning, equipment with washer disinfectors is ideal. Whether using a manual or automatic process a wash rack is indispensable. A table with convenient equipment for the packaging and control of quality is necessary as is an autoclave – ideally a steam autoclave.

➤ **Employee(s)**

The processing must only be carried out by persons who demonstrably possess the necessary know-how and experience and who have access to the required spatial and technical prerequisites.

➤ **Procedures**

The processing runs step for step for:

*Disinfecting and cleaning*

According to EN 556, a medical device can only be referred to as sterile when the theoretical probability of contamination by one viable microorganism is less than one in one million.

The safety of a sterilisation process is therefore dependent upon the initial germ count (bioburden) as well as on the degree of cleanliness of the medical device prior to sterilisation. Effective validated and standardised cleaning and disinfection procedures should be seen as a precondition to safe sterilisation.

### *Control, sorting and maintenance of instruments*

#### *Packaging*

The packaging used during sterilisation must not interfere with the sterilisation process and it must maintain the sterilised condition of the object until use and facilitate unpacking and subsequent handling. It needs quality control. Of the various forms of packaging listed in norms and standards, the following are recommended:

- Rigid aluminium containers
- Peel pouches (paper/transparent plastic combinations)
- Sterilisation paper

#### *Sterilisation by autoclaving*

Steam sterilisation is the safest procedure for sterilisation. It is therefore to be preferred over all other methods. As prescribed by EN 285, steam sterilisation is to be conducted at a temperature of 121 °C for 15 minutes (exposure time), or at 134 °C for at least 3 minutes, both under increased pressure of 3 ATU. Pulsed vacuum procedures are currently used to assure complete evacuation of the sterilisation chamber and its contents and to obtain an even distribution of steam throughout the chamber. Pulsed vacuum procedures are used also to dry the items. When goods removed from the sterilisation chamber are found to have either wet packaging or to have collected condensation, they must be considered unsterile and cannot therefore be used because of the immediate danger of recontamination. Controls of quality automatically accompany this procedure.

#### *Storage*

It is required that the devices are stored in a room which is dry and clean, without too much temperature variation and dust.

### ➤ **References**

AWMF online – Recommendations Hospital Hygiene  
<http://www.uni-duesseldorf.de/AWMF/II/029-010e.htm>





# Day Surgery Procedures

Dick De Jong, MD, PhD, Rico N P M Rinkel, MD, Juan Marin, MD, Paul J M van Kesteren, MD, PhD, Rui Rangel, MD, Saskia Imhof, MD, PhD, Ype Henry, MD, Jaques A Baart, DDS, Arthur de Gast, MD, PhD, Seine Ekkelkamp, MD, Chantal M A M van der Horst, MD, PhD, Jean J M C H de la Rosette, MD, PhD and M. Pilar Laguna Pes, MD, PhD

## Introduction

There has been an exponential growth of ambulatory surgery in the last few decades. Major contributing factors to this have been developments in anaesthesia. Short acting anaesthetics with minimal side effects, improvements in regional anaesthesia, the laryngeal mask, new halogenated anaesthetic gases and new approaches in peri-operative pain management (multimodal analgesia, pre-emptive analgesia) are some of these.

Improvements in surgery have also played an important role. New operative techniques such as endoscopic surgery and other types of minimal access surgery have been developed and surgeons have become increasingly aware of important issues such as patient selection and proper peri-operative care in ambulatory surgery.

In this chapter the role of ambulatory surgery in a number of specialties is discussed. Suitable procedures are recommended and patient selection taken into account.

In the very near future, hopefully, surgeons will not ask themselves: 'Can this operation in this patient be performed on an ambulatory basis?', but rather 'Do I have to admit this patient as an inpatient for this surgical procedure?' If this chapter can be of any help in answering this question, the mission of all authors has succeeded.

## ENT SURGERY

### Introduction

Ear, nose and throat (ENT) surgery comprises a wide range of procedures in a diverse population. In general it appears that the majority of ENT procedures can be performed on a day basis, especially when co-morbidity is absent.

Descriptive data about the amount of ambulatory ENT surgery are scarce but recent reports show a possible increase. In 1998 Brown *et al.* noted that 31% of all ENT procedures in England were performed on an ambulatory basis [1]. Only 2.8% of these patients had an unplanned admission following surgery [1]. In the Netherlands, Wasowicz *et al.* ranked all hospitals according to their percentage of day care adult tonsillectomies, and postulated a possible increase from 2 to 22% if all adult tonsillectomies in the Netherlands were performed on an ambulatory basis [2].

The shift from inpatient to day surgery can also be illustrated by the length of stay for tonsillectomy which is one of the most frequently performed procedures, especially in children. In the 1960s patients were admitted to hospital for approximately one week. Today in most European countries patients have to stay only for a maximum of two days, while the operative procedure remains unchanged. An important change to the approach to care and cure of patients has led to this remarkable transition to ambulatory care for many procedures performed by ENT specialists.

Proper selection of the patient, however, remains the cornerstone of day surgery.

### **Ear surgery**

Only very limited data are available about ambulatory ear surgery. Procedures with a trans-meatal approach such as placement of grommets or myringoplasty are generally performed on a day basis, while procedures with a transmastoidal approach still require inpatient admission. The necessity of post-operative immobilisation after surgery of the ossicular chain is still under debate, thus preventing widespread day surgery. Although evidence favouring this is poor, in most hospitals patients are advised to stay in bed for 24 hours after surgery, and in these cases surgery will not be performed on a day basis. Studies about the necessity of post-operative bed rest will be needed before an ambulatory procedure can be contemplated.

### **Nose**

Almost all nasal procedures (endoscopic sinus surgery and nose reconstruction) can be performed on an ambulatory basis but differences between surgeons, hospitals and countries are vast. Banfield reported a total amount of 70% of rhinoplasty procedures performed as day cases. Some procedures were planned for extended recovery (17%) and the unplanned admission rate was 12 % [3]. Philpott *et al.* investigated, in a retrospective study, the possibility of septoplasty as an ambulatory procedure. From a total series of 109 patients, only 8 were operated on as day cases, while in fact 100 patients seemed suitable for day surgery [4]. The most important contra-indications are possible serious per-operative blood loss or the poor general condition of the patient. Timing of surgery is another important factor. Surgery performed on morning lists has a lower admission rate than surgery on afternoon lists [1].

### **Throat**

Most surgery of adenoids and tonsils in infants is being performed on a day basis in many European countries. In adults, diversity is greater. Some countries are in favour of day care but in other countries extended recovery is the rule. In the Netherlands, Wasowicz *et al.* reported that 91% of all tonsillectomies in children and only 2% of all tonsillectomies in adults was performed on a day basis [2]. Inpatient surgery for adults is advised because of the possibility of primary haemorrhage. Selection criteria for day surgery include the general health and comorbidity of the patient [5]. The distance from home to hospital

might be an important factor as well, with patients living more than half an hour from the hospital being treated as inpatients.

There is a great difference in patients' appraisal of day surgery. In Norway 92% of patients preferred day case tonsillectomy [6]. In Germany most of the patients preferred to stay in the hospital for 4 days post-operatively [7]. German patients were of the opinion that as inpatients they would have better access to effective analgesia. The only European country where patients are generally admitted for more than 4 days is Germany, but it can be assumed that health care politics might play a role there. Laser surgery of the palate or tonsils is mostly performed on a day basis, because of the minimal risk of bleeding. Benign laryngeal lesions are mostly treated as day cases. Only in cases where the airway might be compromised due to oedema or there might be an increased risk of haemorrhage are the patients treated as inpatients.

### **Neck**

Lesions of the neck are generally operated upon in an inpatient setting. With benign lesions, however, day surgery is possible as has been shown by Bratu *et al.* [8]. Forty-six percent of patients who underwent a thyroglossal duct excision were operated on as day cases. Timing of surgery appeared to be an important issue. Patients operated on after 13.00 hours were admitted more frequently. Also, the necessity of a drain prompted admission [8]. An increasing amount of diagnostic procedures in oncological patients (most endoscopies or biopsies) are undertaken as day cases, although a majority of these patients has severe co-morbidity. Careful selection of the patient is therefore mandatory. Ablative procedures are not performed on an ambulatory basis.

## **GENERAL SURGERY**

### **Introduction**

A large number of general surgical procedures can be done on an ambulatory basis. Day surgery rather than inpatient surgery must be regarded as the standard for all elective surgery [9]. It should be considered the principal option and no longer an alternative form of treatment. However, not all patients can be treated on a day surgery basis. It is not the operation that is ambulatory, it is the patient. It is of paramount importance that all patients are carefully selected, taking social, medical (co-morbidity) and surgical criteria into account.

Pre-operative assessment, the providing of information to patients and carers, appropriate treatment and follow-up after discharge all require meticulous attention to detail.

### **Common procedures that can be performed on a day surgery basis**

Procedures suitable for ambulatory surgery have the following characteristics:

- post-operative care might be specific but is neither intensive nor prolonged, and will not lead to unexpected admissions to hospital;
- the risk of severe pre- and post-operative blood loss is low;
- the duration of the procedure is less than 90 minutes;
- post-operative pain is easily controlled.

Day surgery procedures must be performed by highly qualified professionals, with considerable experience in traditional inpatient surgery, to reduce the number of complications and/or unplanned readmissions and to achieve greater efficiency.

Important recommendations for the operative technique are:

- no unnecessary tissue traction;
- no unnecessary tissue tension;
- minimally invasive procedures;
- minimal ischaemia;
- complete haemostasis;
- no unnecessary manipulation;

These surgical principles are also applicable to conventional surgery but are essential for the promotion of an uneventful recovery and a reduction of the number of unplanned admissions after day surgery. Commonly accepted procedures for day surgery are operations for inguinal hernia, breast lesions and proctological problems. Improvements in anaesthesia and surgical techniques have allowed faster recovery with less post-operative pain.

### **Hernia surgery**

The treatment of groin hernias in adults has moved from the classic approach with overnight stay, sutured techniques and general or spinal anaesthesia to a contemporary approach where day case surgery, local anaesthesia with sedation and open mesh techniques are common. There is no universally accepted operation for the permanent cure of inguinal hernia. The Lichtenstein technique employs a sutured onlay mesh patch [10]. It avoids any distortion of the normal anatomy and suture line tension. The Rutkow-Robbins Perfix mesh-plug consists of a polypropylene umbrella cone, which is placed into the hernia defect, reinforced with an onlay patch without suturing [11]. Both techniques can be characterised by:

- a short learning curve;
- a low complication rate;
- less post-operative pain;
- early return to full activities;
- suitable for 85% of primary inguinal hernias;
- low numbers of unplanned admission (< 4%) after day surgery.

The sutured Shouldice type of repair can also be carried out as a day case under local anaesthetic with successful outcomes [12]. In recent years the laparoscopic approach to inguinal hernia repair has raised much discussion. Comparison between open anterior and laparoscopic techniques has led to the conclusion that both the anterior approach and the laparoscopic approaches are equally acceptable in terms of the most important endpoint in hernia surgery that is recurrence rate. The laparoscopic approach is associated with less post-operative pain (both early and late) and a quicker recovery, but this procedure takes more time, needs a general anaesthetic, may cause more serious complications, is more expensive and has a long learning curve [13].

### **Proctological surgery**

Approximately 90% of all anal procedures can be performed on a day surgery basis. Operations like lateral internal sphincterotomy for anal fissures, fistulectomy and the excision of one or two haemorrhoids are possible. Larger lesions such as high fistulas or 3 or more haemorrhoids should be performed with overnight stay, for adequate pain relief and/or wound control. Perfect surgical technique with a minimal amount of tissue destruction is very important. The use of the harmonic scalpel might contribute to the minimisation of trauma. Packing of the anal canal should be avoided as this can lead to urinary retention. Circular staple anopexy for prolapsing haemorrhoids (Longo procedure) is an alternative to more conventional surgical procedures. It is suitable for day case surgery because post-operative pain is less, although there is more risk of potentially serious complications.

### **Breast surgery**

An increasing amount of breast surgery is performed on an ambulatory basis. Benign breast surgery (removal of cysts or fibroadenomas, biopsies of palpable/non-palpable lesions, duct excision, correction of gynaecomastia) is undertaken on a day basis under general anaesthesia or local anaesthesia with sedation. Operations for breast cancer are increasingly becoming day procedures. Sentinel lymph node biopsy has replaced axillary lymph node dissection for most primary breast cancer patients with clinically normal lymph nodes, decreasing post-operative morbidity (lymphoedema, arm numbness), so favouring ambulatory management. It has been shown that patients, operated on for breast cancer on an ambulatory basis, report faster recovery and better psychological adjustment [14].

### **More complex procedures, suitable for day surgery**

Surgeons can perform more extensive procedures on a day basis without compromising the safety and quality of the treatment, although many factors must be taken into account to minimise post-operative morbidity. Adequate pain management is important to facilitate mobilisation and rehabilitation by reducing complications after discharge home. A good example of a more complicated procedure suitable for ambulatory surgery is the (partial) removal of the thyroid gland. A perfect surgical technique and a low threshold for

the decision to admit the patient after the operation when problems occur are essential [15].

Schwartz *et al.* [16] reported on thyroid operations, performed as ambulatory or short stay cases. They proposed that the indications / prerequisites for an ambulatory procedure were:

- hemi-thyroidectomy for nodules with a low risk of carcinoma;
- pre-operative PAAF: no malignancy;
- ASA I and ASA II patients;
- no intra-operative pathology;
- provisional drain until discharge of the patient;
- discharge only when bloody drainage has stopped, and the patient is well.

The main concern after thyroid surgery is haematoma formation, causing respiratory problems. This life threatening complication usually appears within 6 hrs of the operation in more than 75% of the cases where it occurs. Thus at least six hours of post-operative recovery time is required [16].

### **The role of minimally invasive surgery**

Laparoscopy reduces the trauma of a formal laparotomy, providing potential for faster recovery. Laparoscopy, combined with improvements in anaesthesia and analgesia has enabled an increasing number of surgical procedures to be performed on a day case or short stay basis. Some procedures like laparoscopic cholecystectomy, appendicectomy, repair of incisional hernia and reflux operations are now suitable for day case surgery, while gastric banding, adrenalectomy and splenectomy can be performed with a 23 hour stay (ambulatory surgery with extended recovery).

Key factors for success are careful selection of patients (taking medical, social and surgical criteria into account), a standardised anaesthetic protocol, an experienced surgeon, a motivated patient with a positive attitude and a trained day care team. The combined efforts of anaesthetists, surgeons, nurses and general practitioners are fundamental. It is mandatory to get synergy during the whole peri-operative period. Important measures are pre-emptive analgesia, anti-emetic therapy, short-acting general anaesthetics and multimodal analgesia [17].

Infiltration of incisions with local anaesthetic, careful trocar placement, the use of mini and micro instruments, avoidance of the routine use of nasogastric tubes, bladder catheters and drains, early food intake and mobilisation all contribute to the fast recovery of the patient.

### **Laparoscopic cholecystectomy**

In the early days the number of unplanned overnight admissions after day case

laparoscopic cholecystectomy was high (over 40%), but more recent studies have shown a more acceptable number of less than 10% [18].

Today, most patients with gallstones requiring an elective cholecystectomy are eligible for day surgery. Not suitable for day case cholecystectomy are patients with:

- acute cholecystitis;
- choledocholithiasis (confirmed or suspected);
- need for major surgical procedures;
- ASA III (except specified cases);
- ASA IV.

Post-operative admission of the patient after laparoscopic cholecystectomy is necessary for the following indications:

- duration of anaesthesia > 90 min;
- blood loss > 500 ml;
- associated major surgical procedures;
- need for abdominal / biliary drainage;
- visceral / vascular injury;
- conversion to laparotomy;
- hypoxaemia / hypercapnia;
- persistent ECG / haemodynamic alterations.

Otherwise, the patient can be discharged home on the same day if all the regular criteria for discharge are fulfilled. After a laparoscopic procedure it is important to check if the patient can tolerate oral fluids. In some cases a short stay unit might facilitate the transition from inpatient laparoscopic cholecystectomy to a true day surgery approach. However, it is important that any 23 hour facility is seen as an extension of the day surgery unit and not as an alternative [19]. In the literature the safety of ambulatory laparoscopic cholecystectomy has been documented [20].

### **Laparoscopic fundoplication**

Currently most groups performing laparoscopic fundoplication still admit patients for 1-2 days, but laparoscopic fundoplication can be done as an ambulatory procedure. Day surgery success rates of 80% in 113 antireflux procedures have been published [20]. There is some concern regarding procedure specific complications such as unrecognised mucosal perforation.

### **Laparoscopic adrenalectomy**

Most patients can be discharged within 24 to 48 hours after the operation. Laparoscopic adrenalectomy on a day surgery basis is appropriate for small tumours and patients having Conn's disease, but not for patients with a phaeochromocytoma. Laparoscopic adrenalectomy can be a fast operation. It is feasible and safe and yields satisfactory



results for patients as a day procedure when the necessary surgical experience and optimal anaesthesia are both available. 100% day surgery success rates have been published [20].

### **Laparoscopic ventral hernia repair**

The laparoscopic approach to ventral hernias is based on the principles of the Rives-Stoppa open mesh repair. Most ventral hernias may be approached by a laparoscopic technique. Patients having small hernias repaired often go home on the day of surgery but those with larger ventral hernias require a longer stay in hospital. In general, patients who are ambulating well, tolerate oral fluids and have adequate pain control with oral analgesics can be discharged home a few hours after the operation [21].

In conclusion, outpatient laparoscopic surgery is safe, provided that the patient is well informed pre-operatively, thoroughly evaluated by the surgeon before discharge and on discharge does not have pain or PONV.

### **Ambulatory general surgery future agenda**

One day surgery will have limits, but today these limits are unclear. By emphasising information and training of patients and staff, further developments in patient selection, reduction of surgery time, minimally invasive surgery, optimising pain relief, early ambulation, regional analgesia, fluid therapy and oral nutrition, it will be possible to increase the number and type of procedures in the near future.

## **GYNAECOLOGY**

### **Introduction**

Minimal access and less invasive surgery, facilitated by recent technological advances has provided the gynaecologist with opportunities to perform an increasing number of procedures with a minimum of anaesthesia, enabling ambulatory care instead of long term admission. A number of ambulatory interventions may be performed in an office setting due to the fact that general anaesthesia is less necessary, allowing procedures to be performed under local anaesthesia.

### **Common gynaecological procedures, suitable for day care**

#### **Diagnostic Hysteroscopy**

Hysteroscopy is considered the gold standard not only for visualizing the cervical canal and the uterine cavity, but also for treating different kinds of benign lesions localised in that region [22]. The development of scopes with small diameters (3 to 5.5 mm) has made feasible diagnostic hysteroscopy with (or without) local cervical anaesthesia. This has led to a remarkable shift from the ambulatory to the office setting. The even less invasive vaginoscopic hysteroscopy is performed without cervical dilation, a vaginal speculum or

a cervical tenaculum. A hysteroscope is introduced into the vagina, and by using saline irrigation the cervix's external ostium is visualized. Subsequently, the scope is introduced through the cervical canal into the uterine cavity. During a diagnostic procedure it is possible to take biopsies or remove small (<0.5 cm) polyps to obtain histology, but larger polyps and fibroids require operative hysteroscopy.

#### Operative hysteroscopy

Large lesions like fibroids, protruding completely or partly into the uterine cavity, can be removed using a hysteroscopic resectoscope. The resectoscope has a diameter of 8-9 mm and cervical dilation up to 9 mm is indicated which mostly requires regional or general anaesthesia. This technique uses monopolar current to transect tissue in a way similar to transurethral prostatectomy in urology. Monopolar current necessitates electrolyte free distension fluid (in which e.g. sorbitol is added to create osmotic capacity) which limits the operation time by liquid loss. Intravasation must not exceed more than one litre of electrolyte free fluid because this may cause severe cerebral oedema. Left untreated, this may be followed by coma and subsequent death [23]. Nowadays, saline can be used for distension thanks to the recent development of bipolar hysteroscopic instruments, decreasing the chance of intravasation syndrome. New bipolar instruments fitting in a 5 French working channel initiated operative hysteroscopy with 5 mm hysteroscopes. This means that polyps and fibroids up to 2 cm in diameter can be removed in an office setting [24].

#### Endometrial ablation

Many women suffer from heavy menstrual bleeding without anatomical abnormalities of the uterus. If there is no wish for further procreation and hormonal therapy is not feasible, hysterectomy used to be the only option. However, several alternatives have become available in the last few years. Endometrial ablation by hysteroscopy using a resectoscope decreases symptoms sufficiently in most of the treated women to avoid hysterectomy [25]. Newly developed techniques like the Thermachoice balloon or NovaSure system, destroy the endometrium by heating devices which are inserted into the uterine cavity [26]. Unlike the resectoscope which requires experienced surgeons, these devices are very easy to use and shorten operation time to less than 15 minutes. Both endometrial ablation and destruction can be performed in an ambulatory setting.

#### Uterine fibroid embolisation

In general, large and multiple fibroids located in the uterine wall are treated by myomectomy or hysterectomy, necessitating laparotomy. A recently developed alternative is uterine fibroid embolisation which avoids major surgery. Using angiography, the blood supply to the fibroids is blocked by small particles of polyvinyl alcohol which are injected into its main arteries. The blockage of the blood supply causes degeneration of the fibroids resulting in resolution of symptoms. Embolisation is usually undertaken with an overnight stay after the procedure. Preliminary reports show a high improvement of symptoms (up

to 90%) with 40% reduction of overall uterine volume [27,28]. The effect of embolisation on future fertility and pregnancy is not known and, therefore, is not recommended for women who plan to have children. Long term follow up has to show whether fibroids (and symptoms) will or will not grow back after the procedure.

#### Sterilisation

Female sterilisation was one of the first possible laparoscopic treatments and has already been performed in an ambulatory setting for several decades. Laparoscopic sterilisation under local anaesthesia has been described in the literature [29], but has never gained broad popularity. Recently, hysteroscopic sterilisation using the Essure technique has been successfully introduced [30]. In an office setting, titanium-dacron devices are brought into both tubes, inducing a focal tissue reaction leading to tubal occlusion and inducing effective sterilisation.

#### Diagnostic laparoscopy

For many years, the laparoscopic diagnosis of abnormalities of the internal genitalia has proven useful. Its feasibility in an ambulatory setting has been challenged by the development of microlaparoscopy in office gynaecology. Use of small scopes and instruments (3-5 mm in diameter), low insufflation pressure, warmed and humidified insufflation gas and less irritating insufflation gas (N<sub>2</sub>O instead of CO<sub>2</sub>) all may contribute to a less painful intervention and less post-operative pain [31,32,33,34]. In this way, diagnostic laparoscopy under local anaesthesia can be performed, but close anaesthetic guidance and well trained personnel are still needed throughout the procedure.

#### Hydrolaparoscopy

Hydrolaparoscopy has been recently introduced into the diagnosis and work-up of fertility patients [35]. The laparoscope is introduced into the vagina, and via posterior colpotomy the pouch of Douglas and thus the abdominal cavity is reached. By filling the pouch of Douglas with saline, distension is created to visualize the internal genitalia. Small surgical interventions like resection of filmy adhesions and coagulation of superficial endometriosis can be performed through a small working channel in the laparoscope. All of this appears to be feasible in an office setting using local anaesthesia, and can be incorporated in a 'one stop fertility clinic' in which a full diagnostic procedure is undertaken in only one day.

#### Operative laparoscopy

Virtually all benign intra-abdominal gynaecological surgery can be performed laparoscopically, with the exception of dealing with very large uterine (fibroids) or adnexal (ovarian cysts) pathology and suspected malignancy. Laparoscopy is the primary mode of access in cases of sterilisation, surgery for ectopic pregnancy and the removal of small and benign cysts of the ovary. An increasing number of gynaecologists are capable of performing laparoscopic hysterectomies, myomectomies and prolapse surgery. However, a long learning curve has to be taken into account [36].

The laparoscopic approach has made relatively large gynaecological surgery possible in an ambulatory setting, although most patients are not released from hospital on the day of surgery but need one or two days stay for sufficient recovery.

### **Less common procedures, performed on an ambulatory basis**

#### Vaginal hysterectomy

In general, patients need 3-5 days hospitalisation after classic vaginal hysterectomy in which Vicryl sutures are used to ensure haemostasis. The development of vessel seal technology opens the possibility to reduce hospital stay to one or two days. The basis of vessel seal technology is pulsating bipolar current with low voltage and high amperage, applying energy depending on tissue impedance, in combination with physical compression [37]. Thus, effective haemostasis is reached for even large diameter vessels (up to 7 mm). After its successful introduction in laparoscopic surgery, open instruments like the 'coagulation clamp' have been introduced and studied in vaginal hysterectomy [38,39,40]. Because suturing is avoided, tissue trauma is minimized and post-operative pain reduced, facilitating quick release from the hospital.

#### Uro-gynaecology

Until recently, the operation of choice for urinary incontinence was the Burch colpo-suspension. This operation necessitates a Pfannenstiel incision to reach Retzius' space in order to create a suture suspension of para-urethral tissue to Coopers' ligament. In only a few years, this operation has been almost completely replaced by the vaginal approach using a Tension free Vaginal Tape (TVT) under regional or even local anaesthesia [41]. A small incision in the vagina under the urethra is sufficient to guide the tape made of polypropylene behind the symphysis or through the obturator foramen, depending on the technique used. Since cure rates appear to be the same [42], and the vaginal approach is much easier and quicker to perform, it is not surprising that the Burch colpo-suspension has nearly been abandoned. Another advantage is that most patients do not need a catheter for 3-5 days post-operatively which is common after a Burch operation. Most TVT-operations are therefore performed in an ambulatory setting.

## **NEUROSURGERY**

### **Introduction**

An increasing number of neurosurgical procedures are now performed on an ambulatory basis. Advances in anaesthetic and surgical techniques have promoted this transition of patients from the inpatient hospital ward to the short stay department (admission for a period of a maximum of 23 hours, also referred to as 'extended recovery') or the ambulatory unit (discharge of the patient on the same day of operation) without compromising patient satisfaction or surgical outcome. Procedures, originally used for brain surgery like microsurgery, endoscopy, neuronavigation, stereotaxis and others,

are now employed in spine and peripheral nerve operations. They render surgery less aggressive and thus promote rapid recovery. Moreover, the evolution of neuro-radiology, as computerized axial tomography and magnetic resonance, allows better selection of patients. Proper patient selection is of utmost importance. Ambulatory operations should be performed by experienced surgeons which should result in fewer complications and a shorter anaesthetic time.

### **Spine surgery**

Operations for lumbar and cervical herniated disc.

Lumbar microdiscectomy is an effective neurosurgical procedure that can be performed on an ambulatory basis. Various reports state that day case microdiscectomy, which remains the gold standard for herniated disc surgery, can be performed safely and effectively in the majority of patients [43,44,45]. Coexisting lumbar spinal stenosis or osteophytic spurs may complicate the procedure and in these situations even extended recovery is contra-indicated [46].

Ambulatory surgical treatment of cervical radiculopathy can be safely provided in selected patients: the outcome is not different from the inpatient setting. Either a posterior approach (laminoforaminotomy), or an anterior approach is possible [47]. Meticulous microsurgical technique is essential to avoid complications [48]. The anterolateral cervical approach has been proven to be most efficacious for herniated cervical disc, as compared to the posterior approach: recovery is more rapid and with less pain. Fusion of the disc space is undertaken in all cases with special cages. The author would recommend extended recovery for 23 hours, and reserves this procedure for one level herniation without instability, subluxation or osteophytic bone [48].

Recess lumbar syndrome and synovial cysts

The surgical technique is similar to that of microdiscectomy and even more simple because only the nerve route in the recess is decompressed without discectomy. Ambulatory surgery is contra-indicated when the spine is severely degenerated: operations will take too much time due to multilevel disease. Lumbar synovial cysts are a rare cause of lumbar radiculopathy and back pain. Surgical treatment consists of complete excision of the cyst [49]. It is possible to remove the cyst and decompress the root with the use of the microscope or the magnifying endoscope. When synovial cysts are associated with spondylolisthesis ambulatory surgery is contra-indicated.

Vertebroplasty for spinal compression fractures

This operation can be performed on an ambulatory basis, especially in cases when osteoporosis is present [50].

Intradiscal thermoablation and chemonucleolysis for disc back pain.

These procedures may be performed as day cases [51].

## Peripheral nerve surgery

### Carpal tunnel release

Median nerve decompression at the wrist is a very common procedure, performed by various surgical specialists. Indications for surgery include motor weakness, persistent arm and hand discomfort or paraesthesia, unresponsive to conservative therapy. The procedure is performed under local anaesthesia, sometimes combined with sedation and in nearly every case can be managed on an ambulatory basis (see Chapter 2).

### Ulnar nerve decompression or transposition

Outpatient surgery for ulnar neuropathy at the elbow is effective and safe. A recent report documents that the outcome of simple decompression, as compared to anterior subcutaneous transposition for idiopathic neuropathy of the ulnar nerve at the elbow is the same. Simple decompression is the preferred procedure, as it is associated with less complications [52].

### Decompression of the peroneal nerve

The peroneal nerve is vulnerable to compression in the area of the fibular neck. Decompression of this nerve may be undertaken on an ambulatory basis.

### Tarsal tunnel release

Tarsal tunnel release, obtained by transection of the laciniate ligament and external neurolysis of the nerve, is done as an ambulatory procedure for treatment of tarsal tunnel syndrome.

### Peripheral nerve Schwannoma or neurofibroma

Small and simple neurofibromas or Schwannomas can be safely removed on a day case basis using microsurgery. The surgeon must be trained in the use of the microscope and peripheral neuro-stimulation.

## Cranial surgery

### Stereotactic brain lesion biopsy

Stereotactic brain biopsies can be undertaken as day cases. The patient must be well informed during pre-assessment and the procedure is performed under local anaesthesia, allowing discharge home 4 hours after the procedure [53].

### Cranioplasty

Patients with simple cranial bone defects of the skull convexity can be operated on on an outpatient basis because it is easy to work with modern cranioplasty materials.

### Cranial tumours (osteomas)

Selected cases of patients with cranial convexity tumours can be operated upon on an outpatient basis.

Revision of ventriculo-peritoneal shunts

Children with neonatal hydrocephalus and a ventriculo-peritoneal shunt need re-operations from time to time, to extend the distal (peritoneal) part of the shunt. This procedure can be scheduled in the ambulatory department.

## OPHTHALMIC SURGERY

### **Common ophthalmologic procedures, suitable for day surgery**

By far the most frequently performed day surgical procedure is that for cataract. According to data provided by the Organisation for Economic Co-operation and Development (OECD) in Europe the number of operations for cataract continues to increase, so ophthalmologists continue to outpace their surgical colleagues regarding the amount of day surgery performed [54]. In 2003, the overall rate of day case cataract surgery in the top performing countries (Denmark, Finland, the Netherlands and the UK) was more than 90%, while the overall rate of all ambulatory surgery in the same countries was less than 50%. The absolute numbers for cataract surgery are also high. In, for example, Finland and the Netherlands every year almost 700 cataract operations per 100.000 inhabitants are done [54].

Cataract surgery is generally performed with topical or local anaesthesia. Topical anaesthesia is administered as eye drops or gel, containing cocaine 2% or oxybuprocaine/lidocaine 2-4%, instilled in the fornix and on the cornea. This procedure is fast and safe, but unfortunately eye movements are not blocked.

Regional anaesthesia is performed either by injection of lidocaine 2-4% behind the eye ball using an Atkinson needle, or by a canula in Tenon's space. Retrobulbar injection has the risk of perforating the bulbus or causing retrobulbar haemorrhage (especially in patients using anticoagulants). Anaesthesia administered via Tenon's space is safe but may cause a localised hyposphagma in the lower nasal quadrant of the conjunctiva. Either the ophthalmologist or the anaesthetist may be responsible for giving the local anaesthetic, depending on how things are organised in the department.

When the patient scheduled for cataract surgery is not cooperative, the operation must be performed under general anaesthesia.

Cataract surgery is an advanced and very technical operation, performed with specific instruments and an operating microscope under sterile conditions. Small incisions, making stitches superfluous, and foldable intraocular lenses are used. Many types of intraocular lenses are on the market (foldable, yellow ultra-violet blocker, multifocal).

Patients start with the use of anti-inflammatory eye drops the day before surgery. Especially diabetic patients should be aware of fluctuations in their blood glucose level. On the day

of surgery blood pressure and blood glucose are measured in these patients [55].

On the first post-operative day patients have to return to the ambulatory department, for an initial check-up.

### **More complex procedures, suitable for day care**

#### Oculoplastic surgery

Most oculoplastic surgery is performed under local or regional anaesthesia with lidocaine and adrenaline. Examples of oculoplastic surgery in day care are: blepharochalazis, ptosis, brow ptosis, small biopsies, pterygium excision, and entropion and extropion corrections. After the surgery patients should stay in the recovery room for about one hour. Ice pads are used to prevent haemorrhage and swelling. One week later patients return to the outpatient clinic to have their stitches removed.

#### Squint surgery

Strabismus surgery is typically performed in children, using general anaesthesia, and is highly suitable for a day care setting.

#### Glaucoma

Trabeculectomy can be performed in day care under general or local anaesthesia [56]. Pre- and post-operative instructions are comparable with those in cataract surgery.

#### Dacryo cysto rhinostomia (DCR)

This procedure, used to create a connection between the lacrimal duct and the inferior conchae of the nose, might well be performed in day care, under general anaesthesia. Special instructions for the patient must be orientated towards the risk of post-operative bleeding. Anticoagulants should be stopped before surgery.

#### Refractive surgery

Refractive surgery is generally performed in private clinics, under local or general anaesthesia. For laser surgery, local anaesthesia suffices but patients must be cooperative. No special pre-operative measures are needed, while post-operatively eye drops will be prescribed.

### **Post-operative recommendations**

Post-operative recommendations for ophthalmic surgery almost always include careful instructions regarding the administration of eye drops and the protection of the eye with an eye pad. Some patients, especially elderly people and young children, need special instructions from nurse practitioners on how to instill eye drops.

Patients are advised to avoid extreme Valsalva manoeuvres or rubbing their eyes.

Post-operative medication in most cases includes a combination of eye drops containing



an antibiotic (gentamicin, ofloxacin or others), and eye drops containing an anti-inflammatory agent like dexamethasone 1%. In some cases glaucoma medication, such as eye drops containing timololol 0.5% or acetazolamide, is prescribed to prevent an increase in intraocular pressure.

Patients are instructed to be aware of possible serious complications resulting from ocular surgery. When the vision declines and/or the eye becomes red and painful, patients should immediately contact the ophthalmology department or emergency unit of the hospital.

### **Procedures suitable for day care in the near future**

It might be expected that, given the high number of routine ophthalmic ambulatory procedures, the amount of more complex surgery will also increase in the future. In university hospitals and in dedicated eye hospitals some experience has been gained with retinal and less complex vitreous surgery (retinal detachment surgery, pars plana vitrectomy), performed in an ambulatory setting under local anaesthesia. Post-operative management only comprises topical medication and frequent controls in the outpatient department.

### **Conclusion**

It has been shown that patient satisfaction with day surgery treatment for cataract is high. The nurse practitioner plays an important role in this respect. Patients must be informed adequately about the operation, both orally and in writing, with special emphasis on the post-operative care for the operated eye [57].

## **ORAL AND MAXILLOFACIAL SURGERY**

### **Introduction**

As the majority, almost 90%, of all oral and maxillofacial surgery is performed under local anaesthesia, day care is routine practice for all oral surgeons. Only a few operations are undertaken under general anaesthesia, usually with inpatient admission, but nowadays increasingly on a day basis. Ambulatory surgery has gained popularity for several reasons:

- improvements in general anaesthesia, and especially in paediatric anaesthesia [58];
- requests for discharge home from patients and parents of young children;
- demands from insurance companies;
- new developments in oral and maxillofacial surgery.

Procedures performed under general anaesthesia on an ambulatory basis must be carefully selected.

### **Oral and maxillofacial surgery under local anaesthesia**

Infiltration or block anaesthesia of (branches of) the maxillary and mandibular trigeminal nerve can be obtained easily. Most injections are not painful, and the technique is safe and effective. Removal of wisdom teeth, extraction of other teeth, root removal and

apicectomies are routinely undertaken under local anaesthesia. Some of the local blocks or infiltrations, for example anaesthesia of the major palatine nerve and the nasopalatine nerve are painful and unpleasant, especially in children.

### **Children and adults in day surgery**

All oral and maxillofacial surgery unsuitable for local anaesthesia has always been performed during an inpatient admission, under general anaesthesia. Tumour surgery, malar bone, mandibular and Le Fort fractures are still treated in this way, as are osteotomies, maxillary sinus surgery and pre-implantology and implantology. The most important reason for clinical admission is the extent of the surgery and sometimes the general condition of the patient. Improvements in anaesthesia, however, have prompted a change towards day surgery for the less extensive procedures.

Although oral and maxillofacial surgery in children is often performed under local anaesthesia, general anaesthesia is indicated when local anaesthesia is ineffective, painful or unpredictable and when the duration of the surgery is long or uncertain. General anaesthesia is also indicated in uncooperative patients due to age, fear or anxiety, mental impairment or physical disability.

Because the anaesthetist and the surgeon have to do their work in the same region, pre-operative agreement must be achieved on questions like oral or nasal intubation, laryngeal mask and throat pack [59].

### **Surgery**

Extraction of carious teeth in children and in uncooperative adults might be performed under general anaesthesia due to fear, anxiety, mental retardation or physical disability.

Removal of impacted teeth, like third molars, can best be performed under local anaesthesia unless the young adult is very nervous. Removal of mesiodens or other supernumerary teeth in children may be traumatic under local anaesthesia and may be done under general anaesthesia.

Surgical exposure of impacted canines, located palatally or labially in children, can be undertaken under local anaesthesia except when the child is anxious or the position of the canine is unclear.

Cyst enucleation of large dentigenous cysts, follicular cysts or keratocysts, marsupialisation of mucous retention cysts in the floor of mouth (ranula) and excision of the sublingual salivary gland are day case procedures best undertaken under general anaesthesia.

Auto-transplantation of premolars and molars, especially in children is performed often in day surgery. Unilateral transplantation, for instance the 1.5. to the position of the

missing 4.5., is done under local anaesthesia, but bilateral auto-transplantations, 1.5. -> 4.5. region simultaneous with 2.5. -> 3.5. region, is often performed under general anaesthesia, again well possible on a day basis.

Pre-implantology surgery is often carried out on a day basis unless the iliac crest is needed for bone augmentation. Augmentation of the alveolar process and sinus lift procedures with bone from the chin, tuberositas or retromolar ped or with a combination of autologous and artificial bone can easily be undertaken as day cases. Dental implantology is in most cases performed under local anaesthesia unless the number of implants is too great and/or the patient is terrified.

Distraction osteogenesis in the maxilla, like transpalatinal distraction, can be carried out on a day basis. Distraction of the whole maxilla or mandible should be performed under general anaesthesia with inpatient admission.

Osteotomies of the maxilla (Le Fort I) or mandible (sagittal split) and also segmental osteotomies need inpatient admission.

### **Recovery**

After induction of anaesthesia and intubation, the surgeon administers local anaesthesia. The advantages of supplemental local anaesthesia are many: better pain relief during the operation, bloodless operation field and adequate immediate post-operative pain relief. In combination with the newer anaesthetics this procedure results in a fast post-operative recovery, although immediate post-operative swallowing and drinking might be impaired.

### **Procedures to be included in the near future**

In the near future distraction surgery, osteotomies, malar bone and mandibular fracture treatment and even tumour surgery may be performed under general anaesthesia on an ambulatory basis.

## **ORTHOPAEDIC SURGERY**

### **Common orthopaedic procedures, suitable for day surgery**

The most frequent orthopaedic procedure, performed on a day care basis, is arthroscopy of the knee joint. During routine arthroscopy of the knee its cartilage, menisci and intra-articular ligaments can be assessed easily. Surgical treatment of meniscus lesions, extraction of free cartilage bodies and débridement of small cartilaginous lesions can be performed. More complex knee surgery such as arthroscopic anterior cruciate ligament reconstruction may also be performed on a day basis. An overview of other orthopaedic procedures, suitable for the ambulatory setting is given in Table 1.

**Table 1** Routine orthopaedic procedures, suitable for an ambulatory setting**Shoulder**

- arthroscopy and examination under (general) anaesthesia
- arthroscopic and mini-open acromioplasty (Neer's procedure)
- resection of the lateral part of the clavicle
- arthroscopic joint stabilization (e.g. Bankart repair)
- arthroscopic treatment of minor lesions (free cartilage bodies, minor labral lesions etc.)

**Elbow**

- arthroscopy and examination under (general) anaesthesia
- arthroscopic treatment of minor lesions (free cartilage bodies, synovial biopsy)
- extensor tendon release for treatment of tennis elbow
- ulnar nerve transposition
- removal of screws, and plates and/or cerclages

**Wrist/hand**

- arthroscopic treatment of minor lesions (e.g. free cartilage bodies, synovial biopsy)
- carpal tunnel release
- arthroplasty of CMC I joint for osteoarthritis
- finger joint surgery for rheumatoid arthritis / osteoarthritis

**Spine**

- removal of osteosynthesis material
- microdiscectomy for the treatment of a herniated intervertebral disc [67]

**Hip**

- removal of osteosynthesis material

**Knee**

- arthroscopy and examination under anaesthesia
- arthroscopic treatment of minor lesions (e.g. free cartilage bodies, synovial biopsy, meniscectomy, debridement of small cartilage lesions)
- arthroscopic anterior cruciate ligament reconstruction [68]
- removal of osteosynthesis material

**Ankle**

- arthroscopic treatment of minor lesions (e.g. free cartilage bodies, synovial biopsy)
- ligament reconstruction (lateral or syndesmosis)
- removal of osteosynthesis material

**Foot**

- hallux valgus surgery (e.g. Chevron osteotomy, Keller-Brandes procedure, Akin's procedure for hallux valgus interphalangeus)
- resection arthroplasty or arthrodesis for hammer toe deformities [69]

### More complex procedures, suitable for day surgery

With the improvement of orthopaedic surgical technique and better pre-operative assessment, more complex orthopaedic procedures can be performed on an ambulatory basis. An overview of these procedures is given in Table 2.

**Table 2** More complex orthopaedic procedures, suitable for day surgery

<p><b>Shoulder</b></p> <ul style="list-style-type: none"> <li>- arthroscopic rotator cuff surgery [70]</li> <li>- stabilisation of acromioclavicular dislocations</li> <li>- open anterior shoulder stabilizations (e.g. Bankart repair, Bristow-Latarjet)</li> </ul>
<p><b>Spine</b></p> <ul style="list-style-type: none"> <li>- percutaneous stabilization of a limited number of motion segments</li> <li>- percutaneous balloon vertebroplasty (osteoporosis treatment)</li> <li>- one- or two-level implantation of devices that limit segmental extension for the treatment of the dynamic component of vertebral canal stenosis (e.g. X-stop)</li> </ul>
<p><b>Hip</b></p> <ul style="list-style-type: none"> <li>- hip replacement surgery i.e., resurfacing arthroplasty</li> </ul>
<p><b>Knee</b></p> <ul style="list-style-type: none"> <li>- unicompartmental knee replacement</li> </ul>
<p><b>Ankle</b></p> <ul style="list-style-type: none"> <li>- arthroscopy-assisted arthrodesis</li> <li>- ankle joint replacement</li> </ul>

### The role of minimally invasive surgery in orthopaedics

Minimally invasive surgical techniques play an increasingly important role in orthopaedic surgery. The term “minimally invasive”, however, is misleading, maybe it is better to speak of “muscle saving” surgery. Muscle saving procedures will allow patients to mobilise much more easily as compared to conventional surgical procedures, and this might be an advantage in day care. For example, muscle saving total hip replacement through smaller incisions facilitates early ambulation [60]. At the moment, unicompartmental knee replacement is more suitable for the ambulatory setting than total knee replacement [61].

### Special considerations regarding the post-operative period

In orthopaedic day care the patient is stimulated to mobilise as soon as possible. But in most cases detailed instructions are needed to ensure uncomplicated recovery. After shoulder stabilisation, for example, the patient is allowed to exercise his shoulder in a safe zone (i.e. movements in front of the body to a maximum of 90 degrees arm elevation) to prevent re-rupture of the surgically restored capsulo-labral integrity [62].

Orthopaedic surgeons usually do not use drains at all, or only for a couple of hours post-operatively. After knee replacement, however, drains have to stay in place for at least 24 hours.

In joint care programmes, proper pre-operative assessment of the patient's medical condition and of his or her needs in the post-operative period, will eliminate the need for lengthy admissions [63,64]. An increased number of more complex procedures performed on an ambulatory basis will necessitate the establishment of specific outpatient services, for the patient with post-operative questions, problems and/or complications [65,66].

## PAEDIATRIC SURGERY

### Introduction

In 1909, James Nicoll documented for the first time a series of 8988 children, all operated upon on an outpatient basis [71]. His practice was not followed immediately, but from 1970 onwards, more and more paediatric surgery was performed in a day care setting. During the 1<sup>st</sup> European Conference Child and Hospital (1988, Oegstgeest, the Netherlands) the tone was clearly set: 'Children shall be admitted to hospital only if the care they require cannot be equally well provided at home or on a day basis' [72].

In day surgery the standards of medical, nursing and psychological care should be comparable to those for inpatients. A dedicated paediatric day surgical unit should be staffed by specifically trained professionals with an affinity for children. Preferably children should never be nursed together with adult patients. Information for the child and their parents deserves special attention as parents have to take care of the child after discharge home. When problems arise phone contact with the day surgery unit should be possible at all times.

There still is no uniformly accepted lower age limit for the child to be acceptable for day surgery. In the Netherlands anaesthetists will accept babies with a minimum age of 3 months, and prematurely born babies when they have an age of 60 weeks after conception.

When the disease process is stable, chronic illnesses or medication are no absolute contraindication for day surgery. Careful pre-operative assessment by the anaesthetist, sometimes in conjunction with the paediatrician, is necessary.

### Common paediatric surgical procedures

Inguinal hernia and hydrocele

Almost all inguinal hernia repairs and/or resection of hydroceles in children can be performed on an ambulatory basis. As most inguinal hernias are due to the failure of the processus vaginalis to obliterate, and thus of the indirect type, closure and division

of the hernia sac or the hydrocele suffices. There is no need to reinforce the back of the inguinal canal. For post-operative pain relief, it is advisable to infiltrate the wound area with a long acting local anaesthetic. An ilioinguinal/iliohypogastric nerve block also serves this purpose. Wound closure (and this applies for almost all operations in children) is preferably performed using either absorbable subcuticular sutures or tissue glue [73]. Removal of sutures is then unnecessary and this considerably reduces the amount of tears shed.

#### Orchidopexy

Surgery for undescended testis, usually performed before the age of 2 years, is well performed in the day surgery unit. The missing testis is usually palpable in the inguinal canal, and when sufficient length of the spermatic vessels is obtained, it can be fixed into the scrotum. The wound is taken care of in the same way as described for inguinal hernia.

A laparoscopic search for the testis might be indicated when the missing testicle is not palpable in the inguinal canal, followed by orchidopexy or a staged Fowler-Stephens procedure. This has also been undertaken in an ambulatory setting [74].

#### Umbilical hernia

Umbilical hernias are rarely symptomatic, and as they often close spontaneously are seldom operated on before the age of 5 years. Of course symptomatic hernias have to be taken care of immediately. The operation consists of an infra-umbilical curvilinear incision, with transverse closure of the fascial defect.

#### Circumcision

Circumcision, in most cases performed for social or religious indications, is easily performed with a bell-shaped circumcision clamp, under general anaesthesia or penile block (using a local anaesthetic without epinephrine) in a day surgery setting. Thermocautery should be used with prudence, as this might cause serious damage to the penile shaft.

#### Lumps, bumps and skin lesions

All types of "lumps and bumps" such as sebaceous cysts, dermoid cysts, haemangiomas and gynaecomastia can be excised on a day basis. Subcuticular sutures or skin glue are advised for wound closure.

### **More complex procedures, suitable for day surgery**

#### Removal of thyroglossal duct or cyst or branchial cleft remnants

A thyroglossal duct or cyst, presenting as a midline neck mass, can be resected including the central part of the hyoid bone (Sistrunk procedure) in the ambulatory suite [75]. A pre-operative thyroid scan is mandatory to ascertain that the cyst is not aberrant thyroid tissue.

Branchial cleft remnants, presenting as a cyst or fistula, can be excised in a comparable fashion.

### Hypospadias repair

Most hypospadias are of the glandular or penile type and can be repaired (MAGPI or Matthieu procedure) in the day unit [76].

### Minimally invasive surgical procedures

(Diagnostic) laparoscopy and thoracoscopy

Paediatric surgeons use the laparoscope mainly for diagnostic reasons (searching for the testis in the case of cryptorchism, biopsy of the liver or tumours), and such procedures are well possible on a day basis. Laparoscopic appendicectomy in children sometimes is performed as an ambulatory procedure [77].

The same applies for diagnostic thoracoscopy, for example for biopsy of the lung.

### Post-operative period

It is usually unnecessary to instruct children or their parents on restriction of activity. It is difficult to enforce and children seem to know perfectly well what to do.

An important issue is pain control at home. Post-operative pain control will be addressed in depth elsewhere in this book, but the assessment and treatment of pain by the parents at home deserves special attention. In a recent study about pain control at home after paediatric ambulatory surgery it was concluded that almost 40% of children clearly were in pain, according to their parents. Some parents were afraid to administer pain killers. They feared that the child might become addicted to drugs [78]. Follow-up by phone the day after surgery was found useful in providing support to the parents [79,80].

### Conclusion

It is not by chance that the first study on ambulatory surgery was undertaken on children. Paediatric day surgery is not only safe, but moreover it is highly appreciated by both children and their parents. Normal family life is less disturbed, and savings for the community are great. In the future more procedures might be possible on a day basis, especially with new developments in minimally invasive surgery.

## PLASTIC SURGERY

### Introduction

Plastic surgeons have long been used to performing operations in a day care setting, even before the evolvement of ambulatory surgery in the 1970s. This particularly applies to hand surgery and cosmetic surgery.



### **Hand and wrist surgery**

Hand or wrist surgery is suitable for day care. Either regional blockades (brachial plexus or regional intravenous) or – by preference of the patient – general anaesthesia can be used. As most operations on the hand and/or wrist are performed in a bloodless field it should be noted that the tourniquet around the upper arm can lead to irritation and so cause restlessness of the patient when the upper arm is not fully numb. If the operation is to last for more than an hour a brachial plexus block or general anaesthesia is preferable.

When general anaesthesia is used a local anaesthetic blockade for post-operative pain relief can be helpful.

A variety of procedures is possible in a day care setting such as correction of Dupuytren's contracture or carpal tunnel syndrome, arthroscopy, arthrodesis of the finger joints, extensive intracarpal ganglion removal, operations for carpo-metacarpal joint arthrosis like arthrodesis or joint replacement, and selected procedures in wrist surgery like removal of carpal bones and arthrodesis of the wrist.

Traumatic cases requiring tendon and/or nerve repairs can be dealt with on a day basis. It should be noted, however, that non-elective surgery increases the demands made on the day care unit.

Care should be taken that the compressive bandage, applied after the surgical procedure, is not too tight. The use of a tourniquet, sometimes results in reactive hyperaemia and this warrants caution. Post-operative elevation of the extremity is advised. When the patient is discharged a sling is applied.

### **Cosmetic surgery**

Operations for cosmetic purposes have long been performed in private clinics, without an overnight stay. The information given to all patients, opting for an operation without medical necessity, needs to be exhaustive, and must include all details about the procedure, possible complications and expected follow-up. So-called cosmetic interventions may also be indicated for purely medical reasons. A blepharoplasty may be necessary because of limited vision due to upper eyelids hanging over the pupil, while breast augmentation may be performed because of a complete lack of or asymmetric breast development. Face lifts may be indicated for purely cosmetic reasons but also unilaterally in patients with facial paralysis.

Abdominoplasty with and without liposuction can be performed on a day basis. Patients leave the ambulatory department with drains to be removed after return the next morning. Careful monitoring of the patient (during massive liposuction), adequate pain management and ample instruction of the patient all contribute to an increase in the number of procedures possible in an ambulatory setting. The possibility of day case

breast reduction is under investigation at the present time. Of course, additional initiatives will require close cooperation with the anaesthetists.

### **Day surgery in children**

Operations performed in children more often than not require general anaesthesia. Even small or recurrent procedures (e.g. laser treatment) in children can only be performed under adequate sedation. Proper, professional preparation of the child is mandatory to minimise anxiety. Correction of congenital hand anomalies such as trigger finger, syndactily, polydactily, cleft hand, as well as corrective osteotomy in the hand, are all possible on a day basis. Ear correction (bat ear, cup ear) and even closure of a cleft lip are undertaken as day cases. Parents and children are equally satisfied. Sleeping at home after the intervention seems to prevent some agitation in this age category. Parents and/or carers have to be informed properly. Since children do so well after these operations, parents often tend to forget that their child has undergone an intervention and have to be discouraged from pushing the child too much. Swimming or skating on ice on the day following removal of a congenital naevus on the foot has been reported!

## **UROLOGY**

### **Introduction**

As in other fields, urology has experienced a marked increase in ambulatory surgery. With developments in surgical and anaesthetic techniques, financial pressures, changing physician and patient attitudes and technological advances, further increases in urology ambulatory care can be expected. When broken down according to organ, the greatest increase is for the kidney and the least for the penis, with ureter, urethra, testes and scrotum all revealing intermediate, but significant, increases. Ambulatory surgery includes those urological procedures that require a limited period of post-operative recovery, so that patients will be discharged from hospital on the same day of their surgical operation. Ambulatory urological procedures should be separated into adult and paediatric cases.

### **General urological procedures, suitable for day surgery**

Vasectomy, hydrocelectomy, vasectomy reversal and circumcision are the most commonly performed ambulatory procedures in adults. These procedures can be performed safely with minimal discomfort [81]. The intra-surgical complications that may arise are minimal as are the immediate and late complications [82].

The practice of paediatric urology has changed much during the last decades. Procedures that were once done only on inpatients are now done as ambulatory cases, comprising up to 60 per cent of all surgery. This trend has continued, with even more cases being undertaken as office procedures. These consist of circumcision, meatotomy for stenosis, lysis of labial adhesions, and meatal dilatation after hypospadias repair. If an operation is

done with attention to detail, it can be completed with minimal complications, although, as evidenced with circumcision, those that do occur can carry significant morbidity and even cause death. The primary limiting factor for performing procedures in the office is the comfort of the patient. The procedure, by necessity, has to entail minimum pain and great ease in obtaining haemostasis and requires a co-operative patient and family. Therefore, even as the number of operations performed on an ambulatory basis increases, there are a finite number of cases suitable for the office.

### **Complex urological procedures**

One of the complex urological procedures that may be considered for ambulatory care is donor nephrectomy. The majority of patients are in a good physical condition and the morbidity caused is minimal [83].

### **Minimally invasive procedures**

Endoscopic procedures in adults account for a substantial part of the workload of a urology unit. These are related to pathology of the urethra, prostate, bladder and ureter. In case of voiding complaints related to prostatic enlargement, laser technology and improved bipolar resection techniques have facilitated ambulatory treatment of the prostate. If the voiding complaints are related to an uncomplicated urethral stricture, optical urethrotomy may be performed in an ambulatory setting.

Transurethral resection of bladder tumours and recurrences accounts for a substantial part of the workload in a urology unit. Transurethral resection as day surgery in selected patients has been enabled by the use of extirpation and fulguration under cover of intravesical lidocaine anaesthesia or submucosal lidocaine injection [84].

Symptomatic ureteral stones are a significant burden to the urological community and disabling to the patients involved. Chen *et al.* studied the safety and efficacy of ureteroscopy as an ambulatory procedure [85]. It was elegantly confirmed that ureteroscopy can be offered selectively as a day case to patients with low surgical risk, especially American Society of Anesthesiology class I patients, and others expected to have an uncomplicated surgical procedure. In the field of oncological urology interstitial radiotherapy of the prostate has received much interest and can easily be performed on an ambulatory basis [86].

The implementation of minimally invasive day surgery in paediatric cases has been studied. In a study by Mohamed *et al.* 209 patients underwent surgery for pelviureteral junction obstruction repair and 305 underwent pyelolithotomy for renal stones. Of these children, 85% were discharged the same day, with no reported readmissions during the immediate or delayed follow-up period. It was concluded that day surgery can be safely used for children requiring open renal surgical procedures that have more traditionally been performed on an inpatient basis. This has considerable resource implications at little cost in terms of patient morbidity [87].

### **Specific instructions**

The weakest link in ambulatory surgery is often the discharge of patients. Protocols and guidelines are important for the safe discharge of patients. The patient who has recovered sufficiently for discharge is considered “home ready”, is in the intermediate stage of recovery and in paediatric cases is to continue the recovery at home under the supervision of a responsible adult. There are many tests of recovery but none suitable for routine clinical use. The mean unplanned overnight admission rate for a multidisciplinary ambulatory centre ranges from 0.12% to 1.2%. Gynaecology and urology have the highest unplanned overnight admission rates. Surgical causes of unplanned overnight admission are three to five times greater than anaesthetic causes. Common anaesthetic reasons for unplanned overnight admission are inadequate recovery, nausea and vomiting, hypotension and syncope. Surgical reasons for unplanned overnight admission included bleeding, extensive surgery, and further treatment. The patient should be discharged by a physician after satisfying a checklist of “discharge criteria”.

### **Procedures to be included in the near future**

Since there is a clear trend towards more minimally invasive endoscopic and laparoscopic treatments one may expect that major procedures may be conducted in an ambulatory setting in the future. One can think of percutaneous stone management, laparoscopic ureteropelvic junction surgery and even laparoscopic radical prostatectomy [88,89,90].

On the other hand this may account only for selected cases in view of the co-morbidity accompanying an increasingly aged population.

## **VASCULAR SURGERY**

### **Introduction**

An arterial anastomosis has for a long time been considered a relative contraindication for ambulatory surgery, so vascular procedures suitable for day surgery include only those for the treatment of varicose veins, and those to gain venous access and access for haemodialysis. These, but also more complex vascular procedures, will be discussed in this chapter.

### **Common vascular procedures, suitable for day surgery**

The most frequently performed vascular procedure in any day surgical unit is without doubt that for varicose veins. Lower extremity venous insufficiency is a common condition, afflicting 25% of women and 15% of men [91]. The vast number of operations often has led to the development of specialised vein units, both in public hospitals as well as dedicated private clinics. It is suggested that the surgical treatment of varicose veins offers greater benefits in the long term, when compared to sclerotherapy [92]. Surgical treatment always must be preceded by duplex imaging, to lower the number of

recurrences [93]. A number of options is available for the surgical treatment of varicose veins, varying from conventional or inverse stripping [94,95] to endovenous obliteration by radiofrequency [96] or laser [97]. Although significant persistent morbidity seems low [98], stripping below the knee is often advised against in order to prevent saphenous neuralgia. Endovenous obliteration requires extra investment in the necessary device and disposable catheters, but advantages such as less post-operative discomfort and faster return to normal activities, as compared to conventional stripping, have been documented [96]. Incompetent perforating veins, easily demonstrable by duplex scanning, can be removed by direct excision.

### **Complex vascular procedures**

#### *Venous access surgery*

Venous access surgery, viz. the insertion of devices for the intermittent or continuous administration of antibiotics, chemotherapy or parenteral nutrition require fluoroscopic equipment for optimal success and safety [99], precluding the performance of this procedure in all ambulatory surgical units.

#### *Haemodialysis access surgery*

Permanent haemodialysis access is achieved by creation of an autologous (Brescia-Cimino) or prosthetic A-V conduit. The general condition of the patient often precludes these procedures from being performed on an ambulatory basis, but when local anaesthesia suffices (in autologous shunts) ambulatory surgery is possible. The high number of post-operative complications and frequently necessary re-operations, however, demand caution [100] and it is often advisable to perform the operation in an extended recovery setting, with a one night admission.

### **Minimally invasive procedures**

In vascular surgery, minimally invasive procedures have been introduced. An important example is the endovenous obliteration of varicose veins. Catheters are inserted percutaneously, and a formal crossectomy in the groin can be avoided [96]. In patients with venous ulceration, the original Linton procedure for resection of incompetent perforating veins has been replaced by subfascial endoscopic division (SEPS), a procedure that has been safely performed on a day basis [101].

Thoracic sympathectomy for treatment of hyperhidrosis or Raynaud's disease can be undertaken through a thoracoscopic approach, and has been performed in a large series of patients on a day surgery basis [102].

Endovascular procedures like carotid artery stenting [103] or endovascular repair of abdominal aortic aneurysms [104], still scrutinized at the moment, might in the future be performed during a short stay admission or even as an ambulatory procedure.

Finally, robotic systems recently have been introduced in conjunction with laparoscopy, enabling surgery for aorto-iliac occlusive disease [105]. In a first series of 8 patients, the use of this combined technique reduced the median hospital stay to 7.5 days, with a range of 3-57 days. Also this approach looks full of promise for the future of ambulatory vascular surgery.

### Specific instructions

After all vascular procedures wound haemorrhage might ensue, so patients must be carefully watched and specific measures taken as needed.

Time off work after conventional stripping of varicose veins might be more prolonged than after endovenous obliteration, but an initial period of 1 week seems advisable [106]. Especially after varicose vein surgery patients must be instructed about the possibility of deep vein thrombosis (DVT). The incidence of DVT has been found to be higher (5.3%) than previously expected [106].

### Procedures to be included in the near future

It is almost certain that in future an increasing number of vascular procedures will be performed on an ambulatory basis. Some of these procedures are mentioned in the paragraph on minimally invasive techniques, although their final impact is not certain at the moment. Kehlet *et al.* suggested that, by using a multimodal approach including careful pre-operative instruction of the patient, extensive peri-operative pain control, reduction of stress response and the more frequent use of minimally invasive surgical access, most elective operations will become day surgical procedures or require only 1 to 2 days of post-operative hospitalisation [107]. Such results will only be attainable with close cooperation between anaesthetists, surgeons and nurses and that is what modern ambulatory surgery is about. Patients with vascular problems will greatly benefit from this.

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# Pre-operative screening and selection of adult day surgery patients

Veera Gudimetla, MD, FRCA, and Ian Smith, BSc, MD, FRCA

## Introduction

Pre-operative screening of day surgery patients remains essential to ensure their safety, as well as to minimise late cancellations and disruption to operating lists. Advanced assessment also provides a valuable opportunity to correct abnormalities, supply information and answer patients' questions, thereby improving the overall quality of their experience. Day surgery patients have often been selected so as to avoid almost all complications, no matter when they are likely to occur. But with the possible exception of small, freestanding facilities, it should be possible to manage complications arising in the immediate peri-operative period just as well in the day unit as elsewhere. Only problems which are likely to occur after the patient is sent home, or which are better managed in hospital, should preclude day surgery.

Many countries have developed their own national guidelines for day surgery. There appears to be considerable variation, not just in the specifics of the recommendations which have been made, but also in the bodies which have issued guidelines, the weight they carry and the extent to which they are recognised and adhered to<sup>1</sup>. As day surgery was once seen as a relatively specialised form of care, suitable for only a minority of patients, this is often reflected in rather conservative guidelines [1]. A major problem with national (or other) guidelines is that they can rapidly become outdated with increasing experience. Although many practitioners will ignore advice they no longer believe to be relevant [2], documents from auspicious bodies are frequently adhered to far longer than their content merits.

Rather than listing groups of patients who can undergo day surgery, a better approach may be to adopt day surgery unless there is a contraindication. Assessing contraindications on the basis of the combined effects of multiple factors and functional limitation, rather than a series of arbitrary cut offs, is likely to add longevity to guidelines and is the approach recently taken in the United Kingdom [3, 4]. The remainder of this chapter will take a similar approach and examine the evidence which exists.

## Pre-operative screening and assessment

There are various models for pre-operative assessment, but in the United Kingdom this is commonly carried out in a nurse led clinic using a structured questionnaire. The

<sup>1</sup> \* IAAS members, personal communication

clinic is best located in the day surgery unit so that the patients can see where they will have to come on the day of surgery. Also, an anaesthetist is likely to be on hand to answer any specific questions which may arise. However, the questionnaire can also be completed by telephone, at a surgical clinic or at home and returned by mail. The completed questionnaire is subsequently checked against a protocol developed in association with the anaesthetic department. The principal aim is to triage patients into those who are definitely suitable for day surgery, those who are clearly unsuitable and a third group who require further targeted assessment. An obvious advantage of face-to-face pre-assessment is that it allows any necessary tests to be performed in a “one stop” service and also provides an opportunity for information giving. Methods of pre-operative assessment will be discussed in greater detail in Chapter 7.

### **Selection criteria: surgical**

With improvements in technique and pain control, an ever widening range of procedures are suitable for day surgery. While individual procedures will be considered elsewhere, a few basic principles apply. Time limits, although frequently quoted, are relatively unimportant with modern anaesthesia. The degree of surgical trauma is more important and abdominal and thoracic cavities should not be opened, other than with minimally invasive techniques. Post-operative pain should be manageable with oral analgesia (or increasingly with extended regional anaesthetic techniques) and there should be no continuing blood loss or requirement for fluid therapy.

Once it is agreed that a given procedure can be performed on a day case basis, all patients scheduled for it should be referred to the pre-assessment service where the decision on day surgery or inpatient care can be made rationally. The only exception should be if the surgeon can foresee a specific instance where the operation will be too complex or extensive in an individual patient.

### **Selection criteria: social**

To ensure that patients are discharged to safe and acceptable home conditions following sedation or general anaesthesia, they are usually required to be accompanied by a responsible, physically able adult who can care for them overnight (or longer for more invasive procedures). The patient or their carer must understand the planned procedure and post-operative care and be willing to accept responsibility for providing further supervision of the patient. Patients are also told that they should not drive for at least 24 hours if they have received anaesthesia or sedation, while the procedure itself (e.g., inguinal hernia repair) may preclude driving for much longer. Easy access to a telephone is important so that emergency help can be summoned, if required.

Several studies show that almost all day surgery patients follow the advice to have a responsible carer with them and to abstain from dangerous activities, at least until the day after surgery [5, 6]. What is not known is how many patients are denied day surgery because they cannot meet these criteria in the first place. Single patients and those with elderly partners or multiple small children are more likely to have difficulties in making suitable arrangements. There is actually little hard evidence for these apparently sensible requirements [7], so it is not really known if it would be safe to relax some of them in certain cases. The best evidence relates to driving, but even this advice is based on the effect of single anaesthetic agents, in isolation and on simulated driving performance in volunteers. There has been little work looking at the effects of modern, shorter-acting day case anaesthetics [7]. There is little evidence that patients who do not comply with current advice actually come to harm, but the numbers of these are small.

A journey time to home of an hour or less is often advocated to ensure easy return for emergency medical care and to minimise distressing symptoms on the way home. This should be considered a relative requirement as patients are often willing to undertake far longer journeys. This should be safe if emergency back-up is available at their final destination. Patient hotels (hotel accommodation with-non nursing care) are an alternative for patients travelling long distances and are especially popular in countries with a thinly spread population.

## **Selection criteria: medical**

Selection of patients should be based on their overall physiological status and not limited by arbitrary limits such as age, weight or American Society of Anesthesiologists (ASA) status [3, 4]. For every patient who is not completely healthy, the nature of any pre-existing condition, its stability and functional limitation should all be evaluated. Treatment should obviously be optimised; if it is not, the patient is not adequately prepared for any form of elective surgery. A pragmatic (but nevertheless fundamentally important) question to ask is whether the management or outcome would be improved by pre- or post-operative hospitalisation. If not, the patient should undergo treatment on an ambulatory basis.

## **Age**

The influence of age on peri-operative outcome in day care surgery is inconsistent among studies [8]. Increasing age predisposes to significant changes in the intra-operative haemodynamics but does not lead to adverse outcomes [9]. It may be more important in extremes of age (>85 years old) [10]. Nevertheless, elderly patients benefit from day surgery, through a significant reduction in post-operative cognitive dysfunction [11]. Although medical and social problems increase with age, these should be considered in their own right and there should be no arbitrary upper age limit [3, 4]. Age limitations for ex-premature newborns will be addressed in Chapter 6.



## ASA

The ASA classification is a crude but simple evaluation of chronic health. Day surgery had often been confined to those of ASA grades 1 and 2 [1], but patients of ASA 3 do not experience more complications in the medium to late recovery period [12] or problems after day surgery [13]. Patients of ASA 1–3 should be suitable unless there are other contraindications and even some ASA 4 patients may be acceptable for day surgery under local anaesthesia.

## Obesity

Obesity is becoming increasingly prevalent in Western society. Guidelines on day surgery have often been quite conservative about obesity [1] because of the increase in peri-operative complications, especially respiratory, that these patients experience [12, 14]. However, these occur during the peri-operative and early recovery periods and would not be avoided by overnight hospital admission. Several observational studies have shown no increase in unplanned admissions following day surgery in obese patients [10,15,16,17].

Current British guidelines suggest patients with a Body Mass Index (BMI)  $\leq 35$  Kg/m<sup>2</sup> should be acceptable (providing there are no other contraindications), while those of BMI 35–40 Kg/m<sup>2</sup> should be acceptable for most procedures [3]. There is little good evidence to support these particular cut off values and anaesthetists have tended to ignore previous arbitrary limits [2]. Currently, 91% of Canadian anaesthetists would accept patients of BMI 35–44 Kg/m<sup>2</sup> for day surgery and half would accept patients over 45 Kg/m<sup>2</sup>, provided they were otherwise healthy [18], a condition which is seldom met in the morbidly obese. Hypertension, congestive cardiac failure and sleep apnoea are all common in morbid obesity and dramatically reduce the acceptability of these patients for day surgery [18]. Practical limitations to the care of obese patients are more often related to the need for appropriately sized facility and surgery equipment.

Day surgery is frequently a good option for obese patients, who should benefit from the use of short acting drugs and avoidance of opioid analgesia; common features of day surgery. Careful pre-operative assessment is required to identify and exclude those with severe coexisting diseases who may be better managed as inpatients. Unfortunately, advice to lose weight is seldom successful.

## Cardiovascular diseases

### *Hypertension*

There is a positive correlation between hypertension and peri-operative cardiovascular complications [19] which applies equally to day surgery patients [12, 14]. Nevertheless, the magnitude of the increased risk from hypertension is relatively small and evidence of pre-existing end organ damage is probably of greater importance as a risk factor [19]. In

a retrospective study of nearly 18,000 day surgery patients, the majority of complications involved intra-operative hypertension, although hypotension and arrhythmias also occurred; there were no peri-operative deaths or myocardial infarctions [12].

A diagnosis of hypertension requires the measurement of elevated blood pressure on more than one occasion, supporting the value of pre-assessment. When elevated blood pressure is detected, the patient should be referred for further assessment, with treatment subsequently started if it will reduce their long term risk. It would seem sensible to defer non urgent surgery while this process is conducted. Antihypertensive therapy should then be continued during the peri-operative period.

Isolated elevated blood pressure readings are almost impossible to interpret, as blood pressure measured in hospital or a clinic is often higher than the resting level. Interestingly, this increase is greater if blood pressure is measured by a doctor than by a nurse [20]. This “white coat hypertension” carries a benign prognosis, but can only be diagnosed with the benefit of normal ambulatory pressure readings [19]. It is difficult to justify cancellation of patients on the basis of elevated blood pressure detected for the first time on the day of surgery, because this should be avoidable with timely pre-assessment.

Cardiovascular risk and the likelihood of myocardial ischaemia increase with stage 3 hypertension, defined as systolic pressures  $\geq 180$  mm Hg and diastolic  $\geq 110$  mm Hg, or with isolated systolic hypertension ( $\geq 180$  mm Hg) [19]. These patients should probably have elective surgery deferred until their hypertension is controlled, although there are no clinical trial data to support this [19]. More rapid measures to control high blood pressure (including sublingual nifedipine and sedation) do not reduce cardiovascular risk. There is no clear evidence that deferring anaesthesia and surgery reduces peri-operative risk in patients with lower arterial pressures [19].

#### *Ischaemic heart disease*

Angina at rest or on minimal effort is a contraindication to day surgery. Patients with stable angina which is optimally controlled are acceptable in the absence of other major risk factors. It is imperative that established  $\beta$ -blockade therapy is continued through the peri-operative period [8].

Cardiovascular risk can be assessed on the basis of several variables [21], but key risk factors include severe angina, heart failure and previous myocardial infarction. Evaluation of exercise tolerance (at least 4 Metabolic Equivalents (METs) capacity or climbing a flight of stairs without any symptoms), the presence of other risk factors (e.g., diabetes, peripheral vascular disease) and the intensity of the surgical procedure should be considered while assessing the suitability for day surgery. Myocardial infarction within the last 6 months has been considered a contraindication for elective surgery due to the increased risk of re-infarction. With advances in the treatment of myocardial infarction, it has been suggested

that elective surgery may proceed safely as little as six weeks later [22], when the atherosclerotic plaque will have stabilised. Similar advice applies to patients after cardiac revascularisation procedures.

Patients with a transplanted heart do not feel the pain of angina and may experience acute rejection, which can be difficult to detect. While day surgery in stable heart transplant recipients has been described as “an acceptable option” [8], there is little evidence to inform the debate.

## Respiratory diseases

### *Asthma*

Asthma is not a contraindication for day surgery, provided it is well controlled and the patient has good exercise tolerance. A history of recent exacerbations requiring hospital admission or systemic steroids warrants caution, as asthma is associated with a five-fold increase in the risk of post-operative respiratory events [23]. Peak expiratory flow is useful in assessing the severity of asthma, but a severity sufficient to warrant lung function tests would preclude day surgery.

It is worth asking asthmatics about previous exposure to non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs only trigger bronchospasm in around 5% of asthmatics and these useful drugs should not be withheld if the patient has taken aspirin, ibuprofen, etc. in the past without ill effect. In the absence of any history, the risks and benefits must be balanced for the individual patient.

### *Chronic obstructive pulmonary disease (COPD)*

COPD is associated with a two-fold increase in the risk of post-operative pulmonary complications [24] which is increased further if the patients continue to smoke [25]. Overall, there is no significant association between respiratory disease and length of stay in recovery after ambulatory surgery [26], suggesting these complications are probably short lived or minor. Asymptomatic patients have a low incidence of complications at approximately 2% (similar to the general population), which increases to 4.5% if they have had symptoms within 30 days of surgery and to as much as one in two if they are symptomatic at the time of surgery [27]. This suggests that elective surgery should be delayed, in order to reduce risk, if there have been recent symptoms. Smoking is associated with an increased risk of respiratory and wound complications [25]. Patients who stop smoking for 6–8 weeks pre-operatively experience fewer wound related complications [28], but cessation of smoking less than four weeks before surgery has no effect on adverse events [25]. Smoking cessation should be encouraged if patients are seen more than four weeks before surgery, although this is seldom effective.

There is no evidence that spirometry is predictive of post-operative events in asymptomatic patients scheduled for day surgery [8]. Exercise tolerance is important and dyspnoea at

rest or on minimal, indoor exertion, would be a contraindication to day surgery. Use of regional or local anaesthesia with limited sedation may increase the proportion of suitable patients.

#### *Acute upper respiratory tract infections (URTI)*

In adults with mild URTI, who are afebrile and have no signs of involvement of the lower respiratory tract, most day surgery will be relatively safe. However, tracheal intubation should be avoided if possible. If pre-assessment is occurring close to the date of operation, the patient should be rescheduled if they are febrile or unwell, or if surgery will involve the airway [29]. In other cases, patients should be advised to telephone the day surgical unit if their condition deteriorates.

#### *Obstructive sleep apnoea*

Patients with obstructive sleep apnoea are at increased risk of peri-operative complications. These include difficult tracheal intubation, hypertension, dysrhythmias, oxygen desaturation, airway obstruction and the need for reintubation [8]. Sudden death from cardiac arrest can also occur after general anaesthesia and many of the cardiorespiratory effects are exacerbated by opioid analgesia [30].

It is estimated that at least 80% of patients with sleep apnoea are undiagnosed. It is therefore important to identify and treat these patients pre-operatively. Nasal continuous positive airway pressure (nCPAP) is the treatment of choice and there is some evidence that this prevents serious post-operative complications [8]. To be considered for day surgery, patients should be established on nCPAP with good control of symptoms, should be proficient in using the device themselves and should wear it for all post-operative sleep periods. There is little evidence to support the safety of regional anaesthesia over general anaesthesia [8], although this may make airway management easier and reduce the need for opioids (which should generally be avoided).

Good evidence to support the safety of day surgery in patients with obstructive sleep apnoea is lacking. One retrospective study showed no increase in unanticipated admission or adverse events compared to controls [31], although the admission rate was unusually high in both groups and patients were not followed up after discharge. The American Society of Anesthesiologists has promulgated "Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea" that includes sections on pre-operative evaluation and preparation, intra-operative and post-operative management, as well as a discussion of inpatient vs outpatient surgery; the guidelines can be found at <http://www.asahq.org/publicationsAndServices/practiceparam.htm#apnea>.

#### **Diabetes mellitus**

Diabetes mellitus produces problems with peri-operative glycaemic control and may induce disease in various end organs. A diagnosis of diabetes does not predict morbidity

or mortality after day surgery [32]. Careful screening (including blood tests and ECG) is needed to identify those with coexisting cardiovascular, renal or autonomic dysfunction, which may independently produce complications. Measurement of glycosylated haemoglobin is useful to demonstrate the stability of diabetic control. Poor pre-operative control increases the likelihood of peri-operative hyper- or hypoglycaemia and wound infection.

Simple regimens for peri-operative glycaemic control appear as effective as more complex ones [32]. Patients should be scheduled first on the operating list, omit their morning oral hypoglycaemic agent or insulin and resume normal diet and medication as soon after surgery as is possible [33]. Starvation times should be minimised and early return to oral intake and insulin after surgery is helped by the avoidance of nausea and vomiting. This can be facilitated by preferential use of local or regional anaesthesia, multimodal antiemetic regimens and modification of the range of acceptable day case procedures.

### **Renal and hepatic diseases**

Day surgery is generally contraindicated in patients with end stage renal failure on dialysis because of co-morbidity and practical difficulties [3]. Nevertheless, they can often be considered for simple day case procedures performed under local or regional anaesthesia and this includes the formation of a fistula for dialysis.

Day surgery is contraindicated in severe liver disease, but milder forms of dysfunction should not pose any difficulties [3].

### **Neurological conditions**

Epilepsy is not a contraindication, provided it is stable and well controlled [3]. It could be argued that less stable epilepsy is also not a contraindication, since the patient and their carers will already be used to managing fits in the home environment.

Neuromuscular disorders can pose a number of difficulties, but need not always preclude day surgery. The anaesthetist should always be consulted about specific patients.

Patients with learning difficulties may be awkward to manage in the day surgery unit. However they can be excellent candidates for day surgery because they benefit from the shortest possible length of separation from their normal environment. The presence of related medical conditions should be evaluated.

### **Chronic medications**

A significant number of medications confer benefit and the patient should be actively reminded to take these on the day of surgery. Established  $\beta$ -blockade, in particular, should not be stopped. The majority of the remainder will do no harm if taken as usual. Diuretics may be inconvenient and can be omitted safely on the day of surgery. Insulin and oral hypoglycaemics require special instructions as outlined above. Metformin need not be

stopped before the day of surgery [32]. Oral contraceptives should not be stopped before the majority of operations because the risks associated with unwanted pregnancies are usually greater than those of remaining on therapy.

### *Anticoagulants*

Anticoagulant therapy is not a contraindication for day surgery, but the peri-operative management needs to be tailored to the individual circumstances, taking into account the risks of peri-operative bleeding, interactions with drugs like NSAIDs and the original indication for anticoagulation. If the patient is only on short-term anticoagulation, it makes sense to delay surgery until this treatment has stopped. Prophylaxis against deep venous thrombosis should not be routinely required in day surgery, but may be appropriate for some higher risk procedures.

### *Monoamine oxidase inhibitors*

Although not widely prescribed, monoamine oxidase inhibitors (MAOIs) remain important in the management of severe depression. There are sporadic case reports of interactions between MAOIs and various anaesthetic drugs, especially pethidine (meperidine), but also numerous reports of uneventful anaesthesia [32]. Withdrawing MAOIs up to two weeks before surgery is necessary if all interactions are to be avoided; this may risk a life-threatening exacerbation of the psychiatric disease that should be discussed with the patient's physician before considering drug withdrawal. Although there is no evidence specific to day surgery, MAOIs are not contraindicated if they are necessary for patient well-being; patients should continue their medication throughout the peri-operative period and pethidine, cocaine and indirect acting catecholamines should be avoided [32].

### *Drug and alcohol abuse*

Recreational drug use may pose social problems, which are beyond the scope of this chapter. MDMA ("Ecstasy") and cocaine are dangerous and surgery should not continue if these have been taken recently. Opioid use may make pain relief more difficult, but non-opioid analgesia is often sufficient for many procedures (intra-operative opioids are probably also best avoided, if possible). Cannabis is not a contraindication. Significant alcohol consumption may induce tolerance to many anaesthetic drugs, but is not a contraindication to day surgery in the absence of severe hepatic dysfunction. Patients who are acutely intoxicated should be deferred due to the likelihood of a full stomach and dehydration. Hospital admission prior to surgery may ensure better compliance with fasting policies in the future, although patients have been known to bring supplies into hospital.

## **Anaesthetic problems**

Patients with previous or family problems with anaesthesia should always be notified

to the anaesthetist for specific advice, although few of these difficulties will preclude day surgery. Succinylcholine apnoea is not a contraindication, as succinylcholine (and mivacurium) can usually be avoided.

Many patients with difficult airways present few problems if managed with a laryngeal mask airway, as is common in day surgery. Although tracheal intubation in a patient with a difficult airway may introduce some delay, there is no fundamental reason why they cannot be managed safely as a day case if airway management equipment is available.

Malignant hyperpyrexia is not a contraindication to day surgery, although the rarity of the condition means that there is little high quality evidence. Patients with malignant hyperpyrexia susceptibility can safely undergo day surgery using a trigger free anaesthetic. Prophylactic dantrolene is not advised, as its adverse effects (including prolonged muscle weakness, hepatotoxicity, local phlebitis, dizziness, confusion and drowsiness) outweigh any possible further reduction in the likelihood of malignant hyperpyrexia [34]. However, it is important to have an adequate supply of dantrolene in the surgical facility at all times, should unexpected treatment be needed.

As there is still a remote possibility (<1%) of malignant hyperpyrexia after a trigger free anaesthetic [35, 36], post-operative temperature monitoring for a period of at least four hours is advised [32]. The patient and their carers should also be given clear instructions about early symptoms that should prompt their return to hospital.

## Laboratory and other screening tests

Routine screening tests, including blood tests, ECG and X-rays are of no clinical benefit [37-43]. The majority of “abnormal” results represent false positives and are often ignored without adversely affecting clinical management or outcome. In addition, they are unpleasant and expensive, and may cause unnecessary anxiety, delays and cancellations.

All investigations should be clinically directed based on the findings of the pre-operative evaluation. In essence, testing should be performed in situations where an otherwise undetectable abnormality is relatively likely (e.g., “silent” ischaemia in diabetic patients) or to determine the severity of a known abnormality. Pulmonary function tests and advanced cardiovascular testing are not indicated as patients with symptoms sufficient to warrant these investigations would not be suitable for day surgery in most units [3, 8]. Testing for sickle cell status is not routinely done for adults, since sickle cell disease would have manifested clinically by adult life and that the finding of sickle cell trait would not alter the anaesthetic management<sup>2</sup>. This argument is clearly not valid in children.

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<sup>2</sup> British Association of Day Surgery, personal communication

## Future developments

The selection criteria for day surgery have expanded considerably and should no longer be based on conservative and arbitrary limits without underlying evidence. The Western population is becoming older and heavier and several co-existing diseases, such as diabetes, are becoming more common. The indications for surgery are also changing, which, with an ever increasing desire to limit costs, increases the proportion of unhealthy patients presenting for day surgery. Older patients who live alone are also more likely to lack appropriate post-operative home support, a significant challenge for day surgery in an area where there is little good evidence as to the level of care patients actually require. Such patients may require mobilisation of community health services for support.

There remains much variation between countries in the proportion of patients undergoing day surgery. The United States and Canada currently lead the world and they are unquestionably accepting sicker patients than most other countries. In many cases, there is still relatively little good quality evidence to confirm or refute the safety of day surgery in the light of specific conditions, although our ever increasing experience provides some evidence of a lack of serious harm.

It is probable that we have not yet reached the limit of patient acceptability for day surgery, but the law of diminishing returns is likely to apply as it becomes increasingly more difficult to manage patients with multiple or severe co-morbidities in the day setting. While this should be encouraged when there is a clear benefit to the individual patient, we must also be willing to accept that it might be easier and probably safer to manage many of these complex cases as inpatients.

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Raafat S Hannallah, MD

## Introduction

Children are excellent candidates for day (ambulatory or outpatient) surgery. Most children are healthy, and most paediatric surgical procedures are simple and associated with prompt recovery. It is not surprising, therefore, that up to 80% of paediatric surgery in many countries is performed on a day surgery basis [1,2]. The key to the success of this practice lies in careful selection, screening and preparation of prospective patients. Today, many newly introduced anaesthetic agents help ensure smooth onset, prompt emergence, fast recovery and safe discharge with good control of post-operative pain and vomiting. This has expanded our ability to care for sicker patients undergoing more complex procedures than previously possible.

## Patient selection criteria

The primary factors that must be considered when selecting a child for ambulatory surgery are the physical status of the patient and the type of surgical procedure to be performed. These factors must be balanced with the capability of the surgical facility and the ability of its staff to deal with any expected or unexpected complications.

### *The Patient*

The child should be in good health; if not, any systemic disease must be under good control. Today, many patients with chronic medical conditions present for surgical procedures that are usually considered appropriate for outpatient surgery. In these cases, an understanding of the underlying pathophysiology and thorough pre-operative evaluation will help guide the anaesthetists as to the appropriateness of choosing an outpatient setting in each individual patient. The following is a brief discussion of the implications of scheduling some of these patients on an outpatient basis.

*The Ex-Premature Infant* has a higher risk of developing post-operative apnoea than a term infant. Apnoea that occurs following discharge may go unnoticed long enough to cause death or serious neurological injury. It is generally considered that premature infants younger than 50-55 weeks post-conceptual age (PCA) and/or have pre-operative history of apnoea are at greatest risk for post-operative apnoea [3]. If the infant was extremely premature, has bronchopulmonary dysplasia (BPD), anaemia or other neonatal problems; this period may need to be extended. It seems prudent to have a high index of suspicion

when dealing with these infants, and to err on the side of recommending post-operative inpatient care and monitoring. Infants who develop apnoea in the recovery room should also be admitted and monitored.

*The Child with a Runny Nose.* A child who presents with a runny nose may have a completely benign, non-infectious condition (e.g., seasonal or vasomotor rhinitis), in which case elective ambulatory surgery may be performed. On the other hand, the runny nose may be a symptom of an upper respiratory tract infection (URI), in which case elective surgery may need to be postponed. Since an estimated 20-30% of all children have a runny nose for a significant part of the year, every child with a runny nose must be evaluated on an individual basis.

Although the definitive pre-anaesthetic assessment of these patients requires a complete history, a physical examination, and occasionally the interpretation of certain laboratory data, the history is the most important element in the differential diagnosis. Specifically, allergic problems should be actively sought. The general assessment of the child (fever, fatigue, lack of sleep, loss of appetite, etc.) can help differentiate an acute illness from a chronic condition. Parents can usually tell whether their child's runny nose is "the usual runny nose" or something different that may require cancellation of elective surgery. Parents of outpatients can be instructed to call in on the morning of surgery if the child develops a runny nose so the findings can be reviewed and if a decision to cancel surgery is made, they are spared a wasted trip to the hospital. If surgery is postponed because of simple nasopharyngitis, it can be usually re-scheduled in one to two weeks. If a flu-like syndrome that involves both upper and lower respiratory tract is present, surgery should be postponed until at least a month after the child has recovered.

*Asthma* is the most common chronic disease of childhood, affecting up to 5-10% of children. It is not therefore unusual for patients with asthma to present for what is usually a minor surgical procedure in an outpatient setting. The decision to accept and proceed with surgery in such patients depends on the severity and frequency of symptoms and the adequacy of pharmacological control. A good history can help establish the severity of asthma. Children with mild asthma who have infrequent symptoms and do not require continuous medications are acceptable candidates for outpatient surgery. When children with moderate asthma (those who require daily medications to control their symptoms) are scheduled for outpatient surgery, they should be instructed to continue their medications until (and including) the morning of surgery [4]. A beta agonist may be administered in the holding area by a nebulizer to young children or by an inhaler if the patient is older. If the patient is wheezing, has coexisting URI, persistent cough or tachypnoea on the day of surgery, it is best to reschedule the procedure. Children with severe asthma, who are never wheeze free, usually require aggressive peri-operative medical management, and are not good candidates for ambulatory surgery.

*Other Medical Conditions.* Children with well-controlled diabetes, congenital cardiac defects, or haematological problems are often good candidates for brief outpatient procedures that do not interfere with their medical management. Proper consultation with the primary treating physician and a thorough preparation are essential.

Children who are thought to be susceptible to malignant hyperthermia syndrome (MH) can be candidates for outpatient anaesthesia and surgery as long as non-triggering agents are used. A longer period of post-operative observation may be required before these patients are discharged home [5].

### **The Procedure**

The planned surgical procedure should be associated with only minimal bleeding and minor physiological derangements. The length of the procedure is not in itself a significant limitation. Although many experts believe that almost any operation that does not require a major intervention into the cranial vault, abdomen, or thorax can be considered, superficial procedures are selected most often. The five most frequently performed outpatient surgical procedures at the author's institution during the past two years were herniotomy, myringotomy, adenoidectomy with or without myringotomy, circumcision, and eye-muscle surgery.

Outpatient adenotonsillectomy (T&A) is safe and cost effective and there is little benefit in keeping these patients in the hospital more than a few hours after surgery to ensure adequate hydration and absence of bleeding [6]. Recently there have been reports of post-operative apnoea and/or airway obstruction in children after tonsillectomy [7]. Most of those patients were young (less than 3 yr.) and had a documented history of pre-operative obstructive sleep apnoea syndrome (OSAS) or other obstructive phenomena during sleep [8]. These patients have a diminished ventilatory response to CO<sub>2</sub> re-breathing and are at increased risk of post-operative respiratory compromise [9]. In extreme cases the airway obstruction can result in pulmonary hypertension and cor pulmonale. Most of these children continue to suffer from the same symptoms in the immediate post-operative period. It is therefore very important that the indication for tonsillectomy (repeated infections versus obstructive symptoms) be carefully reviewed, especially in young patients. Post-operative observation in a 23-hr. recovery facility is appropriate for patients with mild obstructive symptoms. Inpatient care, or even ICU admission for airway support may be indicated in those with documented OSAS [10].

## **Paediatric peri-operative environment**

A recent publication by the Section on Anesthesiology of the American Academy of Pediatrics introduced specific guidelines for patient care facilities and their medical staff that wish to provide paediatric anaesthesia care [11]. The document emphasized important

facility based issues such as the experience and training of the healthcare team and the resources committed to the care of infants and children throughout the peri-operative period. Competency by the staff in addressing such issues as airway management, fluid administration, temperature regulation, monitoring, vascular catheter insertion, and post-operative pain are as important as the skill and experience of the individual anaesthetist in determining the type of patient and/or procedure to be performed in any specific outpatient facility.

## **Pre-operative requirements**

### ***Pre-operative Fasting***

The need for prolonged fasting before elective surgery in healthy paediatric outpatient patients has been challenged. Studies have shown that children who are allowed to drink clear liquids until 2 hours before induction of anaesthesia do not manifest increase in gastric volume or acidity over those who fast overnight [12]. Solid food is not allowed on the day of surgery. Children may drink clear liquids until 2 hours of the scheduled surgical time. Breast fed infants are allowed to nurse up to 4 hours pre-operatively [13]. The main advantage of these liberal guidelines is that children are not thirsty and irritable while waiting for surgery. Other possible benefits include a decreased incidence of peri-operative hypotension and hypoglycemia. Unfortunately, many paediatric outpatients still arrive at the facility on the morning of surgery with unnecessarily long periods of starvation. This is more frequently seen in those scheduled for morning surgery, where meeting the older guidelines of at least four hours fasting would have required the parents to awaken the child to offer fluids [14].

### ***Pre-operative Laboratory Testing***

The incidence of anaemia in healthy children is extremely low and does not usually require modification in the anaesthetic management [15, 16]. Today, most anaesthetists will not request a haemoglobin (Hb) or haematocrit (HCT) level determination unless the medical history suggests that significant anaemia may be present, e.g., in infants, adolescent females, or in the presence of chronic disease [15]. Routine urinalysis adds little to the pre-operative evaluation of a healthy child and should be omitted.

### ***Patient/Family Education/Preparation***

The practice of outpatient anaesthesia is synonymous with speed and efficiency. Patients arrive as close to the time of scheduled surgery as possible. The time available for orientation and pre-operative counselling on the day of surgery is often very brief, and may not allow for a detailed explanation of the proposed procedures. Most outpatient surgical facilities, therefore, have some form of a pre-operative information/preparation programme for children awaiting surgery. Typically, these programmes are offered one or two weeks before the day of surgery, and provide reading material for the family, allow

for telephone counselling, and/or organize visits to the facility a few days before the scheduled day of surgery.

Rosen *et al.* found that children who participated in a pre-operative preparation programme were more likely to be co-operative during induction than those who did not [17]. Kain, on the other hand, found that 2-12 yr. old children who received an extensive behavioural preparation programme prior to outpatient surgery were less anxious in the pre-operative holding area, but not during the induction of anaesthesia or post-operatively [18].

## Screening

Most outpatient surgical units actively participate in the pre-operative screening of their patients. The degree of involvement varies from a simple telephone call to the parents a day or two prior to surgery, to the establishment of a formal screening clinic to clear all patients before surgery. Shortly after the operation is scheduled, the parents can be interviewed by telephone to review the child's medical history. Information is sought concerning past or present risk factors, such as a history of prematurity, cardiac or respiratory problems. This information helps to determine if additional pre-operative evaluation or consultation is required prior to the day of surgery. In some cases, it may lead to a re-evaluation of the appropriateness of scheduling the procedure on an outpatient basis. Fasting (NPO) orders are reinforced, and practical matters related to parking, what to bring to the hospital and expected duration of stay are explained.

On the day of surgery, all patients are screened for acute illness and NPO status. Vital signs are recorded. Any consultation reports are evaluated, and the need for special pre-operative psychological or pharmacological treatment is considered before the child arrives at the operating room area. Experience with this method has been extremely favourable, with a lower rate of cancellation than patients who were not screened [19]. Future efforts will undoubtedly be directed towards using the Internet to have the parents answer these questionnaires and get needed information from the Web at a time convenient for them.

Although many outpatient units find that having a screening clinic to examine all the patients prior to the day of surgery reduces the time for pre-operative evaluation on the morning of surgery, there is no evidence that this method provides better medical evaluation or reduces cancellation compared to telephone or last-minute screening [20]. Potential disadvantages include added staffing cost, and the need to have the parents take additional time off work and travel to bring the child for the extra visit.



## Pre-anaesthetic management

### *Pharmacological Premedication*

An ideal pre-anaesthetic drug should result in pre-operative sedation without delaying recovery and discharge from the facility. Oral midazolam, which is now available as a standard syrup preparation, can be administered orally in a dose of 0.5 mg/kg, 20-45 minutes before induction of anaesthesia to facilitate separation from the parents and improve the co-operation with anaesthesia induction.

### *Parents Presence During Induction*

Since one of the main reasons for administering pre-medication is to facilitate separation of the child from the parents, some anaesthetists find that they can reduce or even eliminate the need for such agents by allowing the parents to stay with the child during the induction of anaesthesia [21]. Although still controversial, this approach is being requested by many parents. Some institutions have specially built induction rooms where the parents can accompany their children without having to wear special operating room attire. Others allow selected parents to wear a cover-all gown or scrubs and walk with the child into the actual operating room. Studies have shown that children are less upset when their parents are present [21]. Parent selection and education are essential for the success of this approach, since anxious parents can make their children even more upset [22,23].

## Anaesthetic agents and techniques

The choice of an anaesthetic technique for the paediatric outpatient should ensure smooth induction, quick emergence at the end of surgery, prompt recovery, and rapid discharge with no or minimal pain and/or PONV. Although many of the newer agents and techniques that were developed to meet these goals are familiar to all anaesthetists, it is important to review the rationale for their selection in outpatients.

### *Inhalational Techniques*

Inhalation induction has long been favoured by children and paediatric anaesthetists. For over four decades, halothane has been the standard inhalational induction agent in paediatrics. It offered reasonably fast onset with minimal airway irritation. Despite some concerns over its tendency to slow the heart rate and, in the presence of hypercarbia, predispose the child to develop arrhythmias, it continues to be used in many parts of the world as the most cost effective agent.

*Sevoflurane* has low solubility, a very pleasant smell and does not irritate the airways. Sevoflurane results in smooth induction with no airway irritation, and faster emergence and recovery when compared to halothane [24]. Sevoflurane undergoes metabolic breakdown in the body that results in release of free fluoride ions. The clinical significance

of this breakdown appears to be negligible, especially in children undergoing short outpatient surgical procedures. There is no question that the availability of sevoflurane has reduced the need for pre-operative sedation or the use of alternate induction techniques in paediatric outpatients.

*Desflurane's* low blood-gas partition coefficient (0.42) makes it a very suitable agent for paediatric outpatients. However, desflurane is not indicated for the start of anaesthesia induction in children because it results in a high incidence of airway irritation, moderate to severe coughing and laryngospasm [25]. Desflurane should be introduced following other induction agents, typically sevoflurane or halothane. Desflurane maintenance results in significantly faster emergence and recovery than when halothane is used [26,27].

Recovery following un-supplemented desflurane and sevoflurane anaesthesia has been associated with a higher incidence of excitement than when halothane is used [28]. Attempts to modify the emergence agitation that is frequently seen with these agents have not been completely successful. Attention must be given to ensuring adequate analgesia in these patients. Even in the absence of pain, as usually seen in children who have a functional regional block, agitation still occurs. Recent experience indicates that a dose of 2-3 mcg/kg of fentanyl is effective in reducing this emergence phenomenon without delaying emergence or discharge when desflurane is used in paediatric ENT patients [29].

### ***Intravenous Techniques***

Intravenous induction is the method of choice in many older children especially when a eutectic mixture of local anaesthetics (EMLA) is used to perform a painless venipuncture. The use of EMLA in outpatients requires careful planning, since at least one hour of contact time under an occlusive dressing is required for full effect. Efforts to have EMLA applied at home by parents should be encouraged especially with the current availability of a pre-packaged "EMLA patch". In most cases EMLA should be applied to two potential IV sites to have a back-up site available in case the first venipuncture is not successful.

When *thiopental sodium* is used for induction in healthy un-premedicated children, a relatively large dose (5-6 mg/kg) may be required in order to ensure smooth and rapid transition to general inhalational anaesthesia. Children who receive barbiturate induction tend to be sleepier and require more airway support for the first 15 minutes of recovery than those who have received halothane. This difference disappears by 30 minutes [30].

Studies on the use of *propofol* in children indicate that it results in smooth induction with a lower incidence of side effects and faster recovery than thiopental. Propofol can be used in a dose of 2.5-3.5 mg/kg for induction of anaesthesia in children who accept venipuncture. Pain on injection can be minimized or even prevented by using the large antecubital veins for the drug administration. If the hand veins must be used, lidocaine can be mixed with propofol (1-2 mg lidocaine / 1 ml of propofol) immediately prior to its

injection, with excellent results. Alternatively, propofol infusion can be started following a brief inhalational induction and establishment of an IV access. Because of their higher volume of distribution and increased clearance, children require a higher infusion rate (125-250 mcg/kg/min.) than adults. This is especially true for younger children, and during the early part of maintenance. Propofol has been extensively used as a part of a total intravenous technique (TIVA) for children undergoing endoscopic or other diagnostic procedures outside the operating room. Propofol anaesthesia has been consistently shown to be associated with an extremely low incidence of post-operative vomiting even following surgical procedures that normally result in vomiting e.g., strabismus surgery [31], and when combined with ondansetron, tonsillectomy [32]. The absence of vomiting has been shown to result in a faster discharge home time when compared to halothane [30].

## Peri-operative fluid management

Children undergoing very brief surgical procedures (e.g., myringotomies) may not need any parenteral fluid administration as long as they are not excessively starved pre-operatively, and are expected to be able to ingest and retain oral fluids soon after they are awake. For most other children, intra-operative maintenance fluid administration can be calculated based on the child's body weight according to standard formulae.

Intravenous fluid therapy during and after surgery is specifically indicated in longer operations (over 30-60 minutes); in procedures known to be associated with a high incidence of post-operative nausea and vomiting (e.g., strabismus surgery); and in young children who have been fasting for a prolonged period of time [1]. If continuing post-operative loss through vomiting or inability to tolerate oral intake is anticipated, it is advisable to start making up that anticipated deficit early on so that it is assured that the child is well hydrated when ready to go home, and therefore avoid delaying discharge while "catch-up" fluid administration is instituted. Adequate parenteral hydration also obviates the need for forcing children to ingest oral fluids before they are allowed to go home. Recent studies confirm that children who are forced to drink before leaving the facility have a higher incidence of vomiting, and are discharged home later, than children who are allowed to drink only when they are thirsty enough to request a drink [33].

## Post-operative analgesia

The need for analgesics following surgery depends upon the nature of the procedure and the pain threshold of the patient. Regional blocks or local infiltration should be used whenever possible to supplement general anaesthesia and to limit the need for narcotics during recovery [1]. Post-operative pain or discomfort can be managed by one or a combination of the following methods:

### ***Mild Analgesics***

Acetaminophen or paracetamol (10-15 mg/kg PO) is the most commonly used mild analgesic for paediatric outpatient patients. For young children, the initial dose is often administered rectally (up to 45 mg/kg) prior to awakening from anaesthesia [34]. Supplemental doses are given orally every 4-6 hours (not PRN) to maintain an adequate blood level and effective analgesia [35]. Acetaminophen can be combined with codeine for more effective control of moderately severe pain and/or discomfort. Acetaminophen with codeine elixir contains 120 mg acetaminophen and 12 mg codeine per 5 ml. The usual dose is 5 ml for children 3-6 years, and 10 ml for the 7-12 age group.

### ***Non-Steroidal Anti-Inflammatory Drugs (NSAID)***

NSAIDs, e.g., ketorolac, have proved effective in relieving post-operative pain following minor operations in children. Ketorolac is an efficacious NSAID. Early administration immediately following induction seems to provide optimal post-operative analgesia. Ketorolac like many other NSAIDs, has some troubling side effects, with reported instances of decreased bone repair after osteotomy, bronchospasm, acute renal failure and possibly increased surgical bleeding secondary to altered platelet function [36].

### ***Potent Narcotic Analgesics.***

When narcotics are indicated in the recovery period, a short-acting drug should be chosen. Intravenous use allows more accurate titration of the dose and avoids the use of "standard" dosages based on weight, which may lead to a relative overdose. If remifentanyl is used intra-operatively, planning for post-operative analgesia must be started prior to awakening. Fentanyl, up to a dose of 2.0 mcg/kg, is our drug of choice for intravenous use. Meperidine (0.5 mg/kg) and codeine (1.0-1.5 mg/kg) can be used intramuscularly if an intravenous route is not established. Intramuscular codeine tends to result in less vomiting than other opioids, especially morphine [37]. Nasal administration of fentanyl has been shown to result in an analgesic blood level comparable to that following IV use [38], which makes it useful in children who do not have, or have lost, their IV access [39].

### ***Regional Analgesia***

Regional anaesthesia can be combined with light general anaesthesia to provide excellent post-operative pain relief and early ambulation, with minimal or no need for narcotics. By placing the block before surgery starts but after the child is asleep, one can reduce the requirement for general anaesthetic agents during surgery, which in turn may result in a more rapid recovery, earlier discharge, more rapid return of normal appetite and less nausea and vomiting.

The types of blocks that can be used safely in the paediatric outpatient surgical patient are limited only by the skill and interest of the anaesthetist. Generally, the techniques chosen should be simple to perform, have minimal or no side effects and not interfere with motor function and early ambulation.

*Ilioinguinal and iliohypogastric nerve block* can be performed by infiltration of 0.25% bupivacaine solution (in doses up to 2 mg/kg) in the region medial to the anterior superior iliac spine. This block has been used successfully to provide excellent post-operative analgesia for paediatric outpatient patients following elective inguinal herniotomy or orchidopexy.

*Dorsal nerve block of the penis* can be performed by simple injection of 1-4 ml of 0.25% bupivacaine without epinephrine deep to Buck's fascia 1 cm from the midline. This has been shown to provide over 6 hours of analgesia following circumcision. Alternate approaches to penile block are a midline injection or subcutaneous infiltration (ring block), which presumably blocks the nerve after it has ramified into the subcutaneous tissue. Topical application of lidocaine on the incision site at the conclusion of surgery has also been shown to be effective.

*Caudal block* provides excellent post-operative analgesia following a wide variety of surgical procedures such as circumcision, hypospadias repair, orchidopexy, and herniotomy. By using bupivacaine, 0.25% solution in a dose of 0.5-0.7 ml/kg, no motor paralysis is produced. If a larger volume (1 - 1.5 ml/kg) is indicated, the use of a 0.125% bupivacaine or 0.2% ropivacaine is recommended to avoid motor weakness [40]. Although voiding may be slightly delayed in children who receive a caudal block, catheterization is never needed, and children can be allowed to go home before voiding.

## Post-operative nausea and vomiting (PONV)

PONV can be a significant problem in paediatric outpatients. Despite the use of short acting anaesthetics and opioids, the incidence of PONV remains largely unchanged over the past decades. The benefits of using newer anti-emetic drugs is largely negated by the increased emphasis on early ambulation and resumption of oral intake that is usually prevalent in outpatient centres. Factors that increase the incidence of PONV include the type of surgical procedure, the presence of pain, the use of opioid analgesics, history of motion sickness, and sudden movement. Certain surgical procedures are particularly emesis prone such as tonsillectomy, strabismus repair, orchidopexy, hernia repair, ear surgery and laparoscopy. Tramer *et al.* reviewed 27 randomized clinical trials involving a total of 2033 children and found an average of 54% incidence of early (<6 hr.) and a 59% incidence of late (up to 24 hr.) emesis without prophylaxis [41].

The incidence of PONV can be greatly reduced by the prophylactic use of antiemetic drugs. However, mainly because of cost considerations and potential side effects of these drugs, routine prophylaxis is not indicated in all patients. Tools to predict an increased risk for developing PONV have been developed in adults [42] and more recently in children [43]. Four independent risk factors for post-operative vomiting in children have

been identified: duration of surgery of thirty minutes or longer, age three years or older, strabismus surgery, or history of post-operative vomiting in a previous operation or PONV in relatives (mother, father, or sibling) Using this four item risk score, the incidence of post-operative vomiting can be predicted to be 9%, 10%, 30%, 55%, and 70% when 0,1,2,3,and 4 risk factors are present.

Prophylactic use of antiemetic drugs has become a common approach to minimizing emetic symptoms after outpatient surgery because it is more effective than trying to treat vomiting after it occurs. Patient satisfaction is increased, and discharge home is faster. A recent multicentre trial concluded that intravenous ondansetron prophylaxis (0.1 mg/kg; maximum 4 mg) was more effective than placebo in preventing post-operative vomiting in children 1-12 years old and 1-24 month old during both the 0-2 hr and 0-24 hr study periods [44,45]. Intravenous ondansetron (0.1 mg/kg) was also found effective in treating established post-operative emesis in yet another multicentre trial of 2,720 paediatric outpatients [46].

Although intravenous ondansetron is an effective prophylactic antiemetic, many authors continue to compare it to other less expensive alternatives. Davis *et al.* compared the effects of ondansetron (0.1 mg/kg), droperidol (75 mcg/kg) and placebo on the incidence of emesis in children undergoing dental surgery where anaesthesia was maintained with N<sub>2</sub>O/O<sub>2</sub> and alfentanil [47]. The 24-hr incidence of emesis was significantly less with ondansetron (9%) than with placebo (35%) or droperidol (32%). Ondansetron treated patients had a significantly shorter hospital stay than the droperidol treated patients.

Dimenhydrinate, an H<sub>1</sub> receptor antagonist, has been used to both prevent and treat post-operative vomiting in children for several decades. In a prospective randomized study of children undergoing strabismus surgery, Vener *et al.* concluded that, compared to placebo, dimenhydrinate (0.5 mg/kg IV) decreased post-operative vomiting both in hospital and for 24 hr after discharge (10 and 39% vs. 38 and 65% respectively), without prolonged sedation or other adverse effects [48]. The study suggests that dimenhydrinate's efficacy stems from actions on the vestibular/inner ear system, decreasing the development of late or delayed vomiting during and/or after the car ride home in outpatients.

Granisetron is a selective 5-HT<sub>3</sub>-receptor antagonist, which has a more potent and longer activity against vomiting associated with chemotherapy than ondansetron. In a randomized, double-blind study of 97 paediatric outpatients, Cieslak *et al.* found that 40-mcg/kg intravenous granisetron prophylaxis decreased post-operative vomiting from 42 to 9% when compared with a placebo [49].

The fact that there are many approaches to the management of PONV would indicate that there is no one answer to the problem [50]. It appears that a combination antiemetic regimen, possibly combined with the intra-operative use of dexamethasone is as close

to being the most effective as one can possibly get. It is probably fair to say that, even now, many anaesthetists continue to base their choice of antiemetics on personal experience and anecdotal evidence. Even when scientific data strongly suggest that one drug, or a combination of drugs, is superior to all others, the cost factor must be taken in consideration. What price tag does one put on patients' comfort and satisfaction is beyond the scope of this discussion. Nevertheless, it is expected that any new treatment modality of PONV in the future will have to prove pharmaco-economic as well as pharmacodynamic superiority to existing protocols.

For patients with persistent post-operative vomiting, our current approach is to stop any attempt at offering oral fluids and ensure adequate intravenous hydration. Intravenous ondansetron 0.1 mg/kg is administered. In the absence of an intravenous line, or if vomiting occurs after the IV is removed, ondansetron ODT can be placed over the tongue for quick absorption without the need for swallowing [51]. Occasionally rectal promethazine 0.5 mg/kg (Phenergan 12.5-25 mg), or prochlorperazine 0.1 mg/kg (Compazine 2.5-5 mg) are administered in the hospital and/or given to the parents to use at home.

## Recovery and discharge

### *Recovery*

Rapid recovery and early ambulation are major objectives in paediatric outpatient surgery. When we deal with outpatients, we must guarantee safe discharge not only from the recovery room but also from the hospital. There is no second opportunity to transfer care of the outpatient to other medical or paramedical personnel, and there is no further period of observation, monitoring, and treatment [52].

Facilities for post-operative care vary among institutions. Patients in some centres go to the main recovery room and then to an area from which they are discharged home. Others are discharged home directly from the recovery room. In freestanding units the patient goes directly to the recovery area until discharged, while in many office practices the child may have to go home directly from the operating area. Many parents want to be with their children as soon as the operation is terminated. Parents should not have access to the recovery room until the child's vital signs have stabilized, airway obstruction is no longer a threat and awakening has begun. Parents can care for and hold, cuddle, and feed the child and their involvement helps reduce the need for a high nurse to patient ratio [53].

### *Discharge Home*

Discharge of the child from the hospital cannot be based on criteria used for adults (e.g., ability to make decisions). The patient must at least have reached a maximum on the recovery room scoring system, appear to be fully awake and have no evidence of

surgical or anaesthetic complications. In an effort to provide uniform care and to ensure a complete legal record, most institutions have developed discharge criteria. Unlike a scoring system, all criteria must be met. Discharge from the unit can be guided by, but not necessarily limited to, the following:

1. Attainment of a state of consciousness appropriate to the developmental level.
2. Appropriateness and stability of vital signs.
3. Absence of respiratory distress.
4. Ability to ambulate consistent with the developmental age level.
5. Ability to swallow oral fluids and cough or demonstrate a gag reflex.
6. Absence of nausea, vomiting, and dizziness.

The attending physician may write a discharge order in advance so that, provided specific discharge criteria are met, the patient is authorized to be released without further evaluation by a physician at the time of discharge. A registered nurse documents the status of the patient, acts only as an observer to document that all criteria are met and makes no decisions independently.

Every child, of whatever age, must have an escort home. The journey preferably should be by private car or taxicab and the escort should be provided with written instructions as to the home care of the child and be provided with a telephone number to call for further advice or to report complications. In addition to counselling the parent of each child about post-operative care, most units have designed handouts that specify the care to be provided and the signs that might herald a complication. For convenience, the handout is usually limited to post-operative instructions for a specific operative procedure.

## Complications and admissions

### **Complications**

Although life threatening complications after day case anaesthesia are rare, discomfort that prolongs or complicates recovery is common [54]. The most commonly reported complications before discharge are sore throat, headache, muscle pains, nausea and vomiting, and post-operative pain.

### **Admissions**

Complications that result in unplanned admission of the patient to a hospital are usually the same types of problems discussed previously, but they occur with either greater frequency or greater severity. In a well formulated programme in a modern institution, the admission rate is usually less than 2 percent. At our institution, the unplanned admission rate for surgical outpatients has dropped from 0.9 to 0.3 per cent [54].



The most common reasons for admission of the patients can be grouped into anaesthetic (e.g., protracted vomiting or severe croup), surgical and social/administrative reasons.

Severe post-operative vomiting is the most common anaesthesia related reason for unanticipated overnight admission after outpatient surgery. Although croup is now uncommon after endotracheal intubation of paediatric patients, it does occur. Fortunately, croup that is severe enough to cause respiratory distress almost always occurs during the recovery phase rather than after discharge. Treatment of croup with racemic epinephrine is highly effective; nevertheless, we do not recommend discharge home unless the physician believes that the croup is mild; the parents have observed this problem in their child previously and are not alarmed; the parents live close to the hospital; and the child no longer requires epinephrine to alleviate symptoms. In general, the smaller the child, the more likely is the possibility of admission. Croup can be a life threatening complication. If any doubt exists concerning its severity and course, admission to the hospital is indicated.

Surgery related reasons for admission can be the result either of an unexpected complication (e.g. post-operative bleeding after tonsillectomy) or of more extensive surgery than originally scheduled.

Unplanned overnight admission may also be necessary if it becomes apparent that the parents are unable or cannot be relied on to take care of the child at home.

## Follow up

Telephone or mailed questionnaires are necessary to determine the frequency of post hospitalization problems. A large percentage of parents have reported that their child has continued to have an upset stomach, sleepiness, and so on after the return home [54]. Fortunately, most of the complications reported are mild and require no treatment. A questionnaire should be designed not only to detect the child's problems but also to determine if the parents were satisfied with the care received and, if not, to request suggestions for improvement.

Any ambulatory unit should collect and analyze data for trends that might indicate ways to correct deficiencies and eventually to improve patient care. Design and modification of policy are better done by prospective review rather than by reacting to mishaps. The former method leads to more uniform, safer care and minimizes the potential for medico-legal actions.

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### Introduction

The main aim of any day unit should be to offer safe, high quality care, which is both effective and efficient. The selection of suitable patients for day surgery, patient information, assessment and preparation are essentials for the achievement of successful outcomes of care. Nurses and clinicians working together and utilising their complementary skills contribute to the process of patient information and assessment in day care. A protocol of pre-operative assessment should be agreed and implemented in any day unit. All the staff should be fully aware of this process and dedicated care pathways should be available in order to facilitate patient selection and preparation for day care.

### Pre-operative assessment

Pre-operative assessment can be defined as a process that ensures patient fitness for the planned surgery and anaesthetic, minimises the risk related to the procedures and the risk of late cancellations. This can best be achieved by implementing a protocol of patient assessment that should include assessment of the patient's medical status, assessment of the patient's home circumstances and information for the patient and their carers. At the end of this process the patient should be medically fit for surgery and fully informed on all aspects of the day surgery experience, including understanding and acceptance of the surgical and anaesthetic techniques as well as the organisation of pre- and post-operative care and possible complications.

All day surgery patients should undergo pre-operative assessment. A multidisciplinary approach to the organisation of day surgery units and clinical practice within them is essential. There should be interaction between physicians, nurses, families and patients, with nursing staff playing a key role as co-ordinators of patient care [1].

#### ***Objectives of pre-operative assessment***

The process of pre-operative assessment in day surgery should assure that:

- the patient is suitable for day surgery;
- the patient is medically fit for surgery and anaesthesia and risks are minimized as a result of correct preparation;
- the patient fully understands the proposed surgical and anaesthetic procedures and wishes to undergo the planned operation;

- the patient receives and understands oral and written information covering all aspects of the day surgery experience;
- the patient fully understands the pre- and post-operative instructions including fasting instructions, medications to be taken or discontinued;
- the carer is fully informed of the day surgery process and agrees to escort the patient home;
- home support will be provided according to the patient's special requirements;
- anxiety level and fears that the patient may experience are minimised;
- the procedure has been booked and confirmed.

### ***The process of pre-operative assessment***

Although there is little research into the suitability of pre-operative assessment criteria and protocols for patient selection [2,3,4,5], guidelines are provided by national bodies and professional associations.

Figure 1 illustrates a typical assessment process. Nurses, anaesthetists, surgeons and general practitioners contribute to the various phases of the assessment process.

### ***When and where should pre-operative assessment take place?***

The best organisation and time for the assessment should be decided locally and will depend on the length of time patients have to wait between the outpatient visit and their admission as well as the social environment of the area. It will also vary according to the specific pre-operative investigations required by individual patients and the local day unit policy and organisation [1,2,3,4,5].

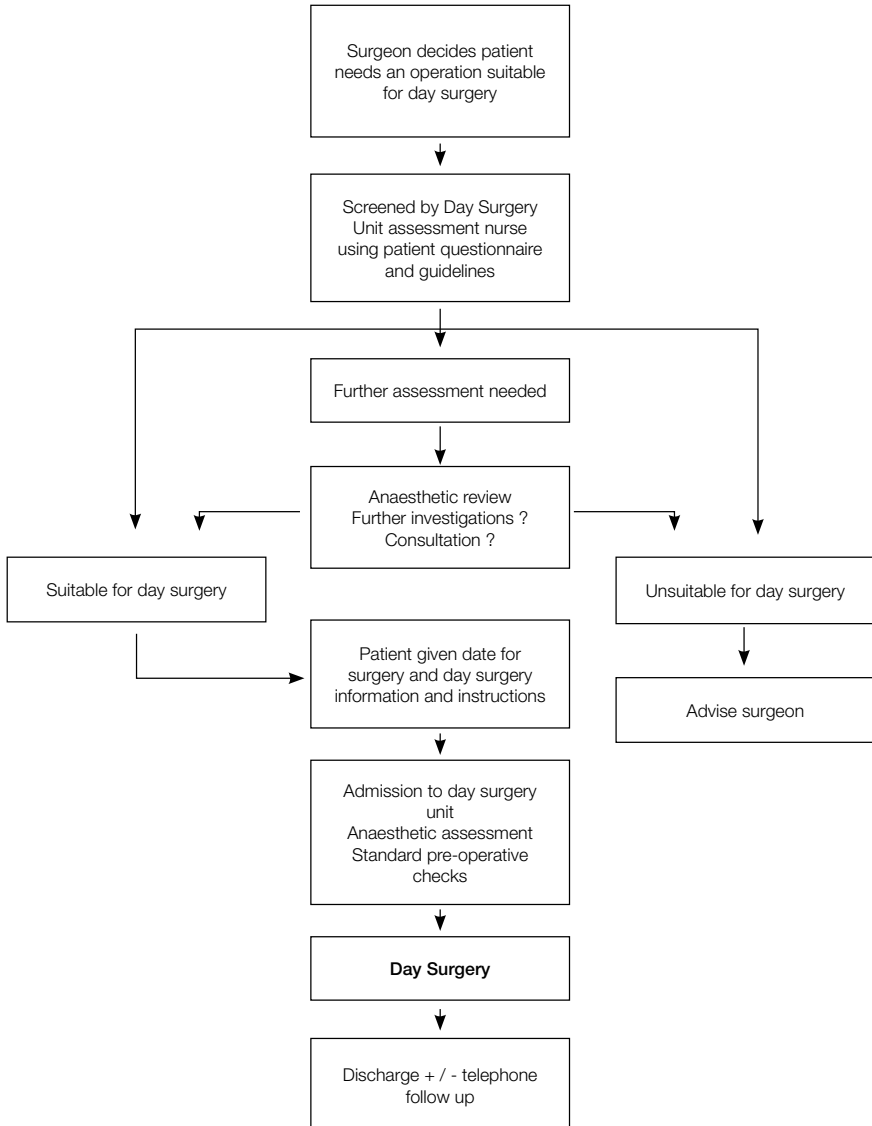
Pre-operative assessment should ideally be undertaken in the day surgery unit so that the patient will have the opportunity to find out where the unit is, to see the facilities and to meet the staff who will provide the care. This all helps to reduce patient anxiety. If patients undergo assessment by their general practitioner or in the hospital outpatient department, leaflets and /or videos can be provided to explain the day surgery process to the patient in more detail.

Pre-operative assessment should ideally be performed at the time of initial consultation. In this case, immediately following the decision to operate it will be possible to book and plan the operation and initiate the process of patient information and preparation for day surgery. This result can be achieved if a protocol for patient selection and preparation has been agreed and implemented in the day unit.

### ***Who should perform pre-operative assessment and how?***

A protocol for pre-operative assessment should be agreed and implemented in any day unit. All the staff should be fully aware of this process and dedicated sheets should be available in order to facilitate patient selection and preparation for day care. The anaesthetists play a key role in the development of selection guidelines and protocols. This does not mean that the anaesthetists should always assess the patient. In most

**Figure 1** Typical assessment process





cases a well trained assessor, most commonly a nurse, will be able to perform pre-operative assessment. Many patients will not need to see an anaesthetist before the day of the operation.

Questionnaires, phone calls and interviews are suitable methods for patient assessment. No one has been proved to be superior to the other in randomised trials [2,3,5,6]. It is recommended that day units develop a strategy for the assessment of patients and audit the results of the method of assessment.

### **Selection criteria**

In the process of patient assessment *social selection criteria* and *physical selection criteria* must be considered. It is beyond the scope of this chapter to discuss detailed selection criteria, and only some general indications on selection criteria for day surgery will be provided.

#### *a) Social selection criteria:*

Assessment of home circumstances and social selection criteria is mandatory in order to assess patient fitness for day surgery. Co-operation with the general practitioner is advisable to achieve appropriate selection.

Examples of social selection criteria are the following:

- live within one hour travelling time from the day surgery unit or hospital;
- have a responsible adult carer both to take the patient home and to provide help and assistance at home during the first 24 hours;
- have adequate home circumstances like indoor toilet, telephone, stairs or lift according to the planned procedure.

#### *b) Physical selection criteria*

The protocol of social and physical selection criteria for patient selection should be agreed by anaesthetists, surgeons and nurses in any day surgery unit. It is advisable to print these selection criteria developing a selection questionnaire in order to follow strictly the agreed selection protocol. Figure 2 shows an example of a questionnaire for the selection of patients.

For detailed information on patient selection criteria see Chapter 5 (for adult patients) and Chapter 6 (for children).

### **Waiting lists and pre-operative assessment**

Patients due to undergo day surgery within three months of pre-operative assessment should not require a new assessment visit. Patients should be contacted around two weeks before scheduled surgery to confirm their attendance and verify that no change has occurred in their medical condition.

**Figure 2 Patient selection questionnaire****PRE-OPERATIVE QUESTIONNAIRE****NAME AGE Female / Male**

PLEASE CIRCLE THE ANSWER THAT IS TRUE FOR YOU (Yes/No)

**1. Social selection criteria**

- 1.1. Do you have a telephone at home? **Y/N**
- 1.2. Do you have easy access to a toilet? **Y/N**
- 1.3. Do you have someone to look after you at home? **Y/N**
- 1.4. Do you have someone to take you home? **Y/N**
- 1.5. Do you need help to organise care ? **Y/N**

**2. Medical assessment**

- 2.1. Do you get chest pain or breathless climbing two flights of stairs? **Y/N**
- 2.2. Do you get angina more often than once each month? **Y/N**
- 2.3. Have you had a heart attack within the last twelve months? **Y/N**
- 2.4. Are you treated for an abnormal heart beat? **Y/N**
- 2.5. Are you treated for heart failure? **Y/N**
- 2.6. Do you have asthma attacks more often than once each month? **Y/N**
- 2.7. Do you have epileptic seizures? **Y/N**
- 2.8. Are you treated with insulin for diabetes? **Y/N**
- 2.9. Are you treated for kidney disease? **Y/N**
- 2.10. Are you treated for liver disease? **Y/N**
- 2.11. Do you have difficulty with neck movement? **Y/N**
- 2.12. Have you had a problem with an anaesthetic? **Y/N**
- 2.13. Has your family had problems with anaesthetics? **Y/N**

**3. Additional information**

- 3.1. Do you have an allergic reaction to medicines (rash or swelling or wheeze)? **Y/N**
- 3.2. Do you smoke? **Y/N**
- 3.3. If female, could you be pregnant? **Y/N**
- 3.4. Do you have loose teeth or crowned teeth? **Y/N**
- 3.5. Do you have a pacemaker? **Y/N**
- 3.6. Do you have a hearing aid? **Y/N**
- 3.7. Do you have contact lenses? **Y/N**
- 3.8. Do you drink more than one pint of beer / 2 glasses of wine / 2 shorts a day? **Y/N**

**4. Please list the medicines that you take**

- 4.1.....
- 4.2.....
- 4.3.....
- 4.4.....
- 4.5.....

**5. Please list any previous operations**

- 5.1.....
- 5.2.....
- 5.3.....
- 5.4.....
- 5.5.....
- 5.6.....

**6. Contact in case of Emergency**

**Name**.....

**Relationship**.....

**Address**.....

.....

.....

.....

**Telephone**.....

OFFICE USE ONLY. Thank you.

**Height: centimetres**

**Weight: kilograms**

**BMI: kg/m<sup>2</sup>**

The patient should be asked to inform the day surgery unit if:

- they want to change the date;
- a change in medication has occurred;
- a new significant illness has developed;
- a minor illness has occurred and will not resolve by the date of surgery.

When the waiting list is longer than three months or the patient asks to postpone the date of their operation for more than three months from the assessment visit, it is suggested that the patient is given a date for a further assessment visit four to eight weeks prior to surgery.

## Patient information provision in day surgery

### *Introduction*

In a day surgery environment, contact with patients is brief and intense. It does not compare with the time once taken to prepare a patient for the same procedure in inpatient surgery. Also, patients are now in charge of their pre-operative preparation and recovery takes place at home. This makes information provision a challenge for day surgery. It is generally accepted that providing the patient with information about day surgery and individual procedures is an important aspect of day surgery management [1,7]. An effective information provision policy aims to improve patient satisfaction with the overall day surgery experience and aid anxiety reduction. In fact, an informed patient is likely to experience less anxiety and is thus able to better adjust to surgery. This, in turn, will increase the overall staff satisfaction, avoid delays and contribute to the smooth running of the Day Surgery Unit (DSU). However, there are still uncertainties and disagreement on how to best provide this information. Critical questions include the appropriate level, or levels, of information to be provided, when such information should be provided and who should provide the information. Just giving information randomly to the patient is not sufficient for the effective psychological preparation of patients undergoing day surgery. Information must be provided within a formalized framework of healthcare and delivered in a structured manner. It is not intended to be just reassuring, it aims to empower patients with their own healthcare. Information to be given to the patient must be consistent throughout the staff of the unit and the primary care physician. Some patients require more information than others. Too little information can cause confusion and delays. The patient may not know what is expected of them or their caregiver. On the other hand, too much information may cause unnecessary anxiety for the patient. Finally, the role of each staff member in information provision should be identified and the timing of information provision co-ordinated since patients will come in contact with and receive information, at different stages, from administrative, nursing and surgical staff [1,8,9,10].

In an ideal situation people in general retain only 20% of information given verbally, so it is unrealistic to expect patients to assimilate and understand important information pertaining to surgery, especially since they may be worried or in pain. Nevertheless, good verbal communication skills are essential. Information is introduced and reinforced verbally ensuring compliance with procedures. It can offer reassurance thereby reducing anxiety and can be adapted to meet the individual needs of patients. Moreover, the simplest way to make sure patients receive and remember essential information is to provide them with clearly written leaflets, which can be referred to at any time. In this case, the patient is more likely to comply with healthcare instructions and is “primed” to seek further information, advice and/or help. Written information should support and be supported by verbal information.

### ***Criteria for Patient Information Provision***

Organization and management of patient information provision for any DSU will vary depending on the individual characteristics of that unit, such as location, hospital policies, etc. No two structures are alike. However, criteria for policy development which are common to most DSUs can be identified. Day surgery patient contact can be divided into stages, the number of which will depend on individual characteristics. In Figure 3, a maximum of 8 stages has been identified, from patient referral to post-operative examination. For each stage, the location, type of contact, contact person and information content are described. Within these 8 stages, there are two categories of information to be provided to the patient, general and procedure specific. The timing of information provision can be divided into 3 phases - before admission, on admission and on discharge. Information should be provided to match patients' coping levels.

Taking into consideration these criteria, four different information packets providing for two levels of information disclosure, full and minimal, are recommended.

### ***Categories of Information***

There are two categories of information to be provided to the patient: general and procedure specific.

General information refers to organizational aspects of the DSU and its procedures and practices. It identifies the location and gives other useful information e.g. address and telephone numbers, public transport information, parking, etc. It also includes basic procedural information general to all procedures performed in day surgery, e.g. admission times, etc. From this information the patient should understand what to generally expect and what is expected of them. Procedure specific refers to the clinical information regarding the patient's condition and surgical procedure. One leaflet should be designed for each procedure performed in the unit. Grouping procedures into categories will only confuse patients. For example, a leaflet entitled “Haemorrhoids/Anal Abscess-Fistula/Pilonidal Disease” may lead the patient to believe that he will undergo 3 procedures.

**Figure 3** stages in providing information to patients in day surgery

	Location	Face to Face	Phone contact	What content
<b>Stage 1</b> Decision for Day Surgery	Primary Care Physician's office Outpatient clinic Day Surgery Unit	Primary Care Physician Specialist consultant Day Surgery Staff		Day Surgery introduction leaflet Verbal information Procedure specific information Preparation procedures
<b>Stage 2</b> Making an appointment			Administrative staff Day Hospital Unit	Appointment for pre-assessment examination Directions , What to expect More information: via fax, e-mail, web site
<b>Stage 3</b> Pre-assessment visit	Hospital – Outpatient Dept; Day Surgery Unit Private medical facilities	Specialist – Surgeon Nurse		Day Surgery Unit Instructions and Procedure leaflet Procedure specific general info leaflet Book surgery, Pre-operative check, Informed consent
<b>Stage 3b</b> Pre-operative examination Two weeks before surgery (if surgery is booked more than 1 month in advance)	Day Surgery Unit	Anaesthetist Nurse		Verbal information Procedure specific informed consent leaflet Advice/instruction from previous leaflets Question-answers, introduce questionnaire
<b>Stage 4</b> 2-3 days before surgery			Nurse administration?	Surgery confirmation and verbal information
<b>Stage 5</b> On the day	Day Surgery Unit	Nurse Surgeon Anaesthetist		Verbal information Advice/instruction from previous leaflets Caregiver leaflet
<b>Stage 6</b> Discharge	Day Surgery Unit	Nurse Surgeon Anaesthetist		Verbal information about discharge and recovery procedures, hand out questionnaire Question-answers
<b>Stage 7</b> Follow up: same day and within the week			Surgeon Nurse	Verbal information - instruction
<b>Stage 8</b> Post-operative examination (Predetermined date, depending on type of procedure)	Day Surgery Unit Primary care physician's office	Surgeon Primary care physician		Verbal information - instruction Collect completed questionnaire

Information should include details about the condition, why and how the procedure is performed, procedure specific pre-operative and post-operative recovery instructions, such as shaving and wound care. Diagrams can be helpful. This is an important aspect of patient information in that the patient will need to receive and fully understand this information in order to give his informed consent to undergo the intended procedure.

**Phases of Information**

The information to be provided to patients can be organized into 3 phases: phase I, before admission; phase II, on admission; phase III on discharge. Some information will overlap thus helping the patient understand and retain the more important issues.

*Phase I – before admission*

The main emphasis at this phase should be on “informing” the patient, i.e. procedural (order of events), behavioural (skills, teaching), sensory information (likely sensations), etc. Table 1 shows the types of pre-operative information to be included in information packets.

Table 1 Types of Pre-operative Information	
Pre-operative information provision	
Procedural information	The sequential order of events on the day of surgery i.e. what will happen next.
Behavioural information	The behaviour(s) or action(s) the patient is required to undertake either before, during or after the surgical procedure i.e. adopting a certain position for the surgical procedure, deep breathing exercises, no lifting for 6 weeks, keeping the limb elevated, gentle movements only, etc.
Sensory information	The bodily sensations the patient is likely to experience either before, during or after the surgical procedure i.e. the likely sensations of the drugs entering the body during the initial stages of anaesthesia, degree and duration of pain, etc.
Cognitive coping strategies	The positive thoughts a patient can draw upon in order to gain assurance they will be safe, awake from their operation, be unharmed and gain a full recovery i.e. being told of the highly trained staff, effective drugs, modern well maintained equipment, many safe operations performed, etc.
Relaxation	Individual strategies of relaxation or a planned programme of relaxation techniques, music therapy, hypnosis, other simple methods of distractions, etc.
Modelling	Directly by actively copying the required or desired behaviour or by indirectly copying i.e. quietly watching and copying the required or desired behaviour. This could be via a real- life event, a relative or friend, the media or a video/audio-tape programme or leaflet produced by the hospital, etc.
Modified from Mitchell M (2001) Constructing information booklets for day- case patients. <i>Ambul Surg</i> 9, 37- 45	

During the pre-assessment interview the patient along with the nurse can choose the correct amount of information to be provided. This interview also allows the opportunity for questions and a chance for the nurse to reiterate some crucial points of the day surgery procedure, e.g. when to stop eating and drinking, a ride home. Emphasis can be put on helpful aspects such as the appropriate clothing, for instance loose trousers for knee arthroscopy. A tour of the facilities may be in order if the patient wishes it. During this phase skill teaching may take place, i.e. post-operative exercises, ways of dealing with pain, possible sensations following surgery/anaesthesia.

#### *Phase II – on admission*

The strategy to be followed in this phase is “supporting”, i.e. psychological care (formal programme), social support (relatives). The patient should be, at this point, well informed as to what is going to happen. However, a long waiting period may be a cause of complaint and anxiety. Possible reasons for any delay on the day of surgery should be included in the information packets. Procedural, behavioural and sensory information should be provided briefly although the main emphasis at this point should involve the repetition and reinforcement of key information for support and anxiety reduction. Prior to discharge, the caregiver (relative/friend) should be present during the giving of information.

#### *Phase III – on discharge*

The first two weeks following discharge are seen as the most important since patients are striving to return to normal. The information packet should contain the information patients need to return to normal as quickly and safely as possible. Information includes post-operative pain management, nausea, medications, common wound care, sleep disturbance, aspects of bathing, stretching and heavy exercise, returning to work, driving and advice on sexual matters. Patients usually want to know what complications may arise in the post-operative period, how can they be recognized, and what should be done about them. Recovery is at home, not in the hospital, and since patients tend to forget or misunderstand the information given at discharge, they should be encouraged to use the day surgery telephone help line. Caregivers should be provided with the same information.

#### **Level of information disclosure**

Two levels of information disclosure, minimal and full, can be distinguished. Recent studies suggest that not all patients require the same amount of information [9]. Some patients require more information than others. Evidence has suggested that anxiety can be reduced by matching the amount of information provided to the patients’ individual coping style. This approach towards information provision concords with one of the prominent psychological theories on coping referred to as vigilant, fluctuating and avoidant (Table 2), i.e. vigilant copers should receive copious amounts of information whereas avoidant copers very little. Fluctuating copers may require more information on one aspect of day surgery and less on another. Table 3 illustrates a proposed information pathway for the 3 coping styles throughout the 3 phases of information provision.



**Table 2** Innate coping styles

<i>Vigilant coper</i>	Patients with this coping style look for and constantly process all threatening information in order to gain control over the main threat related aspects of the situation, thus protecting themselves from any unexpected dangers. They should receive copious amounts of information as too little makes them more anxious.
<i>Avoidant coper</i>	Patients with this coping style tend to withdraw from threat-relevant information. They should receive a small amount of information as too much makes them more anxious.
<i>Fluctuating coper</i>	Patients with this coping style fall between the two extremes. They should generally receive a small amount of information as too much may make them anxious. However, in certain areas they will desire greater detail i.e. proposed surgery. Minimal plus selected areas of disclosure therefore recommended.
<p>Mitchell M (2001) Constructing information booklets for day-case patients. <i>Ambul Surg</i> 9, 37-45                  Mitchell MJ (1999) Patient's perception of day surgery: a literature review. <i>Ambul Surg</i> 7, 65-73.</p>	

**Table 3** Coping style information pathway

	<i>Avoidant coper</i>	<i>Fluctuating coper</i>	<i>Vigilant Coper</i>
<i>Before admission</i>	Simple information concerning treatment, care and recovery; emphasis on relaxation; specific information enquiry	Simple/specific information concerning treatment, care and recovery; specific information enquiry	Extended information detailing treatment, care and recovery; emphasise quality of care and treatment
<i>On admission</i>	Simple behavioural and procedural information; emphasis on relaxation; specific information enquiry; cognitive coping strategies	Simple/specific behavioural and procedural information; emphasis on relaxation; specific information enquiry; cognitive coping strategies	Extended information detailing behavioural procedural, and sensory information; emphasize quality of care and treatment; cognitive coping strategies
<i>On discharge</i>	Simple information; brief problem solving procedures; specific information enquiry; telephone helpline number, nurse initiated telephone call	Simple/specific information; brief problem solving procedures; specific information enquiry; telephone helpline number, nurse initiated telephone call	Extended information; detailed problem solving procedures; specific information enquiry; telephone helpline number, nurse initiated telephone call

Modified from: Mitchell M (2000) Psychological preparation for patients undergoing day surgery. *Ambul Surg* 8, 19-29.

**Formalized framework**

In a formalized framework of patient information provision policies within each DSU, care must be taken to assign communication roles to all staff members and an information provision schedule identified. It is important for the patient to receive the appropriate amount of information at the appropriate time from the appropriate person. Without this, a patient may receive contradictory or conflicting information, which increases confusion and lessens patient satisfaction. Roles for the day surgery staff are identified and described in Table 4. The information provision schedule can be drawn from Figure 1.

**Table 4** Day surgery staff and their roles in information provision

<i>Primary Care Physician</i>	<ul style="list-style-type: none"> <li>- introduces patient to day surgery</li> <li>- provides introductory general and procedure specific information</li> </ul>
<i>Surgeon</i>	<ul style="list-style-type: none"> <li>- assesses patient for day surgery</li> <li>- advises patient</li> <li>- provides specific information about disease and surgical procedure, what is expected of the patient clinically</li> <li>- obtains informed consent</li> <li>- may perform post-op telephone follow-up</li> </ul>
<i>Anaesthetist</i>	<ul style="list-style-type: none"> <li>- pre-operative assessment</li> <li>- provides information about what will happen on day of surgery</li> </ul>
<i>Nurse</i>	<ul style="list-style-type: none"> <li>- greets and cares for patient at pre-assessment and on day of surgery</li> <li>- builds day surgery rapport with patient</li> <li>- provides information and ensures that relevant information has been transmitted</li> <li>- listens to patient and answers questions</li> </ul>
<i>Administrative Staff</i>	<ul style="list-style-type: none"> <li>- telephone contact, booking and liaison with medical personnel</li> <li>- reference to information</li> <li>- administrative procedures: admission and discharge</li> </ul>

### ***Paediatric Day Surgery***

Patient information in paediatric day surgery will vary slightly. For many children hospital admission can be very stressful and this is always minimised by involving parents wherever possible in their care. Anxiety must also be alleviated in the parents because relaxed, informed and happy parents help produce happy relaxed children. Parents will require all the same day surgery information which would be provided for patients, but written with them in mind. A certificate of bravery could be awarded to the paediatric patient at discharge.

When referring to overnight fasting, an example of re-wording for parents might be: "Eating and Drinking Restrictions - The most important thing you can do for your child is to follow these feeding instructions. Your child's surgery may be delayed or cancelled if these instructions are not followed."

## **Guidelines for Construction of Information Packets**

### ***Introduction***

The content and design of any written information is crucial. A part of the DSU budget should be allotted to the preparation and updating of printed information packets. Legal

aspects need to be taken into consideration, as some laws may dictate what information a patient must receive [10].

Four different information leaflets are recommended:

1. An illustrated leaflet briefly describing the DSU and its mission. This serves as an introduction to the unit. (Table 5).
2. A more detailed general information leaflet about the DSU, procedures and instructions (Table 6).

**Table 5 Booklet construction: Day Surgery General Information Leaflet**

<i>Day Surgery</i>	<ul style="list-style-type: none"> <li>• What is day surgery?</li> <li>• Why should I have day surgery?</li> <li>• Is it safe?</li> <li>• Can I have day surgery?</li> <li>• What happens after surgery?</li> <li>• What would I need at home?</li> </ul>
<i>Day Surgery Unit</i>	<ul style="list-style-type: none"> <li>• Where is the Unit? Describe facilities and services</li> <li>• Address, telephone numbers and operating hours</li> <li>• Describe quality of service</li> <li>• Referral to Day Surgery</li> <li>• Map of location, directions for public and private transport, parking and brief hospital details</li> </ul>

**Table 6 Booklet construction: Day Surgery Unit Instructions and Procedures**

<p>Welcome to the DSU</p> <hr/> <ul style="list-style-type: none"> <li>• Describe Day Surgery Unit</li> <li>• Introduce staff, facilities and services</li> <li>• Contact information</li> <li>• Brief descriptions of each step of the Day Surgery Itinerary.             <ol style="list-style-type: none"> <li>1. Pre-assessment examination</li> <li>2. Pre-op examination</li> <li>3. The day of surgery</li> <li>4. Discharge</li> <li>5. Recovery</li> </ol> </li> </ul> <p>Information should answer the questions:</p> <p>What should the patient expect?</p> <p>What is expected of the patient?</p> <ol style="list-style-type: none"> <li>6. Other</li> </ol> <p>What to wear</p> <p>What to bring in, including diversionary activity</p> <ul style="list-style-type: none"> <li>• Pre-assessment instructions and procedure checklist</li> </ul>
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**Table 7** Booklet construction: Procedure Specific Information

## Medical Information

- Describe medical condition – what is it?, why operate?
- Describe surgical procedure
- Describe surgical itinerary
  1. Pre- op, fasting, medications ...
  2. anaesthesia
  3. complications
  4. discharge
  5. recovery
- Normal/abnormal condition
- Pain relief and medications
- Wound management
- Role of Caregiver
- Mental state
- Personal hygiene
- Return to normal activity (work, driving, operating machinery, physical and sexual activity)
- Diet
  6. Post-op procedures and examination
- Informed consent
- Space for handwritten patient-specific instructions
- Space for handwritten appointment dates and times
- Contact information

3. An information leaflet describing each individual surgical procedure, instructions and post-operative information, procedures and instructions (Table 7).
4. An information leaflet for the caregiver and relatives describing the facilities, what is expected of them and other general helpful information (e.g. where to find food and drink) (Table 8).

**Table 8** Booklet construction: Information for Caregivers**Key points to include**

- Role of caregiver in Day Surgery
- What is expected of caregiver before, during and after surgery
- Parking arrangements – map and costs
- Availability of refreshments
- Details about facilities, such as shops
- The routine in the unit including the usual timing of admission and discharge
- Contact information

**Also provide any specific information the caregiver needs to know regarding a specific procedure**

- Indicate approximate length of time caregiver is likely to be needed
- Information regarding prescribed medications

## Style

Presentation and language are vitally important. Written information should be provided on as few pieces of paper as possible. A leaflet should be handy and easy to manipulate. Language should be simple, straightforward and easy to read, with short sentences and clear expressions. Do not use jargon. The effort should be made to translate and stock information packets in different languages for ethnic minorities (consideration should also be taken for deaf and blind patients).

A general style should be chosen and used for all printed material. Design and colour should be consistent throughout with a few illustrations or pictures of the unit. An appropriate layout for content includes a 12-point type or larger clear type faces e.g. Times Roman font, use of lots of “white space”, the use of headings, lists and summaries, text being lined up to the left and the use of bold type or different fonts to emphasize points (Table 9).

**Table 9** Style guidelines for information packet construction

<i>Language</i>	<ul style="list-style-type: none"> <li>• 12-year old reading level</li> <li>• Easy to read and straightforward</li> <li>• Short sentences and clear expressions, no jargon</li> <li>• Only essential information included</li> <li>• Translations in other languages available</li> <li>• Alternative forms of information for deaf or blind patients</li> </ul>
<i>House style</i>	<ul style="list-style-type: none"> <li>• One main design</li> <li>• One main colour</li> <li>• Hospital logo and/or pictures of the unit</li> </ul>
<i>Type, style and layout</i>	<ul style="list-style-type: none"> <li>• Use 12 point type at least, larger for eye patients and children</li> <li>• Use consistent and clear type faces such as Times Roman</li> <li>• Use subheadings, lists and summaries</li> <li>• Line up text to the left</li> <li>• Use bold type, bullets or different fonts to emphasize points</li> </ul>

A useful approach to the design of information is to provide a “questions answered” format. The use of a web site to make information more readily accessible should also be considered.

## Questionnaire

The final step in information provision is obtaining feedback from the patients and caregivers themselves. This can be carried out by a questionnaire with space for free comment. It can be used to assess levels of overall satisfaction and to obtain information on all aspects of day surgery. Questionnaires can also be designed to concentrate on specific areas, e.g. pain or patient information provision (Table 10).

**Table 10** Booklet construction: Patient and Caregivers Satisfaction Questionnaire

<b>Introduction</b>
<ul style="list-style-type: none"> <li>• Inform patient of questionnaire</li> <li>• Explain why it is necessary</li> </ul>
<b>Format</b>
<ul style="list-style-type: none"> <li>• yes- no questions</li> <li>• rating scale 1-5</li> <li>• free comment</li> </ul>
<b>Avoid too many questions and ones that are too long</b>
<b>Key questions relating to Patient Information Provision to be included</b>
<ul style="list-style-type: none"> <li>• Did you receive verbal and written information and instructions about day surgery?</li> <li>• What information was most helpful?</li> <li>• Were leaflets clear and did they contain an adequate amount of information?</li> <li>• What could be added to improve information?</li> <li>• What could be taken out?</li> <li>• In what other ways could the leaflets be improved?</li> </ul>

Patients should be informed from the very beginning that they may be asked their views by questionnaire and that their answers will help improve the quality of the day surgery service. The completed questionnaires should be audited periodically and the resulting recommendations should be implemented as soon as possible.

### **Examples of information leaflets**

The materials presented are intended as guidelines for construction of information leaflets and many examples are given. When developing information protocols, it should be kept in mind that each day surgery unit is different. Materials presented in this section can be adapted to fit the needs of each individual DSU. Before full implementation in DSU, all material will need to be tested and piloted extensively with patients. Material should also be periodically revised and updated according to patients' suggestions and complaints and changes in DSU policies and procedures.

*Annex 1 : Day Surgery: general information.*

*Annex 2 : Day Surgery: information guide for caregivers.*

*Annex 3 : Day Surgery: Inguinal Hernia Repair informative guide*

*Annex 4 : Day Surgery: Questionnaire*

## **Obtaining patients' consent to day surgery procedures**

A basic condition in the relationship between a physician and their patient is the patient's consent to treatment or care [11,12]. This is a declaration by which a patient agrees to

undergo diagnostic tests and/or treatments and a doctor assumes the obligation to treat.

The patient's consent should be obtained according to ad hoc national regulation. Nevertheless some general considerations can be provided.

Health professionals need consent from patients before they examine, treat or care for a patient. Adults are considered competent to give consent unless demonstrated otherwise. The process of obtaining consent is not a simple event and often requires multiple contacts with the patient. The consent obtained can be withdrawn by the patient at any time.

Young people aged 16 or older are generally considered competent to give consent for themselves. Children aged 15 or less can also give consent but it is strongly advisable to involve their parents in the process. In the case of younger children someone with parental responsibility must give consent on the child's behalf. A parent can consent if a competent child refuses but if a competent child consents to treatment a parent cannot over-ride that decision. The doctor actually treating the patient should ideally obtain the consent.

Patient information is crucial in the process of consent. Information given to the patient should include the benefits and risks of the surgical and anaesthetic procedures, alternative treatments, possible post-operative transient and permanent complications, detailed information of the day surgery care plan including patient and carer obligations.

The consent can be ideally written in a specifically prepared consent form for specific procedures and signed by the health professional and the patient but a signature on a consent form does not prove the consent is valid. The aim of the written form is to record the patient's decision and testimony that a discussion has taken place. The signature of two health professionals on the consent form is advisable in many situations.

It is suggested that any DSU develop a policy regarding the process and the written documentation of consent.

## **Patient documentation and care pathways**

In the DSU, as in any other hospital environment, there needs to be an efficient method of documenting the care that the patient receives. Standards for Records and Record Keeping, (1993) states that "The record will demonstrate the chronology of events and all significant consultations, assessments, observations, decisions, interventions and outcomes". Sutherland [13] highlights the fact that written records are the only method whereby it is possible to determine retrospectively the relevance, suitability and outcome of day surgical intervention. Due to the short length of time that patients spend in the day surgery unit, nurses are at a disadvantage in evaluating care, and therefore need to be more vigilant in their documentation [14].

Most day units use a single care plan for each patient for the documentation of the complete day surgery process. This includes the pre-assessment questionnaire, admission information, anaesthetic charts, operation notes, recovery documentation and discharge information. In many units the care plan only ends with the post-discharge telephone follow-up. These care plans should be flexible enough to enable the recording of the specific needs and wishes of individual patients.

To reduce the time taken to document care for each patient, multidisciplinary care plans usually take the form of checklists and questionnaires with areas for free text to note specific details of each patient's requirements. These care plans provide a framework, linked to expected outcomes, for planning and ensuring appropriate delivery of care within set time periods [13]. Different versions of care plans can be designed specifically for particular patient groups or procedures. A day unit may have care plans for patients undergoing general anaesthesia, local anaesthesia, or paediatric cases.

Care plans are a useful audit tool in assessing how patient care is planned, delivered and recorded but should not be relied upon solely to assess the effectiveness of patient care delivery [1]. Quality assurance programmes should also look at the completeness and consistency of documentation, as there may be a lack of uniformity in recording data (e.g. how pain is scored) and this will influence outcomes. Monitoring assists in the evaluation of the quality of care given and the maintenance of accurate, concise medical records is important for recollection purposes in the event of complaints or litigation. As the task of recording patient care is undertaken by surgeons, anaesthetists and nurses, the outcomes of documentation monitoring should be reviewed and acted upon by a multidisciplinary team.

## **Audit of the pre-operative assessment process**

Auditing of the pre-operative assessment service is important. Results of audit should be discussed with all the professionals involved and action taken to ensure an improvement of the service.

Much relevant information can be included in the audit: number of patients assessed, patients not attending pre-operative assessment, cancellations of surgery after pre-operative assessment, unplanned overnight stays and reasons, operations cancelled on the day of surgery and reasons, operation cancelled by the hospital and reasons, patient satisfaction and staff satisfaction.

Audit is a key action in the process of quality improvement.



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Day Surgery Unit

**How do I make an appointment?**

To use this service, you will first need a written referral from your primary physician. To make an appointment for your hospital visit, please call: ☎049/8215659

Monday through Friday

9 am-12 pm  
2 pm-3 pm

or in person at the Centre's Admissions Office, ground floor, ex Busonera Hospital:

Monday through Friday

9 am-12 pm  
2 pm-3 pm

**How long will I have to wait?**

Presently, the average waiting time for Day Surgery is about 3 months. This is due to the large number of patients coming to the Centre (2,906 patient treated in 2004).

**Where is the Day Surgery Unit?**

The Day Surgery Unit is located at:

ex Ospedale Busonera  
via Gattamelata, 64 – Padova

From the main entrance on the ground floor, at the end of the central corridor to the right are:

Examination rooms (rooms 5,6,7,8,9)  
Secretarial office (room n. 2)  
Doctor's office (room n. 3)  
Rest rooms (room n. 11)

⇒ Paid parking can be found at the parking structure next to ex-Busonera Hospital. From the train station, take bus n. 24 or 19 for Hospital (bus stop in front of main entrance) continue on foot to stop light, proceed left. Hospital is about 100 mt ahead on the right.

The Operating Rooms are located at:

Day Surgery Unit

Via S. Giovanni di Verdara, 115 - Padova  
Surgery Department – 2° floor

Maps are available upon request

The Centre is open:

Monday through Friday  
7:30 am - 1 pm and 2 pm - 7:30 pm  
tel. 049 8215659



Padova University Hospital

Day Surgery Unit

## DAY SURGERY

*A general information leaflet*

## Annex 1 Day Surgery: General Information

## Day Surgery Unit

**What is day surgery?**

Many patients can now come into the hospital, have their operation, and go home on the same day. Back at home they are looked after by relatives or friends, supported by the community health care team.

**Is it safe?**

Recent advances in both general and local anaesthetics and improvements in surgical techniques, make day surgery as safe as staying in the hospital. Thousands of operations have been carried out successfully in this way over the last twenty years.

**What are the advantages of day surgery?**

Most operations can be carried out sooner and admission dates are much less likely to be cancelled if you are able to have day surgery. Many people like to spend as little time as possible in hospital and prefer to be at home with their children, family and friends. There is less disruption to your daily routine, for example childcare is easier to plan and very often you will be back at work sooner.

**Could I be a day surgery patient?**

It depends what operation you need. Almost half of all surgical procedures can be carried out on a day surgery basis. At the Day Unit procedures include varicose vein surgery, joint surgery, hernia operations,

breast lump removal and hemorrhoid removal.

Not everyone is fit enough for day surgery.

Careful assessment of your general health is made before booking.

Normally you need to live within an hour's drive of the hospital. At home you need access to a telephone and bathroom.

**What happens after day surgery?**

You will not be allowed home unless it is completely safe for you to leave the hospital the same day. A very small number of people have to stay overnight for unforeseen reasons, but this happens in only about three out of every hundred cases.

You are expected to arrange for someone to drive you home. You should not drive yourself for at least two days after any procedure performed under sedation or general anaesthesia.

**What would I need at home?**

It still takes some days to get over certain operations, just as it would if you stayed in the hospital. You and your caregiver (a relative or friend) will be given advice about what to do at home during this time. It might mean that your caregiver will need a day or two off work in order to look after you at home. If you have any worries once you are at home, help and advice will be only a telephone call away. Your will be given a contact number to use in case you need it.

**Day Surgery in Padova**

The *Day Surgery Unit* of the University Hospital of Padova offers this valuable service to the community by carrying out surgical and diagnostic procedures over the course of one day, without an overnight stay in the hospital. This is a new form of health service that puts you, the patient, in a central position, closely collaborating with your doctor and nurse in your own health care decisions and management. You will be kept informed, as clearly and simply as possible, from your very first contact with the Centre. And throughout your course in day surgery you will be prepared and cared for by our medical, nursing and administrative staff.

Dr. U. Red, surgeon for the 3th Clinical Surgery Unit, University of Padova, is the head of the Day Surgery Unit and leads the team of highly qualified professionals, doctors and nurses, and highly trained administrative staff. The Centre's personnel are at your service to answer any and all questions you may have.

Centro Multidisciplinare di Day Surgery

**Where is the Centre?**

The Day Surgery Unit is located at:  
ex Ospedale Busonera  
Via Gattamelata, 64 – Padova

From the main entrance on the ground floor, at the end of the central corridor to the right are:  
Examination rooms (rooms 5,6,7,8,9)

- Secretarial office (room n. 2)
- Doctor's office (room n. 3)
- Rest rooms (room n. 11)

⇒ Paid parking can be found at the parking structure next to ex-Busonera Hospital. From the train station, take bus n. 24 or 19 for Hospital (bus stop in front to main entrance) continue on foot to stop light, proceed left. Hospital is about 100 mt ahead on the left.

**On the Day of Surgery-**

The Operating Rooms are located at:

Day Surgery Unit  
Via S. Giovanni di Verdara, 115 - Padova  
Surgery Department – 2° floor

Metered parking is available near the hospital.

Maps are available upon request

**Once at home**

**Post-Operative On Call service**

Physician on Call

**049 8212761**

**"I have a problem..."**

To help the Health Service meet the needs of its patients, this service was created for your organizational needs. If you have any problems or questions please contact:

Mrs. C.White (Head Nurse)

☎049 8726977

Monday through Friday 9 am – 12 pm

If you wish to speak with our medical personnel, please contact:

Mrs. Smith (Head secretary)

☎049 8215671

Monday through Friday

9 am – 11 pm and 2 pm – 6 pm

The Centre is open:

Monday through Friday

7:30 am - 1 pm and 2 pm - 7:30 pm

tel. 049 8215659



Padova University Hospital

Day Surgery Unit

## DAY SURGERY

### Information Guide for Caregivers

**Annex 2** Day Surgery: Information Guide for Caregivers

Day Surgery Unit

Dear Caregiver,

*Someone dear to you is about to undergo a surgical procedure at the Centro Multidisciplinare di Day Surgery. Day Surgery can be very beneficial for the patient. A few hours after the procedure, the patient returns home to recover in familiar surroundings. There is no overnight stay in the hospital. As his/her care giver you may need to take a couple of days off work to look after our patient. The length of time that you may be needed will depend on the type of surgery. The nursing and surgical staff are always available if the need should arise.*

*Dott. U.Red*

*Head, Centro Multidisciplinare di Day Surgery*

Visiting with patient: Each patient is allowed 2 visitors, family members or friends. Visitors should be over the age of 14. Please attend smaller children in the waiting room. However, their presence is discouraged. Visitors will be able to accompany patient in pre-op and recovery when the patient is settled. Most patients are discharged within 4 hours of surgery

For your convenience vending machines for refreshments and snacks are located near the waiting room. A coffee shop is just outside the hospital gates. No smoking is allowed inside the hospital.

Cellphones are allowed only in the waiting rooms and outside the hospital.

Specific post-operative care instructions will be given by that doctor at discharge.

On the evening and day following surgery, a member of the Centre's surgical staff will call to check on the patient. However, if the need should arise don't hesitate to use the Post-Operative On call Service (see back of leaflet)

**Preparation check list for Day Surgery**

**Patient:**

- Be on time
- Do **not** eat or drink anything after midnight before procedure
- Take medications the morning of procedure with small sips of water
- Wear comfortable loose-fitting clothing
- Do not consume alcohol or smoke several days prior to surgery
- Come to Day Surgery with all pre-operative exams, National Health Care card and ID
- Arrange for someone to drive to and from the hospital and someone to stay at home with you for the first 24 hours after surgery
- Inform the Centre of any illness (e.g. cold) contracted within a week of scheduled surgery

**Before coming to the Centre on the day of surgery :**

- Take a bath or shower
- Remove all make-up, nail polish and jewelry

**What to bring:**

- Something to read or do while waiting
- A case for contact lenses and/or dentures

**What NOT to bring:**

- Valuables, such as jewelry, or too much money

**After Surgery:**

- Check that all necessary information and medications have been given, if not ask the doctor or day surgery staff
- Follow their instructions for taking medications and suggestions for diet and rest
- Do not let the patient drive
- Do not allow the patient to drink any alcohol
- Do not allow the patient to operate machinery
- Do not allow the patient to conduct business or sign important documents
- Make sure the patient takes home all x-rays and exams brought in from the outside

Day Surgery Unit

- On day of surgery
- Be on time and fasted from midnight
- Take regular medications and prescribed antibiotic with small sips of water
- Inform you doctor of any family history of thrombophlebitis
- Have groin area shaved as instructed
- Come to Day Surgery with all pre-operative exams, National Health Care card and ID
- Arrange for someone to drive to and from the hospital and someone to stay at home with you for the first 24 hours after surgery

At home

- Get as much rest as possible. Drink plenty of fluids, eat light meals and avoid alcohol.
- Some pain in the groin area is normal. Take pain reliever as directed by your doctor.
- Some swelling and soreness of the surgical wound is normal
- Stitches will be removed after about 1 week. If pain increases, pulsates or you notice changes in your wound, please contact the Center.
- A slight fever is also normal. If your temperature exceeds 38°C, contact the Centre.
- Post-operative check-up after 1 week to remove stitches. Periodic check ups after 3 weeks, 6 months and 1, 2 and 3 years.

If you have any problems or cause for concern, contact your doctor or the on-call service right away.



Padova University Hospital  
Day Surgery Unit

**Post-Operative On Call service**  
Physician on Call

**049 8212761**

**Dates to Remember**

Anaesthetic examination

Date: \_\_\_\_\_ time: \_\_\_\_\_

At the Ospedale Militare

Surgery:

Date: \_\_\_\_\_ time: \_\_\_\_\_

At the Ospedale Militare

**Medications:**

\_\_\_\_\_

**Other Instructions:**

\_\_\_\_\_

\_\_\_\_\_

Day Surgery Unit  
Via S.G. di Verdara 115 - Padova  
Sezione Chirurgica 2° piano  
049 872-6977

**Day Surgery**

**Inguinal Hernia Repair**

*Informative guide*



## Annex 3 Day Surgery: Inguinal Hernia Repair Informative Guide

## Day Surgery Unit

**Dear Patient,**

Welcome to the Day Surgery Unit

To ensure the success of your operation, I would like to invite you to follow the instructions given to you by our medical team carefully. Also, I would encourage you to read over the materials presented and ask any questions you may have.

As your doctor has explained to you, inguinal hernia repair can be carried out in Day Surgery. You will come to the Centre in the morning and your operation will last about 1 hour. You will be able to go home in the afternoon, after a complete post-op exam.

*Doti. U. Red*

*Head, Centro Multidisciplinare di Day Surgery*

If you need help please call:

*Mrs C. White, Head nurse*

☎ 049 872 6977

If you wish to speak with our medical

personnel, please contact:

*Mrs. Wilson* ☎ 049 821 5702

Day Surgery Unit

ex Ospedale Busonera

via Gattamelata, 64 – Padova

The Centre is open:

Monday through Friday

7:30 am - 1 pm and 2 pm - 7:30 pm

tel. 049 8215659

**What is an Inguinal Hernia?**

A hernia occurs when inner layers of abdominal muscle become weakened. The lining of the abdomen then bulges out into a small sac, and part of the intestine or abdominal tissue may enter the sac.

Some people with hernias remain relatively free from symptoms, while others experience swelling and, sometimes, severe pain. A hernia can cause other potentially serious problems (e.g., infection, bowel obstruction). Surgery is the only way to repair them, because they do not resolve on their own.

**What happens during surgery?**

A Hernia repair operation lasts about an hour. It is usually carried out under local anaesthesia or epidural anaesthesia, which is also called a spinal anaesthetic that numbs a larger area or region of the body containing the hernia. An incision is made over the site of the hernia. The protruding tissue is returned to the abdominal cavity, and the sac that has formed is removed. The surgeon repairs the hole or weakness in the abdominal wall by sewing strong surrounding muscle over the defect. At times, it may be necessary to strengthen the abdominal wall with a piece of synthetic material called "mesh", usually well tolerated by the human body.

**Are there any complications?**

Complications from inguinal hernia repair surgery are very few. You may experience:

- Swelling and soreness at the incision site
- Headache and nausea after anaesthesia
- Post-operative infection of the incision site, treatable with antibiotics
- Loss of sensitivity around the incision site
- Allergic reaction to anaesthesia

Although unlikely, a hernia may reoccur in about 5% of cases, even many years after repair surgery.

**What happens after surgery?**

After surgery, you will be taken back to your room to recover. You will normally be discharged in the afternoon, after your doctor ascertains you are able to stand and walk. The surgeon will give you post-operative indications to follow at home and will advise you regarding heavy lifting, jogging, or doing strenuous exercise. Generally, you will have some difficulty walking the first few hours after the operation, and climbing stairs the first couple of days. Bathing will require care so as not to wet the incision site. Sexual activity is usually too uncomfortable to enjoy the first week or two. You should be able to drive your car within a few days. Depending upon your occupation, you can expect a recovery period lasting from one to six weeks.

## Day Surgery Unit



Padova University Hospital

Day Surgery Unit

16. In what other ways could our brochures be improved to better fit our patients' needs?
- 1 2 3 4 5  
not at all very helpful
17. How would you rate your greeting by the Day Surgery Centre personnel on the day of your surgery?
- 1 2 3 4 5  
cold very warm
18. How would you judge the comfort of our waiting room?
- 1 2 3 4 5  
uncomfortable comfortable
- 18a. In what ways was it uncomfortable/comfortable?
19. If you underwent an operation, who was the most reassuring before the operation?
- The surgeon  
 The nursing staff  
 The anaesthetist  
 No one  
 Other \_\_\_\_\_
20. How would you rate the information received regarding post-operative instructions and check-ups?
- 1 2 3 4 5  
incomprehensible very understandable
21. When you were discharged from day surgery, was the personnel helpful?
- 1 2 3 4 5  
not at all very helpful
22. What aspects of the Day Surgery Centre did you find favourable? (check all that apply)
- Organization  Medical assistance  
 Nursing assistance  Equipment  
 Administrative aspects  
 Comfort and cleanliness of the environment
23. What aspect of the Day Surgery Centre did you find unfavourable? (check all that apply)
- Organization  Medical assistance  
 Nursing assistance  Equipment  
 Administrative aspects  
 Comfort and cleanliness of the environment
24. How would you overall rate our Day Surgery Centre?
- 1 2 3 4 5 6 7 8 9 10
26. What suggestions could you make to help us improve the quality of our service?

## DAY SURGERY

### Questionnaire

Day Unit is open  
from monday to friday  
7:30 a.m. to 7:30 p.m.  
tel. 049 8215659



Annex 4 Day Surgery: Questionnaire

Day Surgery Unit

Dear Sir/Madam,

*Would you please take some time to answer the questions in this booklet.*

*It is important for us to know what you think about our Day Hospital as a patient or caregiver.*

*Your comments will help us better our service, to make the day hospital experience a positive and above all tailored to fit the patient.*

*Your views and comments will be strictly confidential.*

*Thanking you in advance for your kind cooperation,*

*Doit. U. Red  
Head, Day Surgery Unit*

1. Age:
- 18 years or younger
  - 19-30 years old
  - 31-50 years
  - 51-60 years
  - 61-70 years
  - over 71

2. Gender.
- male
  - female

3. Education
- No diploma
  - Elementary school
  - Junior high school
  - High School diploma or equivalent
  - College Degree or higher

4. Profession
- employed
  - unemployed
  - retired
  - housewife
  - student
  - other

5. Who referred you to the Day Surgery Centre?
- A friend
  - A specialist
  - Your primary physician
  - Other
- Please specify \_\_\_\_\_

6. Is this the first time at the Day Surgery Centre?
- Yes
  - No, it is my second time
  - No, it is my third time
  - No, it is my fourth or more

7. How did you make your first appointment?
- By telephone
  - In person at the Centre

8. Did you have any difficulty with the telephone service?
- No
  - Yes, I had to call back many times
  - Other \_\_\_\_\_

9. If you came in person, how would you judge our direction signs? (circle one)
- rather confusing                      very clear
- 1                      2                      3                      4                      5

10. How long did you have to wait before your first appointment?
- Less than 2 weeks
  - 2 weeks to 1 month
  - 1 to 2 months
  - over 2 months

11. How would you rate the waiting time?
- too long                      just right                      too short
- 1                      2                      3                      4                      5

12. Were you adequately informed about the possible waiting time for your first visit?
- Yes
  - No

13. Was the information received regarding day surgery, preparation for day surgery, instructions and procedures clear and adequate?

- unclear and inadequate                      very clear and adequate
- 1                      2                      3                      4                      5

14. How would you rate the written information given to you?
- useless                      2                      3                      4                      very useful

- 14a. If information was inadequate, what information needs to be added or changed to make it more useful?

- 14b. If there was too much information, what should be eliminated?

15. What information was most helpful to you?
- Oral
  - written
  - both

Johan Raeder, MD, PhD

## The Ideal Anaesthetic for Ambulatory Surgery

As with all cases of surgery, the choice of a proper anaesthetic drug and technique for ambulatory surgery should be based on considerations of safety, quality and cost effectiveness, with the safety issue as the most important concern. As ambulatory surgery has some specific characteristics, the way of looking at these three main issues may be different from major inpatient surgery. Ambulatory surgery should be well planned, elective surgery done during daytime, usually of minor or intermediate invasiveness and involving stable patients of good or fairly good general health. This implies that the risk of severe problems arising from patient safety is less likely to occur. On the other hand, if problems do occur they will be much less tolerated and accepted by patients and society. In the ambulatory setting the patient or economic provider may choose between different facilities, thus putting a high impact on good perceived quality of care and patient satisfaction foremost. This may be in conflict with another important concern; how to run a unit cost-efficiently with high patient turnover, short recovery stay, rapid discharge and minimal occurrence of re-admission or post-discharge problems. However, the safety, quality and cost effectiveness may go well together: with a high safety standard the patient will prefer your unit and the costs of treating complications as well as malpractice compensation will be minimized. Furthermore, with good quality of care the patient will feel well rapidly after the procedure and prefer to be discharged early. If high satisfaction and no problems are encountered after discharge, this will also mean cost minimization for all players involved.

In conclusion: The discussion on the ideal choice of anaesthetic technique should be based on demands for a close to zero risk of mortality and permanent disability, and then moving the focus into aspects of quality and cost efficacy. Further, the success of a chosen anaesthetic is highly dependent upon adjuvant issues, such as the skill and routines of the personnel involved, proper monitoring and dosing, and the use of non-anaesthetic adjuvant drugs and methods for pain and nausea protection.

## Safety

In the survey of Warner *et al.* from the early 1990s, the mortality after more than 45,000 ambulatory surgery cases was similar to matched control persons not undergoing surgery [1]. As many as 60-70% of all elective procedures in the USA and some places in Europe

are performed on an ambulatory basis. There is a trend towards undertaking more extensive procedures and treating sicker and more elderly patients in the ambulatory setting, resulting in increased safety challenges. Still, in a recent 60 days survey of 18,500 Danish patients, there was no mortality caused by the anaesthetic procedure and no cases of permanent disability [Engbaek J, personal communication].

Low mortality in ambulatory care is not guaranteed. During a one year period in Florida there was a 12-fold increase in mortality when office-based procedures were compared with similar procedures done in dedicated ambulatory surgery centres [2]. This was mainly due to inferior monitoring and equipment, and the absence of anaesthetic staff in the office settings with the fatal cases. In a major survey of both inpatient and ambulatory care in 800,000 Dutch patients, specific issues of anaesthetic quality and handling were identified as significantly important for maintaining low mortality [3]. These included documentation of equipment checks according to written protocols, the same anaesthetist directing and available during the procedure and present during emergence, a full time working nurse anaesthetist, reversal of muscle relaxants and the use of local anaesthetics as a part of the post-operative analgesic regimen [3].

## Quality: The optimum anaesthetic

The most important aspects of quality in an optimum anaesthetic technique are rapid and clear headed emergence, no post-operative pain, no post-operative nausea or vomiting and absence of any per-operative side-effects or discomfort. These are very important issues for patients.

### ***Rapid and clear headed emergence:***

This may not always be perceived as an issue by patients; as long as they are safely asleep without nightmares, they expect they will have a good experience. However, if they have a prolonged time of slowly resolving anaesthetic drug effect, patients may experience a prolonged post-operative transition to being fully awake, with dizziness, fatigue and discomfort. A prolonged awakening may also have implications for safety and the need for surveillance (i.e. cost), since the airway may get obstructed, patients may have problems with oral intake and important information may not be understood. If patients have a rapid emergence, it has been shown that they may leave the operating room sooner and even by-pass the recovery unit, (i.e. fast tracking)- both important economic aspects [4].

### ***Minor or no post-operative pain:***

Because modern general anaesthetic drugs are cleared rapidly, adequate pain protection after emergence is a vital component for success. For both pain and nausea prophylaxis, a multimodal approach with different additive or synergistic acting drugs is proven to be

the most effective. The pain after ambulatory surgery is usually moderate, but still there is a need to minimize the pain in order to get optimal quality, with the patient mobilized and discharged as soon as possible. As the opioids may provoke post-operative nausea and vomiting (PONV) (see below) and fatigue, there is a case for achieving maximal pain control with a non-opioid multimodal regimen [5]. It has been shown that paracetamol in an optimal dose is a proper basis in this context [5]. The starting dose should be 2 g orally or 1 g intravenously, continuing with 1 g four times a day in an adult patient of at least 60 kg weight and less than 60 years of age. Otherwise, dose reduction should be considered. As paracetamol is very rapidly cleared from the stomach, a pre-operative tablet administration 1-2 hours ahead of surgery may do very well as a start. Rapid disintegrating tablets may be given up to 30-45 minutes before induction of anaesthesia. Intravenous paracetamol is usually well tolerated, but must be given as a 100 ml infusion, whereas IV pro-paracetamol (i.e. prodrug of paracetamol) may provoke local irritation and unpleasant sensations in the awake patient. The rectal route is more unpredictable and should be avoided if other options are possible. NSAID or Cox-2 selective NSAIDs (i.e. coxibs) may also be given orally 1-2 hours pre-operatively, but injectable options such as ketorolac or valdecoxib are an alternative. It has been shown that the combination of NSAID or coxib with paracetamol have a small, additive analgesic effect [6].

Whereas traditional NSAID should be the routine drug of choice due to a possibly better cardiovascular profile, the coxibs may be preferred in patients with asthma, allergy, mild dyspepsia and for procedures with a risk of peri-operative bleeding problems [7].

It has also been shown that adding corticosteroids will have a further analgesic prophylactic effect, and in addition provide protection against PONV and stimulate the appetite [8]. Whereas a dose of 3-4 mg IV dexamethasone will be appropriate for PONV prophylaxis, the dose should probably be at least 8 mg in an adult to also provide good analgesic protection [9]. Corticosteroids are usually given IV soon after induction because they have a delayed onset. If dexamethasone is given to the awake patient, sometimes an unpleasant, transient perineal sensation will occur.

Infiltration of local anaesthetic in all incisions, typically either bupivacaine 2.5 mg/ml or ropivacaine 2 mg/ml, is recommended as a routine in all ambulatory cases [10]. Due to the cardiotoxicity of bupivacaine, ropivacaine should be preferred in cases with extensive (i.e. more than 30-40 mls) need of infiltration. Infiltration at the end of the procedure will have a longer post-operative duration, but some claim that pre-operative infiltration is better due to the possible pre-emptive effect of blocking pain stimulation from surgery in the periphery [11]. Controversy exists as to the benefits of installing local anaesthetic into the peritoneal cavity before closure of laparoscopic wounds. Most studies indicate a beneficial effect of installing 40-50 mls of diluted local anaesthetic after laparoscopic cholecystectomies [12] whereas others do not find a significant analgesic effect [10]. Controversy also exists as to the benefit of installing local anaesthetic into the knee joint

or other joints for post-operative pain relief [13]. However, for more invasive procedures such as cruciate ligament repair, there seems to be a definite benefit [14]. A new way of expanding the use of local anaesthesia for post-operative pain relief is to put a small, multi-orifice catheter into the wound and connect this to a pump for continuous slow injection of local anaesthetic. This method is safe and beneficial for many types of major ambulatory surgery and may be used in the post-operative period for 2-3 days or more [15].

If opioids are needed in the post-operative management of an ambulatory patient, the choice of agent and dosing strategy may not be very different from any other similar surgical procedure. Small doses of a titrated opioid, such as fentanyl 0.25-0.5 microg/kg, may be recommended while the patient is in the post-anaesthetic care unit (PACU), whereas a rapid conversion to an oral drug is appropriate after PACU discharge. Oxycodone may be a better oral choice than codeine, due to its more predictable absorption and action [16]. Some 5-10% of the Western population has a genetic inability to convert codeine to active morphine resulting in a poor drug effect [17]. Oxycodone may be given in 5-10 mg tablets for relieve of temporary pain or given as 10-20 mg sustained release formulation if it is expected that the pain will be more long lasting. A more detailed description of analgesic techniques for day surgery can be found in Chapter 9.

### ***Absence of post-operative nausea and vomiting (PONV):***

This is an issue of special importance in ambulatory patients, as PONV may delay discharge and result in problems with the oral intake of fluids, food and tablets in the post-operative phase. Choosing an anaesthetic technique with a decreased risk of PONV as well as using proper prophylaxis when the risk is calculated to be more than 20-40% is recommended [18,19]. PONV may be divided into inherent risk for the patient in question and risks associated with the choice of anaesthetic and surgical techniques. Major patient risk factors include female gender, non-smoking status and previous susceptibility to nausea or vomiting, either after general anaesthesia or during travelling. Risk factors from anaesthesia are the use of inhalational agents, including nitrous oxide in high risk patients [20], the use of post-operative opioids and the use of high dose (i.e.  $\geq 2.5$  mg) neostigmine for neuromuscular block reversal [21]. Whereas laparoscopy is associated with less PONV than a similar surgical procedure done by laparotomy [Raeder et al, submitted], there is still an increased risk of PONV with all stimulation and manipulation of the gastro-intestinal organs and surgery in the innervation area of cranial nerves. This includes ENT surgery, squint surgery and thyroid surgery.

In order to reduce the risk of PONV, there may be a point in not using neuromuscular blockers when possible in ambulatory patients, or otherwise to avoid the need of reversal by just using a starting dose or a short acting agent (e.g. mivacurium), so that the "train of four" (TOF) ratio by the end of the procedure is at least 90% by spontaneous degradation of the relaxant. Another measure is to use total intravenous techniques instead of inhalational anaesthetics; however, the additional emetic effect of inhalational agents may

be compensated for by adding an extra anti-emetic prophylactic agent beyond what was otherwise planned [18].

Nitrous oxide will expand air pockets inside the gastrointestinal tract and may reduce surgical accessibility during laparoscopy. This may lead some to avoid nitrous oxide, in addition to the potential emetic effect of this agent in high risk patients [20]. However, in a healthy, fasting patient with no gastric obstructions or paralyses, the amount of air inside the gut lumen is very sparse and the potential for expansion by nitrous oxide low. A total intravenous technique will almost always imply using propofol infusion, and this drug is anti-emetic per se, providing PONV protection during the first hours after the end of anaesthesia [22]. Any means to reduce the need of post-operative opioids for pain prophylaxis and treatment will also be of benefit in reducing the risk of PONV (see above) [18].

A rough estimation of PONV risk may be done using the Apfel score: 1 point is given for a) female gender b) opioid need post-operatively c) non-smoking status d) previous PONV or extensive travel sickness. The risk of PONV may be calculated from total points in the individual patient: 1 point: 20% risk, 2 points: 40% risk, 3 points: 60% risk, 4 points: 70-80% risk [19]. Even though prophylaxis implies giving drugs to many patients who actually will not need them, there may be an argument for routine PONV prophylaxis when the baseline risk is more than 20-40%, as the prophylactic drugs have few serious side-effects and most (except 5-HT<sub>3</sub> antagonists) are fairly cheap. Droperidol, 5-HT<sub>3</sub> antagonists and corticosteroids are the best documented antiemetic prophylactics, providing protection for 24 hours after a single dose [18]. Whereas droperidol and 5-HT<sub>3</sub> antagonists are best given at the end of the procedure, the corticosteroids have a slower onset of action and should be given early during the procedure. In a case with medium or high risk of PONV (i.e. more than 40-60%) giving all three drugs may be appropriate.

***Absence of other side-effects or discomfort:***

When opioids are used for post-operative analgesia they may disturb sleep quality during the following night with a reduction in rapid-eye-movement (REM) sleep and a subsequent vigorous catch-up sleep the night after. Post-operative shivering, not caused by hypothermia, may be seen after all kinds of general anaesthesia, but is more frequent after potent inhalational anaesthetics. Within this group of drugs, shivering is more frequent with isoflurane than with sevoflurane or desflurane. Shivering is quite unpleasant for the patient, will increase the oxygen demand and may provoke pain from the operation wound when the movements are vigorous. The routine use of active forced-air patient warming has greatly reduced the occurrence of shivering. If treatment is needed, shivering may be alleviated with any IV opioid, but meperidine and also clonidine have been shown to be the most efficient opioid treatment options.

Hallucinations may be a frightening experience after ketamine based anaesthesia or sedation, but are fairly effectively prevented by a concomitant benzodiazepine. Agitation

may be a problem especially after sevoflurane anaesthesia in children (see Chapter 6). As to headache, confusion and cognitive dysfunction, there does not seem to be a relationship to any specific general anaesthetic drugs or techniques [23], but headache may be a specific problem after 5-HT<sub>3</sub> antagonists and dural puncture.

## Cost effectiveness

A variety of questions need to be asked to determine the cost effectiveness of anaesthetic drugs and equipment. Examples are:

- Will savings in drug costs create more costs for staffing or patient surveillance?
- Will a change in anaesthetic technique result in a greater or lesser cost for rescue drugs or additional measures?
- Will a change in anaesthetic technique affect length of stay in the recovery unit or hospital admission and re-admission rates?
- Will a different choice of a drug alter drug wastage?
- Is it more cost effective to use disposable or non-disposable equipment?

Cost effective calculations are not always straightforward but are assuming increasing importance.

## Different anaesthetic techniques

### Loco-regional techniques

#### **General aspects [24]**

Loco-regional techniques have a good potential for ambulatory surgery as they have minor generalized drug effects, the option of being awake during the procedure and superior pain control immediately after the procedure [24]. However, the ideal of zero mortality and no permanent disability after ambulatory care [1] has been challenged by reports of rare, but serious, complications of permanent nerve damage [25], spinal haematomas and spinal toxicity [26]. In a report from France, 56 major complications were reported after loco-regional anaesthesia in a mixed population of 158,000 in- and outpatients [27]. These included 9 cardiac arrests during spinal anaesthesia and 12 cases of probably permanent nerve damage after peripheral blocks. Overall, very few of the complications were permanent and most of them occurred in sick inpatients.

Rapid emergence in the operating room, has resulted in the concept of fast tracking, i.e. direct transfer of the patient from the operating room to a phase-II recovery area, bypassing the post-operative care unit (PACU). This concept has evolved successfully with local and regional techniques [28]. In a recent USA survey of 5 centres, 90% of all

cases with monitored anaesthesia care (MAC; i.e. local anaesthesia with IV sedation) were fast tracked compared to 32% of cases with general anaesthesia [29]. Increased time consumption for regional block establishment and delayed recovery due to urinary retention or paralysed legs after spinal anaesthesia, are still major challenges for these techniques in the ambulatory setting [24]. In a recent British survey of practice in 270 departments for either day case cystoscopy or knee arthroscopy, all the respondents used general anaesthesia as their major method with supplements of local anaesthetic in 26% of cystoscopy and 77% of knee arthroscopy cases [30].

Better post-operative pain control is still a major area for improvements [31], and loco-regional techniques have consistently proved beneficial [31,32]. As loco-regional analgesia usually is established before initiation of the surgical trauma, there is a potential of exploiting the benefits of pre-emptive analgesia, with less pain generating reflexes into the central nervous system. In a survey of clinical use of pre-emptive analgesia, prolonged peri-operative epidural analgesia was the only modality associated with a possible pre-emptive effect [33]. The disappointing results of the pre-emptive analgesia concept in most clinical studies may be due to shortcomings in study design. Some recent studies have suggested a more reliable pre-emptive analgesic effect when an efficient drug [34] or local anaesthetic block is applied in advance of surgery and continued per- and post-operatively. In a recent survey with this aspect in focus, the pre-emptive concept has been found significantly useful both for local anaesthetic wound infiltration and NSAIDs [11].

Because less opioid analgesics are needed when loco-regional techniques are used, a lower incidence of PONV is usually seen when these techniques are compared with general anaesthesia [35]. Heavy opioid use with sedation can negate this advantage.

The peri-operative setting and choice of techniques may have an impact on the incidence of impaired cognitive post-operative function, which is reported with a higher frequency in elderly patients and after major surgery [23]. When regional anaesthesia was compared with general anaesthesia in a prospective, randomized way, there was a tendency ( $P=0.06$ ) of less impairment after regional techniques [36].

Local anaesthesia combined with sedation, also called monitored anaesthesia care (MAC), is a concept increasing in popularity. The technique is simple and cheap and is associated with a high potential for fast tracking [4]. However, care should be taken to avoid overdosing of local anaesthetics (e.g. during liposuction) and excessive respiratory depressant adjunctive sedatives.

Sedation during loco-regional techniques may be indicated either because of pain, patient anxiety or because of patients' preference. Use of sedation may add some new side effects. In a study of loco-regional patients with either propofol or remifentanyl sedation, Servin *et al.* showed more respiratory depression and per-operative nausea with remifentanyl, and more



per-operative pain and delayed emergence with propofol [37].

Regional anaesthetic drugs are usually cheaper than their general anaesthetic counterparts. Increased time consumption for block establishment and prolonged bed rest or urinary retention after spinal blocks should be added to the drug cost calculation and weighted against uneventful recovery with less nausea and pain. Depending on local circumstances the net economic balance may be totally different in different settings. In a study of desflurane versus spinal anaesthesia for laparoscopy, the latter was cheaper [38], whereas Danelli *et al.* found no difference in total cost when spinal anaesthesia was compared with general anaesthesia for hysteroscopies [39]. In studies of successfully applied monitored anaesthesia care with local anaesthesia and sedation, this technique in economic terms usually comes out favourably [40].

### ***New methods, equipment and drugs***

As in other areas of anaesthesia, there has not been much new on the market for regional anaesthesia and ambulatory surgery during the last few years. One exception was the launch of ropivacaine and levobupivacaine as less toxic alternatives to bupivacaine. Whereas levobupivacaine is very similar and equipotent to racemic bupivacaine, ropivacaine seems to be slightly less potent in most applications. Ropivacaine seems to have a better separation between motor and sensory block, and has recently been approved for spinal use and continuous post-operative infusion. There is still debate ongoing whether the increased cost of these new drugs is justified by their possible clinical benefits [41].

An interesting area of refined use of equipment and drugs are the reports of prolonged infusion of local anaesthesia into wounds for some days after ambulatory surgery, reported by Rawal's group [15] and others.

The use of functional magnetic resonance investigation (MRI) of local anaesthetic drug distribution, may provide an important insight into the potential effects of different techniques, as demonstrated by Klaastad *et al.* with brachial plexus techniques [42].

### ***Epidural anaesthesia for ambulatory surgery***

There are few recent reports in the literature on epidural anaesthesia for ambulatory care. Epidural anaesthesia is usually regarded as more time consuming compared with other techniques. Recovery advantages were identified in a study of Mulroy and co-workers, who showed a faster discharge after epidural blocks with either lidocaine or 2-chloroprocaine when compared with spinal lidocaine or low-dose bupivacaine [43]. However, in another study of 256 haemorrhoidectomy patients, either 20 ml lidocaine 1% or bupivacaine 0.5% epidurally was used, but observation time in hospital was a minimum of 5 hours and 2% of the patients were admitted due to urinary retention [44]. In a study of lower body surgery, epidural administration of 16 ml lidocaine 1.6% was used, but all

the patients were observed for 6 hours in the hospital [45]. Although epidural needles were large and some outpatients used NSAIDs or had a history of bruising, epidural steroid injections caused no haematoma in a mixed population of 1,035 patients [46]. A recent case report has been published on a 35 year old woman with no risk factors, apart from per-operative ketorolac administration, who developed an epidural haematoma after discharge following an ambulatory arthroscopy under epidural anaesthesia [47].

### **Paravertebral Anaesthesia**

Paravertebral anaesthesia is a unilateral alternative with prolonged post-operative pain relief. It has been used successfully for ambulatory breast surgery [48] and inguinal hernia repair [49,50]. In a study using paravertebral ropivacaine for hernia repair, the average time for block administration was 12 min and analgesia was provided for 15 hrs, which was significantly better than with ropivacaine local infiltration block [50]. In a series of 30 patients there were 2 cases of block failure and 2 cases of prolonged recovery due to epidural effects [49].

### **Spinal anaesthesia**

Some of the controversies and updates of spinal anaesthesia for ambulatory patients have been reviewed by Salinas and Liu [51]. The occurrence of transient neurologic symptoms (TNS) has been especially associated with ambulatory surgery, the lithotomy position or manipulation of the hip joint during knee arthroscopy, and with lidocaine [51]. TNS is a benign and self-limiting condition, but in a study by Tong *et al.* the patients with TNS had more pain during the first 72 hrs after surgery and reduced daytime function for 24 hrs, compared with the patients without TNS [52]. Variation of the lidocaine concentration or hyperbaricity seem to have little influence on the incidence [52], although there seems to be a lower incidence when the lidocaine dose is reduced [51]. In a study of 36 patients with 25 mg lidocaine spinally, no TNS was observed [53]. However, in order for lidocaine doses of less than 40 mg to be effective, an opioid adjunct is usually needed [51]. In the study by Buckenmaier *et al.*, 20 microg fentanyl was added to 25 mg lidocaine for anorectal procedures [53], whereas Lennox *et al.*, added sufentanyl 10 microg to only 10 mg lidocaine for gynaecological laparoscopy [54]. In the latter study it appears that anaesthesia was on the lower threshold for acceptance, as 30% of the patients reported intra-operative discomfort. However, motor recovery and discharge readiness was even faster than in a comparator group with desflurane anaesthesia [54]. A mixture of lidocaine 20 mg with fentanyl 20 microg was sufficient for knee arthroscopy in the study of Ben-David *et al.* [55]. Another approach for reducing TNS is to use ropivacaine or bupivacaine. In studies of identical doses of these two drugs, either 12.5 mg [56] or 15 mg [57], there was no TNS. A conclusion in favour of ropivacaine was made, as motor block was less prominent and recovery faster compared with bupivacaine. This may be due to non-equipotency in dosing, as bupivacaine probably should be dosed lower than ropivacaine for equal effect [58]. Future studies need to clarify whether there still is a clinical issue of less motor block and shorter recovery with ropivacaine in minimal effective dose.

Other drugs that have been used successfully for brief ambulatory spinal anaesthesia are chloroprocaine and 5% procaine; these drugs have little risk of TNS.

Bupivacaine for ambulatory spinal anaesthesia is usually combined with an opioid in order to reduce the dose and duration of motor block. Still, with a combination of bupivacaine 15 mg + fentanyl 10 microg 50-75% of the patients had impairment in walking and standing for more than 90 minutes. This was in spite of a low incidence of motor block – less than 25% of the patients had measurable per-operative weakness in the leg musculature [59]. Urinary retention delayed average discharge by ½ hour when spinal levobupivacaine 10 mg or ropivacaine 15 mg were compared with lidocaine 60 mg [58]. In a study of hernia repair, Gupta *et al.* used fentanyl 25 microg together with either bupivacaine 6 mg or 7.5 mg. The 6 mg dose resulted in a need for IV supplemental analgesia in some cases, and average discharge time was in the 5-6 hrs range in both groups. 17% of the patients needed catheterization and 5% were admitted overnight for this reason [60]. In a study of bupivacaine 10 mg spinally for hysteroscopy, recovery and discharge were significantly longer than with remifentanyl + propofol anaesthesia [39].

Whether patients undergoing ambulatory surgery with spinal anaesthesia can be discharged before voiding is an issue of debate. Mulroy *et al.* claims that otherwise healthy patients of less than 70 years of age, with no history of voiding problems and not undergoing surgery in the perianal or perineal region or hernia repair, may be discharged safely 2 hrs after bupivacaine 6 mg spinally, even if they have not voided [43].

An approach to further reduce the dose of bupivacaine is to use hyperbaric bupivacaine and the lateral decubitus position for 10-15 minutes in order to achieve a unilateral spinal block. This was used successfully by Korhonen *et al.* who compared 4 mg bupivacaine with a mixture of 3 mg bupivacaine + 10 mg fentanyl for knee arthroscopy. The latter group had a higher rate of fast tracking and a shorter recovery unit stay, but discharge readiness was similar in both groups with a mean value of 3 hrs [61]. A major problem, with an opioid adjunct to spinal anaesthesia is a high frequency of pruritus, with an incidence of 25-75% [51,61]. With a combination of IV droperidol 0.625 mg and nalbuphine 4 mg, Ben-David *et al.* were able to reduce significantly the incidence of both pruritus and nausea, without provoking any more pain [55].

### ***Use of peripheral blocks for ambulatory surgery***

Peripheral blocks have the major advantage of not resulting in general haemodynamic changes to the same degree as a centro-axial block. They may be applied with long-acting drugs, as a full recovery from the block is usually not necessary or sometimes not even beneficial before patient discharge.

### ***Lower extremity surgery***

For lower extremity surgery there are several choices of regional techniques. In a study of

1,200 knee surgery patients, the combination of femoral and sciatic block resulted in less pain and less hospital admissions than general anaesthesia without block [62]. Although simple and efficacious when successful and widely used, the ankle block technique may be somewhat unreliable. Combined with a saphenous or femoral nerve block, posterior popliteal sciatic nerve block seems like a more reliable alternative. Several authors advocate the use of sciatic nerve block using different approaches. Provenzano *et al.* investigated the popliteal fossa nerve block supplemented by a saphenous nerve block in 834 patients who underwent foot and/or ankle surgery [63]. In 80% of the cases, this technique was successful even when performed by anaesthetists with little training. There were no incidents of post-operative neuralgia or neuropraxia. Using a different technique, Pandin *et al.* report a remarkable no failure rate in a sciatic nerve block in the supine position [64]. Using landmarks somewhat higher up than the popliteal fossa and a nerve stimulator, these investigators were able to block the tibial and superficial peroneal nerves in 100%, while the deep peroneal nerve and the postero-femoral cutaneous nerves were blocked in 97% and 83% of the patients, respectively [64]. The use of long acting local anaesthetics is advocated and it seems safe to discharge the patients before the block has run out, with appropriate instructions [65,66].

The use of regional foot blocks as an adjunct to general anaesthesia, is thought to prolong the period of post-operative pain relief and thus be beneficial for patients undergoing day case surgery. In one study by Clough *et al.* on outpatient bony foot surgery, however, the supplement of a foot block did not alter the consumption of post-operative analgesic tablets or the overall patient satisfaction [67]. The authors concluded that although the foot block prolonged the time to the first perceived post-operative pain it was not detrimental when used as an analgesic in the outpatient setting.

### **Upper limb surgery**

For surgery below the elbow the axillary plexus technique is the most popular approach. Trans-arterial approaches are simple to perform. Using a peripheral nerve stimulator, the humeral approach seems as reliable as the axillary approach [68]. Both techniques involve stimulation and injections in three to four sites. The lateral infraclavicular plexus block is simpler, with only one stimulation and injection necessary to provide a good blockade of all the nerves (i.e. ulnar, radial, median and musculocutaneous nerves), as shown by Deleuze *et al.* [69]. Whether the co-administration of adjuvants such as an opioid, and  $\alpha_2$ -agonist or ketamine is beneficial is still unclear. The addition of 0.3 mg of buprenorphine to the local anaesthetic tripled the post-operative analgesia period in a study with axillary blocks [70]. Further studies are needed in order to elucidate this controversial topic. The question of dosage and volume is another interesting area of investigation. Does the same dosage diluted to a higher volume increase success rate, area of blockage or duration of block? Krenn *et al.* compared axillary blocks with 150 mg of ropivacaine diluted to 30, 40 or 60 ml volume and found that an increased volume to 60 ml reduced the time to onset of motor, but not sensory block [71]. No differences

were found in the duration of the blocks. Although they concluded that the sensory block was the most important for successful surgery, the faster onset of motor block may be of benefit in order to determine whether the block is effective or not.

Another rapidly emerging area of interest is the use of ultrasound guided blocks. Ultrasound in the practiced hand enables an imaging of peripheral nerves and vessels and the possibility of guiding the block needle with real time imaging, thus reducing the risk of nerve damage. The ultrasound technique has been used successfully in infraclavicular blocks [72] and has also been shown to improve the quality of obstetric epidural anaesthesia [73].

#### ***Ilio-inguinal field block for inguinal hernia repair***

Aasboe *et al.* has compared pre-operative inguinal field block and peri-operative sedation with general anaesthesia + wound infiltration for inguinal hernia repair [74]. They found that patients anaesthetised with an inguinal field block had a shorter recovery time, less pain, better mobilisation and higher satisfaction than the patients who received general anaesthesia and wound infiltration. These differences lasted for the entire one-week observation period. Even though there are reports of transient femoral nerve palsy following this technique [75] the use of an inguinal field block seems highly recommendable for inguinal hernia repair in day case surgery.

#### ***Early discharge with long-acting peripheral nerve blockade: is it safe?***

Whether one should discharge patients before a peripheral block has run out is controversial. Concerns about possible nerve damage and the risk of accidental harm to an anaesthetised limb remain arguments against early discharge. In a prospective study involving 2,382 peripheral nerve blocks of both the upper and lower extremities with an early discharge, the incidence of complications was very low and most patients (98%) were highly satisfied with the choice of anaesthesia [76]. Only 6 patients (0.25%) had persistent paraesthesia after 7 days that might have been associated with the nerve block. The authors concluded that even longer acting local anaesthetics would be beneficial in order to reduce the frequent incidence of persistent pain at 7 days [76].

#### ***Local anaesthesia***

Local anaesthesia is often unsuited for major surgery, either due to insufficient ability to block all relevant pain structures or to the high dose needed and toxicity with extensive infiltration. This may be different with intermediate and minor surgical procedures presenting for ambulatory care. Local anaesthesia is simple and cheap and provides excellent post-operative pain relief [24]. A study of local anaesthesia for inguinal hernia repair came out favourably when compared with general or spinal anaesthesia [77] and this has also been supported in a recent editorial and a large patient survey from Denmark [78]. Local anaesthesia has the potential for increased utilization as many surgical procedures get less invasive as a result of new technology and skills. Examples of this development

are the reports of local anaesthesia during vaginal taping for stress incontinence [79] and sentinel node biopsies for breast cancer [80]. Infiltration of local anaesthesia in the wound combined with general anaesthesia is also beneficial. Pavlin *et al.* reported a 32% reduction in post-operative opioid consumption when this approach was used [31].

### **Conclusions, loco-regional anaesthesia for ambulatory surgery**

In general, loco-regional techniques are well suited for ambulatory surgery. Fast tracking with local anaesthesia and IV sedation seems to be an increasingly popular alternative to general anaesthesia and seems to reduce post-operative pain and the risk of cognitive dysfunction. Early discharge with long acting peripheral blocks seems safe and recent data advocate discharge of spinal anaesthesia patients before voiding, provided some important restrictions are followed. Whereas epidural anaesthesia seems to have a very limited role in present ambulatory practice, there seems to be an ongoing role for refined spinal anaesthetic techniques. Avoidance of TNS by restrictions on lidocaine use and the alternative use of low dose bupivacaine, levo-bupivacaine or ropivacaine are well documented, especially in combinations with spinal opioids. Procaine or chlorprocaine may also be used.

## **General anaesthesia**

General anaesthesia with modern agents has a record of very good safety, rapid onset, rapid offset, rapid emergence and ease of administration. When choosing a general anaesthetic technique, there will be aspects that are dependant upon whether inhalational, intravenous or a combination of these techniques is chosen [81].

### **Inhalational anaesthesia**

Even though the pungency of sevoflurane is low and the action rapid, inhalational induction does not seem to be very popular in adults and has also declined in children due to the ease of IV-line establishment using the “eutectic mixture of local anaesthetics (EMLA)” cream and an incidence of emergence agitation after sevoflurane [82]. However, there are centres who routinely use sevoflurane for induction of all ambulatory patients, and the inhalational technique should always be a part of the armamentarium. It is preferred for adults with needle phobia and children with difficult veins or poor co-operation. Sevoflurane is the best potent agent for inhalational induction. There will be less airway irritation and a more rapid sequence when compared with desflurane or isoflurane.

The main area for inhalational anaesthesia will be during maintenance after an intravenous induction. They are easy to administer and easy to monitor as it is possible to have online breath-to-breath monitoring of end-tidal concentration which will be in fairly good equilibration with the brain effect site during maintenance. The risk of overdose is reduced as there will be no accumulation beyond the concentration set on the vaporizer.

When using re-breathing and low flow systems the drug costs will generally be lower than with total intravenous (TIVA) techniques. The investment costs of the equipment (i.e. vaporizer, scavenger, room ventilation etc.) will be higher than with TIVA techniques, although most operating rooms are routinely equipped for inhalation anaesthesia. The inhalation equipment is more bulky for transportation into rooms or areas not dedicated for inhalational anaesthesia, such as a diagnostic room or an office-based unit. Inhalational agents provide better patient maintained respiration and more rapid immediate emergence when compared to propofol [14]. This difference in emergence is only evident during the first 5-15 minutes after procedures of short or intermediate duration [83]. For procedures lasting more than 2-3 hours there seems to be a benefit with desflurane [84] in terms of faster emergence and better respiration when compared with sevoflurane. There is an increased incidence of shivering [85] and PONV after potent inhalational agents, the latter especially with isoflurane or desflurane [86], when compared with propofol [87].

### ***Nitrous oxide***

Although controversial due to possible toxic effects, pollution and nausea, nitrous oxide continues to be popular as an adjunct to either TIVA or potent inhalational anaesthetics. This is due to rapid offset even with prolonged administration, an almost absence of respiratory depression and a combined analgesic+hypnotic action, reducing the need for other anaesthetics [88]. The role of nitrous oxide as a cause of PONV has been controversial and debated. In a meta-analysis the conclusion was that nitrous oxide may contribute to PONV when the baseline risk is high, but otherwise not [20]. One problem with nitrous oxide is the evolving regulations on the allowed levels in the OR air to minimise risk to the personnel working there. As with other inhalational anaesthetics, cumbersome and expensive equipment is needed for safe administration and scavenging adding to investment costs. These should be balanced against the fairly low usage costs.

### ***Intravenous anaesthesia***

Any routine IV induction agent may be used such as barbiturate, etomidate, propofol and, in the rare cases of severe hypovolaemia, even ketamine together with a benzodiazepine. Propofol is considered by many to be the cornerstone in modern ambulatory general anaesthesia due to a rapid and clear headed recovery, most often in a pleasant mood, combined with some protection against nausea and vomiting. In order to dose more precisely in a simplified way, the commercial target control infusion (TCI) system Diprifusor ® has become popular in Europe. Instead of using the usual mg/kg way of dosing, the Diprifusor ® will control the pump rate to deliver a chosen plasma concentration to the patient and adjust infusion to maintain a stable concentration in spite of ongoing distribution out of the blood plus elimination. However, the benefit of this system has been disputed. The algorithm is not very accurate [89], the necessary pre-filled syringe system is expensive and it has recently been shown that a good clinician may achieve better total economy by manual infusion schemes using generic propofol [90]. In most operating rooms, the cost of intravenous drug equipment is in addition

to the already present inhalation equipment. However, the new pumps presently being launched allow for the use of generic propofol and also for adjustments and replacement of the computer algorithm. A further promising development with the new generation of pumps is to target the propofol computer pump for site of effect concentration instead of plasma concentration [91], allowing for more accurate and fast titration to the desired level of effect.

### ***Opioids***

Opioids are needed as a part of general anaesthesia together with propofol, and many will also prefer to use some opioid together with inhalational agents in order to reduce the consumption of gas and to provide analgesia after emergence. The difference between the modern opioids seems to be solely in pharmacokinetic characteristics as their side effect profile at equianalgesic effect level seems to be almost identical. In terms of onset, sufentanil and fentanyl are slower than alfentanil and remifentanil. In terms of duration of effect, the context sensitive elimination half-time should be considered and also the dosing level. If post-operative analgesia is the goal, dosing should focus on administration soon before the end of the procedure. Care should be taken especially not to use high doses of fentanyl, as this may slow down recovery and increase the incidence of PONV. On the other hand, small doses (i.e. 0.5-1.0 microg/kg) of fentanyl are quite short lasting (20-30 min) and excellent for controlling intermediate post-operative pain.

The latest addition to the opioid armamentarium, remifentanil, is very well suited for ambulatory care due to its rapid onset, similar to alfentanil, and an unrivalled rapid clearance within minutes, even after large doses or prolonged administration. Questions have been raised as to whether these potent opioids may induce acute tolerance and an increased post-operative need for analgesics after a few hours of infusion or repeated administration [92,93,94].

### ***Neuromuscular block, intubation***

The use of neuromuscular blocking agents has definitely declined in modern ambulatory surgery. Almost all cases of ambulatory surgery have an empty stomach and the surgery case mix consists mainly of procedures without the need for profound muscle relaxation. Decreased use of endotracheal intubation has also occurred because of the increased popularity of the laryngeal mask airway (LMA) [95]. It has been shown that the LMA is less traumatic during introduction and reduces post-operative sore throat compared with endotracheal intubation [95]. The LMA will not protect against gastric fluid regurgitation or aspiration into the airways, but using a model with built in gastric tube facilities the stomach may be safely drained, for instance during laparoscopic procedures. Still, there are cases where a 100% assurance of non-moving is needed (e.g. eye-surgery, ear surgery, micro-surgery) and cases where many anaesthetists will prefer to have an endotracheal tube in place for safety reasons (e.g. tonsillectomy, extensive laparoscopy). With modern potent short acting drugs (i.e. propofol and alfentanil or remifentanil) and



the use of local anaesthetic spray, endotracheal intubation may be accomplished without neuromuscular blockade.

A bolus dose of 2-3 microg/kg remifentanyl given slowly over 2-3 minutes during or after induction of sleep with propofol will ensure sufficiently profound analgesia and relaxation of the vocal cords to allow for endotracheal intubation. However, most anaesthetists will prefer to use a non-depolarizing neuromuscular blocker for intubation, and also when the surgeon prefers to have relaxation present during their dissection. A single dose of cis-atracurium (0.08 mg/kg) or rocuronium (0.6 mg/kg) will usually do, both for intubation and surgery. If the TOF shows at least 90% recovery by the end of the procedure, there is no need for neostigmine reversal. As neostigmine is associated with a dose related increased risk of PONV, non-reversal may be of benefit. If the TOF is less than 90%, a dose of up to 2.5 mg neostigmine with glycopyrrulate should be used. Suxamethonium is still the optimal relaxant in terms of rapid onset and short duration, but the side effects of muscle pain and occasional anaphylaxis may be a problem. Mivacurium is a non-depolarizing alternative with spontaneous degradation within 20-30 minutes, but like suxamethonium, rare deficits of genetic degradation failure may be seen.

## Monitoring Needed

Basic monitoring is appropriate for the routine case, including continuous ECG, pulse oximetry, non-invasive blood pressure readings, and basic respiratory monitoring with capnography, oxygen tension and inhalational agent concentration if these are in use. As the routine patient is young or middle-aged with adequate cardiovascular function and there is only a very small risk of sudden, major bleeding; an arterial line is rarely used in ambulatory surgery. However, it may be useful for checking blood gas values during pneumoperitoneum and also for controlling the rapid shifts in blood pressure which may occur during induction and positioning of patients for major procedures. Usually one good venous line will do during induction of anaesthesia. When total intravenous anaesthesia is used, supplementation with a second IV line is recommended – one for the infusion of drugs with an ongoing Ringers acetate solution running and the other with a slowly running colloid or crystalloid solution with the option of rapid rate increase for controlling the haemodynamics. It is very important to have visibility of the drug infusion line and also to have one-way valves and active obstruction alarms on drug pumps so as to ensure that intravenous drugs are delivered to the patient's circulation. As a typical ambulatory procedure will rarely last more than 2-3 hours, no major fluid shifts are involved and with rapid recovery, no urinary catheter is needed in the routine case. A central venous line is very rarely used, for similar reasons. These patients will drink and ambulate within a few hours.

The bispectral index (BIS) is the best documented mode of monitoring anaesthetic depth, and will be a useful, although not obligatory, adjunct. BIS is useful both for avoiding awareness if neuromuscular blockers are used [97], and for titration of the anaesthetic depth for a rapid emergence [98]. Overdosing of an anaesthetic drug is less prone to happen when this device is used. The cost of electrodes for BIS is quite significant and there may be an option for less expensive alternatives to BIS in the future, although they still need to be better documented.

When neuromuscular blocking agents are used, monitoring of function is recommended for instance by the TOF ratio.

As with all anaesthetic cases, there may be a need for more extensive monitoring of the patients respiratory function or haemodynamics if the patient has any malfunction or serious concomitant disease or if there is a specific high risk surgical procedure being performed.

## **How to make a final choice of technique in the individual case?**

There is no conclusive evidence to highlight any technique as superior in safety, in terms of the close to zero incidence of mortality or permanent disability. The choice must be made on total quality for the patient and cost effectiveness for the unit. Quality for the patient may vary individually, depending upon personal preferences, such as being awake, fear of needles, risk and tolerance of side effects such as post-operative nausea and pain. Cost effectiveness will also vary individually with the surgical unit in question, acquisition costs of drugs, staffing, out of theatre induction or regional block facilities, post-operative recovery facilities and so on. However, the following are some general approaches that reflect the author's personal preferences in his setting:

- 1) For superficial surgery or cases with minor surgical invasiveness local anaesthesia with individually tailored and minimized sedation may be preferred.
- 2) For surgery of some duration, in areas suitable for regional anaesthesia, with an expected medium or high intensity of post-operative pain, a regional nerve block or centro-axial block may be recommended. The same may be valid in patients with a definite preference for regional techniques or in patients with a high risk of nausea or vomiting.
- 3) For other procedures general anaesthesia is usually chosen, mostly due to the decreased time consumed for preparation and the ease of administration. With general anaesthesia care must be taken to ensure optimal prophylaxis against pain and nausea in the post-operative period.

## Future perspectives

In the future we may expect developments in drugs, equipment and organization of anaesthesia for ambulatory surgery. Development of an esterase degraded propofol analogue sleeping agent is probably going to be successful and may further improve the emergence after intravenous anaesthesia. Xenon is a promising, although still very expensive and probably somewhat emetogenic, inhalational agent with rapid on-off effect, minor influence on circulation and respiration and no pollution problems. New, highly efficient and rapidly acting neuromuscular blocking reversal agents are presently being tested in patients. With local anaesthesia we may hope for a break through in the research for safe, slow release formulations which may provide local anaesthetic effect for days after a single injection. This may be an important asset to the field of post-operative pain relief where we are still in need of better drugs and methods. For PONV prophylaxis and treatment, the NK1 antagonists seem to be a new important drug principle adding to those already available for multimodal options.

In terms of monitoring there may be an option for introducing more sophisticated non-invasive monitoring of cardiovascular and respiratory function. We are already into an area of numerous ongoing attempts to copy and improve the BIS concept for anaesthetic, or more precisely, sleep depth monitoring. An important breakthrough here will be if we can get monitors for on-line monitoring of surgical stress so as to better individualize the dosing of analgesic drugs during general anaesthesia [98]. Surely, we will see further development in less expensive and less bulky equipment as well as wireless technology which will provide a better working environment in the OR and also facilitate the mounting of monitoring in the pre-operative holding area and a very smooth transition of the patient with full monitoring to the PACU after the procedure.

Internet technology will spread further, with better options of always having full access to every patient's health record and to provide better exchange of information between the healthcare providers and the patient, both before and after the procedure. In the organizational area we already have the development of more office-based surgery and anaesthesia. This will probably proceed as drugs and equipment improve, although we will always have to keep a close eye on the appropriate standard of care being used when we move out of the hospital where all backup facilities are readily at hand.

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Anil Gupta, MD, FRCA, PhD

## Introduction

Pain is a common symptom and a natural consequence of all trauma, both surgical or non-surgical. It is a protective mechanism for the prevention of further body injury in conscious persons, and self-limiting when acute. Pain is a multi-factorial experience, not just a sensation. Emotion, perception and past experience all affect an individual's response to noxious stimuli. Improved post-operative pain control through innovation and creativity may improve compliance, ease of delivery, reduce length of hospital stay and improve patient satisfaction [1]. The intensity of perceived pain varies tremendously between individuals and is related to the type of surgery and the intensity of the consequent trauma, previous exposure and experience of pain, the sex and age of the individual as well as the degree to which the individual is psycho-socially prepared prior to the procedure. Thus, inguinal herniorrhaphy in a young woman who has never previously been exposed to a painful stimulus is more likely to be severe than in an old man who has previously undergone many operations. Pre-operative preparation through information and reassurance usually leads to a greater acceptance or reduced perception of pain, and thereby leads to a greater satisfaction with surgery. Patient satisfaction is a true outcome measure. Unfortunately, methods used to alleviate peri-operative pain in the ambulatory setting have focused mainly on pharmacological pain management and surrogate outcome measures. The latter is particularly problematic in view of the fact that surrogate measures such as decreased visual analogue pain scores may not reflect improved patient satisfaction because of other reasons. Patients may be dissatisfied with a procedure not because pain relief was poor, but because they had severe post-operative nausea and vomiting (PONV). With the better treatment modalities for pain management in ambulatory surgery, other factors, such as PONV, are becoming increasingly important for the patient. Good analgesia has been said to be one of the four A's (alertness, ambulation, analgesia and alimentation) [2] for successful ambulatory surgery.

True patient outcomes such as patient satisfaction have, in the past, addressed the early post-operative period prior to home discharge. This period is within the hospital or surgical facility with access to trained healthcare professionals and most patients would probably feel safe and comfortable. Consequently, the post-discharge period is of greater importance for the patient, and even the caregiver. Unfortunately, this has been poorly assessed and outcome studies have focussed excessively on the pre-discharge period [3]. Pain following home discharge after ambulatory surgery remains poorly studied. In this respect, the studies by Rawal *et al.* [4] and McGrath *et al.* [5] as well as a systematic

review by *Wu et al.* [6] have been pioneering in bringing the anaesthetist to the home. Future studies on pain management should focus on this phase after facility discharge and until complete recovery and return to work.

The healthcare funder (insurance companies, sickness allowance, employer programmes, etc) has increasingly come into focus since the cost of healthcare has multiplied enormously over the last decade. Early return to work after surgery has been stressed by healthcare systems in Europe who have to pay for sickness absenteeism, while insurance companies (commercial or governmental) in the USA pay compensation for healthcare costs but not work absenteeism. For hernia repair, pain seems to be the most important cause of prolonged convalescence [7,8]. Most specialised care institutions recommend immediate return to daily activity to optimize recovery, but the duration of convalescence after hernia repair varies considerably among systems. All these aspects play a significant part in optimal patient care and management, specifically with respect to pain management at home.

## Importance of Pain Control

Adequate and immediate pain control is important in order to avoid both short and long term complications in the post-operative period. Poor pain control results not only in physical distress but also delays in mobilization which in turn can result in delayed recovery, post-operative complications and work absenteeism. Pavlin *et al.* reported that pain was the primary or secondary reason for limiting activity in 54% of patients, that average pain scores correlated inversely with activity and that the least pain score correlated best with patient satisfaction [9]. The adverse physiological effects of poorly controlled peri-operative pain include: respiratory effects (decrease in vital capacity leading to difficulty in coughing forcefully, hypoxia, retention of secretions and atelectasis), cardiovascular effects (tachycardia, increased myocardial oxygen consumption, myocardial ischaemia, as well as deep vein thrombosis due to inactivation from fear of pain), gastrointestinal (nausea, vomiting, delayed gastric emptying), urinary (difficulty in urination leading to prolonged hospital stay) and metabolic effects (increased metabolic and oxygen consumption and an increased stress response) [10]. In addition, psychological effects in the form of fear and anxiety leading to anger, resentment and insomnia can further delay recovery. Furthermore, the intensity of post-operative pain may be important in predicting the development of chronic pain states following limb amputation, breast surgery and inguinal hernia repair [11,12]. Adequate and prompt treatment of pain would avoid the adverse effects of poorly controlled pain and lead to improved recovery and outcome in the ambulatory surgical patient.

In children, the impact of poor pain management cannot be over emphasized. Although the effects may be transient in many children, prolonged and persistent changes in behaviour

have been found, particularly in the younger child (< 3 yrs), those with moderate-severe pain at home and those with a previous difficult experience of healthcare [13]. Post-operative pain also appears to be a clear predictor of PONV in children [14].

## Pain Mechanisms and Pain Measurement

The International Association for the Study of Pain defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”. Somatosensation refers to the physiological process by which sensory neurons are activated by physical stimuli resulting in the perception of touch, pressure, pain, etc. In contrast, nociception refers to the physiological process of activation of specialized neural pathways, specifically by tissue damaging or potentially tissue damaging stimuli [15]. Pain is a conscious experience. It can result not only from afferent neural pathways but also from alterations in somatosensory processing as well as a combination of psychosocial factors. Surgery produces local tissue damage with subsequent release of algescic substances including prostaglandins, histamine, serotonin, bradykinin, 5-hydroxytryptamine and substance P, as well as the generation of noxious stimuli that are transduced by nociceptors and carried by afferent nerves to the spinal cord.

Cutaneous stimuli result in activation of primary afferent fibres including the A fibres that carry the sensation of touch, pressure or hair movement, unmyelinated C-fibres that respond by a prolonged burning sensation, or thinly myelinated A fibres, which evoke a sharp, intense, pricking sensation. These latter nociceptive fibres respond to intense heat, cold, mechanical and chemical stimuli. The fast-conducting A fibres carry the initial sensation of pain while the C-fibres are believed to conduct the second sensation of pain. Somatosensory signals are then transmitted to the dorsal horn of the spinal cord or to the dorsal column nuclei, which can be activated by both nociceptive and non-nociceptive fibres. It is the dorsal horn of the spinal cord that primarily processes inputs of the nociceptive primary afferent fibres. The dorsal horn is anatomically organized in the form of laminae I-VI, which differentially receive input from the nociceptive and non-nociceptive nerve fibres. Second order neurons are grouped into the wide dynamic range neurons (WDN) which are activated by both innocuous and noxious stimuli and receive inputs from skin, muscle and visceral organs and are believed to account for the referred pain from the viscera, and the nociceptive specific neurons (NSN). The latter respond only to noxious stimuli under physiological conditions. The axons of the WDN and NSN crossover and gather in a bundle of ascending fibres in the contralateral anterolateral spinal region and ascend towards targets in the brainstem and diencephalon. The combined effect of spinal excitatory and inhibitory systems determines which messages are delivered to the higher levels of the central nervous system. For a more comprehensive discussion on the mechanisms of pain, the reader is referred to textbooks on pain.

The methods for assessment of pain vary depending on the age of the patient. In neonates and infants, multidimensional scales using composite measures of behavioural and physiological responses can be used. These include the premature infant pain profile (PIPP) [16] or the neonatal infant pain scale (NIPS) [17]. In older children (> 3 yr), the Wong-Baker faces pain rating scale has been recommended [18], while children > 6 yr usually can self report on the pain intensity using the visual analogue pain scale (VAS). The latter scale is also used in adults in addition to the numeric rating scale (NRS). NRS is easier to use in the early post-operative period or when assessing pain in patients following home discharge.

## Severity of Pain following Day Surgery

The incidence of moderate to severe pain varies between 15 – 70% following ambulatory surgery. In a survey of 250 adults undergoing ambulatory surgery in the USA, > 70% had moderate to severe post-operative pain [19]. McGrath *et al.* found that 30% of patients (1,495/5,703) had moderate to severe pain at 24 h after ambulatory surgery [5] while McHugh reported that 17% of patients had severe pain despite modern anaesthesia and surgery [20]. Pain intensity clearly varies by procedure. Procedures causing most pain included micro-discectomy, laparoscopic cholecystectomy, shoulder surgery, elbow/hand surgery, ankle surgery, inguinal hernia repair and knee surgery [5]. Other studies have shown that pain following laparoscopic cholecystectomy was only mild in intensity [21] and inguinal hernia repair under spinal anaesthesia with fentanyl and bupivacaine was associated with only mild-moderate post-operative pain up to 1 week after the procedure [22]. Beaugeraard *et al.* found that the best predictor of severe pain at home was inadequate pain control during the first few hours following surgery and this may be an important factor in the aggressive management of early post-operative pain [23]. Despite the high frequency of post-operative pain, patient satisfaction remains overwhelmingly high. This could be due to multiple factors including acceptance that pain is an inevitable outcome of surgery and the reluctance of patients to report pain as a negative outcome of surgery, as well as absence of recall. One questionnaire study showed that almost 46% patients were prepared to suffer pain rather than complain [24], suggesting that public information and education on pain relief is important in order to achieve success in pain management. However, if patients expect full pain relief, disappointment may be great if analgesia is incomplete, thus stressing the importance of good pre-operative information in achieving better patient outcome.

## Strategies for Pain Management in Day Surgery

Good pain relief involves the use of methods that are minimally invasive and associated with minimal side effects, are rapidly effective in the vast majority of patients and can be applied universally without access to advanced medical technology. They should allow for individual variations between patients and facilitate early recovery and mobilization.

The simplest methods involve the use of oral analgesics in pre-packaged combinations. Although these are associated with a high patient compliance, there are several drawbacks: many patients do not use tablets regularly, there is a large variability in absorption of the drug, the onset of action is slow and the efficacy of this method is extremely variable. Alternative techniques involve the use of peripheral nerve blocks, local infiltration of anaesthetics and other drugs, intra-nasal, transmucosal and transdermal analgesics and sometimes trans-electrical nerve stimulation. It is important to add that pain is multifactorial and, therefore, a multimodal approach to its management is essential. No single technique can achieve the same result as a combination of methods individualized to the patients' requirements. In order to understand the effectiveness of management, it is essential to assess, reassess and document pain intensity using standard methods [2]. This has been done at our institution for > 10 years with good results [25]. Self-assessment of pain by the patient helps to individualize pain management. Standardised, procedure specific methods should be used which have documented effects. Strategies used for the reduction in pain as well as some of the methods used by us are described in greater detail below.

### **1. Patient Information**

Pain is an inevitable outcome of a surgical procedure. However, a well informed patient is usually well prepared for the pain that follows. It has been shown that patient education and pre-operative preparation can reduce post-operative pain [26]. These authors also found that more effective pain control was achieved when patients were medicated upon onset of sensation rather than onset of pain. A meta-analysis of 191 studies on surgical patients found that psycho-educational care has a beneficial effect on recovery, post-operative pain and psychological distress after surgery [27]. Psycho-educational care included such factors as healthcare information, teaching of skills and psychological support. Pain intensity varies considerably following different types of operation and a considerable inter-individual variation exists for the same operative procedure. Knowledge that pain differs following different procedures is important in order to prepare the patient for the post-operative period. This can be done using procedure specific brochures during the pre-operative assessment or using videos where the patient can be given information about operative procedures and pain management. An anaesthetist or nurse based patient information system is also an option, but expensive. We are currently using the Internet as an information system for our patients and have a library of procedures with video clips, which can be accessed from home for procedure related patient information. This information is short but intensive and covers most aspects of the operation and the peri-operative period. The library is presently stocked with approximately 20 procedure specific videos and is constantly being updated with newer operative procedures, both diagnostic and therapeutic. This is an important way to make available all the necessary information for the patient without them having to leave their own home. It also has the advantage that it is available 24 h a day, is cheap and is readily available. The experience has so far been only positive. It is estimated that > 60% of Swedish homes have access

to the Internet today and this is likely to rise further. Those patients not having access to the Internet at home can access these videos during their hospital visit via the intranet. We have not assessed whether this leads to a reduction in pain intensity post-operatively.

### **2. Preventive or pre-emptive pain management**

Although pain is a subjective feeling, its intensity can be predicted pre-operatively depending on the type of procedure, the age and the sex of the patient and the preventive and pre-emptive measures used to reduce pain. Preventive analgesia incorporates not only pain management prior to its onset (prior to incision) but even intra- and post-operative intervention to relieve it. This is different from pre-emptive analgesia where pre- and per-operative methods are used to reduce post-operative pain intensity [28]. Pre-emptive methods have been studied extensively in the literature with opposing results. Although attractive in theory, one meta-analysis of the literature suggested minimal clinical benefit of pre-emptive analgesia with paracetamol, local anaesthetics or morphine [29]. A recent meta-analysis including both inpatients and outpatients found that pre-emptive local anaesthetic wound infiltration and non-steroidal anti-inflammatory drug (NSAID) administration reduced analgesic consumption and increased time to first rescue analgesic request, but not post-operative pain scores [30]. Unfortunately, many studies on pre-emptive analgesia are either poorly designed or poorly performed with an inadequate number of patients. A large prospective study specifically aimed at studying these principles in the ambulatory setting would be useful.

### **3. Early, aggressive and multimodal pain management**

To achieve maximal benefit quickly, it is imperative that pain management in the post-operative period is both early and aggressive. Waiting until pain becomes moderate to severe before starting therapy usually means a delay in achieving pain relief, or inadequate pain relief. Consequently, post-operative pain management should be started in the operating theatre so that adequate time is given for the drugs to achieve maximal effect. Combinations of paracetamol, NSAID/COX-2 inhibitors, local anaesthetics and opioids are used pre- and intra-operatively and continued post-operatively depending on the expected severity of pain. In this way, maximal benefits with minimal side effects of individual drugs can be achieved. This is the cornerstone of good analgesic therapy [31]. If pain is moderate-severe in the post-operative period, it is important to use drugs with a short onset of effect and preferably intravenously. A good example is fentanyl in doses of 25-50 µg i.v., which gives good pain relief within 3-5 min in contrast to morphine which can take 10-15 min (Table 1). The short duration of action of fentanyl means that alternative strategies need to be in place quickly so that by the time fentanyl's effect is fading away a longer acting drug has been able to achieve satisfactory and prolonged analgesia. However, longer acting analgesics also have longer lasting side effects. In the USA, long acting opioids are very rarely used; instead the practice is to make the transition to oral drugs earlier.

Table 1 Pharmacology of Post-operative Analgesics					
		Dose	Onset of action	Duration of effect	NNT
Peripherally acting analgesics	Paracetamol	1 g X 4	30 – 60 min	4-5 h	3.6 (1 g oral)
	NSAIDs				
	T. Ibuprofen	200 mg x 3	30 – 60 min	6 – 8 h	2.7 (400 mg)
	T. Diclofenac	50 mg x 3	20 – 60 min	3 – 6 h	2.3 (50 mg)
	T. Tramadol	50 mg x 3	60 – 120 min	6 – 12 h	2.4 (150 mg)
	Inj. Ketorolac	20 mg x 3	15 – 30 min	4 – 6 h	3.4 (30 mg i.m.)
COX-2 inhibitors					
	Inj. Valdecoxib i.v.	40 mg x 2	10 – 20 min	6 – 8 h	NA
Opioids					
	Inj. Fentanyl i.v.	0.5 - 1 µg/kg	2 – 3 min	30 – 60 min	NA
	Inj. Morphine i.v.	0.05 mg/kg	5 – 10 min	1 – 2 h	2.9 (10 mg i.m.)
	Inj Pethidine i.v.	0.015 mg/kg	5 – 10 min	30 – 60 min	2.9 (100 mg i.m)
Others					
	Inj. Clonidine i.v.	0.5 - 1 µg/kg	5 – 15 min		NA
	Inj. Ketamine i.v.	5-10 mg	5 – 15 min		NA

Table 1. The dose, onset of action and duration of effect, and the numbers needed to treat (NNT) for different, commonly used drugs in adults are shown. The list is not comprehensive.

NA = not available.

#### 4. Post-discharge pain relief methods

Achieving good pain relief in the post-anaesthesia care unit (PACU) is not enough. Post-discharge pain has been found to be a significant problem in recent studies. In one study, Rawal *et al.* showed that despite good analgesic methods, > 30% patients continue to suffer from moderate-severe pain at home, which leads to disturbed sleep and probably delayed complete recovery [4]. In a meta-analysis of post-discharge symptoms after ambulatory surgery, Wu *et al.* found that the overall incidence of post-discharge pain was 45% (range 6 – 95%) and pain was the commonest symptom of patients at home [6]. Therefore, it is important to incorporate strategies for adequate pain relief at home. The commonest method continues to be the use of tablets (different agents, different doses and different frequency of administration). Practical regimes and routines need to be established in the facility, which are written and preferably operation specific. Proper follow-up of patients is important in order to ensure that these routines are effective. Depending on the type of surgery, the traditional method of using tablets may not be adequate. Several alternatives are available, and some of them have been found to provide better pain relief than traditional methods. The techniques started in the facility which provide good pain relief at home include: patient controlled regional analgesia using



local anaesthetics in tissue planes or intra-abdominally, intra-articular analgesics (opiates, NSAIDs and clonidine), regional blocks with catheters *in situ* (femoral block, axillary block, interscalene blocks etc), intranasal drugs and today, even transdermal techniques using the principle of iontophoresis. Some of these techniques are described in greater detail below.

### **5. Follow up and assessment**

In order to be able to confirm that routines and techniques do work, it is important to use standardised methods to follow up patients at home after 1-7 days. This not only provides a demonstration of quality but also offers reassurance to patients that they have not been forgotten. It is important because some patients are afraid of going home on the same day of surgery because of the fear of unmanageable pain. Follow-up and documentation are very important and should be undertaken routinely by all ambulatory surgery units. Training programmes for professional groups (doctors and nurses) have been shown to be beneficial in changing treatment practice, especially in the use of medicines and dosage forms in children following ambulatory surgery [32]. These authors also found that the great majority of children experienced pain at home following day case ENT operations. They concluded that parents need information on how to manage their child's pain and a training programme for doctors and nurses can improve the treatment of children's pain even at home [33].

The methods used to follow up patients vary tremendously. The commonest system is a post-operative telephone call, but standardized questionnaires are sometimes used. Non-availability of patients at the time of calling is a problem with the former method, although this can be greatly reduced by scheduling the time of the call with the patient. Poor response frequency can be an issue with the latter method. A good possibility for the future is an interactive computer based method where the patients can answer a standardised questionnaire at their convenience. With the widespread availability of computers today in many homes in developed countries, it would be interesting to explore this possibility in the future.

## **Pharmacological Management of Pain**

Most institutions and even patients rely upon the use of pharmacological agents to relieve post-operative pain. A complete list of all drugs available for the management of pain would be too extensive. Table 1 lists the commonest drugs used post-operatively (PACU) and documented in the literature. For a more detailed pharmacology of these drugs, the reader is referred to more extensive texts written on the subject. Broadly, pharmacological agents used for pain relief can be classified into four major groups:

### **1. Peripherally acting analgesics**

The drug most commonly used and described as 'peripherally-acting' is paracetamol

(acetaminophen). Although it is believed by many to act via 'peripheral' mechanisms, central effects of paracetamol have been described. Paracetamol is available both as a tablet and now in an injectable form (Perfalgan®). It is a good analgesic, particularly for the management of mild-moderate pain, but can also be used as a complement to more powerful analgesics such as opioids in multimodal pain management. Administered orally, the onset of action can be slow (up to 60 min) and it is important to take paracetamol 'by the clock' during the early post-discharge period (usually 1-2 days). Used in single doses of 1 g for adults (20-40 mg/kg in children), paracetamol has been found to reduce pain intensity by 50% in about 50% of patients [34]. Higher doses do not offer better pain relief but increase the incidence of side effects and should be avoided. Although the numbers needed to treat (NNT) is relatively high for paracetamol 1 g (NNT 3.6), it offers good analgesia with minimal side effects, specifically in ambulatory surgery patients. Because of its satisfactory safety profile in healthy patients, paracetamol should be prescribed 'by the clock' in order to obtain good global pain relief. It is relatively contraindicated in patients with liver disease (Table 2). When combined with codeine 60 mg, the NNT of paracetamol 600 mg can be reduced to 3.1, which may be reasonably satisfactory for management of mild-moderate post-operative pain.

## **2. Non-steroidal anti-inflammatory drugs (NSAIDs) (including COX-2 inhibitors)**

This group of drugs is particularly useful with mild to moderate post-operative pain, and injectable forms can be used for severe post-operative pain although the onset of action can vary from 15-30 min (Table 1). NSAIDs are clearly beneficial in a dose-dependent manner with a NNT for 50% reduction in pain intensity for naproxen of 2.6 [35]. When used in higher doses, NSAIDs can produce side effects, which are disproportionate to their improved efficacy [36]. The risk for peri-operative bleeding using NSAIDs is low but these drugs should be used with care in high risk patients and during high risk surgery. Used appropriately, NSAIDs provide excellent analgesia and are a good complement to paracetamol as well as opioid analgesics, provided the contraindications for their use are strictly followed (Table 2). In contrast to NSAIDs, the COX-2 inhibitors have a minimal effect on thrombocyte function and the risk for peri-operative bleeding is small. However, recent studies suggest a greater risk of cardiac complications [37, 38], specifically myocardial injury, due to an imbalance in the coagulation cascade and these drugs should not be used long term in the cardiac compromised patient. Single doses of COX-2 inhibitors or when used over a short period of time such as during post-operative pain management (1-2 days) have not been shown to cause any major adverse event in healthy patients. They should continue to form a useful part of the armamentarium for the management of post-operative pain. There is no data about the administration of single doses or one-day administration of COX-2 inhibitors in cardiac compromised patients. One recent study found an increased risk of cardiac events when parecoxib and valdecoxib were given for ten days for the management of post-operative pain in patients undergoing coronary bypass surgery [39]. Evidence from data published recently seems to cast some doubts about the routine long term use of even NSAIDs in cardiac compromised patients [40].

**Table 2** Contraindications and side effects

	Contraindications	Side effects
Paracetamol	Liver disease	Exanthema
NSAIDs	Renal or liver failure, allergy to ASA, bleeding tendency, gastric ulcers, asthma and heart failure (NYHA III-IV)	Peri-operative bleeding, headache, nausea, dizziness
COX-2 inhibitors	Renal or liver failure, allergy to ASA, ischaemic heart disease and heart failure (NYHA II-IV)	Headache, nausea, dizziness
Opioids	COPD	Pruritus, PONV, sedation
$\alpha$ 2 adrenergic agonists	Hypotension	Hypotension, sedation

Table 2. Some common contraindications and side effects of analgesics are shown. NYHA New York Heart Association, COPD Chronic Obstructive Pulmonary Disease, ASA Acetyl Salicylic Acid (aspirin), PONV Post-operative Nausea and Vomiting, NSAID Non-Steroidal Anti-Inflammatory Drug, COX-2 Cyclo-Oxygenase 2.

### 3. Opioids

Opioids have been used for centuries in the management of pain and are probably the commonest drugs used for severe post-operative pain. The choice of opioids is vast but during ambulatory surgery fentanyl used in small doses has the advantage of rapid onset of action (3–5 min) and a modest duration of effect (30 – 45 min) with minimal side effects (Table 1). Fentanyl can be administered in different ways including intranasal, transmucosal and recently even transdermal techniques. The latter have mostly been tested in chronic pain settings or in inpatients. Other opioids such as morphine can also be used but have a slow onset of action (5 – 15 min) and a much longer duration of effect (2 – 4 h), which lasts well into the post-discharge period. Morphine-6-glucuronide, a metabolite of morphine has been shown to have a long duration of action but a better toxicity profile [41]. Some view the long duration of action of morphine as an advantage, but there is a potential risk of opioid related side effects such as PONV, sedation, pruritus and, rarely, respiratory depression occurring at home. Despite these theoretical disadvantages, the use of oxycodone has been shown to result in earlier discharge, lower pain scores and a reduction in the incidence of PONV following ambulatory laparoscopic cholecystectomy [42]. Some caution needs to be taken in prescribing opioids for post-discharge pain relief. Opioids should be used in the management of severe post-operative pain at home if other techniques prove to be inadequate.

### 4. Local anaesthetics for infiltration

Local anaesthetics are highly effective when injected locally into tissue planes during superficial office-based surgery, and even for short periods when used as single injections.

Prolonged pain relief has seldom been achieved using single doses, except during inguinal herniorrhaphy where pain relief up to 7 h has been reported [43,44]. Recent studies have focused on the management of acute post-operative pain using local anaesthetics injected intermittently or continuously via catheters. These catheters have been placed in different sites subcutaneously, intra-articularly, perineurally and intraperitoneally and have provided good pain relief for 4-24 h [21, 45, 46]. The side effects reported have been few and plasma concentration of local anaesthetics has been far below those known to produce toxic effects in patients. The method appears to be promising but more studies are needed in a larger number of patients focusing not only on the efficacy of this method compared to traditional methods but also on such complications as wound infections which may result in serious outcomes for patients.

Many drugs can prolong the action of local anaesthetics and are used today for the post-operative management of pain following ambulatory surgery. These include alpha-2 antagonists (clonidine), NSAIDs (ketorolac) and opioids (morphine). Most studies have found that clonidine and ketorolac prolong the duration of action of local anaesthetics but the effects of morphine have been more equivocal. Fentanyl or clonidine added to spinal local anaesthetics has been shown to provide good and prolonged post-operative pain relief following herniorrhaphy [22, 47]. This could be a pre-emptive effect of the drug rather than a pharmacological effect. More studies are needed in this area since the initial results appear to be very promising.

### **5. Peripheral Nerve Blocks**

The list of nerve blocks that can be used for the management of post-operative pain is long but the commonly used blocks are summarized in Table 3. Peripheral nerve blocks (PNBs) are particularly useful in the sick and elderly patients where general anaesthesia may be considered to be a risk due to co-existing morbidities. The advantage of PNBs are that surgical analgesia can be obtained in a limited field with minimal side effects and prolonged post-operative pain relief, particularly when long-acting local anaesthetics are used, or when combined with adjuvants such as morphine, sufentanil or clonidine. The latter can cause hypotension and sedation, both of which are undesirable in the ambulatory setting [48]. Catheters can also be inserted during application of nerve blocks and intermittent injections of local anaesthetics used to achieve prolonged pain relief. The major disadvantage is the unpredictability of effect and, particularly in inexperienced hands, high failure rates. Success rates can be improved through repetitive training, use of nerve stimulators and recently, ultrasound to detect and target specific nerves [49]. Rarely, nerve damage can occur especially when the technique is poor in the presence of peripheral nerve diseases such as diabetes mellitus, or when superficially placed nerves are blocked such as the ulnar nerve at the elbow. Injection of local anaesthetic near the nerve should be stopped immediately if the patient complains of pain or paraesthesia during injection as these symptoms suggest intra-axonal injection which can lead to nerve damage. Intravascular injection of local anaesthetic can occur if aspiration is not

Upper extremity blocks	Lower extremity blocks	Central Blocks
Brachial plexus (Interscalene, infraclavicular, axillary) block	Femoral nerve block	Epidural/spinal
Intravenous Regional Anaesthesia (IVRA)	Sciatic-femoral-lateral femoral (3-in-1) block	Caudal block
Elbow (Ulnar nerve) block	Inguinal nerve block	Paravertebral block
Wrist block	Ankle block	
Digital nerve block	Digital block	

Table 3. The common nerve blocks of the upper and lower extremity, and the central blocks for post-operative pain management are shown. The use of adjuvants prolongs effective post-operative pain relief (see text for details).

performed prior to injection, and this can lead to local anaesthetic toxicity in the form of cardiovascular depression or convulsions. Infections and local haematoma formation are other extremely rare complications of central or peripheral nerve blocks. The presence of infection at the site of injection or the use of anticoagulants should caution the anaesthetist against the performance of central or peripheral blocks.

### 6. Other techniques

Intra-articular analgesics (local anaesthetics, morphine, NSAIDs, and clonidine) have been injected following diagnostic or minimally invasive procedures of the knee, foot and shoulder with varying degrees of success. Local anaesthetics provide good pain relief of short duration (< 2 h) [50] while morphine can give mild reduction in pain when used in doses of 5 mg for up to 24 h [51,52]. NSAIDs have consistently proved to reduce post-operative pain when injected intra-articularly [53,54] but there has been some concern about the possibility of delayed osteophyte formation. When single doses of NSAIDs are injected intra-articularly, it is unlikely that bone healing will be affected. Clonidine also reduces pain when injected intra-articularly but the results have been equivocal with some bias in favour of clonidine [55]. When morphine is injected intra-articularly, there has been an issue of whether the effect seen is a peripheral analgesic effect or via systemic absorption [51]. This controversy is likely to persist for some time in the future.

Intravenous regional anaesthesia (IVRA) is used commonly for operations of the upper extremity when the expected duration of surgery does not exceed 1 h. The method is simple, effective and offers the advantage that surgeons can use it without anaesthetic supervision. It is easy to use and serious complications are uncommon being limited to

the systemic effects of the local anaesthetic drug if the tourniquet fails. Unfortunately, IVRA is limited by its short duration and post-operative pain can start early and can sometimes be severe. The use of adjuvants such as ketorolac or clonidine added to the local anaesthetic can prolong the duration of analgesia post-operatively, and both have been shown to reduce the intensity of tourniquet pain significantly [56,57,58]. Postural hypotension and sedation have been reported after clonidine, which can sometimes be a problem in the day surgery patient. IVRA has the additional advantage that patients can be discharged early with only a short post-operative observation time. The method is highly recommended in the appropriate patient undergoing ambulatory surgery.

## Non-pharmacological Pain Management Techniques

A number of non-pharmacological methods are used today for the management of pain following ambulatory surgery. These can often be used in combination with the techniques listed above. Some of those commonly used are briefly described below.

**1. Elevation of the operated site.** Pain results partly due to localized oedema from inflammation but also due to extravasation of fluid due to the dependent position of the operated tissue such as the hand or foot. Elevation of the arm or foot can reduce swelling by helping drain away the oedema thereby reducing pain.

**2. Use of cold compresses.** Specifically following knee surgery, cold compresses have been shown to reduce pain. These are now available in different sizes and shapes for use in different parts of the body. In order to prolong the effect, ice-cold water can be used to circulate through these compresses and offer excellent pain relief. Simple, wrapped packs of ice are also effective.

**3. Acupuncture.** This has been shown to be effective for post-operative pain relief in many studies on inpatients and outpatients. In one study, Gilbertson *et al.* showed that following arthroscopic acromioplasty, real acupuncture compared to sham acupuncture offered significant improvement by way of lower pain levels, less analgesic use, increased range of movement, and greater patient satisfaction [59]. The main drawback of this method is the need for expertise in the use of the technique, which is not commonly available. More studies are needed to find a clear place for acupuncture during ambulatory surgery.

**4. Trans-cutaneous nerve stimulation (TENS).** This offers an alternative to conventional pain management and is very effective in some patients but not others [60]. Although very helpful in chronic pain states, the balance of opinion today is against its routine use except under specific circumstances. It is probably not the method of choice for use in the management of acute post-operative pain.

## Practical Guidelines

In order to achieve good pain relief in the ambulatory surgery setting, a set of guidelines, listed below, can be helpful in planning the use of an appropriate method. These guidelines should be used only as suggestions, and innovative thinking in special cases must always be considered.

1. Plan the pain management early together with the patient through adequate information and discussion pre-operatively.
2. Start planned management pre- or intra-operatively in order to provide the best pain relief when the pain is worst (during the early post-operative period, and prior to bedtime). This can be in the form of nerve blocks or tablets pre-operatively, or the injection of local anaesthetic or other drugs intra-operatively.
3. Use aggressive methods to prevent pain and treat it early and actively when it occurs.
4. Use drugs in full doses rather than titrating to effect, especially in the early post-operative period.
5. Think of post-mobilization and post-discharge pain and plan management before rather than after its appearance.
6. Treat patients as individuals rather than averages. Some patients respond better to one drug than other drugs.
7. Particularly in children, the presence of parents, a warm bed and the home environment are major factors in reducing pain.

A summary of some common ambulatory surgical procedures and appropriate methods for post-operative pain management is shown in Table 4. Depending on the experience of the anaesthetist and institutional preferences, this table provides suggestions for the options available in post-operative pain management. It is important to stress that single dose infiltration of local anaesthetics provide only short term pain relief, and although catheter techniques can be a good option for prolonging post-operative pain relief, the number of studies published in the literature are limited, many are not blinded, and only a few studies have compared this technique with a 'standard-of-care'. More studies on this important subject are keenly awaited and desired.

**Table 4** Pain Relief according to Procedure

Operation	Recommended technique	Alternative technique
Herniorrhaphy	Inguinal nerve block (LA + NSAID)	LA infiltration + NSAID
Simple mastectomy	Paravertebral block	LA infiltration + NSAID
Arthroscopic procedures of the shoulder	Interscalene block	LA infusion via catheter
Hallux valgus correction	Foot / ankle block	LA infiltration + NSAID
Hand surgery	Brachial plexus block	LA infiltration + NSAID IVRA
Laparoscopic cholecystectomy	Incisional + Intraperitoneal LA	LA infiltration + NSAID
Tonsillectomy	Paracetamol + codeine + NSAID (?)*	

Table 4. Recommended methods for pain relief according to operative procedure are shown. LA Local Anaesthetic, NSAID Non-Steroidal Anti-Inflammatory Drug. \* See text for details.

## Conclusions

Management of post-operative pain in the ambulatory setting is a challenge. The development of clinical guidelines for pain management, which are preferably procedure specific, is essential in order to achieve good results and a satisfied patient. These guidelines should be written and tested and should offer best pain relief for a specific procedure. Individual patient requirements should always be considered keeping in mind the biological variation between individuals. Regular follow-up should be undertaken in order to identify drugs that do not provide adequate pain relief, and these methods should be replaced with alternative techniques that have been tried, tested, and shown to be effective. Good pain relief requires teamwork and incorporates not only the healthcare team, but also the patient and their carers.

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# Management of Post-operative Nausea and Vomiting in Ambulatory Surgery

Filadelfo Bustos, MD, Candy Semeraro, MD, Servando Lopez, MD, and Manuel Giner, MD, PhD

## Introduction

Understanding post-operative complications in ambulatory surgery (AS) is important in order to reduce them to a minimum and provide better quality care. Anaesthetists and patients recognize their importance. Macario *et al.* [1] analyzed the clinical results of ambulatory anaesthesia considered most important by anaesthetists. First came pain followed by nausea and vomiting. Jenkins *et al.* [2] published a similar study, but looked at the ranking patients put on symptoms they would most like to avoid. Pain was placed first followed by discomfort due to intubation, and nausea and vomiting.

Post-operative pain, and nausea and vomiting are the most frequent medical causes of delay in both immediate recovery and discharge from the surgical ambulatory unit [3]. They are also the commonest cause of hospital admission and delay in return to patients' daily activities [4,5].

Increasingly, more complex procedures are being performed on an ambulatory basis. They have a higher index of post-operative complications, particularly pain, and nausea and vomiting. The control of these is an important challenge for anaesthetists working in AS.

To analyze post-operative nausea and vomiting (PONV) the sequence used for any nosological entity can be followed viz:

1. Is it a real problem? How big a problem?
2. At which moment during the process does it appear? The answers to these two questions are the *epidemiology* of PONV in AS.
3. What are the causes and the predisposing factors? Can the patients most likely to suffer PONV be recognized, suspected or predicted? This is the *aetiology*.
4. What may be the consequences? How does it present? This is the *clinical presentation*.
5. Last of all, but maybe the most important, is: what can be done to avoid or deal with PONV? This is *prophylaxis and treatment*.

These five issues will be addressed in turn and all the evidence-based data regarding PONV will be classified [6,7] (Table I).

## Epidemiology

PONV is one of the most common complications following AS. Its incidence varies depending on the group analyzed and whether prophylaxis has or has not been used. In a series of more than 5,000 patients published by Tong *et al.*, 8.9% presented with post-operative nausea and 3.5% with post-operative vomiting whilst still in the surgical unit [8]. In one study, the incidence of PONV at home is estimated at around 2-4%, and is most frequent in patients who have already presented with these symptoms while recovering in the unit [3]. In another study the incidence of post-discharge nausea and vomiting was found to be 36%, and occurred primarily (72%) in patients who had not vomited in the unit [9].

In a review in 2002, in which the incidence of post-operative symptoms after all types of ambulatory surgery was analyzed, the global incidence, without medical management or protocol of nausea was 17% (0-55%) and of vomiting, 8% (0-16%) [10]. In this study, approximately 14% of patients presented symptoms for three or more days, and 62% required an average of 3.2 days before resuming daily activities. In Sinclair's study regarding PONV in ambulatory surgery, the incidence of PONV was 4.6% in the recovery unit and 9.1% after 24 hours [11]. In children the incidence is lower (5-20%), increases until puberty (34-50%) and then decreases again [12]. Therefore, PONV is a considerable problem, starting during immediate post-operative recovery and continuing until late recovery at home.

## Predisposing factors

By identifying the predisposing factors for PONV in AS it should be possible to predict which patients are most likely to present with nausea or vomiting during post-operative recovery and so anticipate the need for preventive measures and treatment. Several authors have tried to define these predisposing factors to PONV and to establish a risk index to predict a patient's probability of presenting with PONV. In 1993, Palazo and Evans defined a model with three factors: female sex, previous history of PONV and post-operative administration of opioids [13]. Koivuranta *et al* identified five predictive factors for PONV: female sex, previous history of PONV, prolonged duration of surgery, non-smokers and history of motion sickness [14]. Apfel *et al.* developed a multivariate model with four factors: female sex, history of motion sickness or PONV, non-smoker and the administration of post-operative opioids. In adults undergoing balanced general anaesthesia, the risk of PONV was approximately 10%, 20%, 40%, 60% or 80% depending on how many factors were present: nil, one, two, three or four respectively [15,16,17,18]. These authors studied patients undergoing various ambulatory procedures.

In AS, Sinclair *et al.* [11] developed a mathematical model aiming to predict ambulatory patients who could benefit from anti-emetic treatment. They studied 17,638 ambulatory

surgical patients prospectively and, using a regression analysis with the data from half of the patients, developed a model which was then validated with the remaining half. The incidence of PONV was 4.6% and 9.1% in the post-anaesthetic care unit and after 24 hours respectively. The factors stated by Apfel *et al.* were confirmed and others were added, including the following risk factors. Evidence ratings (see Table 1) are shown in brackets:

- Patient specific risk factors [11,14,15,16,17]:
  - Age, decreased the likelihood of PONV by 13% for each 10-yr increase (IV A)
  - Female sex, with a 3.6 times higher risk for PONV than men (I A)
  - History of PONV or motion sickness, increases the risk of PONV by 3 times (IV A)
  - Non-smoking status, with an incidence of PONV 1.5 times higher than smokers (IV A)
- Anaesthetic risk factors:
  - Balanced general anaesthesia, increased 11 fold the risk for PONV compared with regional [11], and twice compared to the use of total intravenous anaesthesia [19] (II A).
  - Duration of anaesthesia, increasing the risk for PONV by 59% for each 30-min. increase [11] (III A).
  - Use of volatile anaesthetics [20] or nitrous oxide [21] (II A).
  - Use of intra-operative (II A) and post-operative (IV A) opioids [17,18]
  - High doses of neostigmine (II A) [22].
- Surgical risk factors [11]:
  - Duration of surgery (each 30 min. increase in duration increases PONV risk by 60%, so that a baseline risk of 10% is increased by 16% after 30 min) (IV A).
  - Type of surgery – plastic surgery, ophthalmic surgery, and orthopaedic shoulder surgery are six times more likely to experience PONV. ENT dental, non-shoulder orthopaedic, and non-D&C gynaecological surgery are two to four times as likely to experience PONV (IV B)

Table 1 Evidence Rating Scale	
<i>Level of evidence based on study design</i>	
I	Large randomized, controlled trial, n ≥ 100 per group
II	Systematic review
III	Small randomized, controlled trial, n < 100 per group
IV	Nonrandomized, controlled trial or case report
V	Expert opinion
<i>Strength of recommendation based on expert opinion</i>	
A	Good evidence to support the recommendation
B	Fair evidence to support the recommendation
C	Insufficient evidence to recommend for or against



Starting with these factors, Sinclair *et al.* [11] developed a mathematical formula to predict the individual risk of a patient undergoing ambulatory surgery. There are other factors which can induce PONV in ambulatory surgery, although they have no clinical significance, such as hypotension due to sympathetic block, abrupt movements during recovery and phase of the menstrual cycle. Of all these factors, only those related to anaesthetic management can be directly modified. The others cannot be modified.

In paediatric patients there is a reduced incidence during infancy (5-20%), which increases until puberty where the incidence is around 34-50% [23], and then decreases again. Female sex becomes important after puberty. Surgical procedures causing the most PONV during infancy are adenotonsillectomy, surgery for strabismus, hernia repair, orchidopexy and circumcision [24,25].

## Repercussions or clinical manifestations

PONV can cause electrolyte alterations, dehydration, haematoma at the wound site, wound dehiscence, aspiration, oesophageal rupture (Boerhaave syndrome) together with anxiety, general malaise and patient dissatisfaction [26,27]. Regarding ambulatory procedures, PONV prolong the patient's recovery both during their stay in the surgical unit as well as at home. They are the most frequent cause of prolonged recovery, followed by pain. They obstruct the flow of patients through the unit, the patient's return to daily activities as well as causing unanticipated admissions to hospital [3,4,5,28].

## Treatment strategies

Therapeutic manoeuvres to reduce the incidence of nausea and vomiting in ambulatory surgery should be based on the following:

- *reduction of base risk factors*, through general peri-operative measures,
- *determination of PONV risk level for each patient*,
- *prophylaxis guidelines depending on each patient's risk level*, based on evidence, safety and cost-effectiveness,
- *determination of rescue treatment* for patients presenting PONV despite prophylaxis.

The management of nausea and vomiting is possible if *multimodal protocols* are developed, with various synergic procedures, *depending on the evaluated risk*.

### 1. General measures

In daily practice various measures can be used to reduce the incidence of PONV [7,29,30]:

- By using regional anaesthesia whenever possible, in patients with a high risk of PONV (III A).
- By avoiding extensive sympathetic nerve blocks which cause hypotension (IV A).
- By using total intravenous anaesthesia with propofol (I A).
- By avoiding emetogenic agents: nitrous oxide (II A), inhalational anaesthetic agents (IA), minimization of intra-operative opioids (II A), doses of neostigmine < 2.5 mg (II A).
- By ensuring adequate hydration (III A).
- By effective analgesia incorporating local anaesthetics and inhibitors of cyclo-oxygenase (II A)
- By using anxiolytics (benzodiazepines) (IV A).

## 2. Antiemetics

Vomiting is a natural reflex action to many different stimuli involving co-ordinated activity of the gastrointestinal tract, the diaphragm, and the airway muscles. The neuro-anatomical site co-ordinating these actions is referred to as the *vomiting centre*, which is found in the lateral reticular formation in the brainstem and receives multiple afferent inputs from the higher cortical centres, cerebellum, vestibular apparatus, vagal and glossopharyngeal nerves, nucleus tractus solitarius and chemoreceptor trigger zone (CTZ). This latter area lies in the floor of the IV ventricle, outside the blood brain barrier and in contact with cerebrospinal fluid, allowing substances to reach the cerebrospinal fluid from blood. These anatomical areas are rich in histamine, serotonin, cholinergics, neurokinin-1, and dopamine receptors. Antagonist drugs acting on one or more of these receptors are used in the management of PONV.

In recent years, different classes of drugs have been used in the management of PONV [31]. The antiemetic efficacy of these drugs can be compared using the number needed to treat (NNT) that indicates the number of patients needed to be exposed to a particular intervention for one patient to benefit had they received placebo or no treatment (i.e., the number of patients who must be exposed to a therapeutic drug for at least one patient not to present with PONV, which would have happened if this patient was treated with placebo or no treatment). The risk of drug related adverse effects is estimated with the number needed to harm (NNH) [32]. Another important point is the most effective moment for administration.

Considering these aspects, the most frequently used drugs will be reviewed, especially those used in AS [7,29].

(a) **Droperidol.** It is a dopamine antagonist type butyrophenone, which also has alpha-blocking characteristics and can cause extrapyramidal side effects. Since the US

Food and Drug Administration (FDA) drew attention to the potential for cardiac arrhythmias (QTc prolongation which can lead to potentially fatal torsades de pointes) and sudden cardiac death with doses of droperidol  $\leq 1.25$  mg, droperidol use has been reduced. Nevertheless, there is sufficient scientific evidence to recommend droperidol, at doses of 0.625-1.25 mg i.v. at the end of surgery, as prophylaxis for PONV with an NNT of 5 for nausea and an NNT of 7 for vomiting (I A) [7,30,33].

(b) **Metoclopramide.** This is a benzamide capable of blocking central and peripheral dopamine receptors and which promotes gastric motility while increasing lower oesophageal tone. In high doses it has been shown to have receptor 5-HT<sub>3</sub> antagonistic effect. With an NNT of 16 for nausea and an NNT of 9.1 for vomiting, metoclopramide at doses of 10 mg at the end of surgery is not useful in PONV management [34].

(c) **Serotonin antagonists.** *Ondansetron, Dolasetron, Granisetron and Tropisetron.* These are receptor 5-HT<sub>3</sub> antagonists within the nucleus tractus solitarius and area postrema centrally. Though differing in their duration of action, they seem to have similar efficacy and similar side effects of constipation, headache, and liver enzyme elevation. These drugs are most effective when given at the end of surgery (III A) [35]. Except granisetron, useful for post-radiotherapy nausea and vomiting, the rest have been useful in PONV. The most studied is ondansetron and scientific evidence confirms its use in the management of PONV and for being the most cost-effective 5-HT<sub>3</sub> (ondansetron 4 mg, granisetron 1 mg and tropisetron 5 mg) [36,37].

A 4 mg dose of ondansetron has an NNT of 5.6 for nausea and an NNT of 5.5 for vomiting in PONV prevention. Granisetron 0.35-1 mg, tropisetron 5 mg and dolasetron 12.5 mg i.v. are also used for PONV prophylaxis and treatment. Studies on dose effect and cost effect also confirm the use of 4 mg doses of ondansetron in adults (I A) and doses of 50-100  $\mu\text{g}/\text{kg}$  in children (II A), at the end of surgery, compared to higher doses [38,37]. It is also useful in reducing NV after discharge [40].

(d) **Dexamethasone.** At a dose of 5 - 10 mg i.v. in adults, and 1.5 mg/Kg. in children administered at induction, it decreases PONV (II A). Its mechanism of action is unknown, but it has been related to prostaglandin and depletion of 5-HT. In adults, the NNT were 7.1 and 4.3 to prevent vomiting and nausea, respectively. In children the NNT was 3.8 [41].

(e) **Propofol.** Its use as the induction and maintenance agent shows an NNT of 5 during the first 6 post-operative hours (I A). A 20 mg bolus dose is effective for treating established PONV in the early post-operative period. The mechanism of antiemetic action is unknown, but it has been demonstrated that there is reduced area postrema activity and lower concentrations of serotonin and its metabolites [42].

(f) **Transdermal scopolamine.** An anticholinergic agent applied 4 hours before anaesthesia has an antiemetic effect (II B). Systematic review of trials with transdermal scopolamine found an NNT of 6 in PONV prevention. Its limitations

are a 4 hour onset to full effect, although significant reduction occurs by 2 hrs. Scopolamine also causes frequent but minor side effects (visual disturbances, dizziness, dry mouth, etc), which are very important in the elderly [43].

- (g) **Other antiemetics.** The use of *phenothiazines* (*promethazine* 12.5-25 mg i.v. and *prochlorperazine* 5-10 mg i.v., at the end of surgery) have been shown to be effective but limited in ambulatory surgery because of the resulting sedation (III B). Promethazine 6 mg may be useful. *Antihistaminics* act by blocking the histamine H1 receptor in the solitary tract, but also block the acetylcholine receptors, responsible for side effects (sedation and dry mouth) (II A). IM *ephedrine* 0.5 mg/kg (IIB) is another antiemetic that has shown efficacy for day surgery.
- (h) **Nonpharmacological techniques.** *Acupuncture, transcutaneous electrical nerve stimulation, acupoint stimulation and hypnosis.* All have shown antiemetic efficacy when used before surgery [7,25,29].
- (i) **Antiemetics with potential clinical use.** Neurokinin-1 antagonists (substance P), and cannabinoids (dronabinol, nabilone) [29].

### 3. Prophylaxis

There is agreement that not all patients should receive PONV prophylaxis (I A). Patients with a small risk of PONV are unlikely to benefit from prophylaxis and would be put at unnecessary risk from the potential side effects of antiemetics. On the other hand, in patients at high risk of PONV, the use of prophylactic antiemetics is more cost effective than a placebo, because of the increased costs associated with NV. Therefore, guidelines for the prophylaxis of PONV in ambulatory surgery need to evaluate each patient's risk of presenting such a complication. For that purpose one should know which predisposing factors are present:

- *Patient factors: female sex, history of PONV or motion sickness, non-smoker, use of peri-operative opioids.*
- *Type of surgery: laparoscopy, laparotomy, plastic surgery, breast surgery, ENT surgery, strabismus surgery.*

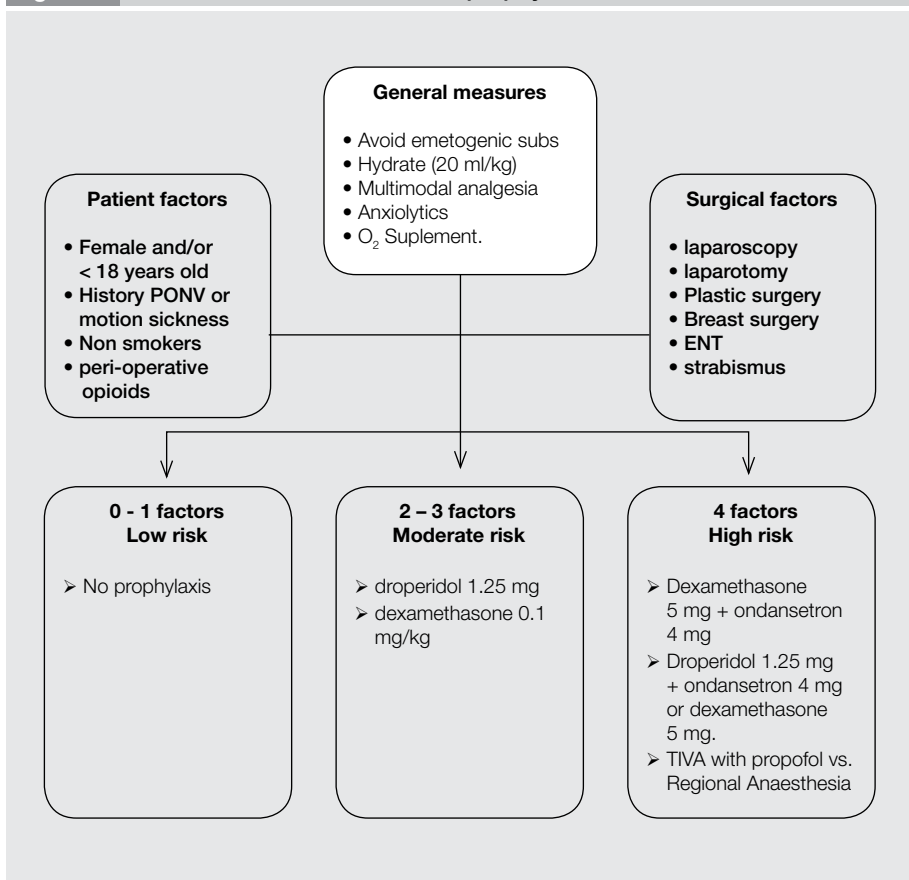
Strategies to reduce PONV should be applied in all patients, regardless of the risk of PONV: consider regional anaesthesia in high risk patients (III A), and if general anaesthesia has to be used, a total intravenous anaesthesia with propofol (V) is preferred; intravenous fluid hydration 25 mg /kg (III A); avoiding nitrous oxide and reversal of neuromuscular blockade (II A); multimodal analgesia with minimization of intra-operative opioids (II A).

Depending on predisposing factors, risk can be predicted and guidelines proposed (figure 1):

- 0-1 risk factor → low risk: general measures, no prophylaxis.
- 2-3 risk factors → moderate risk: monotherapy with droperidol 1.25 mg i.v., dexamethasone 0.1 mg/kg i.v., or ondansetron 4 mg i.v. (II A).

- $\geq 4$  risk factors  $\rightarrow$  high risk: antiemetic combination with two or three prophylactic agents (V): droperidol 1.25 mg i.v., dexamethasone 0.1 mg/kg i.v., serotonin antagonists (ondansetron 4 mg i.v., dolasetron 12.5 mg i.v., tropisetron 5 mg, granisetron 0.35-1 mg i.v.) + total intravenous anaesthesia with propofol.

**Figure 1 Recommendations for PONV prophylaxis**



Droperidol is the best cost effective drug followed by dexamethasone and ondansetron [29]. Although surgical procedures are usually of short duration in the ambulatory setting, timing of administration of antiemetics depends on the drug. Scopolamine patch should be applied as early as possible, dexamethasone should be given just after induction, and ondansetron and droperidol are more effective at the end of surgery.

#### 4. PONV treatment

Despite all these prophylactic measures, some patients will still present with PONV and will need effective treatment. Firstly promoting factors such as pain, hypotension, abrupt movements, anxiety, etc, must be controlled. Treatment will depend on the prophylactic drugs that have been given, since a different drug should be tried (Table 2).

- Patients with no prophylaxis: ondansetron 1 mg, dolasetron 12.5 mg, granisetron 0.1 mg or tropisetron 0.5 mg.
- Patients who received dexamethasone or droperidol: serotonin antagonists (ondansetron 1 mg, dolasetron 12.5 mg, granisetron 0.1 mg or tropisetron 0.5 mg).
- Patients who received an anti 5-HT<sub>3</sub>: dexamethasone 0.1 mg/Kg or droperidol 1.25 mg.
- Patients who received a combination of ondansetron + dexamethasone + droperidol, during the last 6 hours: other drugs such as ephedrine 0.5 mg/Kg i.m., propofol 20 mg i.v..
- Patients who received a combination of ondansetron + dexamethasone + droperidol, more then 6 hours before (effective half-life of ondansetron): repeat ondansetron 1 mg and/or droperidol 0.625 mg. Dexamethasone can be repeated 8 hours after the first dose. Other drugs, such as ephedrine 0.5 mg/Kg i.m. and propofol 20 mg i.v. can be administered at the same time.

Drug used in prophylaxis	Drug for use in rescue treatment
No prophylaxis	Ondansetron 1 mg
Dexamethasone or droperidol	Ondansetron 1 mg
Anti 5- HT <sub>3</sub>	Dexamethasone 4-8 mg (0.1 mg/Kg)
Combination of 2-3 drugs < 6 hours ago	Ephedrine 0.5 mg/Kg IM Propofol 20 mg IV
Combination of 2-3 drugs > 6 hours ago	Ondansetron 1 mg or droperidol 0.625 mg Dexamethasone if 8 hours have gone by Ephedrine 0.5 mg/Kg IM. Propofol 20 mg IV

In children, moderate-high risk cases are best treated with *ondansetron 100 µg/kg i.v. + dexamethasone 150 µg/kg i.v. or droperidol 75 µg/kg i.v.* In the case of PONV in the following 6 hours, the drugs should not be repeated, but the prophylactic drug can be repeated after 6 hours [7].

## Conclusion

PONV is a frequent complication in ambulatory surgery, both during hospital stay as well as at the patient's home. They cause delay in post-operative recovery, discharge from hospital and return to patient's daily activities. A flexible, cost effective, multimodal protocol is required to evaluate PONV risk and to provide prevention or treatment. Treatment requires knowledge of the prophylaxis used (drugs, doses and timing of administration) so that other drugs may be given. The incidence of this problem can thus be decreased in AS.

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# Discharge criteria and recovery in ambulatory surgery

Imad Awad, MB, CHB , FCARCSI, Francis Chung, MD, FRCPC

## Introduction

Ambulatory surgery is continually evolving with more complex procedures being performed, and more American Society of Anesthesiologists (ASA) III patients being eligible. To ensure patient safety and an efficient running of the service, more emphasis has been placed on patient recovery and discharge from the phase II recovery or day surgical unit (DSU).

In this chapter, discharge criteria and the fast track concept will be addressed together with an overview of the complications and factors delaying discharge.

## Definition of recovery and the fast track concept

Recovery is an ongoing process that begins at the end of intra-operative care and continues until patients return to their pre-operative physiological state [1]. This process is divided into 3 phases [2]. *Early recovery*, from the discontinuation of anaesthetic agents until recovery of protective reflexes and motor function, *intermediate recovery*, when the patient achieves criteria for discharge, and *late recovery*, when the patient returns to his pre-operative physiological state.

## Discharge scoring systems

To discharge patients safely from the post-anaesthesia care unit (PACU), various scoring systems have been devised. The Aldrete scoring system utilises numeric scores of 0, 1, or 2 assigned to motor function, respiration, circulation, consciousness and colour with a total score of 10 [3]. Later, pulse oximeter values replaced the colour parameter (Table 1) [4]. Using this scoring system, when patients achieve a score of  $\geq 9$ , they are rendered fit to be discharged from the PACU to a step-down unit or DSU where phase II recovery occurs until they reach the criteria for discharge home. Phase III recovery lasts for several days and continues until the patient is back to their pre-operative physiological status and is able to resume their daily activities.

**Table 1** The modified Aldrete scoring system for determining when patients are ready for discharge from the post-anaesthesia care unit

Discharge criteria from PACU	Score
<b>Activity: Able to move voluntarily or on command</b>	
Four extremities	2
Two extremities	1
Zero extremities	0
<b>Respiration</b>	
Able to deep breathe and cough freely	2
Dyspnoea, shallow or limited breathing	1
Apneic	0
<b>Circulation</b>	
Blood pressure +/- 20 mm of pre-anaesthetic level	2
Blood pressure +/- 20–50 mm pre-anaesthesia level	1
Blood pressure +/- 50 mm of pre-anaesthesia level	0
<b>Consciousness</b>	
Fully awake	2
Arousable on calling	1
Not responding	0
<b>O<sub>2</sub> saturation</b>	
Able to maintain O <sub>2</sub> saturation >92% on room air	2
Needs O <sub>2</sub> inhalation to maintain O <sub>2</sub> saturation >90%	1
O <sub>2</sub> saturation <90% even with O <sub>2</sub> supplementation	0

A score  $\geq 9$  was required for discharge. From Aldrete JA. The post-anesthesia recovery score revisited [letter]. *J Clin Anesth* 1995;7: 89-91 with permission.

### Fast tracking

This is a clinical pathway that involves transferring the patient from the operating room to the DSU and bypassing the PACU. The use of ultra short acting drugs, proper selection of patients, and elimination of post-operative complications (pain and post-operative nausea and vomiting (PONV)), will enable patients to achieve an Aldrete score of 9 or 10 in the operating room and therefore bypass the PACU. The pitfalls of the modified Aldrete scoring system is that it does not address pain and nausea and vomiting, common side effects in the PACU. White *et al.* devised a scoring system that included pain and emetic symptoms into the Aldrete scoring system [5] (Table 2). Under the new fast tracking scoring system the maximum score is 14; a score of 12 (with no score less than 1 in any category) provides a criteria for bypassing the PACU.

**Table 2** White et al scoring system to determine whether outpatients can be transferred directly from the operating room to the step down (phase II) unit

Discharge criteria	Score
<b>Level of consciousness</b>	
Awake and oriented	2
Arousable with minimal stimulation	1
Responsive only to tactile stimulation	0
<b>Physical activity</b>	
Able to move all extremities on command	2
Some weakness in movement of extremities	1
Unable to voluntarily move extremities	0
<b>Haemodynamic stability</b>	
Blood pressure <15% of baseline MAP value	2
Blood pressure 15–30% of baseline MAP value	1
Blood pressure >30% below baseline MAP value	0
<b>Respiratory stability</b>	
Able to breathe deeply	2
Tachypnoea with good cough	1
Dyspnoeic with weak cough	0
<b>Oxygen saturation status</b>	
Maintains value >90% on room air	2
Requires supplemental oxygen (nasal prongs)	1
Saturation <90% with supplemental oxygen	0
<b>Post-operative pain assessment</b>	
None, or mild discomfort	2
Moderate to severe pain controlled with IV analgesics	1
Persistent severe pain	0
<b>Post-operative emetic symptoms</b>	
None, or mild nausea with no active vomiting	2
Transient vomiting or retching	1
Persistent moderate to severe nausea and vomiting	0
<b>Total possible score</b>	<b>14</b>

A minimal score of 12 (with no score <1 in any individual category) would be required for a patient to be fast tracked (ie, bypass the post-anaesthesia care unit) after general anaesthesia. Abbreviation: MAP, mean arterial pressure. From White P, Song D. New criteria for fast-tracking after outpatient anaesthesia: a comparison with the modified Aldrete's scoring system. *Anesth Analg* 1999;88:1069-72 with permission.

One goal of the fast track concept has been to reduce nursing workload and cost, while others promote fast track recovery to improve the quality of care, by focussing attention on getting patients back to their pre-operative state as quickly as possible. Nursing and personnel costs account for the majority of PACU expenditure as opposed to only 2% related to medication and supplies [6]. Before implementing this concept, it should be fully validated with randomised controlled trials to address whether the benefits outweigh the risks. In a large multi-centre study involving 2,354 patients, the PACU bypass rate of patients having general anaesthesia increased from a baseline of 15.9% to 58% after a period of a 1 month educational programme [7]. The recovery times of patients who were fast tracked was significantly shorter compared to that for patients who were not fast tracked,  $84.6 \pm 61.5$  versus  $175.1 \pm 98.8$  min,  $P < 0.001$ , with no change in patient discharge. In patients undergoing regional anaesthesia for orthopaedic surgery, Williams *et al.* [8] devised the Regional Anaesthesia PACU Bypass Criteria (RAPBC) (Table 3). This score allows patients to bypass the PACU after regional anaesthesia techniques, including neuraxial anaesthesia. Using the RAPBC in patients undergoing variable types of lower limb orthopaedic surgery, 87% (756/869) patients were able to bypass the PACU, with no significant differences between mild and invasive surgical procedure categories. These patients were discharged home earlier and had a lower incidence of unplanned hospital admission. However, they needed more nursing intervention in the ASU when compared with patients who did not bypass the PACU [9]. In another study of patients undergoing ambulatory orthopaedic procedures, 83% of 99 patients were successfully fast tracked. The patients that achieved fast track criteria did not increase the operating room (OR) time and were discharged home earlier [10]. Patients in the fast track group were not compared to conventional PACU admission and the study was conducted in two institutions with different nursing and recovery settings. A recent prospective study randomised 207 patients undergoing standardised general anaesthesia into two groups: fast track and PACU [11]. In the fast track group, 81% of patients bypassed the PACU successfully. 97% of patients undergoing arthroscopy met the fast track criteria and were able to bypass the PACU. In gynaecological laparoscopy, this figure was only 72%. In this study, although the time to discharge was shorter in the fast track group, the total number of nursing interventions and nursing hours were not different between the two recovery groups. This finding demonstrates that the early phase of recovery represents only a tiny proportion of the overall nursing input. Other nursing inputs, such as intravenous therapy, medication, hygiene, education, ambulation and emotional support make up most of the workload. It is perhaps not surprising that no cost savings were made using the fast track approach with these definitions. From the above studies we can conclude that fast tracking patients cannot be justified on the basis of cost saving as there is no obvious improvement in outcome and cost savings [12]. It should be noted that the definition of fast tracking is highly variable between institutions.

**Psychomotor tests of recovery** A battery of tests is available that can simply be divided into two categories: paper and pencil tests and non-paper tests of recovery. These

tests have been adapted from other areas for evaluating the post-anaesthesia period. The Trieger dot test is an example of paper and pencil tests [13], as is the letter ('p') deletion test. The Maddox wing [14] (a device to test extraocular muscle balance), driving simulators [15], reaction time tests, and peg board tests [16] have all been used. The flicker fusion threshold [17], which measures the frequency at which the patient perceives a flashing light to be continuous, has been used as well as perceptual speed tests [18] and the digit symbol substitution test [19]. Recently, the multiple sleep latency test (MSLT) to measure sleepiness and another test to assess patients' balance by standing them on a dual forceplate has been suggested [20,21].

**Table 3** PACU bypass Score for the UPMC-Montefiore Surgicenter

Parameters	Scores
<b>Movement</b>	
Purposeful movement of (at least) one lower and one upper extremity	2
Purposeful movement of at least one upper extremity but (neither lower extremity)	1
No purposeful movement	0
<b>Blood pressure</b>	
Within 20% of baseline, without orthostatic changes	2
Between 20-40% of baseline, without orthostatic changes	1
Less than 40% of baseline, or orthostatic changes	0
<b>Level of consciousness</b>	
Awake, follows commands	2
Arousable, follows commands	1
Obtunded, or persistently somnolent	0
<b>Respiratory efforts</b>	
Able to cough involuntary on demand	2
Only able to cough involuntary but not on demand	1
Dyspnoea or apnoea	0
<b>Pulse oximeter score</b>	
SpO <sub>2</sub> ≥ 95% on room air	2
SpO <sub>2</sub> ≥ 95% with face mask or nasal cannula	1
SpO <sub>2</sub> < 95%	0
<b>Total possible score</b>	<b>10</b>

The minimum score to qualify for PACU bypass is 8. Patients considered for PACU bypass should not require interventions for pain, post-operative nausea and vomiting, or shivering. From Williams BA, Kentor ML, Williams JP *et al.* Process analysis in outpatient knee surgery: Effects of regional and general anesthesia on anesthesia-controlled time. *Anesthesiology* 2000; 93: 529-38 with permission.

Many of these tests are complex and impractical in the clinical setting and none has been specifically validated by follow-up studies providing adequate criteria to guide discharge in the ambulatory setting.

### Discharge criteria from the DSU

Discharge of patients home from the DSU requires strict adherence to validated criteria to ensure patient safety and which may prevent unnecessary litigation. Discharge assessment may be performed by physician evaluation or by qualified nurses in the DSU who adhere to a written protocol for patient discharge. Criteria for the safe discharge home following ambulatory surgery has been developed by Kortilla *et al* [22], an outcome based system. Chung *et al.* [23], devised the post-anaesthesia discharge scoring system (PADS), which was later modified to eliminate the fluid intake and output parameter [24] (Table 4). This is a cumulative index that measures the patient's home readiness; it is based on five major criteria: (1) vital signs; (2) ambulation and mental status; (3) pain; (4) PONV; and (5) surgical bleeding. Patients who achieve a score of 9 or greater and have an adult escort are considered fit for discharge. When input and output criteria were eliminated from the discharge scoring system.

The PADS permits evaluation of all patients who have had various procedures and anaesthesia. PADS determines the optimal length a patient stays after ambulatory surgery, and its use has been shown to enable patients to be discharged within 1 to 2 hours of surgery [25].

Typical outcome based criteria for discharge are also being used in ambulatory surgery facilities, where each criterion must be met, and include:

- Alert and oriented to time and place
- Stable vital signs
- Pain controlled by oral analgesics
- Nausea or emesis controlled
- Able to walk without dizziness
- Regional anaesthesia: block appropriately resolved
- No unexpected bleeding from operative site
- Given discharge instructions from surgeon and anaesthetist, and prescriptions
- Patient accepts readiness for discharge
- Adult present to accompany patient home

### Is oral fluid intake necessary before discharge?

Oral intake of fluids is no longer a prerequisite prior to discharge home. Studies that have addressed this practice in the ambulatory setting include; Schreiner *et al* [26] and Kearney

**Table 4** Chung *et al.* [23], Post-anesthesia discharge scoring system (PADS) for determining home readiness

Post-anesthesia Discharge Scoring System (PADS)	Score
<b>Vital signs</b>	
Vital signs must be stable and consistent with age and pre-operative baseline	
Blood pressure and pulse within 20% of pre-operative baseline	2
Blood pressure and pulse 20–40% of pre-operative baseline	1
Blood pressure and pulse >40% of pre-operative baseline	0
<b>Activity level</b>	
Patient must be able to ambulate at pre-op level	
Steady gait, no dizziness, or meets pre-op level	2
Requires assistance	1
Unable to ambulate	0
<b>Nausea and vomiting</b>	
Patient should have minimal nausea and vomiting before discharge	
Minimal: successfully treated with or medication	2
Moderate: successfully treated with intramuscular medication	1
Severe: continues after repeated treatment	0
<b>Pain</b>	
Patient should have minimal or no pain before discharge	
The level of pain that the patient has should be acceptable to the patient	
Pain should be controllable by oral analgesics	
The location, type, and intensity of pain should be consistent with anticipated post-op discomfort	
Pain acceptable	2
Pain not acceptable	1
<b>Surgical bleeding</b>	
Post-operative bleeding should be consistent with expected blood loss for the procedure	
Minimal: does not require dressing change	2
Moderate: up to two dressing changes required	1
Severe: more than three dressing changes required	0

Maximum SCORE = 10; patients scoring  $\geq 9$  are fit for discharge. From Chung F: Recovery pattern and home-readiness after ambulatory surgery. *Anesth Analg* 1995; 80:896-902 with permission.



*et al.* [27] in the paediatric population and Jin *et al.* in the adult population [28]. Schreiner *et al.*, assigned children undergoing ambulatory surgery into either “mandatory drinkers” or “elective drinkers” groups. Children in the mandatory drinking group experienced a higher incidence of vomiting and prolonged hospital stay compared with the latter group. In the Kearney *et al.* study, children were randomly allocated in the post-operative period to one of two groups; drinking oral fluids or having oral fluids withheld for 4 to 6 hours post-operatively. The incidence of vomiting in the group with fluids withheld was significantly less than in the group that drank. The greatest effect of withholding oral fluids was seen in patients receiving opioids, where vomiting was reduced from 73% to 36%. In the Jin *et al.* study, neither drinking nor non-drinking worsened the incidence of post-operative nausea and vomiting, nor did it prolong hospital stay. Drinking oral fluids is not a requirement prior to discharge from the DSU. Requirements for discharge may be found in American Society of Anesthesiologists’ Practice Guidelines for Postanesthetic Care [29], and updated at <http://www.ASAhq.org/publicationsAndServices/standards/36.pdf> (2004). Oral intake is only necessary for selected patients on a case by case basis. Medical staff and nurses should be taught that drinking fluids is not a prerequisite to discharge and discharge protocols should be modified.

## Is voiding necessary before discharge?

Both general and spinal anaesthesia affect the detrusor muscle function. Prolonged distension of the bladder can lead to significant morbidity. Distension beyond the volume associated with voluntary emptying causes bladder atony and impaired voiding after return of function, and subsequently retention of urine [30]. Risk factors for post-operative urinary retention are: anorectal surgery, old age, male sex, spinal anaesthesia and hernia surgery [31,32]. In current practice, voiding is not a requirement before discharge from DSU as it could delay the discharge of 5%-11% of patients who have no risk factors of urinary retention after ambulatory surgery [33]. The incidence of urinary retention in low risk patients is less than 1% using inability to void at bladder volume of 600 ml as criteria for defining urinary retention [34]. These patients voided within 3 hours of surgery. When discharging low risk patients who have not voided, they should be given written instructions to seek medical help if they are unable to void within 6 to 8 hours of discharge. In high risk patients, ultrasound monitoring of bladder volume has been used to determine the need for catheterization and found to be more accurate than clinical judgment. There is good agreement between the ultrasound scanner estimates of urinary bladder volume and urine volume measured after emptying the bladder [35].

Spinal anaesthesia using long acting local anaesthetics is associated with delayed return of bladder function and retention. Intrathecal bupivacaine 10 mg when compared with lidocaine 100 mg, was associated with delayed detrusor function, urine volume of  $462 \pm 61$  ml and generated 1.6 times the “cystometric capacity” (the bladder volume

needed to have an urge to void pre-operatively) [36]. In contrast, using short acting spinal anaesthetics in low risk procedures is associated with minimal risk of retention and patients can be discharged home without the need to void prior to discharge [37].

## **Malignant Hyperthermia**

Patients with proven or susceptible malignant hyperthermia (MHS) present regularly for ambulatory surgery. Overnight hospitalisation for these patients is not required. Ambulatory procedures in MHS patients can be undertaken as long as a trigger free anaesthetic is used and a minimum of four hours of temperature monitoring is provided post-operatively [38]. This is in keeping with the guidelines of the Malignant Hyperthermia Association of the United States (MHAUS) and the Malignant Hyperthermia Association of Canada (MHA Canada) [39,40]. The patient should be given written instructions as to how to monitor temperature at home and how to recognize signs of malignant hyperthermia together with contact details of how to seek medical advice.

## **Factors delaying discharge**

The overall safety record of modern ambulatory anaesthesia is impressive with major morbidity and mortality being extremely rare. A major study of 38,958 patients undergoing ambulatory surgery found that the risk of dying in the 30 days after surgery was 1:11,273 [41]. The incidence of myocardial infarction, stroke, and pulmonary emboli was extremely low; lower than would be expected among a similar age group who had not undergone ambulatory surgery. However, minor sequelae are relatively common and may lead to delays in discharge, unanticipated admission, and returns to the hospital.

The unanticipated post-operative admission rate from the ASU is an important outcome measurement; in most hospital based centres, it averages 1-2% (admission rates are much lower in freestanding surgery centres). In practice, the most common causes for admission in adults and children are surgical factors, such as pain, bleeding and extensive surgery [42,43].

## **Discharge following regional anaesthesia**

The main advantages of regional anaesthesia are better pain control, minimal risk of nausea and vomiting and faster discharge. Patients having regional anaesthesia for upper limb surgery can achieve PACU bypass criteria faster, have less pain and nausea and are discharged home faster with less incidence of unplanned hospital admission when compared with general anaesthesia (GA) [44,45,46]. Even when combined with GA, a

suprascapular block can improve recovery profiles and facilitate early discharge after arthroscopic shoulder surgery [47]. The benefits of avoiding GA may be apparent up to 3 days post-operatively, when testing can reveal cognitive defects in GA patients that are not present in patients who received local anaesthetic infiltration [48]. There have been no trials comparing regional blocks with the new, less soluble, volatile anaesthetics, which have more rapid recovery profiles.

Spinal anaesthesia is a simple and reliable technique that has been widely used for ambulatory anaesthesia. Currently the use of lidocaine has declined because numerous reports of transient neurological symptoms (TNS) after spinal anaesthesia [49]. Recently the use of 2-chloroprocaine as an alternative to lidocaine in ambulatory anaesthesia has been revisited [50]. The quality of surgical anaesthesia and motor block of 2-chloroprocaine 40 mg was similar to 40 mg lidocaine. None developed TNS in the 2-chloroprocaine group, these patients had faster resolution of sensory anaesthesia, and they achieved discharge criteria earlier, including time to complete regression and voiding. In another study, 40 mg of 2-chloroprocaine produced similar motor block compared to bupivacaine 7.5 mg [51]. Procaine 5% 100 mg can also be used with low risk of TNS.

Ben-David *et al.* [52], demonstrated that small doses of dilute bupivacaine (7.5 mg/0.25%) provided reliable anaesthesia for knee arthroscopies, with discharge time of 202 min. Vaghadia *et al.*, showed that a combination of 25 mg of lidocaine and 25 µg of fentanyl produces sufficient anaesthesia for brief laparoscopic procedures [53]. Patients met discharge criteria at 122 min, although pruritus was common upon discharge and at home.

One factor limiting the popularity of outpatient spinal anaesthesia among anaesthetists is postdural puncture headache (PDPH). It seems that 25-gauge pencil point needles produce an incidence of PDPH <1%, and the headaches that occurred were mild and self-limited [54]. Fine needles (29 gauge) must be used to achieve similarly low headache rates with Quincke point needles. In a prospective study involving 676 patients assigned to 27G Whitacre or 27G Quincke, the incidence of PDPH was 0.37% and 1.51% respectively [55].

Before allowing patients to ambulate after spinal anaesthesia, it is important to ensure that the motor, sensory, and sympathetic blocks have regressed. Suitable criteria to judge when this has occurred include normal perianal (S4-5) sensation, plantar flexion of the foot, and proprioception in the big toe [56].

## Post-operative instructions, escort issue and driving issue

The success and safety of an ambulatory surgery programme depends on patient understanding and compliance. A lot of responsibility has been placed on patients to

adhere to the information and instructions given to them before their surgery. Patients often forget verbal instructions or ignore them [57,58]. Written instructions must be provided. Given the availability of sophisticated information systems, it was perhaps inevitable that these technologies would find their way into patient education. Instructional video presentations have been shown to patients pre-operatively. Although those who saw the video claimed that they found it helpful, their knowledge about the peri-operative period was not demonstrably better than those who had not seen it [59]. A recent study suggests that failure to adhere to written instructions could be related to low health literacy and age [60]. In this study low health literacy was more prevalent in patients aged > 65 years.

The American Society of Anesthesiology recommends having an adult escort to accompany patients home after ambulatory surgical procedures [61], and this is a consistent requirement in surgery facilities. Various studies have shown that there is significant psychomotor and cognitive impairment after anaesthesia and therefore a responsible adult escort is required to accompany home patients undergoing ambulatory surgery [62,63,64]. An incidence of 0.2% (60/28,391) of patients with no escorts was observed in a prospective case controlled study over 38 months [65]. In this study, 2 groups of patients without an escort were identified: patients known not to have an escort pre-operatively (known no escort, n=24) and patients whose escort did not show (no show escort, n=36). General anaesthetic agents impair psychomotor function and skills related to driving for up to 8 hours post-operatively [66,67,68]. These studies were conducted prior to the current short acting agents, which provide faster recovery and earlier return to normal daily activity. Some general anaesthetic agents have been shown to permit prompt return of driving skills at two, three, and four hours post-anaesthesia, when compared to the corresponding control sessions [69]. It is important to note that healthy volunteers, unlike patients, do not experience peri-operative anxiety, sleep deprivation, and post-operative pain. Furthermore, patients may receive a pre-operative sedative medication, and post-operative analgesics or antiemetics. In a prospective study of 20 patients undergoing knee arthroscopy under GA, patients showed lower alertness levels and impaired driving skills pre-operatively and 2 hours post-operatively [70]. These parameters returned to normal 24 hours post-operatively.

## Conclusion

Ambulatory surgery will continue to grow and expand in the future. It is our responsibility to use validated, outcome based criteria to discharge patients home safely. Regional anaesthesia for upper and lower limb surgery is growing in popularity and it plays a significant role in eliminating the commonest causes for delayed discharge: pain and PONV. Fast tracking is a concept that needs to be further evaluated to find an ideal model where cost and time saving benefit patient care.

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# Patient Outcomes and Clinical Indicators for Ambulatory Surgery

Paulo Lemos, MD and Ana Margarida Regalado, MD

## Introduction

The past three decades have seen a huge increase in the number and complexity of procedures performed on a day basis worldwide. During the 70s and 80s ambulatory surgery (AS) was considered “low risk” as it was based on simple, minor surgery in healthy patients. Since then there have been many changes in our world, both medical and social. Medical science has developed new drugs, devices and equipment allowing impressive advances in anaesthesia and surgery. Socially, patients’ standards of living have risen with consequent improvement in living conditions, communications and transport. As a result, the scope of AS programmes has widened to include sicker patients undergoing more complex surgery from a greater cross-section of the population.

Increasingly governments and other healthcare funders are pressing for an increase in AS because of its financial advantages. The challenge is that AS must be as safe (or safer) and of the same quality as the same procedures done on an inpatient basis. At no time should quality of care be subsumed to economic benefit.

The essence of maintaining quality is to focus on the outcomes, and therefore this must be a major issue for all the partners in the healthcare system (patients, health professionals, hospitals, healthcare funders). The literature reports low rates of adverse events or complications during the intra-operative and immediate post-operative periods in AS [1,2,3]. However, AS programmes must continuously monitor outcomes in order to maintain high quality. Clinical indicators must be developed to promote a safe, effective and efficient environment in AS [4].

## Patient outcomes

Outcomes research is a tool to assess the overall efficacy of healthcare intervention. With other tools, outcomes research helps define processes and pathways in order to achieve the best performance goals, thus improving the quality of healthcare performance. Due to the complex teamwork organization that exists in the majority of AS centres, many different outcomes need to be defined in order to include the maximum possible dimensions of performance [5].

In the past, surgical and anaesthetic outcomes mainly referred to mortality and major morbidity. These are quite rare events, and thus investigators now focus their attention on less severe but more frequent clinical outcomes, such as minor surgical, medical and anaesthetic complications. These outcomes are critically important for the quality evaluation of an AS programme, but they do not address issues of vital importance to patients and their families, such as respect and caring, or functional health status and quality of life.

Since the costs of healthcare delivery are increasing, it is not difficult to foresee that economic outcomes will be a major determinant in all healthcare systems. All care and quality processes that we propose to implement will be dependent on the relationship between benefits and costs.

## A) Medical Outcomes

### Mortality and major morbidity

The incidence of death and major morbidity associated with AS is extremely low [1,2,6]. Therefore, substantial data are needed to obtain accurate assessments of these outcomes. We also need to consider the time frame adopted by different authors, in order to attribute complications to the surgery or anaesthesia [7]. In the day case setting patients remain in hospital for only a few hours, and clearly monitoring should be performed after their discharge. The traditional 30 day outcomes are unnecessarily long for the majority of anaesthetic outcomes, but seem reasonable to evaluate surgical results such as infection rate, recurrence, chronic pain, etc.

In a study of 38,598 day cases, Warner *et al.* demonstrated a 1:11,273 risk of dying within 30 days of surgery [6]. However, only two of the four mortalities were medical: they sustained myocardial infarction (MI), within 7 days of surgery. The other two patients died in traffic accidents. Of the 31 patients who developed a major morbidity event (1:1455), 14 (45%) had a MI (1:3220), 7 (23%) had a central nervous system deficit (1:6441), 5 (16%) had a pulmonary embolism (1:9018), and 5 (16%) had respiratory failure (1:9018). Twelve patients (39%) had their major adverse event more than 48 hours after surgery, pointing out the necessity to audit the outcome for longer than the first day after surgery. The authors also demonstrated that these major adverse events occurred less often than they would have expected in a matched population, concluding that the overall risk of major morbidity or mortality from an AS procedure is very low. In another major prospective study, no anaesthesia related readmissions or deaths were identified in 17,638 consecutive patients undergoing AS [8].

However, the mortality rate can depend on the type of facility. Vila *et al.* found a death rate per 100,000 procedures performed of 9.2 in offices and 0.78 in ambulatory surgery centres (ASCs) in Florida [9]. These authors concluded that if all office-based surgery procedures had been performed in ASCs approximately six deaths per year could have been prevented.

Fleisher *et al.* determined the rates of death after 564,267 day surgery procedures in elderly patients [10]. There were no deaths on the day of surgery in physicians' offices, 4 deaths in ASCs (2.3 per 100,000 outpatient procedures), and 9 deaths in the hospital day units (2.5 per 100,000 outpatient procedures). The 7 day mortality rate was 35 per 100,000 day procedures in physicians' offices, 25 per 100,000 in ASCs, and 50 per 100,000 in the hospital day units. The authors concluded after multivariate analysis that more advanced age, prior inpatient hospital admission within 6 months, and invasiveness of surgery identified those sicker patients who were at increased risk of inpatient hospital admission or death within 7 days of surgery.

Chung *et al.* identified independent risk factors for adverse peri-operative events in their ambulatory setting [11]. They found a 12% prolongation of post-operative stay in those patients with pre-existing congestive heart failure and a 2-fold increase in the risk of intra-operative cardiovascular events in those patients with previous hypertension. Patients suffering from asthma and smokers had a 5-fold and 4-fold increase in risk of post-operative respiratory events, respectively. Obese patients also had a 4-fold increase in risk of intra-operative and post-operative respiratory events, while patients with a history of gastro-oesophageal reflux had an 8-fold increase in the risk of intubation related adverse events.

The majority of unplanned overnight admissions following AS are due to surgical causes [12]. In several trials, surgical bleeding and procedure related factors (longer than anticipated, need for observation, etc) were found the most important causes of hospital admission after AS [13,14,15]. Most care should be taken in procedures prone to haemorrhagic events, such as nasal procedures [16]. Vaghadia *et al.* found that gynaecological (therapeutic abortions) and urological surgery (transurethral resection of prostate) accounted for the highest number of bleeders (86%) [17]. This study included more than 170,000 day case procedures and overall readmissions for bleeding of 0.04%. The authors concluded that the majority of bleeders could have been identified if they had been observed for 30-45 min. So, careful surgical haemostasis during the peri-operative period and vigilant post-operative surveillance, at least for the first hour after the majority of procedures, are warranted if good day care outcomes are to be achieved. Interestingly, Awad *et al.* demonstrated that the incidence and causes of unplanned hospital admission following AS in children were similar to those for adults [18]. They conducted a 3 year study of more than 10,000 children who underwent day surgery, of whom 242 (2.2%) experienced unplanned hospital admission. Reasons for admission were surgical (54%), anaesthetic (16%), social (14%), medical (11%) and unclassified (4%).

## Minor morbidity

While mortality and major morbidity are quite unusual, minor complications are quite frequent. Wu *et al.* reviewed the literature and identified post-discharge symptoms after day surgery [19]. Pain (overall incidence after discharge was 45%), nausea (17%), vomiting (8%), headache (17%), drowsiness (42%), tiredness or fatigue (21%), myalgia (31%) and sore throat (37%) represented the most common symptoms. The presence of these symptoms can affect length of stay and time to discharge and later may cause difficulties in the resumption of normal daily activity and function at home. All efforts should be made to avoid them, especially the most frequent and incapacitating symptoms of pain, and nausea and vomiting. While specific strategic approaches will be discussed elsewhere, some pertinent issues do apply here.

### **Post-operative pain**

As previously stated, post-operative pain was the most commonly reported symptom following AS found in the systematic review done by Wu *et al.* [19]. Poor post-operative pain control is a cause of patient dissatisfaction [20,21]. Often it is not reported by patients when they feel that their caregivers are concerned about them [22]. Patients should expect to have some pain after every surgical experience. However, inadequate post-operative pain control has many disadvantages. Beyond the many adverse physiological effects associated with pain (respiratory, cardiovascular, gastrointestinal, urinary, metabolic, etc), it can result in a prolonged stay in the post-anaesthetic care unit (PACU), delayed discharge [23], and increased rates of unanticipated hospital admission or readmission. Pain has been implicated in disruptive sleep, in reduced activity levels at 24 hours after surgery and as the primary or secondary reason for limiting activity in more than 50% of patients [24]. McGrath *et al.* found that one quarter of their patients (1,495/5,703) complained of moderate to severe pain at 24 hours after AS [25]. In an extensive retrospective evaluation that included 20,817 day surgery patients, Coley *et al.* found a 30 day return/readmission rate of 1.5% (313 patients) [26]. Pain was the most commonly reported reason for return, occurring in 120 (38%) of those patients.

In spite of the new drugs and devices, a national survey performed by Apfelbaum *et al.* concluded that post-operative pain continues to be under managed [27]. More than 80% of patients reported moderate-severe pain and around 60% of patients were concerned about post-operative pain. Post-operative pain management needs to be carefully watched in the future as more extensive surgery is transferred from the inpatient to the day care setting. It is essential to raise awareness that adequate peri- and post-operative pain management must be incorporated in every day surgery programme, based on specific guidelines, patient information and ongoing assessment, including at home. Shaikh *et al.*, found 75.4% patients with pain after ambulatory lumbar microdiscectomy, 33.9% of them with severe pain [28]. Higher levels of pain can be expected after laparoscopic cholecystectomy, anal procedures or orthopaedic surgery (shoulder, elbow, hand, knee,

ankle, foot, etc). The most significant predictor of severe pain in the first 24 hours after hospital discharge was insufficient pain control during the first hours following surgery [29], pointing out the importance of aggressively managing pain early in the post-operative period.

A multimodal pain control approach is essential in modern AS. Pain management in AS based on paracetamol, non-steroidal anti-inflammatory drugs, local anaesthetics and other non-pharmacological techniques, in combination with the appropriate use of opioids, should be used to improve patient comfort and achieve better day surgery outcomes (see Chapter 9).

### ***Post-operative nausea and vomiting***

Post-operative nausea and vomiting (PONV) is one of the most unpleasant experiences associated with anaesthesia. It represents a frequent cause of patient dissatisfaction [20,21] and many patients are theoretically willing to pay a considerable amount of money (US\$ 61 – US\$ 113) to get a “totally effective antiemetic” [30]. The occurrence of PONV can be of central importance in the day case setting, as it can cause delays in patient turnover, affect length of stay, require additional nursing time to care for affected patients [31], delay discharge, and increase rates of unanticipated hospital admission [13]. Vomiting may also be associated with more serious outcomes, including increased risk of aspiration and suture dehiscence, oesophageal rupture, subcutaneous emphysema, and bilateral pneumothoraces [32,33].

In spite of the recent developments of newer anaesthetic agents, the incidence of PONV can still be as high as 30% [34,35,36]. Multimodal management using a combination of drugs appears to be the best approach to minimize PONV [37]. Multifactorial causes are involved in PONV aetiology. Apfel *et al.* developed a simplified risk score for PONV [38] in order to determine the need for PONV prophylaxis: female sex, non-smoker, previous history of PONV or motion sickness, and anticipated use of post-operative opioids. Apfel *et al.* conducted a large clinical trial of 4,123 patients who had more than 40% risk of developing PONV, in order to compare antiemetic strategies [39]. They found that ondansetron, dexamethasone, and droperidol each reduced the risk of PONV by about 26%. Propofol reduced the risk by 19% and nitrogen by 12%. The authors concluded that because antiemetic interventions are similarly effective and act independently, the safest or least expensive should be used first. They recommend that prophylaxis is rarely warranted in low risk patients, single interventions may benefit moderate risk patients, and multiple interventions should be reserved for high risk patients. They have determined the estimated incidence of PONV after one, two, three or four drugs intervention in patients with 10%, 20%, 40%, 60% or 80% baseline risk for developing PONV, corresponding to 0, 1, 2, 3 or 4 PONV risk factors. For example, a single drug intervention in a patient with an 80% risk of PONV (4 risk factors) will reduce the risk to approximately 60%. Additional drugs will each reduce the incidence by an additional 26% of the remaining risk. Conversely, the absolute risk reduction in a patient with a baseline risk of 10% (no risk factors) is only about 3%; this

corresponds to a number needed to treat of about 40, which would probably not justify the expense and risk of prophylactic treatment. From the economic point of view it seems very sensible. The question is: “Should we apply this concept strategy whatever the surgical regimen (inpatient versus outpatient) used?”

Data from the author’s day surgery centre found a PONV incidence rate of 5.2% and 2.3% with the routine prophylactic use of one (low dose droperidol) or two drugs (low dose droperidol plus dexamethasone), respectively. There has been no unplanned overnight admission due to PONV since 2003. This antiemetic prophylaxis represents a € 1.3 increase in the cost per patient treated which seems irrelevant in the context of the total cost of treatment and the benefits obtained.

Hydration can have some impact on the incidence of drowsiness, dizziness and PONV as late as 24 hours after surgery. As in all types of surgery, day case anaesthesia needs appropriate pre-operative fasting. The American Society of Anesthesiologists has Practice Guidelines for pre-operative fasting that recommends patients without gastrointestinal disease should consume unlimited amounts of clear fluids until 2 hours before surgery (<http://www.asahq.org/publicationsAndServices/practiceparam.htm#fasting>, 1999). Early post-operative ambulation can emphasize the effects of dehydration. Several studies where patients were given higher volumes of isotonic solutions demonstrated a decreased incidence of thirst, drowsiness, dizziness and PONV [40,41], improving patient outcomes as a whole.

## B) Social Outcomes

As mortality and major morbidity are rare events in the day care setting, researchers have the opportunity to focus their attention on patient oriented outcomes. As stated by Deutsch *et al.*, “although clinical outcomes remain important, patients’ post-operative level of function, quality of life, and patient satisfaction are now being evaluated as valid measures of an intervention’s quality and efficacy” [42].

### Functional Health Status and Quality of Life

The great challenge for every clinical team after a surgical procedure is to facilitate the patient’s fastest possible return to their baseline function. This means that we are looking more and more to the patient’s functional health status and quality of life, avoiding all situations that can disturb the post-operative period and hinder the normal return to the basic activities of daily living (ADL).

Investigators have developed several tools to help measure and quantify patient recovery following AS. Myles *et al.* developed a patient orientated quality of recovery score (QoR

Score) after general anaesthesia and surgery in adults, valid and reliable in a large number of patients recovering from a diverse range of surgical procedures [43]. They were able to demonstrate a negative association between the QoR Score and known determinants of post-operative recovery (duration of surgery, time spent in the recovery room and duration of hospital stay). Hogue *et al.* constructed the “24-hour functional ability questionnaire” to measure final recovery and satisfaction 24 h after surgery [44]. This is a valid tool for use in the day case anaesthetic setting. The questions chosen for the questionnaire were those relevant and meaningful to patients and healthcare providers in the day case, general anaesthesia setting.

Other authors have investigated the relationship between the development of minor complications and the ability to resume normal ADL. Beauregard *et al.* studied the severity and impact of pain after day surgery [29], concluding that although pain decreased with time, it was severe enough to interfere with daily activities in a substantial number of patients. Carrol *et al.* reported that those patients who experienced post-discharge PONV (more than 35% of the 143 patients included) were not able to resume their normal daily activities as quickly as those who did not [45]. Swan *et al.* analysed the effect of 11 symptoms (based on the general symptom distress scale developed by Lalonde [46]) and functional status during the first seven days after AS [47]. They concluded that symptom distress persisted until the 7<sup>th</sup> post-operative day after AS for hernia repair and till the 4<sup>th</sup> post-operative day after laparoscopy. Patients experienced decreased functional status during the first 7 post-operative days, especially after hernia repair. Older laparoscopy patients tended to have more symptom distress and decreased functional status compared to younger patients. Only 22% of patients had returned to full or part-time work by the 7<sup>th</sup> post-operative day. This and other papers stressed the fact that although almost all patients do meet the criteria for home readiness shortly after procedures, very few patients are street fit and ready to go back to work until a couple of days, sometimes 1 or 2 weeks, or even later, post-operatively.

Some investigators have studied the impact of the anaesthetic technique on the daily activities of patients. McCartney *et al.* compared the efficacy of regional (axillary brachial plexus) and general anaesthesia for ambulatory hand surgery [48]. They found some early benefits before discharge for those patients who had regional anaesthesia, including less pain and opioid consumption, shorter stay in the PACU and less time in the hospital. However, there were no significant differences between the groups on post-operative days 1, 7 and 14 in relation to pain, opioid consumption, adverse effects, pain disability index [49] or satisfaction.

Functional health status and quality of life become very important outcomes for patients not only in relation to their physical and psychological recovery but also from the economic point of view, as they can be determinants in reaching the time for return to work. This last aspect can also be important for care providers and insurers.



## Patient Satisfaction

To further assess the global efficacy and quality of AS, there has been a movement to include patient satisfaction in outcomes research.

Patient satisfaction has many definitions, although the majority of authors avoid defining it. Fung *et al.* defined it as a patient's reaction to his or her care and is composed of both a cognitive evaluation and an emotional response [50]. For Tong *et al.* it is the "provider's success at meeting those client values which are matters on which the client is the ultimate authority" [51]. Put simply, patient satisfaction depends on the congruence between what patients expect and what occurs to them [50]; patients remain satisfied as long as there are no major discrepancies between what is expected and their actual experience [42]. Patients seem to be more concerned with the interpersonal skills of hospital staff (i.e., how nice the staff are to the patient) [65] than with their technical skills and competence, having sometimes difficulty in fully understanding or judging the care (outcomes) that they receive.

Patient satisfaction is quite difficult to measure. Such a subjective quality indicator depends on an individual patient's education, culture, background, and expectations or concerns, which makes its measurement and the interpretation of results very difficult. Many factors contribute to patient satisfaction, including accessibility and convenience of services, institutional structure, interpersonal relationships, competence of health professionals and a patient's own expectations and preferences [20].

Ware *et al.* developed a patient satisfaction questionnaire designed for ambulatory care including technical and interpersonal care dimensions [52]. As pointed out by Rudkin, patient satisfaction surveys must be performed in order to obtain comments from dissatisfied patients, explore the reasons for them and thus improve the quality of care [53]. Poor quality of care is related to reduced patient satisfaction, but high patient satisfaction scores are not equal to high quality day case services. It is known that most patient opinions are biased to please staff and to avoid criticism of the system for fear of jeopardizing their future care. Only a minority of patients are willing to criticise aspects of their treatment and thus problems are underestimated. By identifying and dealing with the areas for improvement highlighted by this minority, it is more than likely that the quality of care for the anonymous majority of patients can be improved.

Several studies show that there is higher patient satisfaction when some circumstances are achieved or avoided (see Table 1).

To have more complete and reliable results, feedback needs to assess all aspects of the quality of care that impinge on patient satisfaction: i) the structure of the institution or day surgery unit; ii) the process that enables the services to be delivered; iii) and the outcome. Data must be collected especially on two different occasions; one in the

immediate postoperative period (concerning the first 2 aspects) and the other later, around one month, to evaluate global patient satisfaction, including outcome. To have a real feedback of the final outcome, a long follow-up evaluation is important, – one year for surgery such as hernia repair. However, long term outcome assessment is important for every surgical regimen, inpatient or day surgery.

**Table 1** Factors related to higher patient satisfaction

Factors	References
Good post-operative pain control	20,21,29,52,54,55,56
No post-operative nausea and vomiting	21,21,30
Good pre- and post-operative information	57,58,59
Increased surgery availability and short waiting time before surgery	55,60,61,62,63
Avoiding longer operating room and post-anaesthetic care unit times	44
Courtesy of staff and friendly environment	64,65
Privacy within the day surgery facility	55,61,66
Avoidance of patients feeling that they are being discharged too early or rushed	67
Telephone follow-up contact on the next day	68

AS has been organised in a unique way around the patient, radically changing the healthcare system and the health professionals' behaviour. Seeking patients' opinions is obligatory for all day surgery units to improve their quality [51].

### C) Economic Outcomes

Costs within the health service have increased greatly in the last few years, representing almost 10% of the gross domestic product in the majority of the most developed countries of the world [69]. It is natural then to expect some pressure from healthcare management to control costs and to improve efficiency, to make this field more cost effective than before. Physicians are still expected to provide high quality treatment but now cost effectiveness is an important determinant. As a result, researchers have begun to include economic outcomes in their analyses of day case surgery, such as determining the cost effectiveness of certain drugs or devices, effects of recovery times on cost, and overall cost to society (such as lost time at work following surgery) [42]. This cost effectiveness analysis is a technique of economic evaluation designed to compare the costs and benefits of a healthcare intervention to assess whether it is worth implementing.

AS has been shown in several studies to save costs compared to inpatient surgery [70,71,72,73,74]. Nevertheless, we should not forget that in the majority of studies only direct medical costs are included. In fact, many direct non-medical and indirect costs are supported by the patient and his family [7], shifting costs from the hospital, insurance companies or third payers, towards them.

There are more costly new drugs with pharmacological profiles purporting to have fewer side effects or faster recovery and discharge times, and new devices (equipment, monitors) that help to achieve these goals. These drugs and devices propose to make medicine more effective and efficient, with an improved quality of treatment. Increasingly, many papers analyse the role, advantages and cost effectiveness of these new products.

Eger *et al.* developed the concept of “least anaesthetic” meaning by that the judicious use of newer drugs to minimize their cost without compromising the rate or quality of recovery [75]. It can simply apply to a particular form of an anaesthetic technique (i.e., local infiltration with monitored anaesthesia care versus a general anaesthetic), or may mean the delivery of the smallest effective dose (perhaps guided by anaesthetic monitors such as end-tidal analysers or brain function monitors), or even mean the use of adjuvant drugs in order to improve the outcome (i.e., the use of antiemetics). Applying this concept, Williams *et al.* proposed the use of nerve blocks for acute pain management in patients undergoing anterior cruciate ligament reconstruction in order to allow PACU bypass and reliable same day discharge [76]. In another study, Song *et al.* concluded that fast tracking (bypassing PACU) in their facility did not reduce nursing workload after AS nor affect overall costs, although it did decrease recovery time and maintain patient satisfaction [77]. The usefulness of fast tracking techniques can be questioned if they do not improve cost effectiveness.

Dolk *et al.* found inhalation anaesthesia to be cost effective for knee arthroscopy performed on a day surgery basis when compared to propofol [78]. The inhaled anaesthetic techniques with desflurane or sevoflurane were associated with 2-3 min shorter emergence times ( $P < 0.001$ ) and approximately 45% lower cost for consumed anaesthetics as compared with a propofol technique based on target controlled infusion. However, Elliot *et al.* concluded that total inhalational anaesthesia with sevoflurane was not cost effective for day surgery in adults or children due to the high rates of PONV in comparison to mixed anaesthesia regimens, where propofol was the induction agent followed by propofol, isoflurane or sevoflurane [79].

When comparing more recent drugs like remifentanyl and propofol, Eberhart *et al.* concluded that the higher acquisition costs of those intravenous anaesthetics could not be compensated for by an improved speed of recovery [80]. In fact this propofol-remifentanyl anaesthesia technique was more cost intensive than balanced anaesthesia using older drugs like isoflurane and alfentanil.

New brain monitoring devices (such as BIS, PSA or entropy) could be helpful in reducing anaesthetic consumption. Liu proved in a recent meta-analysis that although the use of BIS monitoring can modestly reduce anaesthetic consumption, the risk of PONV, and recovery room time, it did not reduce time spent in the day surgery unit (DSU). The BIS electrode costs exceeded any cost savings gained by the mentioned benefits [81].

In a comparison of costs and recovery profiles of three anaesthetic techniques for ambulatory anorectal surgery, Li *et al.* reported that the use of local anaesthesia with sedation was the most cost effective technique [82]. Not only did this anaesthetic technique have significantly lower costs than the other techniques (spinal subarachnoid block or general anaesthesia), but other clinical benefits (shorter anaesthesia time and home-readiness, fewer patients needing pain medication, more patients highly satisfied) were present as well. Comparing different anaesthetic techniques for ambulatory knee surgery Martikainen *et al.* found that general anaesthesia with sevoflurane was more cost effective than spinal anaesthesia with 2% lidocaine, due to a higher incidence of post-spinal headache with the latter technique [83].

Clinical pathways can have a substantial impact on the total cost of care. Calland *et al.* reported on a clinical pathway for laparoscopic cholecystectomy [84]. Use of the pathway led to an increase in these procedures that could be performed as a day case with a significant reduction in medical resource use, including a decrease in the length of stay and the total cost of care.

Further studies should be done in order to analyse the appropriate place of newer drugs and technology. With the majority of drugs about to lose their patent protection and be replaced by generic alternatives, reduction in the expense of anaesthesia in the near future can be expected.

## Clinical indicators

Clinical indicators are norms, criteria, standards and other direct qualitative and quantitative measures used in determining the quality of healthcare. They should occur sufficiently frequently and reflect an important aspect of quality. They also should be easy to define and to analyse.

The quality and safety of AS should be at least the same as that provided in overnight, acute bed hospitals, but there is evidence that the standards of care are higher in day surgery programmes. The establishment of a process for the assurance of high quality and safe standards of service in DSUs is essential. The identification of universally acceptable clinical indicators for quality assurance in AS is one of the most important goals of the International Association for Ambulatory Surgery (IAAS) and its materialization is one of the major achievements in ensuring high standards of care.

The clinical indicators shown in Table 2 have been derived from the Australian and French Clinical Indicators, and they are those recommended by the IAAS for Quality Assurance in AS [85]. In addition the American Society of Anesthesiologists has developed Outcome Indicators for Office-Based and Ambulatory Surgery that can be found at <http://www.asahq.org/publicationsAndServices/outcomeindicators.pdf>

**Table 2 Clinical Indicators for Ambulatory Surgery**

1. Cancellation of booked procedures	1.1. Failure to arrive at the DSU
	1.2. Cancellation after arrival at the DSU
2. Unplanned return to the operating room on the same day of surgery	
3. Unplanned overnight admission	
4. Unplanned return of the patient to a DSU / Hospital	4.1. < 24 hours
	4.2. > 24 hours and < 28 days
5. Unplanned readmission of the patient to a DSU / Hospital	5.1. < 24 hours
	5.2. > 24 hours and < 28 days
6. Patient Satisfaction	

DSU = Day Surgery Unit

### Cancellation of booked procedures

This indicator provides evidence of the effectiveness of the booking system in day surgery facilities. There are many causes for cancellation of booked procedures. Distinction must be made between cancellation due to failure to arrive and cancellation after arrival at the day surgery. Cancellations may be due to: i) pre-existing medical conditions; ii) an acute medical condition; iii) organisational reasons; iv) other reasons.

Cancelled elective surgical cases result in wasted operating room time and additional hospital expense. Additionally, there is staff demotivation and patient and family inconvenience.

There is little data in the literature describing the frequency of day surgery cancellation. Lacqua *et al.* reviewed 1,063 scheduled cases in a four month period that resulted in 17% (184) cancellations overall. There were 10% (56) day case cancellations, 30% (110) inpatient cancellations and 11% (18) cancellations after admission on the morning of surgery [86]. The authors stressed the importance of improving operating room utilization which could be done by, a more efficient clinical evaluation of the patient before scheduling, improved communication with patients about the proposed procedure and pre-operative preparation, and the avoidance of premature case booking before a complete patient evaluation.

The paediatric population is even more vulnerable to having their surgery postponed because they become ill more easily. Macarthur *et al.* reported a cancelled booked procedures percentage of 10.2% [87]. One hundred and six children out of 1,042 had their procedure cancelled, of which 4.9% (52) were considered preventable due to inadequate preparation of the children (n=38) or to healthcare inefficiency (n=14). Tait *et al.* designed a study to determine the cause and timing of case cancellation in a paediatric day surgical population [88]. The authors found that the majority of the children had their surgery cancelled due to upper respiratory infections (34.6%) or other medical reasons (30.7%). However, 34.7% were cancelled due to scheduling errors like surgery not needed, child had not fasted or difficulties with transportation. Interestingly, the majority of cases 58.3% were cancelled prior to their scheduled surgery date, making it possible to schedule other cases instead. 18.9% were cancelled on the day of surgery prior to leaving for the hospital and 22.8% were cancelled after arrival at the day surgery clinic.

Many systems have been developed in order to decrease the cancellations on the day of surgery. Nurse led pre-assessment supervised by consultant anaesthetists is one of them. Rai *et al.* described the organised nurse led pre-assessment based at an elective surgical centre [89] and found a much lower 5% cancellation rate on the day of surgery, compared to the cancellation rate of about 11% in the healthcare system as a whole. Questionnaires and telephone screening before arrival for AS can be another way to reduce the cancellation rate. Basu *et al.* reported a reduction to a 2.25% cancellation rate for the group that received a pre-operative assessment questionnaire 2 weeks before the expected procedure [90]. Patients were asked to return the questionnaire within 7 days, and contact the DSU if they needed to have their procedure re-scheduled. Those who failed to return the questionnaire were contacted by telephone during business hours, giving an overall figure of 533 (94%) patients contacted by either method. The 33 (6%) patients contacted who needed re-booking for personal commitments or were unsuitable for day care surgery had their places filled by other patients. Kleinfeldt found that pre-operative phone calls could reduce cancellations in paediatric day surgery [91]. She reported an 8% cancellation rate in patients who had been contacted by phone prior to the day of surgery in comparison with a 16.6% cancellation rate in the patients who had not.

The effectiveness and efficiency of a day surgery programme can be maximized by careful organization with appropriate selection, patient information, proper education, and the suitable preparation and assessment of patients (see Chapters 5 and 7).

The Australian Council on Healthcare Standards (ACHS) reported national data on this clinical indicator [92]. They found that the rate of patients who failed to arrive for surgery had decreased, from 1.38% in 1998 to 0.79% in 2003. They also noticed a slight decrease in cancellation after arrival at the day surgery centre, from 1.17% in 2001 to 1.03% in 2003. The main reasons for this cancellation rate were administrative and organisational.

## Unplanned return to the operating room

This clinical indicator may reflect possible problems in the performance of procedures. Since it is a rare event, only studies with large databases can provide reliable data. The ACHS reported national data which showed the unplanned return to the operating room rate stable at 0.04% for six years [92].

## Unplanned overnight admission

Other than using mortality to assess the overall safety and effectiveness of an AS programme, researchers have focused on the rate of hospital admission and recovery room length of stay (see below) as important outcome measures. Overall, the rate of unplanned overnight admission due to surgical, social or administrative, medical or anaesthetic complications averages 1% in most day case centres [42].

Gold *et al.* conducted a case controlled study of 9,616 adult patients who underwent AS to identify clinical and demographic risk factors for admission [13]. The rate of unplanned overnight admissions was 1.04% (100 admissions). These were due mainly to pain (18.6%), bleeding (18.6%) or intractable vomiting (17.5%). These authors found some factors that were independently associated with an increased likelihood of admission: general anaesthesia (odds ratio, 5.2), post-operative emesis (odds ratio, 3.0), lower abdominal and urological surgery (odds ratio, 2.9), time in the operating room greater than 1 hour (odds ratio, 2.7) and age (odds ratio, 2.6). They concluded that the likelihood of unplanned overnight admission is related more to the type of anaesthesia and surgical procedure rather than the patient's clinical characteristics.

Osborne *et al.* found a 1.34% unplanned overnight admission rate in 6,000 consecutive AS procedures [14]. Surgery related admissions (0.95%) exceeded those related to anaesthesia (0.13%), although pain was considered as a surgery related admission. Peri-operative complications related to surgery (1:105) were more frequent than those related to anaesthesia (1:176) and pre-existing medical problems (1:500). Greenburg *et al.* determined an unplanned overnight admission rate of 0.85% in 15,132 consecutive AS patients [15]. Although admission rates by specialty had some variation, no procedure had a higher risk. Pain, cardiopulmonary and bleeding problems as well as longer procedures than anticipated accounted for 73% of the admissions. Tham *et al.*, revealed a 1.5% unplanned overnight admission rate in 10,801 procedures performed on a day surgery basis [12]. Most of the admissions were surgery related (62.8%), followed by anaesthesia (12.2%), social (9.5%) and medical reasons (8.1%). These authors inferred that seventy-five percent of these admissions were potentially preventable. The majority were due to common problems like post-operative pain, surgical observation and social reasons. The non preventable causes were mainly due to unrelated medical problems.

Great difference in admission rates can be found in the literature. Margovsky found an unplanned overnight admission rate of 4.7% in 920 day cases [93]. The surgical, anaesthetic and social reasons accounted for 58%, 37% and 4.6% of the unplanned admissions, respectively. The highest rates of admission were for plastic and reconstructive surgery (12.8%) and orthopaedic surgery (7.5%). The authors proposed several reasons to explain their results: i) inappropriate patient selection; ii) underestimation of the disease process; iii) patients unfit for day surgery; iv) extension of the surgical procedure longer than expected. They proposed that monitoring unplanned overnight admission rates and correcting the aetiological causes will improve day surgery practice.

More complex surgery can lead to higher unplanned overnight admission rates. One example is ambulatory laparoscopic cholecystectomy. Lau *et al.* found an unplanned overnight admission rate of 4.5% in a retrospective analysis of 200 patients who underwent ambulatory laparoscopic cholecystectomy [94]. Uneventful recovery was attained in 92.5% (185) patients. Nine patients were admitted overnight after operation because of PONV (n=3), pain (n=2), urinary retention (n=2), medical observation (n=1) and patient's preference (n=1). These results compare favourably with data from other studies in which the admission rate ranged from 1% to 39%. Robinson *et al.* identified predictors of same day discharge failure in ambulatory laparoscopic cholecystectomy [95]. These authors found three factors that predicted more than 50% discharge failure: age more than 50 years, ASA class 3 or more, and surgery start time later than 1:00 PM. Another example of complex surgery is ambulatory microdiscectomy. Shaikh *et al.* reviewed 106 patients and only 6 required unanticipated admission (5.7%) [28]. Two patients were admitted due to PONV, one due to severe pain, one due to urinary retention and two due to dural tear. The authors pointed out the need for adequate peri-operative pain management and effective control of PONV in order to improve the outcome after ambulatory microdiscectomy.

Ear, nose and throat (ENT) procedures can expect higher unplanned overnight admission rates. Ganesan *et al.* reported 1.8% (29 patients) unexpected overnight admissions in a total of 1,642 patients who underwent ENT day surgery [16]. Twenty-four of these patients had undergone nasal surgery (representing 5.4% of all nasal procedures performed) and the cause of all these admissions was haemorrhage. Further analysis revealed 22 of these 24 nasal operations had included a septoplasty, which had an unexpected admission rate of 13.4%. Dornhoffer *et al.* also reported higher unplanned overnight admission rates (3.9%) in a study of 657 patients who underwent group II otological procedures (i.e., tympanoplasty with or without mastoidectomy, stapedotomy, and middle ear exploration) [96]. A significantly larger percentage of children were admitted than adults (5.7% vs 2.3%), primarily for nausea and vomiting. Three factors were significantly associated with unplanned admissions: the type of surgery (tympanomastoidectomy with ossicular reconstruction), the duration of general anaesthesia (more than 2 hours), and asthma as a coexisting condition.



In a study by Fortier *et al.*, 1.42% of 15,172 consecutive AS patients had an unplanned overnight admission [97]. Surgical, anaesthetic, social and medical reasons accounted for 38.1%, 25.1%, 19.5% and 17.2% of the unanticipated admissions, respectively. ENT patients had the highest unplanned overnight admission rate (18.2%), followed by urology (4.8%) and chronic pain block (3.9%). The predictive factors found were; male, ASA status II or III, long duration of surgery, surgery finishing after 3 PM, post-operative bleeding, excessive pain, nausea and vomiting, and excessive drowsiness or dizziness.

Unplanned overnight admissions will continue to occur with the further increase in day surgery practice, along with the growing complexity of procedures being performed and the higher risk patients being included in these programmes. If the rate of unplanned admissions can be kept at the same level, however, this will indicate an improved quality of surgical outcome.

Unplanned overnight admission rates and their causes should be continually evaluated in every day surgery programme, as a clinical indicator that may offer an opportunity for quality improvement and further programme development. A good example of ongoing evaluation is the national systematic data by the ACHS [92]. In its 5<sup>th</sup> edition, publishing data from 1998 till 2003, there has been a decline in the unplanned overnight admission rates: from 2.46% in 1998 to 1.75% in 2003 (16,101 patients admitted in a total of 922,083 day cases). The rates for the public sector were twice the rates for the private sector. However, the authors did not refer to the complexity of the type of surgery performed, differences in the patients' pathology or differences in the patient populations served.

### Unplanned return and readmission rates

Another important outcome measure in the day surgery setting is the hospital return and readmission rates. This data is difficult to evaluate because some studies do not differentiate between admissions (see unplanned overnight admission rates, above) and readmissions. It has been suggested that an acceptable readmission rate should be between 1 and 2% [98]. Mezei *et al.* in 17,638 consecutive patients undergoing AS found a total (complications of AS and unrelated to surgery) readmission rate of 1.1% [8] and a solely AS complication related readmission rate of 0.15% (1 in 678 procedures). The complication rate was significantly higher among patients undergoing transurethral resection of bladder tumour (5.7%).

Variations in returns or readmissions after AS are probably due to various factors including day surgery unit policies, specialty, age of patients and the level of primary care support available [56]. It is also critical to identify whether the unit intends to discharge all patients on the same day as its standard practice, or whether overnight stays are permitted. Therefore, there is a need to analyse the time when this return or readmission occurs.

More acute and emergency situations can be expected in the first 24 hours after surgery and more chronic complications after that period of time. Because of this the IAAS has recommended that the analysis of this clinical indicator should be divided into two: i) within the first 24 hours; and ii) after this period through 28 days after surgery.

In an extensive retrospective evaluation of returns or readmissions after same day surgery that included a total of 20,817 patients, Coley *et al.* found 1,195 patients that returned to the hospital within 30 days or were admitted directly after surgery (5.7%) [26]. Of these patients, 313 (1.5%) were directly related to the original AS procedure. Pain was the most commonly reported reason for return, occurring in 120 (38%) patients who had an unanticipated admission or readmission. General surgery, ENT and urology were the specialties that had the highest rate of unanticipated admissions and readmissions accounting for 3.2%, 3.1% and 2.9% respectively.

Some authors question the policy of conservative selection in order to guarantee low readmission rates. Sibbritt [99] discussed whether policies should be conservative in patient selection and achieve lower readmission rates or whether they should be more flexible and include more complex surgery and more risky patients, improving accessibility to AS programmes for more of society but with the risk of increasing readmission rates. He concluded that it may be more beneficial to the patient population if more patients are given access to day only treatment. It is important to define the admission/discharge goals of a unit in order to assess the impact on quality of the day surgery programme.

### **Patient satisfaction**

The high importance of this clinical indicator has already been discussed in this chapter. However, two further points should be made. First, even though more than 85% of patients report at least one minor sequelae from their day surgery, satisfaction ratings remain extremely high [100]. Secondly, good post-operative pain control, short waiting time before surgery, good pre- and post-operative patient information and the final outcome after surgery are among the top predictors of patient satisfaction. Bearing this in mind, all efforts should be undertaken in order to improve the overall quality of treatment offered to patients.

### **Delayed patient discharge**

This indicator usually refers to an unexpectedly prolonged period (sometimes defined as six hours or more) from the time of leaving the operating / procedure room to the time of patient discharge from the facility. It may reflect possible problems in the administration of anaesthesia or sedation, the selection of patients or other aspects of management in

a day procedure facility. Some issues should be discussed. First, there are procedures which need more time for patients to recover, making it difficult to decide which patients should really be included in this indicator. Second, it can create some pressure on patients and their relatives in order to be discharged from the DSU quickly. There is one additional factor related to social discharge. Some patients may choose to leave later in the day, to make it easier for their relatives to collect them after finishing their work. For these reasons, this clinical indicator is not recommended.

### Non-useful clinical indicators

There are other clinical indicators that for several reasons are not useful for monitoring daily practice. Being rare, not easy to define or even more difficult to collect, some indicators, as the ones that are described below, are not feasible to implement in DSUs. Mortality and major morbidity rates as well as rates of infections requiring antibiotics are two such categories.

## Conclusion

With the continuous growth of AS, evaluation of different outcomes becomes more and more important in order to achieve safe, effective and efficient high quality AS programmes. The introduction of clinical indicators in AS practice can have an important role in reaching these goals. Outcomes research into new developments in AS must continue in the future with the aim of ever improving the quality of patient care.

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# Freestanding Ambulatory Surgery Units

Kathy Bryant, JD

## Introduction

The use of freestanding ambulatory surgery units (FASUs) has expanded steadily since the first one was opened in Phoenix, Arizona in 1970. Today, there are approximately 4,300 FASUs, called ambulatory surgery centers (ASCs) in the USA [1], which will undertake more than 12 million procedures in 2005 [2]. Combining the delivery of high quality healthcare with a focus on business success has been a major factor in the growth of ASCs. Although business is integrally involved, the first ASC was conceived and developed by physician anaesthetists. Physicians continue to lead the industry both in terms of financing and operating ASCs.

## ASCs Today

Individual ASCs vary widely. Sixty per cent employ 20 or fewer employees [3]. Thirty-seven per cent have two or fewer operating rooms, and only 9% have seven or more [3]. Sixty-three per cent of ASCs offer services in multiple specialties, and 37% offer services in only one specialty. Single specialty ASCs are most frequently in ophthalmology or gastrointestinal endoscopy although orthopaedics is increasingly offered in single specialty ASCs. Patients treated in ASCs are most likely to be ASA physical status 1 or 2, although it is not unusual for ASCs to treat patients of ASA 3. Most are small businesses.

Nearly 80% of surgery in the USA is performed on an outpatient (ambulatory or day surgery) basis [4]. Although a key driver of the movement of procedures from an inpatient to an outpatient basis, ASCs are only one of the providers of outpatient surgery. The majority of outpatient surgery in the USA is performed in hospital outpatient departments and a significant amount occurs in physician offices.

Multiple factors contribute to the expanding use of ASCs, but none contributes more than physician dissatisfaction with hospitals. Physicians are frustrated with the increasing control of hospitals by business people, who often show little regard for physicians' needs in terms of operational and time saving efficiencies. Faced with decreasing reimbursement for their services, physicians are seeking ways to practice more efficiently, and ASCs offer them a tool to do so. By providing physicians a place to practice where their patients are extremely satisfied not only with the quality of healthcare received but also with the customer service and where physicians are controlling the operation, ASCs offer physicians an attractive alternative to hospitals.

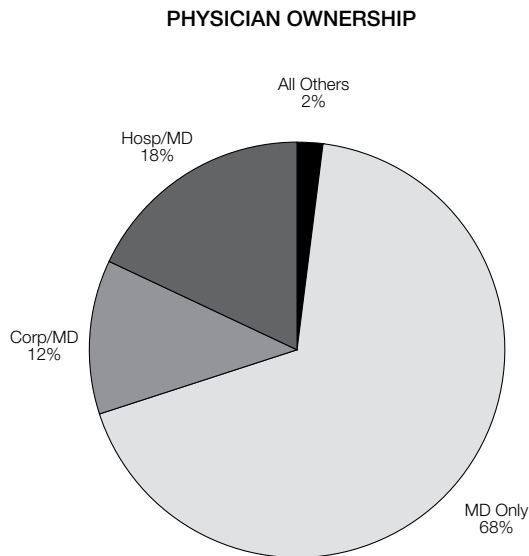
Address

Kathy Bryant, JD  
President  
Federated Ambulatory Surgery Association  
700 N Fairfax St #306  
Alexandria, VA 22314  
UNITED STATES OF AMERICA

Email: [kbryant@fasa.org](mailto:kbryant@fasa.org)

ASCs are so well received by physicians that most ASCs were and continue to be financed by physicians who risk their own personal finances to create an alternative to hospitals. Today, at least 90% of ASCs are financed, in whole or in part, by physicians [5]. With the success of ASCs, businesses (hospitals and ASC-specific companies) are now willing to finance a portion of some ASCs. Figure 1 shows the ownership interests of ASCs that have some degree of physician ownership.

**Figure 1** Ownership interests of Ambulatory Surgery Centers (ASCs) [6]



Although physician financing of ASCs is critical, many physicians who practice in ASCs are not owners. Non-owner physicians benefit from having an efficient place to practice and enjoy all the other benefits of the ASC, except as non-owners they do not share in the profits.

Like physicians, patients find surgery in ASCs an attractive alternative to surgery in hospitals. In the 1970s, healthcare lagged behind many industries in terms of customer service and satisfaction. Hospitals were organized primarily for their own convenience and, in the past, their only competition came from other hospitals with a similar approach to patients. Patients were taken for granted. The idea of competing on customer service was not widespread in healthcare. As ASCs developed, they demonstrated that they were at least as safe as hospitals. This was an essential element of ASCs' acceptance, but it was not enough. The cost savings ASCs offered were not enough either, so ASCs

offered patients excellent customer service and continue to excel in that area today. This means treating the patient as an invited guest rather than someone who has to be there and extending such operational courtesies as simply starting surgery on time and offering comfortable waiting rooms.

ASCs are one of the success stories of the USA healthcare industry. Most improvements in healthcare or customer satisfaction come at an increased cost. ASCs, on the other hand, offer patients and surgeons an improved place for surgery with at least equal, and often better, outcomes. This is achieved at a lower cost. Some might ask, with all these advantages why ASCs do not have an even larger market share. That answer lies in the design of the USA healthcare system.

The development of ASCs in some states has been limited by government regulation. For a twelve year period from the mid-seventies to the late-eighties, the federal government encouraged states to set up “health planning laws” that were designed to keep healthcare facilities from opening or offering expanded services unless the local government determined such a facility or services were needed. At that time, it was believed that duplicating costly equipment or having multiple healthcare facilities offering the same service drove up healthcare costs. The health planning laws were intended to avoid that. Over time health policy experts concluded that such laws do not help control healthcare costs and, in fact, drive them up. So, in 1986, the federal government stopped encouraging states to implement such laws. At that time, 49 of the 50 states had such laws. Since federal incentives for health planning were halted, many of these laws have been repealed, and today only about half of the states regulate ASC development. In states where such laws still exist, hospitals often attempt to use them to stop the state from approving the development of an ASC to protect themselves from competition. Where such laws exist, an ASC can spend more than \$250,000 just to obtain approval to build a facility.

The federal government’s 1982 decision to pay for ASC services under the Medicare programme, which provides health insurance coverage for the elderly and the disabled, was a key development in the expansion of ASCs. This decision not only offered ASCs access to Medicare beneficiaries, but also was viewed as a sign of acceptance of these relatively new facilities and encouraged other insurers to cover ASC services as well. The Medicare action played an important role in helping ASCs achieve a permanent place in the healthcare industry.

### **ASC Operations**

One of the keys to the financial success of ASCs today is a focus on efficient operations. Like physician offices, virtually all ASCs are private entities organized as for profit ventures. According to the American Hospital Association only 23% of hospitals are for profit entities. No data exist showing how successful ASCs are overall, but many are successful

and return profits regularly to their owners. Others barely break even and some ASCs fail. In large part, which ASCs succeed and which fail depends on how the business side of their operations is run.

### **Reimbursement**

To understand the business operation of ASCs, one needs a basic comprehension of the healthcare business in the USA. Usually, three separate reimbursements are provided for a surgical procedure – one for the surgeon, one for the anaesthetist and one for the facility where the procedure is performed. This is true for ASCs and hospitals. Each of these reimbursements is separate and generally is paid directly to the entity or person providing the service.

With the exception of cosmetic surgery, most surgical care is paid for by an insurer with some cost sharing from the patient. ASCs typically deal with several insurers, each of which has its own policies that must be followed to get paid. The rates paid also vary by insurer.

According to one ASC payer survey, ASCs provide significant care to Medicare beneficiaries and realize about 30% of their revenue from Medicare (FASA, unpublished data, 2003). Medicare pays the ASC 80% of a pre-determined rate (ranging from US\$ 333 to US\$ 1,339) for each procedure that is on a list of procedures that Medicare has agreed to reimburse in ASCs. The patient pays the remaining 20% (the surgeon and anaesthetist [if one is used] are paid a separate fee directly by Medicare). Medicare rates tend to be low for all providers but are even lower for ASCs than for other providers. On average, Medicare pays an ASC US\$ 320 less per claim than it pays a hospital for providing the same outpatient services [7].

Although the Medicare programme was a factor in ASCs' acceptance, it has failed to update its regulatory policies in a meaningful way, and today is a hindrance to ASC expansion. Medicare reimburses only for a select list of procedures that meet specified criteria. Over time this list has imposed major limitations on ASCs. Unlike other entities, Medicare limits ASCs to providing only surgical services and thus generally ASCs cannot offer patient services that might efficiently be provided in the same setting as surgery such as X-rays, laboratory services or physician consultations.

For most ASCs, a variety of non-governmental insurers will provide the bulk of revenues. Often insurers will reimburse only ASCs that have a contract with the insurer. In the contract, the ASC agrees to follow certain rules and the insurer agrees to pay a certain amount for each service provided. These rates are usually significantly below what the provider charges for the procedure but part of the agreement is not to bill the patient in excess of this amount. Negotiating these contracts with a variety of insurers is a major task for ASCs.

Despite the cost savings ASCs offer, some insurers refuse to contract with ASCs. This is

sometimes motivated by hospitals that offer insurers better rates if the insurer contracts only with the hospital for outpatient services. Should the insurer refusing to contract with the ASC cover a large portion of patients in a community, this can be a significant problem. To address this, some ASCs provide the care and bill the insurer in the absence of a contract. Generally, the insurer will either pay the ASC for the service directly or pay the patient, which allows the ASC to collect its payment from the patient. This is called providing “out-of-network services”. Normally, when a patient accesses an out-of-network provider, the patient’s contract with the insurer requires the patient to pay a higher co-payment for such services.

Workers’ compensation is an important source of payment for some ASCs, such as those specializing in pain management or orthopaedic cases. Workers’ compensation programmes are insurance programmes that compensate those injured at work. These are operated pursuant to rules established by the individual state governments. Although historically these programmes paid ASCs a percentage of their normal charge for a procedure, more and more of these are limiting the amount that will be paid. Increasingly such programmes are basing their payments on a percentage of Medicare payments as a way of containing costs.

Medicaid provides care to individuals who meet certain criteria, including low income. This programme is operated by the states and, thus, is different in each state. In some states, ASCs provide a fair amount of Medicaid care, and in other states, ASCs are not reimbursed for treating Medicaid patients.

The bottom line is that getting paid for the services they provide is complicated for ASCs and critical to an ASC’s success. Assuring adequate revenue requires the negotiation of good contracts, submitting appropriate and well documented claims in a timely manner and monitoring claims to assure that they are paid properly. It takes an average of about 59 days to get paid [8].

### **Efficient Use of Operating Rooms**

Given existing reimbursement limits, ASCs must operate efficiently to make a profit. Efficiency is also a major factor in attracting physicians to practice in ASCs. With reimbursement declining, physicians are pressured to use their time effectively. ASCs offer a big advantage as the average ASC will turn over operating rooms much more quickly than hospitals and, thus, the physician’s down time between procedures is reduced.

Efficient use of operating rooms requires highly motivated employees who can ensure that everything that is needed is ready when the procedure is scheduled to begin. ASC personnel understand that they must perform at a high level. ASCs are at the forefront of employee satisfaction and motivation to perform. Employees in an ASC understand that turning round operating rooms quickly and meeting the surgeons’ needs are keys to the

ASC's and their own success. Through cross training, employees can and do step in and perform jobs not normally theirs to assure goals are met.

Maintaining an operating room schedule also requires the cooperation of the surgeons. Through education and cajoling, surgeons are motivated to be in the ASC and ready to begin procedures at the scheduled start time. Starting cases on time is not a focus in hospitals, and thus, a much higher percentage of cases start on time in ASCs.

### **Scheduling**

One way for ASCs to maximize their profits is to keep their operating rooms busy during their hours of operation. To do this and to maintain the high rates of on time starts the ASC must schedule appropriately. This is accomplished by accurately projecting the time it will take a surgeon to complete a case and minimizing cancellations.

By keeping data about the operating time each physician who uses the ASC requires for particular procedures, the ASC scheduler can schedule appropriate operating room times for each particular physician. Although, upon occasion, emergencies or other situations cause a procedure to take longer than the allocated time, through good data collection, it is possible to estimate fairly accurately the actual time that will be used for a given procedure.

One method that contributes to efficiency in scheduling and has the added benefit of appealing to physicians is block time scheduling. This involves assigning a particular physician certain blocks of operating room time. The doctor can schedule his patients consecutively with only minimal down time between cases, maximizing the use of time. Sometimes the operating room slots are held only to a certain point (i.e., 72 hours prior) and then, if the block schedule has not been filled, are released for scheduling by other physicians.

Operations cancelled at the last minute are a major impediment to keeping operating rooms busy. ASCs strive to avoid last minute cancellations by assuring that the patient has all the appropriate pre-operative testing, that the results of these match the requirements for ASC surgery and that the individual's insurance paperwork is appropriately processed. Pre-operative screening may be undertaken by telephone or by a visit to the ASC prior to surgery. These screenings are usually conducted by a registered nurse. In some facilities, someone from the billing office places a separate call to gather any insurance information that is needed. Another purpose of pre-operative contact is to make sure that the patient is comfortable with the procedure that will be performed, understands pre-operative and post-operative instructions and has someone to look after them at home following surgery. Some ASCs have found that having patients actually visit the ASC for a pre-operative visit lessens the patients' anxiety and the likelihood that they will arrive late because they get lost on their way to the ASC.

### **Design**

An ASC's design contributes to its efficiency. In designing an efficient ASC, patient flow

and requiring limited staff movement to complete tasks are major considerations. For example, ASCs commonly design their facilities so that a pre-operative patient never sees a post-operative patient as they move through the facility. Not only does this provide for an efficient patient flow, it also avoids creating unnecessary anxiety for the patient about to have surgery. Figure 2 provides an example of a highly efficient two operating room facility. Figure 3 shows a typical four room facility performing procedures in multiple specialties.

A well designed ASC not only contributes to efficient operations but also reduces building costs. To control costs, ASCs strive to provide adequate space for operations without excess space. About half of ASCs have between 185 and 280 square metres per operating room [9]. The case mix affects the space required. When clinical personnel work with the architects designing the ASC, the ASC is more likely to successfully meet these goals. Other design issues are discussed in Chapter 3.

### **Equipment**

Selection of equipment is an important function of ASC operations as it is one of the determining factors for physicians choosing where to perform surgery. According to industry experts, about 20% to 25% of the expenses of opening an ASC is for the equipment, although this will vary based upon the specialties to be performed. Although equipment costs may be less of a concern for ASCs that are already operational, they are still important as about 10% of the average ASC's annual expenses go to the costs of equipment, rental, lease, depreciation and maintenance [10]. Further details of equipping freestanding units are to be found in Chapter 3.

### **Staffing**

Key functions within an ASC include overall administration of the facility, medical direction, nursing services and the business office. Staff are critical to the success of an ASC and account for 37% of the average ASC's costs (not including the costs of the physician who undertakes the procedure and the anaesthetist) [11]. The costs of staff average US\$ 381 per case [12].

The overall running of an ASC is usually handled by an administrator. The exact functions of this position vary, but in general, the administrator, sometimes called an executive director or chief operations officer, is responsible for overseeing the entire operation, including delivery of patient care, quality management, human resources, financial and business development, and regulatory and legal issues. The most common background of ASC administrators is nursing. Smaller ASCs are more likely to be run by nurses who can then fill in when needed in the operating room. ASC professionals can obtain a credential to demonstrate that they have the requisite knowledge for running an ASC. Since it became available in 2002, the CASC (Certified Administrator Surgery Center) credential has been awarded to more than 300 individuals.



Figure 2 International Surgery Center - Salisbury, MD - 2 O.R. | 1 Procedure Architect - Wade Taylor, AIA

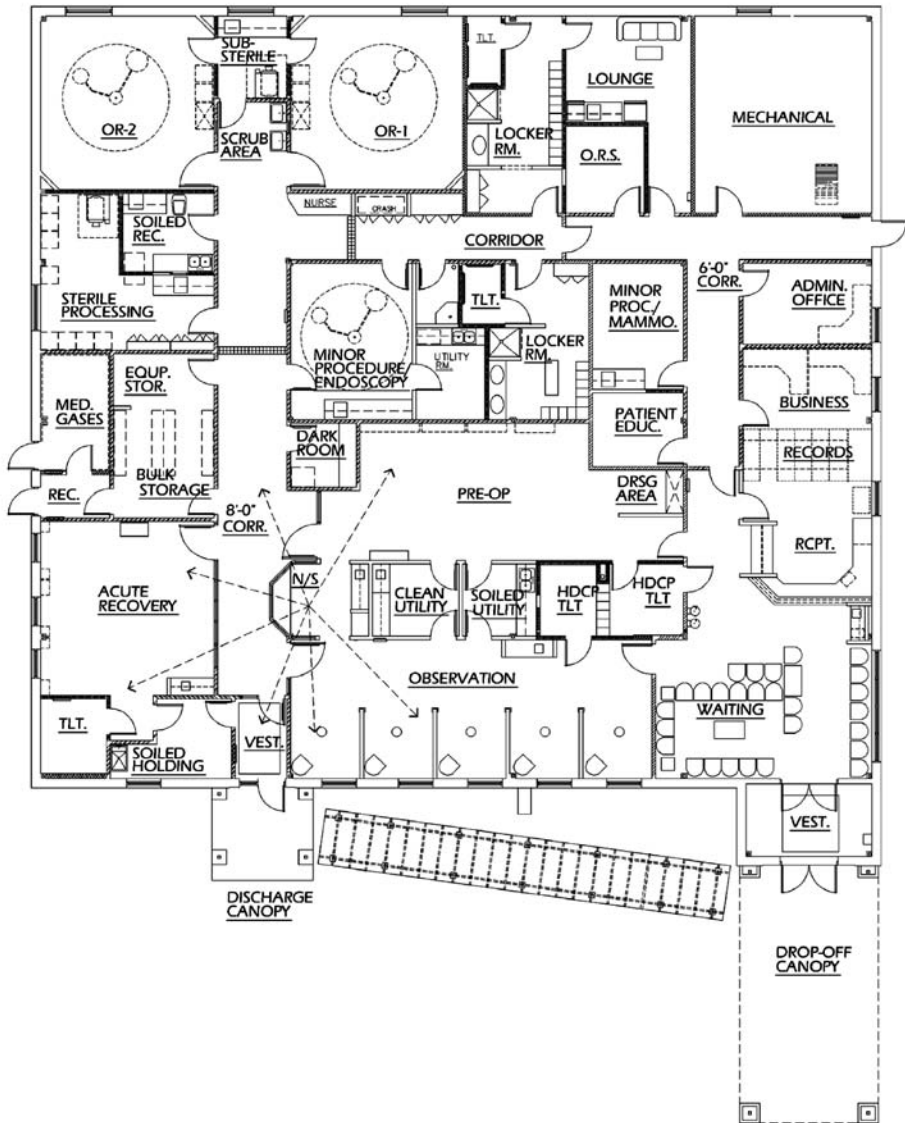
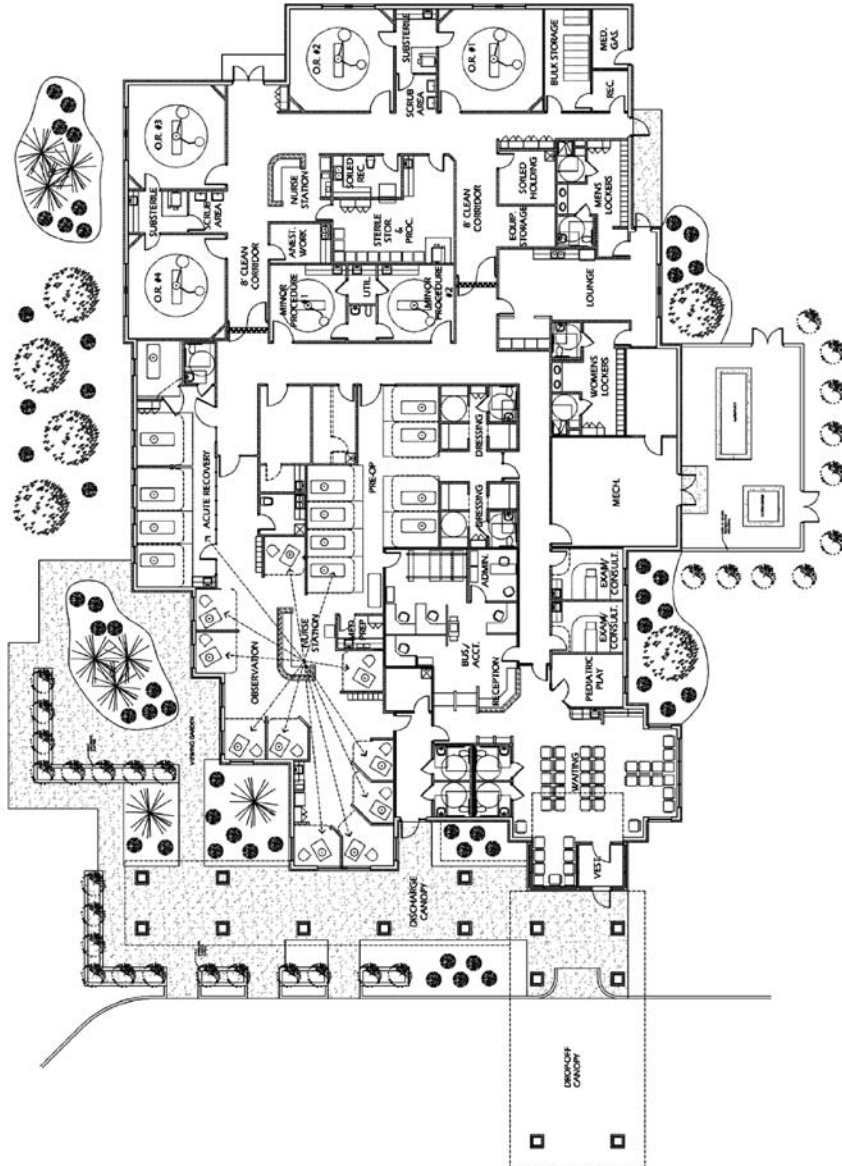


Figure 3 International Surgery Center - Howland - Modified  
Holanda, OH 4 O.R. / 2 Procedure  
Architect - Wade Taylor, AIA



A medical director has responsibilities including developing and making recommendations to the governing body on appropriate medical policies and overseeing the clinical aspects of care, such as what procedures will be performed, what patients are appropriate for the ASC and what policies need to be in place for treating patients with particular health issues. Medical directors are most often contracted to provide services to the ASC rather than being employees, but they can be part-time employees. Medical directors are usually anaesthetists although there are medical directors that come from all aspects of medicine. The medical director of a single specialty ASC is most likely to be a physician in that specialty.

A nurse manager is responsible for the ASC's day to day clinical activities. Such nurse managers are typically operating room nurses with some management experience but more importantly are results oriented individuals who grasp the objectives associated with operating a finely tuned outpatient surgical service.

Obtaining reimbursement on a timely basis is an important part of an ASC's operation. Doing this is typically the responsibility of the business office, which is headed by a business office manager. Working with the business office manager are coders, whose job it is to assure that the correct code for the service provided and ICD-9 diagnoses are appropriately assigned, and billers, whose job it is to assure that claims are completed and submitted appropriately and that reimbursement is received in a timely manner.

ASCs generally contract with an anaesthetic group that agrees to provide anaesthetic services for the ASC. The anaesthetic group submits its own bills to insurers. Occasionally, ASCs employ certified registered nurse anaesthetists (CRNAs).

A list of the typical positions in an ASC, brief position descriptions and related salary information is available in the 2004 ASC Employee Salary and Benefits Survey published by the Federated Ambulatory Surgery Association (FASA) [13].

### **Safety in ASCs**

From their inception, ASCs have focused on patient safety. Data show that ASCs are a safe place to have surgery. A 2005 report shows that 40% of ASCs did not have a single complication per 1,000 patient encounters in the quarter studied and 52% did not transfer even one patient to a hospital for any reason. Nearly 90% of ASCs report three or fewer infections per 1,000 patient encounters. One study shows that perforations during colonoscopy occurred in only 0.03% of cases [14].

Every study performed has shown that the quality of care delivered in ASCs is equal to or better than comparable hospital care. This success has been achieved through adherence to processes and standards that contribute to a safe environment. These are developed and enforced by different types of organizations. Major organizations impacting safety and the standards that result in this high level of safety are summarized below.

**Government Regulators.** The most basic guarantee of safety in an ASC is government regulation. Like most USA healthcare services, regulation of ASCs is primarily a state government responsibility, which means that 50 different regulatory schemes apply to ASCs. Although the regulations in each state are unique, there are some similarities. Virtually all states require ASCs to be licensed. Licensed ASCs are required to operate in accordance with state regulations that may specify such things as how the ASC can be operated, what procedures can be performed and how the facility must be designed. These state licensure requirements do not generally address specific clinical requirements but provide the framework and process that are likely to result in the delivery of quality healthcare. Some states limit which procedures can be performed in an ASC by limiting the number of hours that a patient may remain in an ASC. In Pennsylvania, for example, ASCs may only perform procedures for which anaesthesia lasts no more than four hours, while in Alabama patients can remain in the ASC for up to 12 hours (24 hours if special requirements are met). Limits may be placed on the types of procedures that can be performed. For example, in Tennessee ASCs are prohibited from performing procedures that generally result in extensive blood loss or involve a major invasion of a body cavity. Most states do not allow ASCs to perform emergency surgery. Usually, prior to issuance of a license, the ASC is inspected by a state official, called a surveyor, to verify that the ASC meets the specified criteria for being licensed. The license is generally good for a limited time period, usually a year. It must then be renewed. Renewal may involve a new inspection.

**Medicare.** At the federal level, the Medicare programme provides the primary regulation of ASCs. Technically, requirements apply only to ASCs providing treatment to Medicare beneficiaries, but most ASCs become Medicare certified and, thus, must comply with Medicare's requirements. Medicare reimburses for only a narrow range of services, but does not prevent Medicare certified ASCs from performing a wider range of services to other patients. Medicare certified ASCs must adhere to standards in 10 areas. These standards are called conditions of coverage, and are spelled out in about a dozen pages [15]. The areas they cover include compliance with state law, duties of the governing body, delivery of surgical services, evaluation of quality, physical environment, medical staff, nursing services, medical records, pharmaceutical services and laboratory and radiology services. As an example, the standard for physical environment [16] specifies that the following equipment must be available to all operating rooms: an emergency call system, oxygen, mechanical ventilatory assistance equipment including airways, manual breathing bag, and ventilator, cardiac defibrillator, cardiac monitoring equipment, tracheostomy set, laryngoscope and endotracheal tubes, suction equipment and emergency medical equipment and supplies.

These conditions of coverage describe key mechanisms that assure safety in an ASC. ASCs must verify to Medicare that they meet these standards before they can obtain Medicare certification. This is done through an inspection, called a survey, which is conducted by state officials or a private body approved by Medicare for such purposes. Once certified,

ASCs are required to meet these standards and any updates in the standards. Re-surveys can be conducted at any time to verify continual compliance with the standards.

**Accreditors.** Many ASCs go a step beyond what is required by government programmes and pursue private accreditation. Four private bodies offer accreditation to ASCs throughout the nation. Each of these bodies has its own set of standards that ASCs must meet in order for the ASC to be accredited. Each sends its own surveyor to confirm adherence to the standards before the facility is accredited. Accreditation is for a limited time, typically three years, and a then new survey is required to demonstrate continual compliance with the standards. Many of the standards are similar to those of Medicare but because they are continually being revised (usually annually) they are more up to date and may be more specific. The costs of private accreditation are paid entirely by the ASC. ASCs pursue private accreditation for varying reasons, such as to demonstrate quality to the public, to meet an insurance company requirement, to avoid a government survey or simply as an element of their quality programme.

**Insurers.** Like Medicare, private insurers must decide which healthcare facilities each will contract with. Historically, this has been based primarily on financial issues and the willingness of the ASC to accept reimbursement at the level offered by the insurer, but increasingly insurers are recognizing that contracting with healthcare providers that achieve certain standards may contribute to the insurer's success in the long run. Most that impose standards require that the ASC either be accredited or Medicare certified or both.

**Associations.** A multitude of associations contribute to the safety of care provided in an ASC. ASC specific associations, such as the FASA, contribute to safety primarily by providing education on appropriate techniques and policies and offers opportunities for networking with peers. Medical specialty organizations, such as the American Society of Cataract and Refractive Surgeons and the American College of Surgeons, set standards or practice guidelines for their members to follow in performing procedures, offer education and provide networking opportunities. For nurses, organizations, such as the Association of PeriOperative Registered Nurses (AORN) and the American Society of PeriAnesthesia Nurses (ASPAN) set standards, provide education and offer networking opportunities. Use of information from such associations assures that ASCs are following the most appropriate clinical standards.

### **Key Components of ASC Safety**

External entities such as those discussed above impact safety, however, the most important factors in realizing safety are those internal to the healthcare facility itself. These can be divided into four main categories – the facility, the medical personnel, the procedures performed and the patient selection. Tools used to measure and improve safety as well as those to guarantee appropriate policies when followed contribute significantly to the overall safe operation of a facility.

**Facility.** The physical environment in which care is provided has a major effect on safety and bodies regulating ASCs tend to have standards for the physical environment. At the most basic level, ASCs are required (as are most buildings in the USA) to meet standards set by the National Fire Protection Association. These standards are quite extensive, and an architect with expertise in healthcare is generally involved in designing an ASC to assure that the standards are met. But there are other aspects to the physical environment that affect safety, such as maintaining a sanitary environment to prevent the spread of infections. Medicare requires ASCs to have a programme for identifying and preventing infections.

**Medical Personnel.** An important component in assuring patient safety and delivering the highest quality of care is determining which healthcare professionals can provide services, what procedures they can perform and under what conditions. In the USA, this is done in hospitals and in ASCs through credentialing and privileging. Credentialing is the process of granting a healthcare professional the ability to provide services in the ASC and privileging defines which procedures they can perform there. Although usually done at the same time, they involve two distinct components. When credentialing healthcare professionals, the facility must verify that they meet the criteria for being on the facility's medical staff. For example, the ASC verifies that physicians have licenses to practice medicine and that they are board-certified in their specialty. Malpractice suits, state disciplinary actions, exclusions from participation in federal programmes, etc., are typically reviewed. This process must be conducted when the physician first joins the medical staff and periodically thereafter. After determining that a physician will be allowed to practice in an ASC, the ASC must determine which procedures they will be allowed to perform. This is specifically spelled out and will depend on the ASC's capabilities and on the physician's qualifications. This process must also be followed for all independent health practitioners, including podiatrists, certified registered nurse anaesthetists, oral surgeons and chiropractors.

**Procedures Performed.** As anaesthetic technique has improved and medical technology expanded, more and more procedures can be performed on an outpatient basis. Exactly what procedures can be performed in each facility is a function of the equipment and personnel available. Each ASC must make a determination of what procedures it will perform. The first consideration must be whether state law allows the procedure to be performed in ASCs. Regulations generally do not spell out specific procedures. Instead, they describe criteria that allow procedures to be performed in ASCs. These criteria vary significantly by state. After determining which procedures can legally be performed in an ASC, an ASC must choose which ones it will actually provide. This decision involves clinical factors and financial factors.

Procedures performed in ASCs involve local, conscious sedation and general anaesthesia. Some ASCs limit the procedures they perform to those that do not require general anaesthesia,

e.g. ophthalmic surgery or gastrointestinal endoscopy. The ASC's anaesthetists play a key role in safety by developing policies for which patients are appropriate for the type of anaesthesia that will be used by evaluating all patients prior to surgery to assure that they meet the standards and by evaluating all patients following surgery and prior to discharge to assure that it is appropriate for them to return home. Anaesthesia is delivered by physician anaesthetists or certified registered nurse anaesthetists. It is relatively common for registered nurses to administer conscious sedation under the supervision of a physician.

**Patient Selection.** Although most patients can undergo procedures safely in an ASC, the ASC must evaluate and set standards for what patients it can treat. Criteria for patient selection and the selection process are set out in Chapter 5. These will vary from one facility to another. Certain requirements will also vary from country to country. In the USA, Medicare requires that "A physician must examine the patient immediately before surgery to evaluate the risk of anesthesia and of the procedure to be performed" [17].

**Outcome monitoring.** Outcome monitoring and benchmarking against other similarly situated facilities play a major role in safety. Medicare and all major accrediting bodies require ASCs to engage in these kinds of programmes. The Accreditation Association for Ambulatory Health Care standards say, "Organizations will have in place a process to review key indicators in comparison with other similar organizations."

Almost 500 ASCs participate in FASA's outcomes monitoring project. It provides participating ASCs with quarterly comparisons of their performance to ASCs nationally and ASCs with similar characteristics. Operations, business and clinical indicators are included. For example, infection rates and complication rates are tracked [18].

**Discharge and Follow-up Care.** ASCs have policies outlining the criteria patients must meet before they can be discharged from the ASC. Discharge criteria are discussed in Chapter 11. In the USA, Medicare requires that "before discharge from the ASC, each patient must be evaluated by a physician for proper anesthesia recovery" [19].

As patients will be discharged to their home, the process for assuring that care is adequate begins with educating patients about what care they will need after leaving the ASC. Medicare conditions require that all patients are discharged in the company of a responsible adult, except those exempted by the attending physician [20]. Most ASCs require this for all patients receiving anaesthesia and ASCs often recommend that a responsible adult should stay with the patient overnight following surgery.

Usually, ASCs call their patients a day or two after surgery to assure that all is going well. 23.8% of ASCs reported contacting more than 99% percent of their patients within one business day of the patient encounter [21]. These calls are generally made by a registered

nurse so that any problems can be evaluated and the patient either given instructions as to how to deal with issues or recommendations to follow up with physicians.

When leaving the ASC, patients are told to call their physician if problems develop as it is the physician who must decide whether or not the problem requires medical attention and, if so, what site is most appropriate to provide the needed care. In the case of an emergency after being discharged to their home, patients are instructed to go to a hospital emergency room. Education prior to leaving the ASC regarding what to expect in terms of pain and the usual consequences of surgery assists patients in distinguishing what is a normal reaction to surgery and conditions that require follow up care.

**Transfers to Hospitals.** In ASCs, this is extremely rare. Fifty-two percent of ASCs indicated that they had a transfer rate for a calendar quarter of 0.00 per 1,000 patient encounters [22]. However, Medicare requires ASCs to either have an agreement with a local hospital regarding transfers (called a transfer agreement) or that all physicians performing procedures at the ASC have admitting privileges at a local hospital. When an emergency develops during surgery, it is generally dealt with in the ASC and, once the patient is stable, they are transferred to a local hospital for the necessary recuperative care.

## Future of ASCs

The ASC share of the healthcare market is likely to continue to grow over the next two decades. The demand for and success of ASCs is based upon several factors including the demand for surgery, physician desire to practice in ASCs, patient satisfaction with ASCs and the economic profitability of ASCs. Each of these factors is assessed below.

Overall USA surgical demand is projected to expand significantly over the next few decades. One projection suggests that ophthalmic surgery is projected to increase 15 per cent by 2010 and 47 per cent by 2020 [23]. Much of this expansion will be in outpatient surgery and, thus, the demand for services in ASCs can be expected to grow.

The reasons that physicians have found ASCs a desirable place to practice in the past – efficiency, equipment, staffing and services – will remain important factors in the future. In fact, the increasing surgical demand combined with an expected surgeon shortage mean surgeons will be even more pressed for time. This pressure to treat more patients will demand that surgeons operate as efficiently as possible and, thus, ASCs will be needed.

Not only is surgical growth projected in typically outpatient fields as noted above but incredible growth is also projected in typically inpatient fields such as cardiology [23]. With



hospital operating rooms being busier than ever, scheduling patients there will be more difficult and make ASCs desirable for patients and physicians who do not want to wait several weeks to schedule a procedure.

Increasingly patients in the USA are demanding more data on healthcare, including outcome and safety data. As these data demonstrate the excellent performance of ASCs and this information becomes more widely known, patients will be demanding that their surgery be performed in these settings. Similarly, as patients become more informed about the costs of procedures in various settings, ASCs will become more desirable.

The remaining question is will reimbursement and other factors make it economically desirable to operate ASCs. This is a much more difficult to assess. Medicare is expected to adopt a new payment system for ASCs in 2008. It is widely believed that this system will be based on the one currently used for hospital outpatient services. This would allow patients to compare costs and should encourage the use of ASCs. Over time the new reimbursement system should also improve reimbursement of ASCs. Reform in how Medicare determines which procedures it will reimburse ASCs for is also being promoted. Such a reform would expand access to ASCs. In addition to enhancing access and the profitability of treating Medicare patients, such changes would affect workers' compensation and private insurers that use Medicare as a model.

There are some developments that present challenges for ASCs in the future. A major one is efforts by hospital associations to prohibit physicians from being owners of ASCs. To date, the hospitals have had little success, and it is expected that such provisions will not be enacted, but the industry must be vigilant as enactment of such provisions would impose a major impediment to the advancement of ASCs. Physician leadership of ASCs is a major reason for their success.

Some states have recently questioned whether certain procedures should be performed in ASCs. One such example is a ban on performing laparoscopic cholecystectomy although a recent lawsuit has resulted in some ASCs being able to perform this procedure in Pennsylvania ASCs. Widespread contraction of the procedures that can be performed would limit the development of ASCs. Data that demonstrate safety in ASCs will help to stop such restrictions.

Another concern is increasing regulatory requirements that do not contribute to patient safety. For example, increasingly, states are imposing data collection and reporting requirements that increase operating costs.

The bottom line is that it appears that demand for ASCs will continue to grow. To meet this growing demand, ASCs will rise to meet the need. To continue to expand, ASCs will need to continue to operate efficiently and work extensively with regulatory bodies to

ensure that regulations are implemented only when they enhance patient safety. With a reasonable response to the challenges facing ASCs in the USA, the expansion of ASCs, the services they provide and the patients they serve is likely.

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# Office-based Surgery

Hugh Bartholomeusz, RFD, MB, BS, FRACS, Jost Brökelmann, MD, Jacky Reydelet, MD, and Paul E M Jarrett, MA, FRCS

## Introduction

Office-based surgery, as defined by the IAAS [1], refers to operations or procedures carried out in medical practitioners' professional premises which provide appropriately designed, equipped and serviced rooms for their safe performance. However, the precise understanding of the term and what it encompasses varies from country to country as does its popularity and regulation.

Over the last two decades there has been a shift in where surgery is undertaken. In 1981 in the USA 80% of surgery was performed on an inpatient basis. Of the 20% of day surgery procedures, 1% was performed in freestanding ambulatory surgery centres and 1% in physician office-based facilities [2]. By 1994, only 35% of patients were hospitalised and of the 65% treated as day cases, 12% were dealt with in freestanding units and 8% in office-based facilities. In 2001, 74% of surgery was undertaken on a day basis, 17% in freestanding and 14% in office-based units. At present it is estimated that in the USA about 24% of surgery is performed in physicians' offices: that is about 10 million procedures annually.

Overall day surgery rates in Germany are low compared to the USA but most of the day surgery that is performed is undertaken in physician owned office-based units. However, in many countries with good and growing day surgery rates, the office-based approach has yet to make any significant impact.

## Procedures performed in the office setting

In the early days, only minor procedures with or without local anaesthetic were carried out in physicians' offices. These included those listed in Appendix A. In recent years, more complex surgery has been undertaken in office-based facilities including hernia repair, varicose vein surgery, arthroscopy, fasciectomy for Dupuytren's contracture, carpal tunnel decompression, liposuction, augmentation and reduction mammoplasty, extraction of wisdom teeth, myringotomy, etc. Essentially, most procedures that are being undertaken today in day (ambulatory) surgery centres have been performed somewhere in an office-based facility. In 1997 in the USA the majority of office procedures were plastic surgery (70%) with the remaining mainly accounted for by dermatology, oral surgery, gynaecology, podiatry and ophthalmology [3]. In office-based plastic surgery, aesthetic surgery accounts

for the major part of the work. A survey of the members of the American Society for Aesthetic Plastic Surgery in 1994 found that 50% of surgeons surveyed operated in their office over half the time and 25% almost never performed aesthetic plastic surgery in a hospital [4]. Statistics released by the American Society for Aesthetic Plastic Surgery in 2000 showed that 53% of cosmetic procedures were performed in office-based surgical facilities. Cosmetic surgery dominates office-based practice in many countries. In Germany, perhaps because day surgery is mainly undertaken in physician owned facilities, a broad range of procedures in most specialities is undertaken in office-based units.

### **The reasons for office-based surgery**

The basic advantages of office-based surgery over inpatient surgery are the same as those for day surgery performed in hospital-based or freestanding units (see Chapter 1). However, well managed office surgery with an adequate workload can reduce the cost of procedures for patients when compared to larger freestanding day units. This is particularly attractive to self pay patients and is the reason why office-based surgery is popular in the fields of aesthetic plastic surgery and dental surgery. Because, in general, office facilities are smaller than freestanding units, they can be made more comfortable than their larger counterparts and can offer a more personal service to patients. Their smaller size also means that they can survive financially with a smaller population base and thus be more local to where patients live.

Office-based surgical facilities give the physicians that own them independence from corporate owned hospitals and day units and allow them to benefit from profits accruing from the facility as well as receiving their medical fees. Convenience and more effective use of time are also gains for surgeons using office-based operating facilities.

In some countries, office-based surgery has developed as it is the only way of providing private medical care. For instance, in Belgrade, Serbia, there is an excellent office-based unit undertaking mainly aesthetic and varicose vein surgery.

### **Safety of office-based surgery**

The main safety issues have focused on the use of intravenous sedation and general anaesthesia in office-based surgery. In the UK the Poswillo report on the use of sedation and general anaesthesia (GA) in dental surgery offices [5] revealed five deaths in 1987 (four GA and one sedation) and three deaths in 1988 (one GA and two sedation). Although the numbers were small any death following a simple dental procedure in an otherwise fit patient is a serious issue. Consequently since 2001 there have been essentially no general anaesthetic or intravenous sedation cases undertaken in dental surgeries. In

the USA the growth in office-based general anaesthesia has been accompanied by concerns for patient safety [6]. The survey of the members of the American Society for Aesthetic Plastic Surgery in 1994 revealed that during office surgery an anaesthetist was not present for about one third of the cases where patients received sedation or anaesthesia. Commonly the circulating nurse administered the drugs. 13% of patients suffered respiratory arrest and 1% died. 2% of those replying to the survey were the subject of malpractice claims related to adverse anaesthetic incidents [4]. One death for every 5,000 plus liposuction procedures performed in surgeons' offices in the USA has been reported [7]. In 2001, Domino reviewed the American Society of Anesthesiologists Closed Claims Project database comparing malpractice claims against anaesthetists following office-based anaesthesia and ambulatory surgery in other settings [8]. Although in the study the number of office-based claims was considerably less than the ambulatory surgery claims (partly due to the three to five year delay in claims being resolved) there were some interesting trends. The severity of claims for office-based surgery was greater. 64% of office-based claims were for death compared to 21% of ambulatory anaesthesia claims. More than 46% of office-based complications were judged to be preventable by better monitoring compared to only 13% in the ambulatory surgery group. In 2000, in Florida, the death rate per 100,000 procedures performed was 9.2 in offices and 0.78 in ambulatory surgery centres [9]. In a further study looking at Florida, an anaesthetist was present in only 15% of cases of death in office-based facilities [10]. In recent years, there was an approximately ten fold increased risk of adverse incidents and death in an office setting compared to an ambulatory surgical centre setting [9].

Problems in office-based surgery result from cutting corners and costs, no checks on whether surgeons are properly accredited for the procedures they undertake, an absence of registered specialist anaesthetists in all cases of general anaesthesia and intravenous sedation, a lack of audit of outcomes, surgeons working in relative isolation, inadequate facilities and patient monitoring, and an absence of standard setting, regulation, inspection and accreditation.

## Maximising safety in office-based surgery

Surgeons and anaesthetists working in office-based units should be fully registered and licensed to perform the procedures that they are undertaking. They should be no less qualified than those undertaking the same procedures in hospitals. All staff in the unit should be trained in basic cardiopulmonary resuscitation procedures and conversant with the protocol for the management of a collapsed patient.

Many of the complications of office-based surgery are of an anaesthetic nature. These are reduced when a qualified anaesthetist (physician) is present. Where general anaesthesia is being used an anaesthetist must administer this in Germany. In the USA

the American Society of Anesthesiologists (ASA) believes that this is ideal [11]. However, the American Society for Aesthetic Plastic Surgery in its Office Surgery Guidelines states that general anaesthesia may be 'administered by a board certified anesthesiologist or a certified registered nurse anesthetist' [12]. There is no mention of physician anaesthetist supervision of the nurse anaesthetist though the ASA in its Guidelines for Ambulatory Anesthesia and Surgery, which also apply to office-based work, states that 'non physician anesthesia personnel' should be 'directed by an anesthesiologist' [13]. The greater incidence of anaesthetic complications in office-based general anaesthesia compared to general anaesthesia in an ambulatory surgery centre must surely dictate that all general anaesthesia in office facilities should be administered by, or at least supervised by, a specialist (physician) anaesthetist.

In general when local anaesthesia is used in an office setting there is no requirement for the presence of an anaesthetist [14] although in units in Germany there is no reimbursement for more complicated local anaesthetic blocks unless they are undertaken by an anaesthetist.

The guidelines for the management of sedation with or without local anaesthetic in office-based practice vary from country to country. There are three levels of sedation as defined by the American Society of Anesthesiologists [15]. The third level is deep sedation where airway intervention may be required and this should be managed by an anaesthetist. The lowest level is minimal sedation or anxiolysis and here appropriate monitoring by a suitably trained member of the theatre staff is all that is required after the surgeon has provided the sedation. The discrepancy in management is when moderate sedation is used which is usually achieved by means of an intravenous sedative. Problems may arise if due to patient reaction or inappropriate drug dosage the intended moderate sedation progresses to deep sedation. In Australia [14] and Germany guidelines state that where intravenous sedation is used an anaesthetist should be present. It would seem prudent in an office-based setting, where anaesthetic help is not readily available if something goes wrong, that an anaesthetist should be present when using intravenous sedation. However, in the USA this is not the case. The American Society of Anesthesiologists states only that 'physicians providing moderate sedation must be qualified to recognise 'deep' sedation, manage its consequences and adjust the level of sedation to a 'moderate' or lesser level' [16]. In the UK matters are worse. Intravenous sedation is used for a number of procedures but, with the exception of dental practitioners, the majority of practitioners administering it have not received any formal training in sedation [17].

To maximise safety in office-based work, the role of the anaesthetist may be extended over that expected in an ambulatory surgery centre [18]. This includes taking responsibility for the functioning of monitors and resuscitation equipment, the presence of an oxygen supply and suction, pharmaceuticals and a hospital transfer scheme in case of emergencies.

Patient selection criteria are similar to those for day surgery units though a little more limited. Some health regulatory authorities limit the selection of patients for office-based surgery [18].

The equipment required in an office-based unit is the same as that in a small freestanding day unit (see Chapter 3). Not only is it important that the staff are trained to use the equipment but that they actually use it when necessary. Lack of adequate monitoring has been highlighted as one of the causes of the higher claim rates for injury following office-based surgery compared to ambulatory surgery [8].

Many of the problems with office-based surgery in the USA have come about due to a lack of regulation. Currently only ten states (Arizona, California, Connecticut, Florida, New Jersey, New York, Ohio, Pennsylvania, Rhode Island and Texas) and the District of Columbia require the same standards and regulations in office-based units as they do in ambulatory surgery centres. Only a few states require the reporting of adverse events that occur in office surgery. The excellent and open 'Office-based Anesthesia and Surgery' patient education leaflet from the American Society of Anesthesiologists states that 'without minimum safety standards there is a chance that office-based surgery may be taking place in environments with limited or outdated equipment, few or no emergency resources, inadequately trained staff or insufficient safety precautions' [19].

In Germany the national health administration introduced legal requirements for quality assurance measures for day surgery which became active in January 1993, reinforced in 2004 (Law SGB V § 115b). The purpose of this is to bring the requirements for structure, staffing, equipment, and hygiene to the same level for office-based surgical facilities/freestanding surgical units as those for hospitals (see Appendix B). Following these guidelines, together with tough competition in quality between inpatient surgery in hospitals and office-based surgery, resulted in the very low overall complication rate of 0.65% in an office-based unit between 1992 and 2001 [20].

At present in Australia office-based surgery units are not required to be licensed or registered by government or health authorities nor is there an accreditation process for them.

Guidelines for the safe practice of office-based surgery have been produced by a number of national professional organisations. Good examples include those published by the Australian Day Surgery Council (local anaesthesia and local anaesthesia and sedation procedures only) [14], the Federation of State Medical Boards of the United States [21] and the American Society of Anesthesiologists [22].

Maximum patient safety will not be achieved until all office-based surgery units, just as hospitals and day surgery centres, are regulated and licensed based on guidelines laid



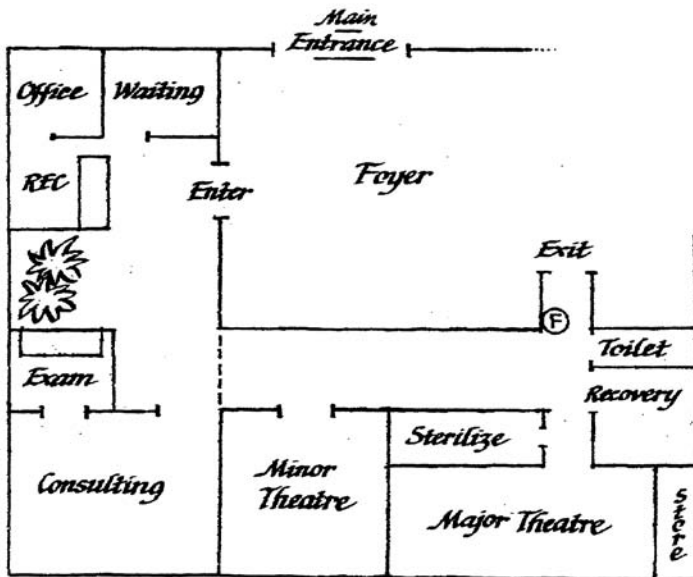
down by healthcare professionals. Until that time, there is a risk that financial gain may be put ahead of patient safety.

### Design issues for office-based units

The outcome quality of the surgery performed in office-based units depends mainly on the skills of the surgeons and anaesthetists working in them rather than the structural quality of the facility [23, 24]. Office-based units, in general terms, are scaled down versions of larger freestanding day units (see Chapter 3) that are attached to surgeons' offices. The actual requirements are dependent on the volume of work to be undertaken and the type of anaesthesia to be used.

In units only undertaking procedures under local anaesthetic the essentials are a dedicated procedure room, which is separated from any consulting room, and a recovery area which is not part of the general waiting room or office. The full requirements of such a unit are outlined in Appendix C and the design of a prototype unit is shown in Figure 1.

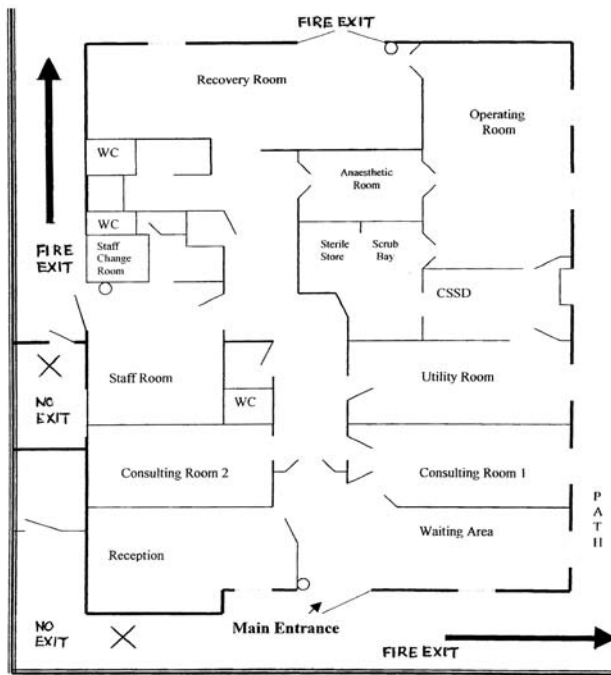
**Figure 1** Model Design of an Office-Based Surgery Facility Based on North Shore Plastic Surgery  
Total Area 100 sq/M



Where office-based units undertake procedures under sedation or sedation and local anaesthesia the facility should have pre- and post-operative holding areas, an adequate size procedure room, a recovery area and appropriate utility rooms. The total recommended requirements of such a unit are shown in Appendix D and a prototype design of such a facility is shown in Figure 2.

Figure 2

### Model Design of an Office-Based Surgery Facility Based on 'Tri Rhosen' Surgery

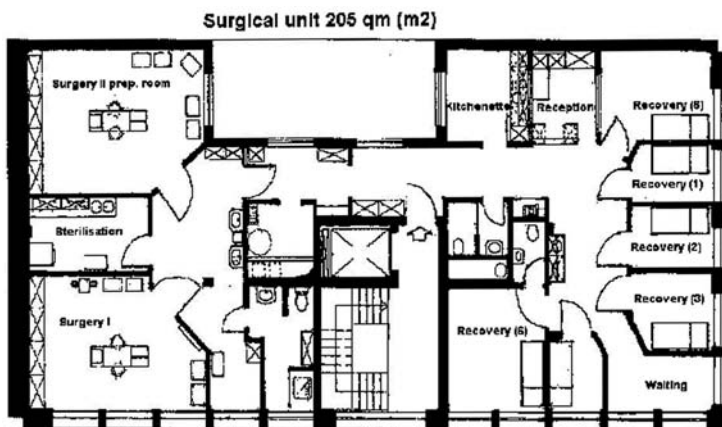


Units undertaking surgery under general anaesthesia should have the same facilities as a small self-contained day surgery unit (see Chapter 3). The quality of the surgery and anaesthesia should be the same as that in a hospital. In German units participation in a quality assurance programme is mandatory. Other features of this type of office-based unit in Germany are:

- The physician's office area and the operating area have to be separated by a lockable door.
- The preference is for patients to be cared for pre- and post-operatively in rooms with one to three bed trolleys rather than in larger rooms where bed trolleys are separated by curtains. It is believed that this affords patients more privacy.
- The size of the operating theatre may be from 20 square metres upwards. This is smaller than that recommended in many countries for operating theatres in self-contained day units. However, it is felt in Germany that well ventilated operating theatres of 21 square metres are sufficiently large in which to undertake hysterectomies and major breast surgery.
- Most of the personnel in the units are trained doctor's assistants some of whom hold special diplomas in ambulatory surgery. Two trained members of staff (doctor's assistant or nurse) plus one trainee and one anaesthetic nurse/assistant are required to staff the operating theatre. In the pre-operative/post-operative area one trained member of staff and one trainee are required per eight to ten patients.
- The average size of a one theatre operating area is approximately 200 square metres (Figure 3).

The minimally required infrastructure to provide day surgery in an office-based facility in Germany is listed in Appendix B.

**Figure 3** Model Design of an Office-Based Surgery Facility Based on "Gynecological Praxisklinik" Total Area 205 sq/M



Some office-based facilities in Germany offer extended recovery. Units undertaking this may be licensed as 'praxis clinics' if they can offer overnight stay with at least two beds,

the presence of at least one qualified nurse outside the normal office opening hours, the on-call availability of a responsible physician, adequate emergency equipment and procedures and washroom facilities.

## The future of office-based surgery

Office-based units differ from freestanding day units in two main ways:

- They are smaller than most freestanding units.
- They are attached to surgeons' offices which provide consulting facilities and often also other treatment eg. physiotherapy and investigative services eg. X-ray, ultrasound, blood tests, etc.

Office-based units thus have the potential to provide a full spectrum of treatment for patients both locally and in the minimum number of visits. This, combined with the ability to more easily manage small units tightly and thus make them financially competitive, will make office-based units increasingly attractive as funding based on diagnostic related group modelling is introduced. However, if this approach to treatment is to become more prevalent in the future it is essential that office-based units are properly regulated by appropriate licensing and accreditation, and monitored by means of quality assurance programmes and comparative audit in the same way as other day units and hospitals already are.

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## Appendix A – Minor Office Procedures

Curettage and cautery skin lesion.  
Excision/biopsy skin lesion.  
Drainage abscess.  
Temporal artery biopsy.  
Toenail surgery – simple and radical.  
Injection or banding of haemorrhoids.  
Rectal biopsies.  
De-roofing perianal haematoma.  
Injection varicose veins.  
Aspiration cysts, joints, cavities.  
Injection into joints.  
Fine needle aspiration cytology.  
Percutaneous biopsy.  
Insertion hormone or drug pellet.  
Vasectomy.  
Cystoscopy.  
Colposcopy.  
Change of plaster cast.

## Appendix B – Guidelines for Minimally Required Infrastructure to Perform Office-Based Surgery

To include procedures performed under general anaesthetic  
(Prepared by the German Bundesverband für Ambulantes Operieren (BAO))

### 1. Accreditation only for specialists

### 2. Structural requirements for an operating unit separated from the doctor's office

- Operating room
- Room for cleaning instruments and for sterilisation
- Changing room/area for staff
- Changing room/area for patients
- Room or area for surgical hand wash
- Clean and dirty utility rooms
- Recovery area/rooms for patients

### 3. Technical requirements

- Operating room: floor and walls easy to clean and decontaminate
- Professional operating room lighting
- Emergency lighting
- Standard ventilation of the operating room
- Equipment for surgical hand wash
- Equipment for resuscitation
- Cardio-pulmonary resuscitation trolley
- Operating table according to speciality
- Adequate surgical instruments
- Professional anaesthesia equipment
- Drugs for anaesthesia and resuscitation
- Theatre supplies (ie. NaCl infusion, sutures and dressing materials)
- Hygienic requirements: professional cleaning, disinfection and sterilisation [25, 26]
- Documentation of nosocomial infections
- Sterilisation – eg. autoclave

### 4. Organisation

- Constant availability of a surgeon/anaesthetist eg. via mobile telephone
- Proper documentation of pre-, intra-, and post-operative medical diagnoses and treatment
- Co-ordination between all physicians involved in the case
- Arrangements for emergency transfer to a surgical unit (hospital)

### 5. *Patients*

- Selection of patient including pre-operative assessment
- Admission arrangements and instructions eg. fasting, medication etc
- Discharge arrangements including medical follow-up and emergency contacts
- Warning regarding driving, alcohol, machinery etc.

The above guidelines should be interpreted as principles only. They are not prescriptive or all inclusive. Details and usage are the responsibility of national and/or local accrediting or licensing bodies or individual physicians.



## Appendix C – Guidelines for Office-Based Surgery

Procedures performed under local anaesthetic alone  
(Prepared by the Australian Day Surgery Council [14])

### 1. Physical facilities

- (a) A dedicated procedure room, separate from any consulting room. This room should contain:
  - Adequate lighting to allow the procedure to be performed safely.
  - Non-slip, non-carpeted flooring.
  - Adequate uncluttered floor space to access and perform resuscitation should this prove necessary.
- (b) A recovery area which is not part of the general waiting room or office.
- (c) Emergency lighting for the procedure room and recovery area.
- (d) Appropriate hand-washing facilities for pre-operative hand washing or scrub.
- (e) Regular and adequate cleaning.

### 2. Equipment requirements

- (a) An autoclave or access to sterile instruments from a sterile supply facility.
- (b) For an open procedure, proper provision for haemostasis should be available (eg. electrosurgical unit).
- (c) Disposable single-use items, including sterile gloves and drapes, ampoules of local anaesthetic, needles, syringes, scalpel blades, and suture material.
- (d) Resuscitation equipment including:
  - A supply of oxygen and suitable devices for the administration of oxygen to a spontaneously breathing patient.
  - A means of inflating the lungs with oxygen (eg. a range of pharyngeal airways and self-inflating bag suitable for artificial ventilation).
  - Adequate suction device.
  - Appropriate drugs for treating emergencies should include midazolam or diazepam, atropine and adrenaline.
  - A range of intravenous equipment.
  - Intravenous fluids and infusion sets.
  - Intravenous cannula.

### 3. Approved procedures for the sterilisation of equipment and the maintenance of sterile operative fields

- (a) Wherever possible single-use disposable items of equipment should be used, including syringes, needles and ampoules for injection. Any single-use article or instrument that has penetrated the skin, mucous membrane and/or tissue must be appropriately disposed of immediately after use or at the end of the procedure.
- (b) When re-usable items of equipment are used then provision must be made for:

- **Physical cleaning:** this is a process for the removal of micro-organisms and bio hazardous materials from the surface of an object. Thorough physical cleaning of instruments to remove blood and other debris is essential if effective disinfection or sterilisation is to occur. Such physical cleaning must always be performed prior to the disinfection/sterilisation process.
- **Disinfection:** this is the process of eliminating all micro-organisms other than bacterial spores.
- **Sterilisation:** this is a process to destroy all forms of microbial life, including bacterial spores. The most effective and reliable form of sterilisation is by steam under increased pressure (autoclaving). Australian Sterilising standards AS 4187 and Standards for Endoscopic Facilities and Services. All instruments, materials and medications introduced into the body tissue must be sterile. Such instruments may be pre-sterilised single-use items, or re-useable items, which have been sterilised before use. Instruments used for internal examinations of mucous membranes (eg. vaginal speculum, rigid sigmoidoscopes and flexible endoscopes) must not have the capacity to transfer harmful micro-organisms between patients. They must therefore be sterilised or disinfected.

- (c) All bio-chemical equipment must comply with Australian Standards AS-3551.
- (d) Sterile drapes where necessary.

#### 4. Staff

- (a) Clinical support and facility responsibilities should be provided by appropriately trained personnel. Office staff should not be seconded for this purpose.
- (b) All staff involved in the performance of procedures should have blood borne virus status assessed and maintain appropriate immunisation against Hepatitis B.
- (c) All staff should be familiar with procedures to be followed in the event of a needle stick injury, which should be carefully documented.
- (d) All staff should be trained in basic cardio-pulmonary resuscitation procedures and the checking of equipment and emergency drugs used for resuscitation purposes.
- (e) All staff must be conversant with a protocol for the management of patient collapse.

#### 5. Patient transfer

An arrangement should exist with a nearby accredited hospital for the transfer of patients in the event of unexpected serious or potentially serious developments.

#### 6. Medical records

- (a) An adequate anaesthetic and surgical record must be maintained. Separate documentation of each procedure should be maintained in a logbook, including date, time, duration, personnel involved in the procedure, and any associated problems or complications.
- (b) Follow up arrangements and post-operative wound care must be clearly outlined to the patient, and written confirmation when appropriate.

*7. Waste disposal*

Disposal of contaminated waste, including sharps, should be properly managed through an arrangement with a licensed contractor.

*8. General*

- (a) An appropriate management structure, which has the ability to address continuous quality improvement (CQI) issues.
- (b) Occupational health and safety guidelines for an operating theatre should be in place and followed. This should include fire safety and evacuation procedures.
- (c) Documentation of regular staff training in cardio-pulmonary resuscitation, the use of emergency drugs, the care and maintenance of equipment.

The above guidelines should be interpreted as principles only. They are not prescriptive or all inclusive. Details and usage are the responsibility of national and/or local accrediting or licensing bodies or individual physicians.

## Appendix D– Guidelines for Office-Based Surgery

Procedures performed under local anaesthetic and sedation or sedation alone  
(Prepared by the Australian Day Surgery Council [14])

Definition.

Sedation for diagnostic and surgical procedure (with or without local anaesthesia) includes the administration by any route or technique of all forms of drugs, which results in depression of the central nervous system.

All guidelines for procedures performed under local anaesthesia alone apply (see Appendix C). In addition the following guidelines apply:

### 1. *Physical facilities*

The complete facility should allow for:

- an admission and reception area;
- pre- and post-operative patient holding areas;
- appropriate utility room;
- toilets suitable for disabled persons;
- refreshment facilities;

### 2. *Procedure room*

- adequate size for procedure undertaken including adequate uncluttered floor space to perform resuscitation should this prove necessary;
- appropriate lighting, ventilation and suction;
- appropriate equipment for the procedure undertaken;
- an operating table or trolley which can be readily tilted;
- quality of staff appropriate to the procedure undertaken.

### 3. *Recovery room*

(a)

- closely related to the procedure room with adequate lighting and adequate uncluttered floor space to perform resuscitation should this prove necessary;
- comfortable reclining seating for patients to complete recovery prior to discharge;
- patients supervised by appropriately trained nursing staff;
- ready access to resuscitation equipment, including oxygen and suction;
- patients should not leave the recovery room unaccompanied.

(b) Discharge area should include:

- wheelchair access;
- vehicle access area;
- ambulance access.

#### 4. *Drugs and equipment*

- (a) A supply of oxygen and suitable devices for the administration of oxygen to a spontaneously breathing patient.
- (b) A means of inflating the lungs with oxygen (eg. a range of pharyngeal airways and self-inflating bag suitable for artificial ventilation).
- (c) Appropriate drugs for cardio-pulmonary resuscitation and a range of intravenous equipment. Emergency drugs should include at least the following:
  - adrenaline;
  - dextrose 50%;
  - lignocaine;
  - naloxone;
  - flumazenil.
- (d) A pulse oximeter: continuous patient monitoring by pulse oximetry is required when intravenous sedation is used. Equipment must alarm when certain set limits are exceeded.
- (e) Ready access to a defibrillator.
- (f) An adequate suction device.

#### 5. *Staff*

- Appropriately trained registered nurse should be present for theatre and/or recovery.
- There must be an appropriately trained assistant present during the procedure who shall monitor the level of consciousness and cardio-respiratory function of the patient and be competent in cardio-pulmonary resuscitation.
- The operator may provide non-intravenous sedation and be responsible for care of the patient provided rational communication to and from the patient is continuously possible during the procedure.
- If at any time rational communication is lost, then the operator must cease the procedure and devote his/her entire attention to monitoring and treating the patient until such time as another practitioner becomes available to monitor the patient and take responsibility for any further sedation, analgesia or resuscitation.
- If intravenous sedative drugs are being administered an anaesthetist should be present.
- If loss of consciousness or loss of rational communication is sought as part of the technique, then an appropriately trained anaesthetist must be present to care exclusively for the patient.
- Techniques, which compensate for anxiety or pain by means of heavy sedation, must not be used unless an anaesthetist is present.
- The practitioner administering the sedation drugs requires sufficient basic knowledge to be able to:
  - understand the actions of the drug or drugs being administered;
  - detect and manage appropriately any complications arising from these actions. In particular doctors administering sedation must be skilled in airway management and cardiovascular resuscitation;

- anticipate and manage appropriately the modification of these actions by any concurrent therapeutic regimen or disease process, which may be present.
- A written record of the dosages of drugs and the timing of their administration must be kept as part of the patient's records. Such entries should be made as near the time of administration of the drugs as possible.
- A policy and procedure manual should be available to all staff.

#### 6. *Patient assessment*

- (a) The patient should be assessed before the procedure. Documentation should include:
  - a concise medical history and examination (should include blood pressure measurement);
  - informed consent;
  - any instructions for preparation and discharge procedure.
- (b) If the patient has any serious medical condition or danger of airway compromise, or is a young child or is elderly, then an anaesthetist should be present to monitor the patient during the procedure.
- (c) Patient assessment can be assisted by:
  - a standardised anaesthesia questionnaire;
  - preliminary nurse assessment;
  - prior surgical referral in cases of doubt as to suitability for office-based surgery.
- (d) Patient information in an understandable written format must include:
  - general information about the processes followed in the office-based facility.
  - limited solid food may be taken up to six hours prior to sedation;
  - unsweetened clear fluids totalling not more than 200 ml/h may be taken up to three hours prior to sedation;
  - only medications or water ordered by the anaesthetist should be taken less than three hours prior to sedation;
  - an H<sub>2</sub>-receptor antagonist should be considered for patients with an increased risk of gastric regurgitation;
  - the guidelines may be modified in some patients, particularly infants and small children, on advice from the anaesthetist.

#### 7. *Selection guidelines*

- (a) Procedures suitable for office-based surgery include those with:
  - a minimal risk of peri-operative haemorrhage;
  - a minimal risk of post-operative airway compromise;
  - post-operative pain controllable by outpatient management techniques;
  - a rapid return to normal fluid and food intake.
- (b) Patient requirements for office-based surgery include:
  - a willingness to have the procedure performed together with an understanding of the process and ability to follow discharge instructions;

- physical status of ASA I or II. Medically stable ASA III or IV patients may be accepted for office-based surgery following consultations with the anaesthetist concerned.
  - In all cases, the ultimate decision as to the suitability of a patient for office-based surgery is that of the surgeon and/or anaesthetist. The decision as to the type of anaesthesia must remain in the province of the anaesthetist and will be based on surgical requirements, patient considerations, the experience of the anaesthetist and the facilities in the office-based surgery.
- (c) Social requirements for office-based surgery include:
- a responsible person able to transport the patient home in a suitable vehicle;
  - a responsible person at home for at least the first night after discharge from the facility;
  - a responsible person is an adult who understands the instructions given to them and is physically and mentally able to make the decisions for the patient's welfare when appropriate.

#### 8. Discharge

- The patient should be discharged only after an appropriate period of recovery and observation in the procedure room or in an adjacent area that is adequate equipped and staffed.
- Discharge of the patient should be authorised by the practitioner who administered the drugs, or another suitably qualified practitioner. The patient should be discharged into the care of a responsible adult to whom written instructions should be given. These should include emergency phone numbers.
- Should the need arise the patient must be transferred to appropriate medical care.

The above guidelines should be interpreted as principles only. They are not prescriptive or all inclusive. Details and usage are the responsibility of national and/or local accrediting or licensing bodies or individual physicians.

Pilar Rivas Lacarte, MD, PhD

## Introduction

The concept of quality in healthcare dates from the origins of medical practice. It is described in the *Egyptian Papyrus*, the *Hammurabi Codex*, and in *The Law* by Hippocrates. The main objectives of quality healthcare focus on best practice and quality care, the so-called ethics–quality binomial.

We understand that when we talk about quality we are referring to the capacity of a product or service to satisfy the needs of the consumer. Quality is a relative as opposed to an absolute attribute, and is subjective, being tied as it is to the service/client product binomial.

The following is a traditional classification of healthcare quality systems [1,2,3]:

- *Scientific-Technical* or *Physical Quality* refers to the care patients receive. It represents the professional point of view, and is established according to evidence-based decisions.
- *Functional* or *Interactive Quality* refers to the interpersonal component of the care process (patient–professional relationship), where the patient and their family judge the differences between expectations and reality.
- *Corporate Quality* corresponds to the image formed by patients, professionals, and the population in general of a health centre. Internal and external clients will be the judges.

Avedis Donabedian provided an essential contribution to the study of healthcare quality [4]. Being aware of the multi-factorial character of healthcare, Donabedian identified elements to be analysed when studying healthcare quality such as: a) the technical component or expression of the adequacy of healthcare; b) the interpersonal component, which expresses the patient – healthcare professional relationship; and c) the environmental component related to safety as an aspect of care. The analysis of methods was classified by Donabedian as follows:

- *Structure evaluation*, or analysis of resource quality, of which “a good structure makes a good product”, is the central theme. This is the basis of healthcare accreditation, improvement workgroups and certifications [5,6,7,8,9].
- *Process evaluation*, or analysis of methods quality, is a dynamic, indirect method. Conferences and meetings provide the usual mechanisms for detecting and



correcting errors. They include clinical practice guides, clinical pathways and all interventions in the process [10,11].

- *Results evaluation* or analysis of results quality is a direct, healthcare, quality evaluation system. Clinical indicators are provided by samples, as well as by questionnaires about satisfaction [12,13].

## History

The perception and analysis of quality have undergone numerous variations throughout time:

**1. Between 1850 and 1920.** This was the era of the precursors to individual quality and overall improvement. Efficacy was first considered by Nightingale, who studied mortality rates in patients admitted during the Crimean War. In her book *Notes on Nursing* [14], which refers to the structural conditions in which care is given, she established what could be understood as the first standards for nursing practice.

We owe the first programme of hospital standardisation, based on aspects of structure, organisation of personnel, work systems, clinical documentation and equipment to Codman [15]. Using this system, the Joint Commission (JCAHO) initiated the practice of accreditation. In its first investigation, only 89 of the 692 hospitals evaluated were found to be up to standard.

**2. Between 1920 and 1940,** Paul Lemboke, surgeon at John Hopkins University Medical School, developed a new quality evaluation method, the medical audit [16]. He established what were called “explicit criteria”, with a data collection system that included verification of the data, and that permitted comparisons between centres and professionals. The generalisation of the audit studies created a foundation for the development of in-centre clinical commissions based on classic staff work revision meetings.

**3. Between 1940 and 1960,** the modern Joint Commission was created and the foundations for the development of process methods were established. In 1951, 3,290 centres were reviewed, the work being funded exclusively by the American College of Surgeons. Given the high costs involved, the surgeons found themselves obliged to join forces with the American College of Physicians, the American Medical Association, the Canadian Medical Association and the American Hospital Association to form the Joint Commission on Accreditation of Hospitals (later named the Joint Commission on Accreditation of Health Organizations [JCAHO]).

**4. In the 1960s,** the internalisation of quality programmes and methodological classification took place. Quality programmes are associated with the financing of centres, stipulating that those hospitals that have achieved accreditation from JCAHO will be accepted for federal programmes that pay care for the elderly and the people with limited income

(Medicare and Medicaid). With that, accreditation, which previously had connotations of prestige, came to be a financial element.

**5. In the 1970s**, this decade saw the beginning of quality assurance, centred more on evaluation than on improvements. J. Williamson, introduced the concept of ABNA (*achievable benefit not achieved*) that measures the difference between the standards considered as desirable and the standards actually achieved. Kessner [17] proposed the *tracers system*, which evaluates global aspects of patient attention in highly prevalent pathologies (diabetes, hypertension, etc.). Gonella [18] proposed the *staging concept* that allowed expected results to be established according to the moment in which care is undertaken. Brook [19] showed the low correlation that existed between the process and the results of care in the long term control of patients. Hulka [20] evaluated the quality of the services rendered, including the opinion of the patients.

**6. In the 1980s**, the preference was for the control of costs. The federal prospective payment by Diagnosis Related Groups (DRGs) established a fixed reimbursement for each pathology, independent of the resources used. Monitoring systems, indicators and the influence and application of the health industry quality systems also appeared.

In 1986, the JCAHO established the standard to be implemented by their quality programme monitoring systems and their methodological development [21].

The JCAHO, in this sense, focused its strategy on the accreditation of different indicator systems, and not on the creation of their own system [22]. Australia, leaders in this field, developed advanced results indicator systems that allowed comparisons between centres [23].

The Accreditation Association for Ambulatory Health Care (AAAHC), formed in 1979, is the accrediting organization for non-hospital ambulatory healthcare, surgical and medical facilities. The American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF), established in 1980 by the aesthetic surgeons, now accredits a broad spectrum of ambulatory surgery practices.

**7. From the 1990s onwards**, the concepts of industry derived Continuous Quality Improvement (CQI) were applied, and clients began to participate in the process.

The concept of total quality involves the entire organization, the objective being to achieve quality at all levels and to change the traditional culture of health organizations. CQI, as adopted by the European Foundation for Quality Management's (EFQM) model [24,25], analyzed all aspects of a process, through an auto-evaluation, based on criteria and sub-criteria taken from the continuous improvement cycle, or PDCA. The PDCA cycle, developed by Shewhart and applied by Deming [26] means: *Plan (identify and analyse*

the problem), *Do* (develop and implement solutions), *Check* (evaluate the results), *Act* (Take appropriate action). Maintaining a complete CQI requires between 5 and 13 hours a week for each doctor.

The concern over the variability in medical practice in the 1980s led to the appearance, in the 1990s, of a) consensus panels, for procedural adoption [28], b) the application of *managed care* [29], aimed at moderating the demands placed on healthcare services (through a review of medical necessity, incentives to use certain providers and case management) c) the systematisation of scientific evidence, through the development of clinical practice guides, based on a meta-analysis of the available scientific evidence [30,31,32].

The fact that patients are given more information and responsibility in the decisions that concern them, as well as the existence, in the same society, of different ethnic groups or groups with very different and sometimes opposing preferences in healthcare, have obliged professionals to question the values on which their decisions are made. This questioning has consolidated bioethical methodology and will influence the redefinition of good practice criteria, management systems and the quality of healthcare in the coming decades.

## Accreditation

Accreditation is a *structure evaluation* or resource-quality analysis system. It is a voluntary process aimed at demonstrating significant achievements in relation to established, recognized healthcare standards. The characteristics of accreditation are that: a) it is a voluntary process, b) it is made by external, independent, trained surveyors, and c) the standards or criteria are applicable and public. Accreditation is a dynamic, periodic, healthcare quality process that demonstrates, with documented evidence, that a centre assures high quality healthcare. Accreditation is certified by an external, independent company in accordance with clear and recognised standards.

*Standards*, then, are the basis for health accreditation. A standard is a criterion that includes the actual knowledge in specific health concepts. A standard changes with technological advances and new techniques and is written in specific terms for specific situations, activities or objectives.

Standards are indicative, not prescriptive, and are evaluated through a points scale. They are grouped in sections or principal functions, and are divided into those of lesser or greater importance, establishing the minimum percentage that must be reached for each one, to achieve accreditation.

For example (according the Australian Standards)

Standard: Access, included in the function *Continuity of Care*

- Definition: The organisation is accessible to the community it serves.
- General Purpose: Give the best possible attention to the patient, determining their present and future needs.
- Specific Objective: That the unit/centre be accessible, and its services, those required by the community to which it lends those services.

In order to perform accreditation, a “Self-Assessment Manual” or an “Accreditation Standards Handbook” has to exist. Here, principal functions are identified, the standards for each one, their objectives and purposes, and the way in which they are evaluated. The manual should be a guide for all those who seek accreditation and should leave no question unanswered, including who and what is an accreditor and the methodology of accreditation.

In order for an ambulatory surgery centre to opt for accreditation, there are some requirements, established by each accreditation organisation, which must be met: a) It must be a formally organized and legally constituted centre, b) It must be operational and providing healthcare for a given minimum period, c) It must provide medical care under the supervision of a group of responsible physicians, d) It must operate according to bioethical principles, e) It must accept the survey’s instructions.

*Accreditation applications* can be first time, can be revisions (due to a previously denied accreditation), or periodic revisions of an already accredited unit/centre (in the time stipulated by the previous accreditation).

The result of accreditation is a ruling by the surveyors, based on the scores for the different standards. For JCAHO, the possible rulings are:

1. **Accreditation with Commendation.** Shows the highest level of compliance in all sections, without the accreditor having made suggestions.
2. **Simple Accreditation.** Accreditation that allows for the incorporation of suggestions, for improvements not affecting principle areas, that will be reviewed at the next visit.
3. **Provisional Accreditation.** The level of overall compliance is acceptable and the centre is accredited, but a shorter than usual period to the next visit is established, during which the deficiencies will have to have improved, or the accreditation will be withdrawn.
4. **Conditional Accreditation.** The unit/centre shows an acceptable level in almost all the standards, but some standards, considered essential, show deficiencies. The unit or establishment is not accredited immediately and a new time period is established, allowing for improvements until the next accreditation visit.

5. **Provisional Non-Accreditation.** The deficiencies in standards are important and the accreditation organisation wishes to decide between non-accreditation and conditional accreditation.

6. **Definitive Non-Accreditation.** The deficiencies are considered insurmountable.

7. **Non- accreditation (Adverse Decision).** Because the unit/centre retires voluntarily from the accreditation process, or renounces, even though accredited.

Accreditations are awarded for a defined or recommended period of time. At the end of this period, the process must be started again. Table 1 presents core functions according to the JCAHO, ACHS and the ASECMA.

Often there is confusion with respect to terminology that refers to other organisational evaluation systems, such as:

**1. Audit.** Audit is an evaluation process that is: a) initially inexpensive, b) obligatory, c) the auditors are guided by laws, d) the auditor applies personal and subjective criteria to compliance, with a “good” and “bad” list, e) the auditor does not necessarily have to be either external or independent, f) the auditor does not score the process.

**2. Authorisation.** Authorisation is a legal process that: a) takes place only once, b) it is for one activity and a specific centre, c) authorisation is awarded by the authorities or administrations according to specific laws. For example: authorise an institution to provide health services, or to a premises to sell food (licensing).

**3. Certification.** Certification is a system that arose: a) from industry, b) for process normalisation, i.e. all elements that arise from a production line are certified as having the same standards of quality. Certifications have only been applied to health in the last few decades, as is the case with the ISO standard.

## Clinical Pathways

To improve the management of some pathology, scientific societies often promote initiatives, recommendations, and guidelines based on the clinical experience of experts. These systems guarantee quality and efficiency. The need for consistency in clinical practice emerges because of the variability of clinical situations, differences in actual clinical practice between departments and centres, and in the use of healthcare resources [33,34].

One solution to this problem is the evidence-based integrated care pathway, also known as clinical pathways, care maps and multidisciplinary care pathways. These terms imply

**Table 1 Present core functions according to the JCAHO, ACHS and the ASECMA.**

<b>JCAHO: Joint Commission on the Accreditation of Hospitals</b>	<b>ACHS: Australian Council on Healthcare Standards</b>	<b>ASECMA: The Spanish Ambulatory Surgery Association</b>
<p>Patient centred functions:</p> <p>a) Rights of the patient and ethics of the organisation, b) Patient evaluation, c) Patient attention, d) Education, e) Continued Attention.</p>	<p>Continued Care:</p> <p>a) Access, b) Entry, c) Assessment, d) Care Planning, e) Implementation of Care, f) Evaluation, g) Separation, h) Community Management.</p>	<p>Patient Centred Functions:</p> <p>a) Rights of patients and ethics, b) Evaluation and quality of care provided, c) Continued care</p>
<p>Structures with important functions: a) Government, b) Upper management, c) Medical panel, d) Nursing.</p>	<p>Leadership and Management:</p> <p>a) Operation of the Governing Body , b) Patient/consumer Rights, Responsibilities and Ethical Issues, c) External Services</p>	<p>Structures with Important Functions:</p> <p>a) Governing Body, b) Managers, c) Medical Staff, d) Nursing Staff</p>
<p>Organisational functions: a) Improvement in the organisation's performance, b) Leadership, c) Management of the care surroundings, c) Management of human resources, d) Information management, e) Vigilance, prevention and control of infection.</p>	<p>Human Resources Management: a) Human Resources Planning, b) Staff Recruitment, Selection and Responsibilities, c) Staff Training and Development, d) Industrial Relations, e) Employee Assistance</p>	<p>Human Resources Management</p>
	<p>Information Management: a) Planning Information Management Systems, b) Data Leadership and Management, c) Data collection, aggregation and use, d) Records Management, e) Information Technology Management</p>	<p>Information</p> <p>Planning: a) Management Systems, b) Data Leadership and Management, c) Data collection, aggregation and use, d) Information Technology Management</p>
	<p>Safe Practice &amp; Environment:</p> <p>a) Consumer and Staff Safety, b) Infection Control, c) Equipment and supplies, d) Functional Design and Layout, e) Maintenance, f) Energy and Waste</p>	<p>Safe Practice and Environment: a) Consumer and Staff Safety, b) Infection Control, c) Equipment and supplies, d) Maintenance, e) Energy and Waste</p>
	<p>Improving Performance</p>	<p>Professional Improvement</p>

that documents are designed through consensus between multidisciplinary groups of professionals, are supported by meta-analysis and clinical trials, and include consistent results on which to base recommendations for treating a pathology or process. They follow the scientific model of accumulation of evidence, use of transparent methods, and production of reproducible results [35,36,37,38,39,40,41,42,43,44,45].

The first integrated clinical pathways were applied in 1980 by Zander at the New England Medical Center in Boston. They represented an operational version of guidelines. Guidelines, or protocols, define the attention and care that the patient should receive. Clinical pathways define when, how, and in which sequence attention and care must be given, and also specify the objectives of each phase. The techniques used in clinical pathways were developed using the same concepts that industry uses to develop a tool to identify different production process rates, in which any variation in the production process is considered sub-optimal. By defining the process, one can identify critical areas, measure variations, and make improvements. Once a phase is corrected to improve the process, it must be re-evaluated. If shown to be effective, the new process might reduce variation, time and cost of production, and might improve the quality of the product (PDCA cycle). However, when clinical guidelines are applied in the health field, not all variations in the pathway are negative. For example, a post-operative extubation at the time specified in a pathway can be dangerous for certain patients. That is why clinical pathways should not be introduced without considering individual differences between patients and a medical support plan.

Both protocols and clinical pathways must be updated when new evidence affects the efficacy of recommendations. In general, recommendations based on level I evidence will be stronger and more resistant to change, see Tables 2 and 3. Along with a thorough literature review, some authors recommend using sentinel markers to find evidence.

<b>Table 2 Classification of scientific evidence. Types of studies as a function of the quality of the scientific data.</b>	
<b>US Agency for Health Care Policy</b>	<b>Jovell et al</b>
Ia - Data from the meta-analysis of randomized controlled tests Ib - randomized controlled test IIa - Data from at least one nonrandomized controlled test IIb - Data from at least one quasi experimental test III - Data from descriptive studies (comparative, correlations, case-control studies) IV - Data from expert committee reports, opinions clinical experience	I - Meta-analyses of randomized controlled trials II - Large-sample randomized controlled trials III - Small-sample randomized controlled trials IV - Nonrandomized controlled prospective studies V - Nonrandomized controlled retrospective studies VI - Cohort studies VII - Case-control studies VIII - Descriptive studies, consensus studies, expert committees IX - Anecdotes, case reports

Despite these principles, not all clinical pathways meet the minimum criteria for quality. The US Institute of Medicine created the following attributes, approved by the international Appraisal of Guidelines for Research and Evaluation (AGREE) [46]: a) validity, application in the clinical context for which it was designed; b) viability, if the same methodology and source of evidence are used, the same clinical pathway is obtained; c) reproducibility, same results achieved by different healthcare personnel in similar health contexts; d) clinical applicability, in a defined clinical and population context; e) flexibility, ability to adapt it to different situations or exceptions; f) planned revision, according to a defined calendar; and g) documentation, by whom, how, and when the clinical pathway is applied.

**Table 3** Strength or magnitude of a recommendation of a function on the type of scientific evidence.

Strength or Magnitude of a Recommendation
A= Recommendation based directly on the meta-analysis of randomized control studies.
B= Recommendation based directly on the control studies or extrapolated from meta-analysis
C= Recommendation based directly on descriptive studies or extrapolated from control studies or meta-analysis
D= Recommendation based directly on the opinions or expert reports or extrapolated from descriptive studies, control studies or meta-analysis

When designing and developing the clinical guide, standard phases will be followed according to several models. For example the FOCUS-PDA17 model, which includes the following phases:

a) **Identification of the process.** To select the process, we will measure the frequency (volume), relevance (in terms of the demand for care), and predictability of the clinical course (low expected variability with adequate attention), which at present are highly variable between departments and centres.

b) **Organization of the work group.** The group must have a motivated leader, and an adequate number of collaborators to allow the group to be multidisciplinary and at the same time operate effectively.

c) **Clarification and simplification of the process:** This includes both the elaboration and the composition of the clinical guidelines, the design of which is based on the elaboration of a temporal pattern of activity and time. On the x-axis, we introduce time in daily columns and the patient location. On the y-axis, we include as many rows as actions, activities, medical treatments, nursing care, physical activity, diet, and other information as required.



d) **Introduction of the plan:** To propose and plan the improvements related to previous actions. We intend to systematize the clinical pathways to improve patient care as supported by the evidence. We intend to clearly define the sequence, duration, and responsibility of the different health professionals. We will also define the educational sequence of the patient and family. An attempt is made to: a) define treatment standards; b) limit the time and number of steps required for minimal process; c) reduce the number of forms required in the care process; d) reduce the frequency of adverse effects; e) reduce costs. The main objective is to achieve better control of the patient's illness and thus avoid re-admissions, unnecessary consultations, and the duplication of different care steps. In Tables 4, 5 and 6, we show an example of the design of three clinical pathways.

e) **Monitoring the results.** The fulfilment of the clinical guidelines must enable the evaluation of their efficacy by the measurement of specific indicators of care quality, as previously defined.

f) **Identification of strategies related to detected variations.** Identifying alternative strategies related to the observed variations. Clinical pathways are dynamic processes. After their initial introduction, we will record any disadvantages and conflicting details. The proposed corrections, supported by evidence, not just observations and anecdotes, will be evaluated by the group.

g) **Communication of the results.** We will communicate our findings to government, professional and scientific organizations.

Once the clinical pathway is designed and introduced, the values used are:

1. Related to the process. Adherence to the clinical pathway and the remaining variations are measured. A variation is the difference between what is projected or expected and what is achieved. This might involve things that have been, but do not now appear, in the description of the clinical pathway, those specified but not carried out, and any adverse events that occur.

2. Related to the clinical results. Staff and user satisfaction will be measured as previously described.

The analysis of the variations associated with the clinical pathway will be collected and studied by the group. If variations are very large, the clinical pathway will be reviewed and possibly redesigned.

For analysis and evaluation we will create a sheet that defines the indicators, criteria, and standards to be measured.

**Table 4 Tonsillectomy Clinical Pathway**

TONSILLECTOMY CLINICAL PATHWAY		Day X PreSurgical ENT Consult Date:	Day -14 to -1 PreSurgery Anaesthesia and Nursing Consult Date:	Day before Surgery Date:	AMBULATORY SURGERY AND RECOVERY Date:	Discharge	Day 1 to 15 after Surgery Date:
<b>ASSESSMENT AND CLINICAL ASSISTANCE</b>	<p><b>Surgeon:</b></p> <input type="checkbox"/> Preoperative ENT consult <input type="checkbox"/> Surgery Written Consent <input type="checkbox"/> Confirm Surgery <input type="checkbox"/> According ASA	<p><b>Anaesthesia:</b></p> <input type="checkbox"/> Visit and Physical Exam. <input type="checkbox"/> Check Preoperative tests <input type="checkbox"/> Anaesthesia Written Consent			<p><b>PreSurgical room Protocol</b></p> <input type="checkbox"/> PreSurgical room Protocol	<input type="checkbox"/> According Unit Protocol <input type="checkbox"/> ENT assistance <input type="checkbox"/> Nurse assistance <input type="checkbox"/> Anaesthesiast assistance	<p><b>Date:</b></p> <input type="checkbox"/> Surgeon assistance
<b>TEST</b>							
<b>MEDICAL TREATMENTS AND NURSING CARE</b>	<p><b>Nurse:</b></p> <input type="checkbox"/> Nursing clinical history <input type="checkbox"/> Vital signs <input type="checkbox"/> Weight: ___Kg <input type="checkbox"/> Height: ___cm <input type="checkbox"/> Preoperative protocol <input type="checkbox"/> Check Surgical Written Consent	<p><b>Nurse:</b></p> <input type="checkbox"/> Check Clinical History and Preoperative tests <input type="checkbox"/> Phone the patient: - remind presurgical treatments. <input type="checkbox"/> - remind admission AS unit time <input type="checkbox"/> - Check health status	<p><b>PRESURGICAL ROOM</b></p> <input type="checkbox"/> Vital signs <input type="checkbox"/> Check preSurgical Treatment <input type="checkbox"/> Diet check <input type="checkbox"/> I.V. route (18 G) <input type="checkbox"/> Midazolam	<p><b>OPERATING ROOM</b></p> <input type="checkbox"/> Decubitus <input type="checkbox"/> Vital signs <input type="checkbox"/> General Anaesthesia	<p><b>FIRST RECOVERY</b></p> <input type="checkbox"/> Vital signs <input type="checkbox"/> Special nurse for children	<input type="checkbox"/> Written PostSurgery information	<input type="checkbox"/> Phone 24 hours after surgery <input type="checkbox"/> Written Evaluation Register
<b>DRUGS</b>	<input type="checkbox"/> Anxiolytic and ranitidine the night before surgery if > 17 years old				<p><b>SECOND RECOVERY</b></p> <input type="checkbox"/> Vital signs <input type="checkbox"/> Remove I.V. route	<input type="checkbox"/> Oral analgesia Ibufrofen /10 mg/Kg/6h or diclofenac 50 mg/6h if > 17 years old <input type="checkbox"/> Anxiolytics first night after surgery if > 17 years old	
<b>ACTIVITY</b>	<input type="checkbox"/> Usual	<b>PATIENT IDENTIFICATION</b>			<input type="checkbox"/> Standard analgesia		<input type="checkbox"/> Usual
<b>NUTRITION</b>	<input type="checkbox"/> Usual <input type="checkbox"/> Nothing by mouth since midnight				<p><b>SECOND RECOVERY</b></p> <input type="checkbox"/> Relative relax. <input type="checkbox"/> Accompanying relatives <input type="checkbox"/> Walk 3 hours after surgery <input type="checkbox"/> Start liquid 2 hours after surgery	<input type="checkbox"/> Usual	<input type="checkbox"/> Usual
<b>PATIENT AND RELATIVES EDUCATION</b>	<input type="checkbox"/> General info from UCSJ (non Requiring Stay Unit) <input type="checkbox"/> Specific pamphlet about tonsillectomy	<input type="checkbox"/> PreSurgery drugs <input type="checkbox"/> PreSurgery instructions document <input type="checkbox"/> Pain assessment form			<input type="checkbox"/> Inform relatives after surgery	<input type="checkbox"/> Inform relatives <input type="checkbox"/> PostSurgery Instructions. <input type="checkbox"/> Nursing Form Discharge <input type="checkbox"/> Written inform about assistance <input type="checkbox"/> Administrative discharge	<input type="checkbox"/> Inform patient and relatives

**Table 5** Classical Herniorrhaphy Clinical Pathway

CLASSICAL HERNIORRHAPHY CLINICAL PATHWAY	Day X Surgeon Consult	Day -14 PreSurgery Anaesthetist Consult	Day -1 PreSurgery At Home	AMBULATORY SURGERY	Day 1 to 6 after Surgery	Day 7 after Surgery AS unit consult	Day 30 after Surgery Surgeon Consult
<b>ASSESSMENT AND CLINICAL ASSISTANCE</b>	<input type="checkbox"/> Pre-operative surgeon consult <input type="checkbox"/> AS evaluation criteria	<input type="checkbox"/> Anaesthetist visit <input type="checkbox"/> Check Pre-operative tests		<input type="checkbox"/> Check Pre-operative tests <input type="checkbox"/> Nursing clinical history	<input type="checkbox"/> Phone control 48 h after surgery	<input type="checkbox"/> Surgeon Assistance	<input type="checkbox"/> Surgeon Assistance
<b>TEST</b>	<input type="checkbox"/> Pre-operative tests						
<b>MEDICAL TREATMENTS AND NURSING CARE</b>	NO <input type="checkbox"/> At home Pre-operative treatment <input type="checkbox"/> Vital signs <input type="checkbox"/> Weight: ____ Kg <input type="checkbox"/> Height: ____ cm			<b>Pre-operative room</b> <input type="checkbox"/> Vital signs <input type="checkbox"/> I.V. route (16 G) <b>Recovery room</b> <input type="checkbox"/> Vital signs each hour	<input type="checkbox"/> Wash and topical wound care according to instructions	<input type="checkbox"/> Remove stitches	NO
<b>DRUGS</b>	NO	NO	<input type="checkbox"/> Diazepam 5 mg at 10 pm <input type="checkbox"/> Ranitidine 150 mg at 10 pm	<b>Pre-operative room</b> <input type="checkbox"/> Antibiotic Prophylaxis protocol <b>Recovery room</b> <input type="checkbox"/> Acetaminophen 2 g IV <input type="checkbox"/> IV fluid until nutrition tolerance	<input type="checkbox"/> Acetaminophen 1g (oral)	<input type="checkbox"/> Analgesia if needed	NO
<b>ACTIVITY</b>	<input type="checkbox"/> Usual	<input type="checkbox"/> Usual	<input type="checkbox"/> Usual	<input type="checkbox"/> Relative relax <input type="checkbox"/> Walk with help	<input type="checkbox"/> Walk, no physical effort	<input type="checkbox"/> Walk, no physical effort	<input type="checkbox"/> Usual
<b>NUTRITION</b>	<input type="checkbox"/> Usual	<input type="checkbox"/> Usual	<input type="checkbox"/> Usual <input type="checkbox"/> Nothing by mouth since midnight	Soft nutrition >>> normal	<input type="checkbox"/> Normal	<input type="checkbox"/> Normal	<input type="checkbox"/> Normal
<b>PATIENT AND RELATIVES EDUCATION</b>	<input type="checkbox"/> General info from UCSI (non Requiring Stay Surgical Unit) <input type="checkbox"/> Surgery written consent <input type="checkbox"/> Graphic information	<input type="checkbox"/> Anaesthesia written consent		<input type="checkbox"/> Inform relatives after surgery <input type="checkbox"/> Written inform about assistance <input type="checkbox"/> Administrative discharge		<input type="checkbox"/> Inform patient and relatives <input type="checkbox"/> Written inform about assistance <input type="checkbox"/> Administrative discharge	
<b>CRITERIA</b>	<input type="checkbox"/> According AS Protocol			<b>Discharge criteria:</b> spontaneous micturition, light pain, oral nutrition, wound satisfactory			<b>Discharge criteria:</b> Correct wound, no hernia appearance
<b>NOTES</b>							

**Table 6 Cataract Clinical Pathway (front side)**

PATIENT IDENTIFICATION:					
CATARACT CLINIC PATHWAY					
Right eye <input type="checkbox"/> Left eye <input type="checkbox"/>	Visit 1 3-4 Weeks preSurgery Date:	Visit 2 Anaesthesia evaluation Date:	Day before Surgery Date:	Surgery PreSurgery room Date:	
<b>ASSESSMENT AND CLINICAL ASSISTANCE</b>	Visit : <input type="checkbox"/> Assign date for Anaesthesia Evaluation <input type="checkbox"/> Haematologist if using oral anticoagulants <input type="checkbox"/> Biometry	<input type="checkbox"/> Physical exploration - Associated pathologies: <input type="checkbox"/> HT <input type="checkbox"/> Diabetes <input type="checkbox"/> Arrhythmia <input type="checkbox"/> ..... - Send request to: <input type="checkbox"/> Generalist Dr. (HT, DM) <input type="checkbox"/> Heart Dr. <input type="checkbox"/> Neurologist <input type="checkbox"/> Haematologist <input type="checkbox"/> ..... <input type="checkbox"/> Oral antiplatelet protocol		<input type="checkbox"/> Anaesthesia written consent <input type="checkbox"/> Surgical procedure was changed <input type="checkbox"/> Cancellation of Surgery	
<b>TEST</b>	<input type="checkbox"/> Chest X ray if >60 years old and known pathology <input type="checkbox"/> ECG if >40 years old <input type="checkbox"/> Analysis following ASA <input type="checkbox"/> Diabetes protocol, if need be			<input type="checkbox"/> TP if oral anticoagulants (<1.2) <input type="checkbox"/> Glicemia if DM (<250 mg/dl)	
<b>MEDICAL TREATMENTS AND NURSING CARE</b>		Weight: _____ Kg <input type="checkbox"/> Height: _____ cm Syst BP: _____ <input type="checkbox"/> Diast BP: _____ HR: _____ <input type="checkbox"/> Check clinical history and tests <input type="checkbox"/> Written consent for anaesthesia <input type="checkbox"/> Check tolerance to 'decubitus'	<input type="checkbox"/> Check Clinical History and Tests	<input type="checkbox"/> Route <input type="checkbox"/> SBP: <input type="checkbox"/> HR: <input type="checkbox"/> O <sub>2</sub> Sat: <input type="checkbox"/> Confirm administration of pre-surgery drugs <input type="checkbox"/> Povidone iodine 5% on eyelids <input type="checkbox"/> Anaesthesia: topical-retrobulbar-peribulbar <input type="checkbox"/> Honan Balloon	<input type="checkbox"/> Fasting <input type="checkbox"/> DBP: <input type="checkbox"/> O <sub>2</sub> Sat: <input type="checkbox"/> Confirm administration of pre-surgery drugs <input type="checkbox"/> Povidone iodine 5% on eyelids <input type="checkbox"/> Anaesthesia: topical-retrobulbar-peribulbar <input type="checkbox"/> Honan Balloon
<b>DRUGS</b>		<input type="checkbox"/> Regular (Anti-hypertensives, ...) <input type="checkbox"/> Pre-surgery drugs - - -		<input type="checkbox"/> Insulin NPH-mixard if G>150 : _____ u/l <input type="checkbox"/> Tropicamide (every 30' since 2h before S.) <input type="checkbox"/> Tropicamide <input type="checkbox"/> Phenylephrine <input type="checkbox"/> Cyclopegicis <input type="checkbox"/> Anaesthetic drops Pre-medication: <input type="checkbox"/> Midazolam <input type="checkbox"/> DHB <input type="checkbox"/> Atientanil <input type="checkbox"/> Acetaminophen	<input type="checkbox"/> Insulin NPH-mixard if G>150 : _____ u/l <input type="checkbox"/> Tropicamide (every 30' since 2h before S.) <input type="checkbox"/> Tropicamide <input type="checkbox"/> Phenylephrine <input type="checkbox"/> Cyclopegicis <input type="checkbox"/> Anaesthetic drops Pre-medication: <input type="checkbox"/> Midazolam <input type="checkbox"/> DHB <input type="checkbox"/> Atientanil <input type="checkbox"/> Acetaminophen
<b>PATIENT AND RELATIVES INFORMATION</b>	<input type="checkbox"/> General info from UCSJ (non Requiring Stay Surgical Unit) <input type="checkbox"/> Informative pamphlet about cataract surgery <input type="checkbox"/> Instructions on how to use topical eye drops <input type="checkbox"/> Things to do and not to do before the second visit <input type="checkbox"/> Special instructions for Diabetics and Hypertensives <input type="checkbox"/> Written Surgical consent	<input type="checkbox"/> Pre-surgery drugs <input type="checkbox"/> Pre-surgery instructions document <input type="checkbox"/> Pain assessment form	<input type="checkbox"/> Phone the patient to: <input type="checkbox"/> Confirm Surgery time <input type="checkbox"/> Remind instructions to patient: drugs, HTA drugs, DM, ... <input type="checkbox"/> Check health status	<input type="checkbox"/> An assistant for the patient exists	
<b>RELATED ISSUES</b>				Concordance to anesthetic plan: <input type="checkbox"/> YES <input type="checkbox"/> NO Eye preparation correct: <input type="checkbox"/> YES <input type="checkbox"/> NO Eye dilation correct: <input type="checkbox"/> YES <input type="checkbox"/> NO	

Table 6 Cataract Clinical Pathway (Back side)

CATARACT CLINICAL PATHWAY	Surgery Operating Room	Post Surgery First Recovery Room	Post Surgery Second Recovery Room	Post Surgery day 1 Date:	1 Week after surgery Date:	2 Months after surgery Date:
ASSESSMENT AND CLINICAL ASSISTANCE	<input type="checkbox"/> Surgery		<input type="checkbox"/> If required: admission to hospital	<input type="checkbox"/> Remove occlusion and lamp exploration <input type="checkbox"/> Check visual acuity	<input type="checkbox"/> Check visual acuity + IOP (optometrist) If Glaucoma or DM: <input type="checkbox"/> Check visual acuity + IOP (ophthalmologist)	<input type="checkbox"/> Check visual acuity <input type="checkbox"/> Remove stitches <input type="checkbox"/> Discharge procedure
TEST		<input type="checkbox"/> If DM, Glycemia mg/dl prescribe 8UJ fast Insuline				
MEDICAL TREATMENTS AND NURSING CARE	<input type="checkbox"/> Patient placement <input type="checkbox"/> Monitoring <input type="checkbox"/> Povidone iodine 5 % eyelids-eye-periorbit zone <input type="checkbox"/> Occlude eye <input type="checkbox"/> Check the correct sterilisation of equipment <input type="checkbox"/> Annotate IOL <input type="checkbox"/> Surgical template document	<input type="checkbox"/> Systolic BP <input type="checkbox"/> Diastolic BP <input type="checkbox"/> HR <input type="checkbox"/> O <sub>2</sub> Sat <input type="checkbox"/> EVA	If abnormal values in tests: <input type="checkbox"/> SBP: <input type="checkbox"/> DBP: <input type="checkbox"/> HR <input type="checkbox"/> O <sub>2</sub> Sat <input type="checkbox"/> EVA <input type="checkbox"/> Remove Route <input type="checkbox"/> Diet: juice, milk, yogurt, biscuits. <input type="checkbox"/> Diet for DM: milk and two toasts			
DRUGS	<input type="checkbox"/> Apply 'de'locl' cream before occlusion	<input type="checkbox"/> Acetaminophen 2g if necessary and not administered during pre-surgery	<input type="checkbox"/> Acetaminophen/8h <input type="checkbox"/> Regular Drugs if needed <input type="checkbox"/> Insulin NPH-mixtard if needed.	<input type="checkbox"/> Antibiotic drops + corticoid steroid every 3h	<input type="checkbox"/> Stop Antibiotic drops + corticoid steroid <input type="checkbox"/> Prednisolone drops for 4 weeks. Weekly reduction	
ACTIVITY		<input type="checkbox"/> Stand up during the 10 minutes after surgery	<input type="checkbox"/> Light exercise <input type="checkbox"/> Sitting (30 min.)	<input type="checkbox"/> Light exercise	<input type="checkbox"/> Usual	
PATIENT AND RELATIVES INFORMATION			<input type="checkbox"/> Inform relatives <input type="checkbox"/> Post-Surgery Instructions. <input type="checkbox"/> Discharge. <input type="checkbox"/> Nursing Form Discharge			
CRITERIA		If no incidences then transfer to Recovery Room	<b>Discharge if:</b> no pain and BP and HR in standard values. Patient accepts discharge			
RELATED ISSUES				Queratitis <input type="checkbox"/> YES <input type="checkbox"/> NO Uveitis <input type="checkbox"/> YES <input type="checkbox"/> NO		Cystic macular oedema: <input type="checkbox"/> YES <input type="checkbox"/> NO

For example:

Indicator of grade of fulfilment.

Criteria: The patients must be interviewed monthly.

Indicator:  $\frac{\text{The number of patients that come each month (month X) to be controlled}}{\text{number of patients included in the integrated care pathway}} \times 100$

Standard: 95%

## Indicators

An indicator (JCAHO: performance measure) is a quantitative tool, giving an objective value to a process, by measuring process results, functions, etc over time. It allows us therefore to measure and evaluate process evolution over time. It can be used for in-house comparisons and comparisons between centres. An indicator is not unchanging, but must last sufficient time for the comparisons over time to be relevant [47,48,49]. According to their characteristics, indicators are classified as:

1. Sentinel: Measures a serious, undesirable and often avoidable process or result. Its appearance requires a systematic revision of the whole process.
2. Index-based: Measures a care event that will require later evaluation only if a) the events index shows a significant tendency in time, b) exceeds established thresholds or c) shows significant differences on comparison with other services or institutions.
3. Tracer: Should be a category or typical diagnostic condition of a given medical speciality or an institution that reliably reflects overall care.

Indicators can also be divided according to the different events they measure: structure, process and result:

1. Structure or organisation indicators, e.g. implementation of the indicator.
2. Process indicators e.g. unsigned informed consents or bad indications in the ambulatory surgery circuit.
3. Results indicator e.g. suspension rate. A results indicator indicates the impact of procedures on the clients. These indicators can be influenced by factors beyond the control of the programme, such as the socio-economic characteristics of the client.

An indicator must have the following characteristics [50]: a) simplicity in application and execution, b) be apt for describing the observed effects, c) transmit the reality clearly, d) reproducibility or repetition of the same value in time, if the conditions are the same for

the same elements, e) sensitivity to the quality of the procedure executed, f) be specific, g) validity, given that they are based on scientific evidence and on expert consensus, g) be easily interpreted without the need for specific preparation, h) be universal, can be moved to other centres and i) ease of measurement.

One of the aims of the indicators is the measurement, detection and improvement of inadequate processes. For this to be possible, the steps are: a) the establishment of an indicator and its standard level, b) temporal control over time of said values, c) detection of inadequate or changing values, e) correction of the inadequacy of a value. To establish which are the inadequate areas it is necessary to have a complete description (map) of the process so that the “critical point” can be localised.

Another aim of indicators is a comparison with respect to themselves (temporal measurement of the data or process) and with respect to the other units of similar characteristics.

The creation of the indicators demands the prior existence of quality standards that can be met and measured. The structure of the indicators is based on knowing what has to be measured; therefore, one must begin by defining those terms. An example:

1. Give a name to the indicator: Failure rate.
2. Sphere of application: All patients operated on by the ambulatory surgery unit in the month of January for whatever procedure.
3. Area affected: Surgery Department.
4. Responsible for the indicator: Dr. Thomas
5. Objective of the indicator: To know the number of patients in which a surgical operation was not carried out, due to their cancellation in the 24 hours prior to the surgery.
6. Unit of measurement: Number of patients.
7. Periodicity: Monthly
8. Data source: List of activities, sheets collected...
9. Value / range desirable values: Rate of cancellations equal to or below.
10. Notes or explanations

The numerator for this indicator would be: the number of patients scheduled, but not operated on, and whose operation was cancelled in the 24 hours before the scheduled time; and the denominator would be: the total number of operations (of this DRG or other type of codification) performed in the unit or centre, in the period described (monthly).

The indicators related to ambulatory surgery appear in the literature from the 1960s on. Seen as the world leader in its field, the Australian accreditation system, proposed in 1986 and generalised institutionally in 1996 [20], has been reduced to 4 elements: a) cancelled operations (in the 24 hours prior to surgery, be it before or after admission to the unit), b) repeat operations, c) unexpected admissions and d) delayed discharge from the unit.

The American Society of Anesthesiologists has developed "Outcome Indicators for Office-Based and Ambulatory Surgery".

In Europe the use of indicators is still under development (see Chapter 12), but we can outline the proposals of the French Quality Group [51] and the Spanish Ambulatory Surgery Association (ASECMA) [52]. For the former these are: a) patients that do not go to their programmed operation, b) cancelled operations after patient admission, c) repeat surgery, d) unexpected re-admission to the same hospital, e) delayed admission to another hospital, f) delay in patient discharge, g) the necessity for unplanned patient care, after discharge. Those proposed by ASECMA are: a) suspension rate, b) immediate admission rate, c) post-operative time in the unit, d) substitution index.

## Conclusions

Analysis systems and quality measurements achieve:

1. The coordination of quality dimensions in healthcare that leads to optimal efficiency and satisfaction for both the professional (e.g., scientific technical quality, optimal performance, etc.) and the patient (information, continuous evaluation and cost management).
2. A guarantee of the objectivity of the healthcare activities and the evaluation of their standards.
3. The definition of the role of each professional, in each part of the process defined in the healthcare plan.
4. The systematisation of information and its relation to incidents and adverse events.
5. Professional confidence and security through evidence-based decisions.
6. Policies promoting the appropriate training and education of staff.
7. The adaptation and distribution of available resources to cover necessities.



## Acknowledgments

We would like to give our thanks for the work carried out by the accreditation group of ASECOMA (Dr. Ramón Gutiérrez, Dr. Alfredo Jiménez, Dr. Juan Marín, Dra. Adela Villoria, Dr. Jose Rebollar, Dra. Caterina Ramón †, and Dr. Pilar Rivas), the work of the clinical pathways group at the Hospital de Viladecans (Mr. Tomás Casasín, Dra. Ana Faura, Dra. M<sup>a</sup> Pilar Rivas, Mrs. Montserrat Santa-Olalla, Dr. Albert Sueiras and Dra. Cristina Vendrell), the financial support provided by the Fis (Health Research Council), and the collaboration of Mr. John Ward in the translation of this chapter.

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The IAAS was founded during the 1st International Congress on Ambulatory Surgery, Brussels, 1995.

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