



Core Topics in

# Operating Department Practice

Anaesthesia and Critical Care

Edited by

Brian Smith, Paul Rawling  
Paul Wicker and Chris Jones

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## Core Topics in Operating Department Practice

### Anaesthesia and Critical Care

Recent developments to medical career structures and roles and responsibilities have raised the profile of operating department practitioners (ODPs). Required knowledge is vast, and exams must be sat in working towards statutory registration. This is the first in a series of three books providing comprehensive information for health-care staff working in the operating department. Topics include anaesthesia, critical care, post-interventional care, enhancing care delivery, professional practice, leadership and resource management. The clear and concise format is ideally suited to study and qualification as well as continued reference during practice. Written by specialists with a wealth of knowledge and experience to offer, and incorporating problem-based learning from case studies, this book will be important for ODPs and theatre nurses throughout the UK, in Australia where the same structures have been adopted, and worldwide for all professionals working in operating departments.

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Critical Care

**Brian Smith**

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**Brian Smith, Paul Rawling,  
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*Liverpool 2006*



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## Foreword

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Most senior consultant anaesthetists will be able to recall times during their early careers when anaesthetic assistance in theatre could be described at best as rudimentary. There was often willing help for the anaesthetists but it was provided largely by those whose training, through no fault of their own, was negligible. It is true, of course, that the early anaesthetic assistants did not have to contend with the complex range of anaesthetic equipment that is now available, and it comes as a surprise to many, for instance, to learn that the use of pulse oximetry did not become routine in the operating theatre until the late 1980s. That chapters in this book include accounts of topics such as perioperative myocardial infarction, mechanical ventilation and awareness during anaesthesia indicates just how much progress has been made since those often unsatisfactory times. Further chapters on the development of a personal portfolio and on the implications of professional accountability also serve notice that the era of the Anaesthetic Practitioner is nigh: an era that the ODAs of twenty-five years ago could never have envisaged. The modern reality, finally, is that the theatre orderly of two or more decades ago is now a degree student, ODP, of whom is required an understanding of the basic sciences which underpin the safe practice of sophisticated modern anaesthesia. This book is the first of a series which should go much of the way towards fulfilling that ambition.

Dr. Simon Bricker  
Consultant Anaesthetist  
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## Preface

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Healthcare in the UK has experienced intense change over the past few years, much of which has been focused on the perioperative environment. The NHS Plan, introduced by the Labour government in 2000, was at the forefront of the modernisation of the UK's National Health Service. Focusing on major areas of concern, such as modernisation of the workforce, increasing patient choice, and increasing the efficiency and effectiveness of patient care, the government strategy to rebuild the NHS has affected every segment of the care sector.

Perioperative practitioners have responded to these pressures by re-examining professional boundaries and roles within perioperative care. As practice has advanced to meet these new challenges, new roles have developed, including for example, the surgical care practitioner, anaesthesia practitioner, and non-medical prescribing practitioners. These roles have the potential to increase the quality of patient care, as well as offering an opportunity for perioperative practitioners to extend their skills, knowledge, and competencies.

The intention is to provide a series of books exploring all aspects of core practice in perioperative care. This book, the first of the series, focuses on developments in anaesthetic practice.

For many anaesthetic practitioners<sup>1</sup> the thought of further professional development can be

<sup>1</sup> The term 'anaesthetic practitioner' depicts the role of either an operating department practitioner or a nurse acting as assistant to the anaesthetist.

daunting. The increasingly specialist area of anaesthetic practice has been mirrored by an increasing need for specialist knowledge. Consider, for example, the differing needs of a patient undergoing major vascular surgery, an elderly patient requiring hip arthroplasty and a young mother undergoing caesarean section under spinal anaesthesia. The advanced anaesthetic techniques available in a modern operating department mean that care for these groups of patients is vastly different.

The purpose of this book is therefore to support anaesthetic practitioners in the crucial process of professional development.

Key learning points are included at the beginning of each chapter to focus the reader on the main topics discussed. The editors have developed the content of this book to reflect current concerns in anaesthetic practice. The book does not try to cover the vast area of anaesthetic practice, instead it focuses on areas of concern where practitioners are developing new roles. The reader should draw on this publication as a key resource for contemporary practice and use it where fitting to apply theory into practice.

The book commences with introductory chapters looking at the advancing role of the anaesthetic practitioner and risk assessment in the anaesthetic environment. Risk assessment is seen as a core area of concern for anaesthetic practitioners because

of the high-risk environment where they deliver patient care.

The book continues by exploring core areas of developing practice, such as electrocardiogram monitoring, applying cricoid pressure, breathing systems, preventing awareness under anaesthesia and developments in resuscitation. The chapters offer knowledge and understanding of key clinical issues which affect practitioners' practice.

Later chapters of the book look at issues in advanced anaesthetic practice, for example, managing difficult intubations, understanding total intravenous anaesthesia and infusion pumps and anaesthesia for patients undergoing electroconvulsive therapy.

The last two chapters of the book explore professional anaesthetic practice in relation to continual professional development – accountability and learning from practice through reflection and portfolio development.

It is at this point of great changes in anaesthetic practice that we offer this textbook, developed by specialists, to support the ongoing professional development of the anaesthetic practitioner.

**Brian Smith, Paul Rawling,  
Paul Wicker, Chris Jones**  
*Liverpool 2006*

# Introduction: anaesthetic practice. Past and present

Brian Smith and Paul Wicker

## Key Learning Points

- Understand historical events in anaesthesia
- Explore the place of present-day changes in anaesthetic practice
- Recognise the importance of evidence in developing a body of anaesthetic knowledge
- Develop a reflective approach to anaesthetic practice

The past three centuries have brought many changes to the care of patients undergoing anaesthesia. Many of those changes have been at the hands of inspirational doctors who many now regard as pioneers of present-day anaesthesia.

Before anaesthesia, surgery was a traumatic event, full of pain and suffering of an unimaginable degree, which often led to patients' death. It is important to understand the horror and brutality of early surgery without anaesthesia, to understand the real value of anaesthesia today. It is hard to imagine how patients must have suffered under the knife when, for example, cutting through the perineum, opening the bladder, extracting a stone and then sewing up the wounds. Meanwhile the patient would have been in unbearable agony, suffering convulsions and muscle spasms, may have gone into deep shock and would have most probably died of the experience.

Joseph Priestly, in 1777, developed one of the most valuable contributions to present-day anaesthesia. Arguably the first anaesthetist,

Priestly discovered the value of nitrous oxide for anaesthesia. The work of Humphrey Davy in 1800 described the analgesic action of nitrous oxide, thus confirming its use for anaesthesia. Nitrous oxide is an anaesthetic gas which anaesthetists still use today to aid the delivery of volatile agents and to control the patient's conscious level and pain.

Nitrous oxide does not, however, come free of controversy. Tramer *et al.* (1996) argue that nitrous oxide is an emetic and causes post-operative nausea and vomiting. Other case reports (Puri, 2001) suggest introducing nitrous oxide to a patient's anaesthetic can raise the Bispectral Index System (BIS) reading, which is a translated electroencephalogram (EEG) of the effects of the anaesthetic on the brain. Indeed Glass *et al.* (1997) found that nitrous oxide combined with propofol raised the BIS reading and patients failed to respond to verbal commands when compared with an anaesthetic without nitrous oxide.

Similarly, in 1847 Simpson suggested that chloroform was the ideal 'knock out' gas for obstetric patients. The discovery of chloroform may not have been an acceptable approach in today's conventional terms; nevertheless the experiments which Simpson carried out on himself, conducted by sniffing the solvents, did lead to the discovery of this early anaesthetic agent. Chloroform remained in practice for a few years but never became the 'single agent' for anaesthesia, because of its rather distressing side effects.

The search was on for other doctors to find the perfect anaesthetic agent. In 1846, William T. G. Morton gave the first ether anaesthetic. This was an exciting stage in anaesthesia and created a strong interest among many surgeons, including Robert Listen ‘The showman surgeon’, Professor of Clinical Surgery at University College London. Shortly after this news had reached Listen, he performed the first pain-free surgical procedure with the patient waking up to ask ‘When will we begin?’.

In 1847 John Snow favoured inhaling ether and later designed a suitable machine for its delivery. He developed this equipment because he discovered that patients received unregulated levels of anaesthetic agent due to flaws in the anaesthetic administration technique. The new equipment resulted in much safer anaesthesia by regulating the depth of the patient’s unconsciousness.

In present-day anaesthesia, the ‘vaporiser’ equipment has developed through a long line of improvements from Snow’s original machine. Today we benefit from the interlocking mechanism on the back bar system to which a vaporiser is attached (Al-Shaikh & Stacey, 2002). This safety feature of preventing two vaporisers turning on simultaneously inhibits the delivery of potentially lethal mixtures of volatile agents. Also, the intricate mechanics of the vaporisers ensures the delivery of an accurate percentage of the volatile agent. The temperature-compensating bimetallic strip helps with this accuracy by detecting any deviations in temperature.

The idea of an ‘anaesthetic machine’ was developed from the work of these early pioneers and has resulted in the sophisticated, but safe and efficient, anaesthetic machines used today. Sir Frederic Hewitt, Elmer McKesson, and Robert Boyle’s invention of the anaesthetic machine, and later improvements from 1898, have produced many advances for anaesthesia. Their early introduction of a machine that could deliver oxygen and volatile agents helped anaesthesia to develop into a precise science. With the advantages of anaesthesia recognised by many surgeons, and its increase in popularity, there became a pressing

need to accurately control the delivery of anaesthetic agents. Anaesthetists required this control to prevent the deaths that occurred regularly with chloroform in 1886. Today the definition of an anaesthetic machine is clear, however, the role of the various pieces of anaesthetic equipment on the machine remain similar in many ways to the original Boyle’s machine.

The original Boyle’s machine delivered fresh compressed gas from cylinders attached to the machine by channelling the flow through the fine controls of a flowmeter. The journey of the fresh gas continued through the volatile agent (ether, chloroform and later halothane) and out the other side of the vaporiser, delivering a mixture to the patient. The patient would receive this mixture usually through an anaesthetic circuit that would have a face mask attached, known as ‘a continuous flow apparatus’. The modern-day anaesthetic machine is also classified under this heading to show that the machine is dependent on a supply of compressed gas.

Another important comparison with past and present anaesthetic practice is the invention of the ‘circle absorber system’. According to Ince and Davey (2000), 200 years before Brian Sword brought carbon dioxide absorption into anaesthetic practice, Joseph Priestly had described the absorption properties of alkalis.

Introducing the circle to anaesthesia in 1928 reduced atmospheric pollution and helped to recycle the patient’s expired gas. Directing the expired gas in a unidirectional way passes the exhaled gas through soda lime to absorb carbon dioxide, thus filtering the mixture and making it suitable for recycling.

Today the principle use of the circle system has not changed and two of the key aims still include improved cost-effectiveness and reduced pollution. However there are many concerns about its use with some modern volatile agents. Moriwaki *et al.* (1997) discussed the known reaction of sevoflurane with carbon dioxide absorbents resulting in the ‘generation of five degradation products’. Their studies have identified that sevoflurane with

partially exhausted soda lime (carbon dioxide absorbent) produced less concentration of the degradation product compound A. The debate continues with the argument that it is unclear if low-flow sevoflurane anaesthesia can lead to renal injury. However, it is noted that a study mentioned by Moriwaki *et al.* (1997) suggests the possibility of compound A contributing to renal injury in the patient.

It is clear that anaesthesia methods, medication and monitoring have changed from the eighteenth century. However, there are also some areas that have not changed and are still taught today. For example, the traditional description of the stages or depth of anaesthesia (Figure 1.1) is still in use today. These stages have informed anaesthetic practice for several years, and have helped the anaesthetist to gauge the dosage of anaesthetic agent to give.

The first description of the stages of anaesthesia was in the days of ether and its delivery by inhalation. It was noted that the patient moves progressively through the analgesia and delirium stages to the surgical anaesthesia stage, enabling tracheal intubation or the surgical procedure to continue. In some unfortunate cases, the delivery of too much of the volatile agent resulted in stage four, medullary depressions, which eventually resulted in death.

This model has aided the anaesthetic team (AAGBI, 2005) to make clinical judgements about the dosage of anaesthetic agents each patient needs. With the increase in different methods

of delivery of anaesthesia, for example, with intravenous and regional approaches, it may be fitting to consider Snow's stages of anaesthesia as applied to non-inhalational delivery.

The question arises of whether all the stages of anaesthesia are present during the use of modern intravenous induction agents. According to Drummond (2000), John Snow's stages of anaesthesia have changed and the emphasis now focuses more on the depth of anaesthesia. Initially, the hazards of overdosing concerned many anaesthetists, however, this focus has also shifted towards reducing underdosage, which can result in awareness under anaesthesia.

Equally, the patient and anaesthetic team should make a joint decision about the anaesthetic approach to use. Total Intravenous Anaesthesia (TIVA; without inhalation agents) might be a more suitable approach when considering each patient's medical history, surgical procedure, and recovery time. A randomised, double-blinded study by Ozkose *et al.* (2002) suggests TIVA can be a useful anaesthetic technique on patients who need to undergo a lumbar discectomy. It promotes rapid recovery without post-operative nausea and vomiting. These conditions offer the opportunity for the patient to have a neurological assessment post-operatively to identify the success of the procedure.

Pharmaceutical agents developed over the last 20 years, such as remifentanyl and propofol have significantly contributed to anaesthesia as

### Stages of Anaesthesia

Stage One – Analgesia: between induction of anaesthesia and ends at loss of consciousness.

Stage Two – Excitement or delirium: often sudden response to stimuli or uncontrolled movements.

Stage Three – Surgical anaesthesia – Plane 1  
Plane 2  
Plane 3  
Plane 4

Stage Four – Medullary depression: overdose of the patient.

**Figure 1.1** Stages of anaesthesia.

alternatives to inhalational anaesthesia. Constant review and trials of different drugs draw new findings and continue to develop the scientific field of anaesthesia.

Evidence-based practice and quality is at the heart of the anaesthetic service. This in turn is dependent on those who invest time, knowledge and resources to increase the effectiveness and safety of anaesthetic provision.

At the time of writing this book, anaesthetists who have undertaken further training, after having qualified as a doctor, predominately deliver anaesthesia. The further training often takes six years or more working through the specialist qualification to become a consultant anaesthetist.

Developing the consultant anaesthetist role has been the result of trial and error by many influential doctors, such as John Snow, Sir James Young Simpson, William T. Morton, and others. According to the Association of Anaesthetists of Great Britain and Ireland (AAGBI) (2006), Dr Henry Featherstone founded the association in 1932 before the birth of the National Health Service (NHS). Before this time general practitioners (GPs) gave anaesthetics as an optional extra to their role. Pay was low for this role, and many saw it as being subordinate to the surgeons.

The main reason for founding the AAGBI was to promote and encourage anaesthetic advances through academic and clinical application. The AAGBI also supported the welfare of anaesthetists because of the pressures experienced by many in that role.

Concurrently, there have been several developments over the last century for the assistants to the anaesthetist. Before 1976, the group of staff referred to as theatre technicians adopted an alliance towards the anaesthetist. They often became skilled and reliable assistants to the anaesthetist with the main purpose of increasing the safety of the patient under anaesthesia.

Theatre technicians soon reached a key stage in their development with the publishing of the Lewin report. The report itself introduced some key changes for this group of staff. According to Wicker

and Smith (2003), the Lewin report (DH, 1970) resulted in national training centres and the name change from technician to operating department assistant (ODA). Ince (2000) states that this report also introduced the City and Guilds of London Institute (CGLI) qualification 752 for Hospital Operating Department Assistants.

Throughout the two-year training scheme the ODA studied knowledge and skills in surgery, anaesthesia, and recovery and related subjects. Although the course prepared ODAs to work in all areas of the operating department, the presence of nurses in surgery created a natural opening in anaesthesia which ODAs migrated towards. The lack of uptake of surgical duties by the individual and the department resulted in a further report in 1989 (NHS Management Executive, 1989, the 'Bevan report').

Theatre nurses were also building on their experiences within anaesthesia. The English National Board (ENB) anaesthetic units of study gave nurses (in England) a nationally recognised qualification to practice as an anaesthetic nurse. The lack of a similar qualification in Scotland led to some confusion of the acceptability of locally developed anaesthetic courses, even when developed by Higher Education Institutes.

These two groups did not work in harmony, tensions arose between ODAs who were aspiring to become registered, and nurses who already had statutory registration. The differences in training led to further tensions as the two groups tried to understand each other's priorities for patient care. Professor P. G. Bevan (1989) identified the overlaps of roles and Wicker (1997) further commented on this area several years later.

Bevan's report identified opportunities for developing both professions through shared learning and management of the theatre service. Partly because of this report, partly the professions' internal changes in thinking, the ODA became an Operating Department Practitioner (ODP). The emphasis changed from 'assisting' to 'practicing', and the profession took another step in its long struggle towards statutory registration.

In 2006, 'The Anaesthetic Team' guidelines (AAGBI) identified the nationally accepted qualification for an ODP. The report recommended that ODPs should hold a Diploma of Higher Education in Operating Department Practice, gained from a two-year programme of study. The increased academic profile for the profession subsequently supported the acceptance on the statutory register with the Health Professions Council.

What is not clear from the AAGBI document is the relevant qualification for an anaesthetic nurse. Since the English National Board (ENB) dissolved in 2002, there has been increasing uncertainty about the accepted nationally recognised qualification for registered nurses wishing to practice in anaesthesia.

Previously the ENB (formerly Joint Board for Clinical Nursing Studies (JBCNS)) 182 units of learning had set out common objectives so the registered nurse could meet the needs of the patient undergoing anaesthesia. Those had encouraged and developed the registered nurse interested in anaesthetic care (ENB, 1994).

Today, *The Anaesthesia Team* (2005) recommends: 'Assistance for the anaesthetist may be provided by ODPs or nurses. Whatever the background, the training for all anaesthesia assistants must comply fully with national standards'. Judging from the activities of the Association for Perioperative Practice, the Association of Operating Department Practitioners and the British Association of Anaesthetic and Recovery Nurses, anaesthetic nursing is still of interest to the registered nurse and their employer. The former group's interest possibly takes its roots from the interesting scientific developments in anaesthetic care. The interest of the latter group may be credited to the national shortage of perioperative staff within the United Kingdom.

Employers seek new ways to staff the whole perioperative service and take action to advance many of their staff skills by crossing once traditional boundaries. Multi-skilling the individual is a long-standing term within the perioperative environment and draws with it the term 'Skill Mix'

as suggested by Mackenzie (1998). At the heart of this idea is the need to ensure that quality of care is affordable by ensuring flexibility across traditional divisions of labour.

It is no longer the historical case as mentioned by Pittaway (2004) that only perioperative nurses should have the opportunity for 'clinical experience and years of service' to progress their career. Instead, all perioperative practitioners today (registered nurses and ODPs) should be able to exercise their professional autonomy and choose which professional experiences would advance their career.

Practitioners may base their choice on the need to fulfil the requirements for registration with the Nursing & Midwifery Council or the Health Professions Council. Alternatively they may base their decision on a wish to undertake academic studies to develop their skills and knowledge in the area. Whatever approach the practitioner adopts, more opportunities for role improvement are available with the examples of the new roles emerging in the perioperative environment (Lipp, 2004).

The National Health Service Modernisation Agency (2004) recommended developing a select group of professionals with non-medical backgrounds to deliver anaesthesia. This development sits well with the two national agendas to reduce the doctors in training hours to a 58-hour week (DoH, 2004) and secondly with the NHS Career framework (Skills for Health) (Figure 1.2).

These two agendas offer opportunities for many perioperative practitioners to develop their knowledge and skills at higher levels to be able to progress their career to specialist practitioner, consultant practitioner and other levels. One possible new role for the perioperative practitioner will be to undertake both prescribing and administration of anaesthesia. Many other countries have set up the 'nurse anaesthetist' role. Within the United Kingdom the National Health Service Modernisation Agency (2004) is reviewing a pilot study looking at the non-medical anaesthetist role. When this role is firmly part of the anaesthetic



**Figure 1.2** A Career Framework for Health. The Career Framework for Health is being developed by Skills for Health to support the introduction of flexible career opportunities for staff across the health sector and the concept of competence-based skills education. See: [www.skillsforhealth.org.uk](http://www.skillsforhealth.org.uk) Skills for Health (2005).

team, then the nurse or ODP performing this role will be accountable in their own right for their performance (Hind & Wicker, 2000). Practitioners should not underestimate the scope of this undertaking, as careful reviewing of this role will be essential to address any accountability, autonomy, educational and registration issues that may arise.

This chapter has explored the long, sometimes torturous, development of anaesthesia, and in particular the role of practitioners working in this speciality. The result of many years of development, scientific investigation and trial and error, is a body of knowledge and skills which help to ensure the safest possible care for patients undergoing anaesthesia. Anaesthesia, on its own, is simply safer than driving a car, with a much lower mortality and morbidity rate.

It is on this foundation that the chapters of this book aim to support the advancing of practitioners' knowledge and abilities through their career progression. The breadth of knowledge from the core subjects will encourage others to continue to question, explore and contribute to the body of knowledge in anaesthesia and critical care.

The growing specialisation of anaesthetic practice, even within anaesthetic practice itself, means that practitioners have to develop skills and understanding far beyond those taught at preregistration level. The anaesthetic practitioner has a professional responsibility to advance patient care and to continue improving anaesthetic practice through developing the profession.

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