The role of non-medical staff in the delivery of anaesthesia services

As part of their workforce development initiatives, the Changing Workforce Programme of the NHS Modernisation Agency, received a number of submissions from interested Trusts to pilot the use of non-medically qualified personnel in the delivery of anaesthetic services. Through their representation on the Board of the Modernisation Agency, the Royal College of Anaesthetists felt it important at an early stage, to be part of the consultation process of proposals for such a fundamental change in UK anaesthetic practice. This was on the basis that any developments in this area should be led by the Speciality, in consultation with the Department of Health, rather than in a fragmented and ad hoc way, by individual Trusts or Workforce Development Confederations. As a result, representatives of the College and the Department of Health’s Changing Workforce Programme undertook a series of fact-finding visits to the USA, Holland and Sweden, to gain a balanced view of the place of non-medically qualified anaesthesia assistants in the various healthcare systems.

This report is the result of those visits. It has been discussed and endorsed by College Council and by the Changing Workforce Programme. It has been circulated to, and discussed by Council of the Association of Anaesthetists who will be seeking views from their members. Both Councils will be represented on the Steering Group, which will take this proposal forward. It has also been circulated, in restricted numbers, by the Changing Workforce Programme, to those Trusts, who registered their interest in developing a pilot programme for the development of non-medical roles in anaesthesia.

While some may find the suggestion of the use of non-medically qualified, anaesthesia assistants unacceptable, College Council felt that it would not be representing our speciality fairly and responsibly if it did not at least consider the proposal and ensure that the College was involved at the outset with any developments, such as the design of training programmes. This could include the need to look at the provision of care during the whole course of peri-operative care and pain management.

We would urge you to read at least the introductory pages, if not the reports of individual visits and not to take isolated sentences or suggestions out of context. The College is not recommending any specific course of action, but has tried to take a balanced and realistic view, understanding that these findings will obviously suit the situation in some Trusts more than others. They may provide one of a number of possible solutions to the impending workforce crisis in anaesthesia and the likely changes in working patterns, resulting from the implementation of initiatives such as the European Working Time Directive.
Introduction

The implementation of the NHS Plan is driving an increase in the acute sector. Both the public and politicians increasingly expect these services to be delivered by a trained workforce. This has major implications for the provision of anaesthetic services.

At present, anaesthetists administer all the anaesthetics in the UK, form 85% of the doctors in critical care and 75% of the doctors in pain management. An anaesthetist is involved in the care of approximately two thirds of all patients treated in an NHS hospital. Anaesthetic manpower requirements are therefore very sensitive to service developments.

When the goals of the NHS Plan are examined, it is unlikely that anaesthesia, critical care and pain management will be able to meet the demand for their services. The reasons for this include:

- Political and public demand for a service delivered by a trained workforce.
- Increased volume of complex (and emergency) work resulting from changing aspirations for quality of care especially in the elderly population.
- Increased emphasis on critical care and outreach services.
- The number of acute receiving sites requiring resident out-of-hours cover.
- Inflexibility of hospital design.
- Projected shortfall of consultants to provide a consultant delivered service.
- The dependence on doctors in training to deliver service.
- Implementation of mandatory rest periods (2004) and reduced working hours, consequent upon the European Working Time Directive (EWTD) and SiMAP judgement.
- Current clinical working practices.
- Uncertainties in the structure of postgraduate training.

The College has therefore examined ways in which the impending shortage of anaesthetic manpower might be addressed. Potential solutions include:

1. A reduction in the number of acute sites, which require the presence of anaesthetic personnel.
2. Partial derogation from the EWTD.
3. The use of non-medically qualified health care professionals as part of the ‘anaesthetic team’.

In order to examine alternative models of providing anaesthetic services, the College clearly needed more information on such models, which exist elsewhere outside the UK. If such a programme were to succeed, a proper training, career and salary structure would need to be developed. Accordingly, the Chief Medical Officer was contacted and he involved Judy Hargadon of the Changing Workforce Programme (CWP) of the NHS Modernisation Agency.

Meetings between Ms Hargadon’s team and the College proved fruitful and it was decided to make the exploration of non-medical roles in the anaesthetic team a joint College/DOH project. On a joint funding basis we initiated visits to centres in the US, the Netherlands and Sweden. The purpose of this report is to consider only the third suggestion listed above, the other two being addressed separately by the College and the Department of Health (DOH). It must be recognised however that in the UK anaesthesia has always been delivered by medically qualified staff. Any change represents a major cultural shift in the delivery of anaesthetic services, which would be very difficult for some clinicians to accept and would require a number of factors to work in harmony. These include cooperation from all the bodies involved in UK anaesthesia, close geographical location of where anaesthesia services are delivered and changes in the way operating theatres are managed.
Summary of findings in USA, Netherlands and Sweden

In Sweden, Holland and the USA, non-medically qualified staff are used in the provision of anaesthetic services.

1 **Sweden**: Anaesthetic nurses (AN's) are all drawn from nursing backgrounds. They may enter AN training direct from graduating as a nurse, although most also have a minimum of two years practical nursing experience. The AN training programme lasts for one year. Physicians supervise a variable number of theatres and for the most part, physicians must be present at the induction and reversal of anaesthesia. AN's, accompanied by a second AN, may work semi-independently with ASA I and II patients undergoing appropriate types of surgery. AN's are not involved in preoperative assessment or performance of any regional blocks, nor do they undertake any other operating theatre role.

2 **Holland**: Anaesthetic nurses are drawn from either nursing backgrounds or straight from school with good 'A' level results; the former group undergo two years training and the latter three years training. Physicians normally supervise two operating theatres and must be present at induction of and reversal of anaesthesia. An anaesthetic nurse must be present at every anaesthetic. AN's are not involved in preoperative assessment or performance of any regional blocks, nor do they undertake any other operating theatre role.

3 **USA**: There are two types of non-physician assistants: CRNA's who take a three year training course and are recruited entirely from intensive care nurses; and anaesthetic assistants (AA's) who have degrees in biological sciences and undertake a three year training course. AA's are supervised in the operating theatre on a 1:2 basis as are the majority of CRNA's in large hospitals. A physician must be present at induction and reversal of anaesthesia. In small rural areas however CRNA's, but not AA's, may undertake relatively independent anaesthetic practice under the supervision of a non-anaesthetist physician, e.g. surgeons, general practitioners etc and in these situations CRNA's undertake spinal and epidural blocks predominantly for obstetric practice. As anaesthetic trainees' salaries are low, the deployment of CRNA's and AA's was not believed to reduce the cost of anaesthesia services significantly.

Common themes

4 In every location, the local system seemed to function well. Heads of anaesthetic departments professed satisfaction with the standard and quality of non-physician anaesthetic staff. Teamwork was closest where the non-physician staff functioned as members of the department of anaesthesia. There appeared to be little evidence to suggest that patient outcomes were affected by the use of CRNA's, anaesthetic nurses or anaesthetic assistants.

5 Each centre used a restricted variety of anaesthetic techniques to simplify and streamline the process. Even so, the throughput per operating theatre per unit time was less than that in the UK.

6 The anaesthetic nurse/CRNA/AA functioned effectively because the individual was entirely committed to the provision of anaesthetic services and their expertise and practise was not diluted by ‘multi-skilling’ or by being taken away for other activities.

7 The construction and location of operating theatres permitted easy supervision of CRNA's/AA's and AN's by a physician; anaesthetic offices were usually in close proximity to the operating theatre, and access to an obstetric theatre and the labour ward was easy. This geographical layout was of the greatest importance in the ability to use skill-mix in the delivery of anaesthesia.

8 Surgeons do not have fixed operating lists or theatres. Theatres are treated as a resource and daily scheduling of cases is undertaken jointly by medical and managerial staff, to maximise capacity and match staff availability with demand. This is a major difference from the UK system of fixed lists and specialty allocations. It carries the consequence that the throughput of cases per unit time is often less than that in the UK but there is greater flexibility over what is done.
Implications for the UK

The College/CWP working group believes that the conclusions listed below may be drawn from its visits with regard to anaesthetic practice in the UK and would welcome views and comments on this section.

The working clinical environment in the UK

The College, when considering possible innovations in UK practice is assuming that important principles agreed by the DOH and the profession will be applied. These are:

From the document ‘Developing the roles of health professionals’ (DOH, 2002) that:

➣ It should be clear to patients and professionals where responsibility for any role or task lies, and there should be appropriate processes for the delegation and referral of patients.

➣ Role developments must not compromise patient safety or the quality of care or outcomes, and

➣ Changes in roles should be supported by appropriate investment in education and training.

And from the ‘Code of Conduct for NHS Managers’ (DOH 2002), that an NHS Manager

➣ Will make the care and safety of patients my first concern and act to protect them from risk

Potential transferability of overseas models of anaesthesia delivery to the UK

I Non-medical anaesthesia assistants (AA’s) could be introduced in the UK. Implementation of UK trained AA’s would take a minimum of five years (see below).

II In hospitals with centralised operating theatre facilities, it would be possible for one physician anaesthetist to supervise up to two operating theatres in which patients are under the direct care of suitably experienced anaesthesia assistants or anaesthetic trainees.

III Such a system would be dependent upon a consultant anaesthetist being able to supervise two lists matched for complexity and having control over the listing of patients in each surgical theatre. There would need to be a major reorganisation of the way in which theatres and surgeons work, and list scheduling would be critical. A senior anaesthetist or surgeon should be in charge of the theatre suite to ensure smooth running of the operating schedules

IV It might well be possible to significantly increase theatre throughput on certain lists, by employing two anaesthetic assistants to work with a single anaesthetist in just one theatre, if the theatre suite design did not incorporate twin theatres.

V There are many types of surgical operating theatre lists that would lend themselves to AA managed anaesthesia, e.g. elective lists with patients of ASA grades 1 and 2.

VI There are also many operating lists requiring the full-time presence of a physician anaesthetist, e.g. paediatrics, ASA 4 and 5 cases, cardio-thoracic, neurosurgery etc. In the UK it would be difficult at present to separate patients on the basis of need rather than on specialty because of the inflexibility in allocation of surgeons and anaesthetists to lists.

VII Throughput per theatre would likely to be lower than at present, because following the overseas models reviewed, a physician anaesthetist would need to be physically present with the anaesthesia assistant at induction and reversal of anaesthesia.

VIII Currently in the UK a physician anaesthetist works with an ODP or anaesthetic nurse caring for a single patient. In other countries, two qualified anaesthetic staff (a doctor plus an anaesthetic nurse or anaesthesia assistant) are present at induction and reversal, with at least one person throughout the procedure, so there would need to be an increase in the numbers of non-medical anaesthetic staff to bring the resulting AN team up to a 2:1 ratio.

IX In the UK, a reduced reliance on anaesthetic trainees (who deliver approximately half the service load) for service may have a greater impact on anaesthesia costs than in the USA, because the salaries of doctors in training are significantly higher here.

X Two areas in which there is a massive demand on trainee and consultant anaesthetists in the UK are those generated by the necessity of providing onsite epidural and ICU services. Although we are not aware of other countries exploring this model, it might be possible for anaesthesia assistants as part of the anaesthetic team to provide such services, provided that there was a suitably experienced medical anaesthetist present onsite together with close geographical location of units.

Sources of potential anaesthesia assistants

XI An exclusively CRNA or nurse derived anaesthesia assistant model would not be feasible in the UK. CRNAs are normally recruited from an intensive care background. The UK currently has shortage of nursing staff, and a particular shortfall in recruitment to intensive care units. It would be impossible to recruit sufficient nurses from the ICU background. Secondly, any significant movement from ICU to AA training could further jeopardise ICU facilities.
The UK has a supply of graduates and other suitably qualified people with variable employment prospects. It would be possible to recruit appropriate individuals into an anaesthesia training school for anaesthesia assistants.

An obvious supply of manpower would be from the existing pool of ODP's and UK anaesthetic nurses. There is no doubt that some ODPS's and anaesthetic nurses aspire to a CRNA type of role. Analogous to the recruitment of highly trained paramedics from the general body of the ambulance service, it would be possible to recruit appropriate individuals from the pool of ODPS's and anaesthetic nurses to train for an anaesthetic assistant role.

Not all our anaesthetic nurses and ODP's could be ‘converted’ to AA's. While some would be suitable and others trainable, there would be a group who could never aspire to the Swedish or Dutch AN model. It will be imperative not to disenfranchise this valuable group of staff. The multi-skilled ODP role and underpinning training has been developed relatively recently, and new methods of service delivery would need to ensure a continued place for the ODP.

**Duration of training**

In both Holland and the USA, graduate entry and school leaver (good A level standard) training programmes last for two-and-a-half to three years. In Sweden the anaesthetic nurse undertakes a one year intensive training, but has very high level of basic school training, and a three year nursing degree. There are similar entry requirements for CRNA training in the US.

Given the proposed entry requirements in the UK, a one year course of training would be too short unless it was top-up training for highly selected individuals. For the large majority of intended recruits, a two year course would have to be devised to provide an appropriate level of both theoretical and practical knowledge. Such a course needs to be competency based, and should be constructed and supervised by the Royal College of Anaesthetists, the professional body tasked with the setting and maintenance of standards of anaesthesia in the UK. This will also ensure close working relationships between anaesthetic assistants and physician anaesthetists.

**Implementation issues**

The development of anaesthetic assistants in the UK would not begin to alleviate our perceived shortage of anaesthetic specialists for four to five years. It would take one to two years to develop appropriate training programmes, with a further two to three years to produce the first output from such a school.

Adequate training is essential and should be structured around a competency-based template. National training standards should be set and local training programmes approved by the Royal College of Anaesthetists.

Implementation of an AA model should be controlled and measured. The system should be piloted to enable smooth implementation and facilitate learning.

Anaesthetic assistants should be part of the anaesthetic and not the general theatre workforce. They should be accountable managerially to the Clinical Director of Anaesthesia.

Theatre organisation, management and list scheduling is paramount and major changes would be needed to the way in which theatres and surgeons work. Supervision would be facilitated if consultants work predominantly at one site for the whole day to avoid problems that could arise from split-site commitments.

It may be possible to import some existing anaesthetic nurses from abroad to help with the initiation of any implementation programme.

The continuing role of the ODP and recovery nurses, working alongside AA’s, needs to be explored further.

**Conclusion**

- The current pattern of delivery of anaesthesia services in the UK will not be able to meet the aspirations of the NHS Plan to increase surgical throughput.
- Non-medically qualified staff are employed successfully in other countries as part of a team in the delivery of anaesthesia services, with good outcomes.
- The use of non-medically qualified staff in the UK is only one of only several strategies, which may be considered as a means of alleviating the shortage in anaesthetic manpower relative to the pattern of demand for services.
- If the decision were taken by the DH to implement the use of non-medically qualified staff in the provision of anaesthesia services, the Royal College of Anaesthetists would wish to collaborate and play a major role in setting the standard of training and supervision of such staff. British anaesthesia has a very high reputation internationally and the College would be anxious to ensure that our current high standards are not compromised.
Visit to the USA

Structure of the visit

The personnel were:

For the College:  Professor P Hutton (President)
    Professor G Smith (Vice-President)

For the DoH:  Dr J Moore (SMO Strategic Medical Workforce Issues)
    Mr G Bennett (Changing Workforce Programme, Modernisation Agency)

The visit to the US lasted from Monday, 7 January to Friday, 11 January 2002 inclusive. Centres were visited in New York, Atlanta, and North Carolina and in addition, there were several conference calls. The week’s work was as follows:

Monday

➢ Visit to Cornell Medical Centre, hosted by Professor S Thomas.
➢ Meeting with Dr R Wilson, Chairman, Memorial – Sloan Kettering Hospital, New York, and Brenna Stein, a senior CRNA at Cornell.
➢ Conference calls with:
    – Professor D Glass, Chairman, Dartmouth-Hitchcock Medical Centre, New Hampshire.
    – Professor F K Orkin, Penn State College of Medicine.
    – Mr Michael Scott, Legal Adviser to the American Society of Anesthesiologists.
    – Professor M Warner, Mayo Clinic, Rochester, Minnesota.

Tuesday

➢ Visit to Mount Sinai Hospital, New York: meeting with Dr I H Sampson, Deputy Chairman of Division.
➢ Visit to St Lukes-Rochester Hospital, New York: meeting with Dr D Thys, Chairman of Division.

Wednesday

Visit to Emory University School of Medicine, Atlanta, hosted by Professor J R Zaidan.

Thursday

Visit to Raleigh Hospital, North Carolina, hosted by Dr B W Coffer.

Friday

De-brief and construction of report, New York.

This programme of visits and conference calls was organised by Professor S Thomas, Deputy Chairman at Cornell Medical Centre, and a Fellow by Election of the College. The locations and people were chosen to give a spectrum of opinion and working practices within the US so that a complete picture of the range of delivery models could be seen. These varied from physician-only hospitals in cities to isolated rural hospitals with only anaesthetic nurses (CRNA’s). The findings are presented in a more rational sequence in this main report so that the key issues emerge in a logical order rather than as they appeared during the visit.

Evolution of anaesthesia services in the USA

The need for anaesthesia in the US has always outstripped the number of doctors trained to deliver it: this is still the position today. A totally physician delivered service across the US is not therefore possible at present given the demand for anaesthesia services.

In the 1950s more than 50% of the staff administering anaesthesia were non-medical and there were Federal concerns regarding the quality of service delivery. At that time the American Society of Anesthesiologists (ASA) decided to push for an increase in physician delivered anaesthesia to progress anaesthesia towards a physician only specialty. A rift developed between the ASA and the American Association of Nurse Anesthetists (AANA), which has still not healed. The CRNA’s have no category of membership within the ASA. In retrospect this was probably a mistake because it allowed two organisations to advance in parallel with different objectives; collaboration would have been more valuable. Indeed, animosity has recently intensified with the AANA’s continuing pressure to get CRNA’s recognised as specialists in their own right who can work without medical supervision.

In the 1970s Physician’s Assistants were introduced in the US. These were graduates from science and biology backgrounds who underwent a postgraduate training course and were intended to work under the direct supervision of a doctor. They are active across many hospital specialties including surgery, gastroenterology, respiratory medicine, trauma and cardiology. For anaesthesia, the main training centre was, and still is, Atlanta. In anaesthesia they currently undertake duties similar to those of CRNAs.
Types of staff who take part in anaesthesia delivery

This section outlines in more detail the staff groups that currently work within US anaesthesia services. Future projections of demand for anaesthesia services are that it will outstrip the supply of trained manpower.

Anesthesiologists (or Attendings)

In 2001 there were approximately 35,000 anesthesiologists (attendings), the nearest US equivalent to the UK consultant. However, the way their work is structured on a daily basis is closer to that of the UK associate specialist, in that all work is allocated the day before to match service demands. Apart from a small number of sub-specialists, attendings anaesthetise across the full range of disciplines. When on call, attendings sleep on site and usually cover more than one sub-specialty aspect of anaesthesia. There is less anesthesiologist involvement in intensive care services or wider post-operative care roles than in the UK, partly for reasons of remuneration.

The exact pattern of employment is variable. Academic anesthesiologists are usually employed by the academic institution and are paid a salary with an additional element based upon the extent of clinical activity. Of the remainder, the great majority, either individually or in a group, contract to a hospital; the patient’s insurance company or Medicare pays a fee for an agreed amount of work to the anesthesiologist (or group) who are independent contractors not employed by the hospital and are responsible for all their own CPD, pension, sickness benefits and travel costs etc. Although the group is collectively responsible for its members, anesthesiologists have to satisfy the hospital’s conditions with respect to safety, CPD etc., usually on an annual basis, in order to be allowed to work (i.e. granted privileges). There is no restriction on hours of work, although around 60 hours/week appears the norm. Some groups choose to operate with smaller numbers of anesthesiologists and more CRNA’s to maximise earnings. A typical anesthesiologist would earn two to three times as much as a nurse anesthetist (Appendix 1). A group practice of anesthesiologists may employ nurse anesthetists and/or anesthesia assistants.

In order to be reimbursed the attendings signature must be on the anaesthetic chart. If the attending was not present throughout the case, they would have to be within immediate calling distance. Medicare reimbursement includes a fee for the presence of the attending. When an attending is supervising more than one room using CRNA’s, the fee for the second, third, or fourth room is reduced.

In a group practice, the anesthesiologists normally appoint one of their number as Director to be in administrative charge of the anaesthetic service. This person interfaces with the hospital to see what services are required, and is also responsible for leading negotiations around annual or incremental service improvements.

Each day there is someone in charge of ‘the floor’ who allocates the attendings, trainees and CRNAs to different theatres. Apart from specialist areas, anesthesiologists do not work regularly at the same time each week with the same surgeon: this gives the system great flexibility.

An anesthesiologist might work alone or supervise residents, CRNAs or anesthesia assistants. On average, the attending might spend one day a week anaesthetising alone, the remainder of the week is spent supervising multiple theatres. The number supervised is determined by the hospital. For Medicare reimbursement, the attending can supervise no more than four rooms, but many institutions have now reduced this to two or three, especially when there are trainee CRNAs, trainee anaesthesia assistants or residents under supervision. A qualified anesthesiologist is always immediately available if needed.

The single anesthesiologist supervising CRNAs in multiple theatres and receiving substantial remuneration is responsible for some of the friction between CRNAs and anesthesiologists.

Residents (trainee anesthesiologists)

Although there are thousands of hospitals in the US, only 141 of them have residency-training programmes. In 2001, with over 35,000 trained anesthesiologists in post, 858 residents (of whom over 50% graduated outside the US) completed their four year training program. This gives a trained: trainee ratio of approximately 10:1.

The total number of resident posts is controlled nationally by the Federal Government and a typically British ‘fudge factor’ based on history, demand and population determines how many residents each programme is allocated per year. The number of residents is varied from year to year in response to predicted demand for specialists. As in Britain, manpower predictions have been misleading and there is a shortage of trained staff. Consequently trainee numbers are currently rising – the number entering training was 1900 in 1994, 850 in 1996 and 1100 in 2001.

The hospital receives funding for most residents from the Federal Government. At around $160,000 per resident this exceeds the salary and residential costs, so they are a ‘free good’. A typical resident’s salary is $30,000–45,000, depending on the programme.Residency training programmes begin after the equivalent of full registration with the GMC and last for four years. The present working week is 80 hours but it is likely that this will be reduced in the near future. If people want to become dually certified in anaesthesia and intensive care, they must do more training on a separate residency programme.

The residency programme confers eligibility to sit the examinations of the American Board of Anesthesiology (the
A CRNA is involved in the provision of 70–80% of all benefits and travel costs etc. (Appendix 1). The employer is also responsible for CPD, pension, sickness many do no on call and if they do, get paid a premium rate. The option. They have fixed hours (usually 40 hours/week), prestigious medical centres. CRNA's are not a cheap option. At present, 45% of the CRNA's are employed by hospitals, 40% are employed by anesthesia group practices and 15% are individual contractors. Their salaries usually range from $80,000–$110,000 per annum, although in some areas where it is difficult to recruit staff, some salaries of senior CRNA's are equal to those of entry-level anesthesiologists in prestigious medical centres. CRNA's are not a cheap option. They have fixed hours (usually 40 hours/week), many do no on call and if they do, get paid a premium rate. The employer is also responsible for CPD, pension, sickness benefits and travel costs etc. (Appendix 1)

Certified Registered Nurse Anesthetists (CRNA)

In 2001 there were approximately 19,000 CRNA's in the United States. A CRNA is a person who has completed a two to four year undergraduate nursing degree, worked as a nurse in critical care and then completed a two year training programme (some of which grant Master's degrees) that satisfies the Council on Accreditation of Nurse Anesthesia Training Programmes. Nurses have to pay their own fees for both of these courses of training. At present there are over 80 training programs graduating approximately 1200 CRNA's per year. This gives a trained: trainee ratio of approximately 7:1. CRNA education is delivered jointly by anesthesiologists and CRNA's.

Because there is now a smaller number of individuals entering nursing courses, more varied opportunities for advanced nursing practice, and a disproportionate fraction of practising CRNA's due to retire in the next five to ten years, it is predicted that there will be a significant shortage relative to demand for the next decade and that CRNA's may be entering a ‘seller’s market’.

At present, 45% of the CRNA's are employed by hospitals, 40% are employed by anesthesia group practices and 15% are individual contractors. Their salaries usually range from $80,000–$110,000 per annum, although in some areas where it is difficult to recruit staff, some salaries of senior CRNA's are equal to those of entry-level anesthesiologists in prestigious medical centres. CRNA's are not a cheap option. They have fixed hours (usually 40 hours/week), many do no on call and if they do, get paid a premium rate. The employer is also responsible for CPD, pension, sickness benefits and travel costs etc. (Appendix 1)

A CRNA is involved in the provision of 70–80% of all anaesthetics. Although in some institutions the work undertaken by CRNA's extends beyond the operating theatre (e.g. pre-operative assessment clinics, pain management), the vast bulk of their work is the care of patients under anaesthesia. Until recently, CRNAs have concentrated on general anaesthesia but latterly they have started to extend their curriculum into regional blocks, including epidurals. The ‘normal’ situation is that a CRNA can work under the ‘supervision’ of a medical practitioner (who need not be an anesthesiologist, but usually is). To obtain Medicare reimbursement, there must be physician supervision with, at the maximum, four nurses per physician.

The AANA is a very politically active association whose political “pull” varies from state to state. As a consequence the freedom and scope of their practice is very variable and is dependent upon state laws. Recently, federal law changed to permit individual states to allow CRNA's to practice independently, but only Iowa has taken action on this. Even there however, because of another state law, independent practice is still not permitted. In New Hampshire there are some ‘Advanced’ registered nurse practitioners who can work unsupervised; in New Jersey every CRNA has to be supervised by an anesthesiologist. The exact regulatory pattern is very varied, but in practice, in large hospitals, the very great majority of CRNA's are closely supervised by an anesthesiologist and only in small, isolated communities do they work alone. In these circumstances, medico-legal indemnity is carried by the hospital and the supervising physician, who is usually a surgeon.

Superimposed on the state laws are hospital regulations and many hospitals insist that a trained anesthesiologist must be at induction of and recovery from anaesthesia (which is also a Medicare requirement for reimbursement).

The AANA and ASA continue to have turf wars with the involvement of local, state and national politics. Some CRNA's were undoubtedly bitter: some of the best of them wished to continue in their supervised role, their leadership was ambitious for independent practitioner status and the doctor is the fee. These individuals, however, appeared to be the exception rather than the rule. It was our impression that although the vast majority of CRNA's wished to continue in their supervised role, their leadership was ambitious for independent practitioner status and the rank and file were not going to oppose this. In some institutions there have been unpleasant and destructive union activities that have been to everybody's detriment.

Anesthesia assistants

In 2001 there were approximately 650 anesthesiologists’ assistants, the anaesthesia version of ‘physicians’ assistant’. The terms anesthesiologist assistant (AA) and anesthesia physician assistant are used interchangeably. In common with CRNA's, AA's pay their own fees and support themselves during training.
Anesthesia assistants were introduced in the 1970s. Training is currently available in only two institutions, Emory University in Atlanta and Cape Western University in Ohio, which graduate approximately 75 people per year in total. Although attempts have been made to establish other schools, they have been unsuccessful. This is partly due to the existence of an alternative and well-established group, the CRNAs, and partly, we understand, that the AANA has actively opposed their development. The remuneration of both groups is similar.

After qualification, anesthesia assistants have many employment opportunities both in teaching hospitals and in private practice. Several institutions employ CRNAs and AAs interchangeably.

The AA was originally introduced because it was felt there was a need for a more technical person working in the operating theatre, rather than the CRNA with a potentially more limited technical education. However it very soon became clear that the ideal function of the AA would be to combine more technical expertise with the clinical expertise of the nurse.

The training programme for an AA lasts for two years. Entry is at graduate level but from a wide range of backgrounds such as chemistry, psychology, engineering, biological sciences, nursing and, in some cases from the humanities. There is a national certifying body, the National Commission for Certification of Anesthesiology Assistants (set up in 1989) and there is a professional organisation, the American Academy of Anesthesia Assistants. Maintenance of certification requires registration of 40 CME credits per two years and successful completion of an examination every six years.

AAs may be employed by a group of anesthesiologists, or by a hospital or medical centre. They have to be registered by the individual state in which they are employed, and they always work under the delegated responsibility of an anesthesiologist, rather than simply under any registered medical practitioner.

Models of service delivery
There are several different models of service delivery, influenced by recruitment issues, remuneration patterns, distribution of residency programmes, and by geography. The factors that dictate which model exists in any hospital depend on:

a Remuneration
The independent contractor status of most anaesthesia practice is a major driver of service delivery patterns. The anaesthetic group determines the most cost-effective way of delivering the services required.

b The presence of Residency programmes
Very few hospitals have residents to contribute to service delivery. Where they are available they are extremely cost effective in service terms (because of their low salaries, associated federal grants, and long hours of employment) and reduce the number of non-medical anesthetic staff needed.

c Geography
There is great geographical variation in service delivery. The majority of medical staff seek employment on the east and west coast; the centre and the south are unpopular. In general (with exceptions), there are more CRNAs working in hospitals in the east than in hospitals in the west where there is still a considerable push to make anaesthesia a purely physician delivered specialty.

In addition to their geographic unpopularity with medical anesthesiologists, the central states have many small, isolated rural centres of population that would not support a full time anesthesiologist. In these locations, decisions have to be made whether to transport patients to bigger centres or whether to treat them locally. Local treatment may result in anaesthesia by a CRNA (unsupervised by an anesthesiologist).

d State and Federal Law
One significant difference between the US and the UK is the importance of state law. All medical and nursing staff have to be registered in the state in which they are working and not all states have the same laws relating to medical and nursing practice (see above).

Models of service delivery – practical examples
We saw or discussed several models of provision:

i All types of medical staff
A few hospitals, e.g. Mount Sinai and St Luke’s-Presbyterian in New York have only attendings and residents; they have no CRNAs or anesthesia assistants. In these organisations the number of residents was approximately equal to the number of attendings.

ii Mixed staffing
In other locations, e.g. the Mayo Clinic and Emory, considerable use was made of CRNAs and anesthesia assistants. In these cases, the number of residents was half to two thirds of the number of attendings and the number of non-medical staff was up to one and half times the number of attendings.
iii No trainees (medical or non-medical)
Where there were no residents at all (e.g. Raleigh), the number of CRNA's exceeded the number of attendings by more than twofold.

iv Non-medical anaesthesia
Very small, isolated rural units in some states have CRNA's only, without a physician anesthesiologist involved in supervision. Less than 5% of anaesthetics in the USA are given under these circumstances.

Categories of staff present in the hospitals that we contacted by visit or conference call are shown in Appendix II.

Organisation and quality

Comparison of CRNA's and anesthesia assistants
We looked for differences between CRNA's and AA's.

The training programmes are broadly similar in duration and content. A direct comparison of the two training courses is shown in Appendix III and the curricula followed in the CRNA and AA training courses are shown in Appendix IV. The anesthesia assistant's programme recruits approximately the same number of men as women, whereas in the CRNA programme females greatly exceed the number of males. Analysis of work patterns following qualification suggests that anesthesia assistants are geographically more stable than CRNA's.

After qualification as an anesthesia assistant or a CRNA the career structure is flat, with few opportunities for advancement over time. Past experience suggests that up to 10% of people qualifying as anesthesia assistants eventually go to medical school and qualify as doctors.

From the point of view of anesthesiologists, there seemed little to choose between the CRNA and the AA in terms of the clinical work they could do. The AA were however proud of their 'scientific background' and the CRNA's of their nursing and human contact experience. In some institutions they worked together well, but apparently in others there was friction. One of the main political differences is that the AANA continues to press for independent practitioner status whereas the AAAA both accepts and promotes the anesthesia team approach with delegation from an anesthesiologist.

Perceived advantages and disadvantages of CRNA's compared with anesthesia assistants are outlined in Appendix V.

Impact of CRNA's and anaesthesia assistants on the training of residents
For a hospital to have residents approved by the American Boards, it must be capable of running without them. As shown above, there are very variable models of skill mix in the operating theatre and the personnel are matched to the workload. Although there are several thousand hospitals in the US, there are only 141 hospitals with training programmes for anesthesiologists.

One argument put forward in favour of AA's and CRNA's is that the residents can be given the cases they need for their training with attendings, CRNA's and AA's doing the rest. Apparently this had led to resentment in some units, but the general consensus was that relationships between residents and non-medical anesthetic staff were reasonably good.

Some CRNA's clearly felt equal to their medical colleagues and felt that there was little difference between them and the residents. Perhaps partly because of this, anesthesiologists were regarding more physicianly things such as pre-operative assessment, peri-operative and postoperative care as becoming more important aspects of their practice.

Design of hospitals
There is absolutely no doubt that in order for delegation by an anesthesiologist to a number of CRNA's or AA's to be both possible and safe the supervising physician needs rapid access to the locations for which he or she is responsible. The concept of 'the floor' or one or more floors on which all the critical care and operative activity is concentrated is central to this model of delivery. The anesthesia team was clearly closely involved in hospital design and redesign. One hospital, in North Carolina, had coronary care, critical care, operating theatres and obstetric unit in a square of corridors around a central atrium. This enables very efficient use of both medical and non-medical manpower, especially out of hours.

Organisation of operating lists
The detailed control of day-to-day scheduling of operating lists was another requirement for using non-medical manpower. Cases and theatres were allocated to individual surgeons on a case-by-case basis as the day progressed. The timing of starts, interplay of difficult cases and forward planning were paramount.

Many US hospitals now plan elective work several weeks in advance and the anesthesia department holds pre-operative clinics for assessing, preparing and consenting patients. Some of this work is done in some locations by CRNA's and AA's, but most is done by anesthesiologists with an allocated sessional commitment.
The efficiency of the whole system depends upon the majority of the cases being elective or semi-elective with the workload for each day known well in advance.

**Quality of anaesthesia provided by CRNA's**

There has been a limited amount of published literature (see Appendix VI) comparing outcomes when anesthesiologists are involved rather than CRNAs. This purported to show eventually that the physician anaesthesia was superior to CRNA delivered anaesthesia but the data are weak. Sporadic reports continue to appear of adverse outcomes in private ‘rooms’ in which surgeons are assisted by CRNAs but provide rubbish rather than hard fact.

All in all, the view expressed by most was that provided there is careful case selection and proper supervision, the outcomes for the majority of cases were the same whether a CRNA or AA was involved or not. In short, there was no great drive to get rid of CRNAs or AAs because of poor outcomes.

**Differences between UK and US practice**

The acute facilities in the American hospital are designed for efficient throughput. The service does not rely on trainees and the vast majority of anaesthetics are given by fully trained personnel. Except from the most remote geographical locations all elective and emergency anaesthetics are either directly administered or directly supervised by an attending physician anesthesiologist. Under these circumstances there appears to be no difference in clinical outcomes between physician-only procedures and joint management between anesthesiologist and CRNA.

The attending spends a greater proportion of the working week in direct or supervisory anaesthetic practice than the UK consultant. With the exception of university hospitals, there are fewer commitments outside the operating theatre and the distribution of residents’ means few are involved in teaching. The group, through the Director, will prospectively agree additional commitments and service developments are introduced collaboratively. The anesthesiologist is expected to comply with any standards set by the hospital or the group. Anesthesiologists regularly move from one group or organisation to another.

In university hospitals, attendings may be granted one to four days per week for research/academic activities and in the OR they are expected to actively teach residents.

The flexible scheduling of the anaesthetic staff’s working week and commitment to resident on-call provision means all anaesthetic staff need to retain broad-based skills. Except in complex sub-specialties, where a sub-group of anesthesiologists might provide cover for that discipline, there is no team relationship between individual anesthesiologists and individual surgeons. Surgeons are allocated a theatre and an anesthesiologist from the pool according to efficiency and case mix.

There is no role equivalent to that of the UK’s Operating Department Practitioner (ODP). If the anesthesiologist requires help during the induction or maintenance of anaesthesia this is provided by the CRNA or AA if present. If the anesthesiologist is working solo, any necessary support will be provided by a scrub or circulating theatre nurse who will not have received specific training for the role.

In general the duration of surgery in the USA is longer than that in the UK. The turnover time between cases is much longer and this is partly related to the lack of anaesthetic rooms and/or ODP to prepare anaesthetic equipment.

**Summary**

- It is evident that when supervised by an anesthesiologist a high standard of anaesthetic care may be provided by trained non-medical staff derived from either a nursing or a scientific background.
- There are no convincing data that outcomes differ between physician anaesthesia and CRNA or AA administered anaesthesia, when the latter are supervised by physician anesthesiologists.
- With the exception of under populated rural areas, all CRNA anaesthesia is supervised by a physician anesthesiologist who may look after up to four rooms (although the commonest number is two to three); a maximum of four rooms may be supervised by a physician anesthesiologist to permit reimbursement by Medicare.
- All AAs are supervised by physician anesthesiologists.
- In order to prevent ‘warfare’ developing between non-physician assistants and physician anesthetists, it would be helpful if the non-physicians were to be brought under the professional umbrella of physician anesthesiologists.
- The system developed in the USA works well because
  1. The design of the hospital is such that all anaesthetising areas are grouped closely together or contiguous.
  2. Anesthesiologists do not undertake ‘fixed’ lists but cover all types of anaesthetic practice according to demand (although there is some specialisation in cardiac and paediatric anaesthesia).
  3. The staff may be used very flexibly and there is no allocation of anaesthetising staff to individual surgeons or specific operating theatres.
- The use of CRNA/AA’s does not result in significant cost savings – it merely provides a source of manpower that compensates for the enormous lack of trained physician anesthetists.
CRNA/AA's are capable of undertaking epidural and spinal anaesthesia without the immediate presence of a physician anesthesiologist.

There is a projected shortfall of physician anesthesiologists in the USA and also a projected shortfall of CRNA's.

CRNA/AA's may be trained to deliver an obstetric epidural analgesia service and also a spinal anaesthesia service for caesarean sections.

CRNA and AA are used almost entirely in the operating theatre setting (including obstetrics, cardiac, and neurosurgery). Preoperative assessment, intensive care, and pain clinics are staffed by physician anesthesiologists and any additional standard nursing assistance is usually provided by appropriate nurses (not CRNA's or AA's).

CRNA's and AA's are used to only a limited extent in the delivery of out-of-hours emergency work, largely because of cost.

Glossary
AA – Anesthetic assistant: a term used in the USA for non-medically qualified personnel usually with a basic science background. The generic term for this group is physician's assistant.
AAAA – American Association of Anesthetic Assistants.
AANA – American Association of Nurse Anesthetists.
Anaesthetist – A term used in Europe, Canada and Australia for medically qualified staff.
Anaesthesiologist – A term in occasional use in Europe for medically qualified staff.
Anesthesiologist – A term used in the USA for medically qualified staff.
Anesthetist – A term used in the USA for non-medically qualified staff.
ASA – American Society of Anesthesiology.
CRNA – Certified registered nurse anesthetist.

Appendix I
Comparison of conditions and salaries

<table>
<thead>
<tr>
<th></th>
<th>Hours of work</th>
<th>Salary (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending</td>
<td>&gt; 60 hr/week</td>
<td>starting 140,00 US median 200,000</td>
</tr>
<tr>
<td>Residents</td>
<td>&gt; 80 hr/week</td>
<td>35–45,000</td>
</tr>
<tr>
<td>CRNA</td>
<td>40 hr/week</td>
<td>90–110,000</td>
</tr>
<tr>
<td>AA</td>
<td>40 hr/week</td>
<td>100,000</td>
</tr>
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</table>

Appendix II
Comparison of staffing in different hospitals

<table>
<thead>
<tr>
<th></th>
<th>Attending (Consultants)</th>
<th>Residents (Trainees)</th>
<th>CRNA</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penn State (PA)</td>
<td>24</td>
<td>36</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Sloan Kettering (NY)</td>
<td>32</td>
<td>5</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>Mayo Clinic (Rochester Minn)</td>
<td>100</td>
<td>50</td>
<td>175  (+90 students)</td>
<td>0</td>
</tr>
<tr>
<td>Mt Sinai (NY)</td>
<td>77</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>St Luke's – Presbyterian (NY)</td>
<td>38</td>
<td>36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Emory, Georgia</td>
<td>65</td>
<td>48 (+ 10 Fellows)</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>Rex Hospital, Raleigh, (NC)</td>
<td>21</td>
<td>0</td>
<td>56</td>
<td>0</td>
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</table>

Appendix III
Training of CRNA and AA

<table>
<thead>
<tr>
<th></th>
<th>CRNA</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance requirements</td>
<td>Fully trained nurse. Usually two to three years ICU experience</td>
<td>Medical college entrance requirements, i.e. UK equivalent of upper second science degree</td>
</tr>
<tr>
<td>Duration of course</td>
<td>two years</td>
<td>two years</td>
</tr>
<tr>
<td>Structure of course</td>
<td>one year clinical training six months classroom teaching</td>
<td>Similar</td>
</tr>
<tr>
<td>No of schools in the USA</td>
<td>&gt;80</td>
<td>two</td>
</tr>
<tr>
<td>Emory Anesthesiologist Assistant Program</td>
<td>Credit hours</td>
<td>Medical College of Virginia Nurse Anesthesia Program</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Summer Semester I</td>
<td></td>
<td>Fall Semester I</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>Introduction to Cardiovascular Anatomy and Physiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Terminology (self study)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instrumentation/Physiology/Pharmacology Lab I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Introduction to Pulmonary Anatomy and Physiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Principles of Airway Management I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anesthesia Delivery Systems and Equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physics for Anesthesia Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Methods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Anesthesia I</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13 hours</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Fall Semester II</td>
<td></td>
<td>Spring Semester II</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>Instrumentation/Physiology/Pharmacology Lab II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Principles of Airway Management II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Principles of Instrumentation/Monitoring and Equipment I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physiology supplement for Anesthesia Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anatomy (taught by medical school Dept Cell Biology)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physiology (taught by medical school Dept Physiology)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Anesthesia II</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16 hours</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Spring Semester III</td>
<td></td>
<td>Summer Semester III</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>Instrumentation/Physiology/Pharmacology Lab III</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Principles of Airway Management III</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pharmacology in Anesthesia Practice I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pharmacology (taught by medical school Dept Pharmacology)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cardiovascular and Pulmonary Physiology in Anesthesia Practice I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anesthesia Principles and Practice I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Anesthesia III</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5 hours</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Summer Semester IV</td>
<td></td>
<td>Fall Semester IV</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>Instrumentation/Physiology/Pharmacology Lab IV</td>
</tr>
<tr>
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<td></td>
<td>Principles of Instrumentation/Monitoring and Equipment II</td>
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<tr>
<td></td>
<td></td>
<td>Cardiovascular and Pulmonary Physiology in Anesthesia Practice II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anesthesia Principles and Practice II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Anesthesia IV</td>
</tr>
<tr>
<td>TOTAL</td>
<td>14 hours</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Fall Semester V</td>
<td></td>
<td>Spring Semester V</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>Senior Seminar in Anesthesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anesthesiology Departmental Seminar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical Anesthesia V</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17 hours</td>
<td>TOTAL</td>
</tr>
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</table>

The role of non-medical staff in the delivery of anaesthesia services

The Royal College of Anaesthetists
Appendix IV (continued)

### Comparison of curricula of CRNA and AA

<table>
<thead>
<tr>
<th>Course</th>
<th>Emory Total credit hours</th>
<th>MCV total credit hours</th>
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</thead>
<tbody>
<tr>
<td>Spring Semester VI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Seminar in Anesthesia</td>
<td>1</td>
<td>Special Topics</td>
</tr>
<tr>
<td>Anesthesiology Departmental Seminar</td>
<td>1</td>
<td>Teaching Methods</td>
</tr>
<tr>
<td>Clinical Anesthesia V</td>
<td>14</td>
<td>Clinical Practicum V</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>16 hours</strong></td>
<td><strong>9 hours</strong></td>
</tr>
<tr>
<td>Summer Semester VII</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Seminar in Anesthesia</td>
<td>1</td>
<td>Principles and Practice of Nurse Anesthesia VI</td>
</tr>
<tr>
<td>Anesthesiology Departmental Seminar</td>
<td>1</td>
<td>Professional Aspects of Anesthesia III</td>
</tr>
<tr>
<td>Clinical Anesthesia V</td>
<td>11</td>
<td>Clinical Practicum VI</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>13 hours</strong></td>
<td><strong>9 hours</strong></td>
</tr>
<tr>
<td>Entire Program</td>
<td>104 semester hours</td>
<td>72 semester hours</td>
</tr>
<tr>
<td>Basic Health Sciences (anatomy, physiology, pathophys, etc)</td>
<td>23 semester hours</td>
<td>18 semester hours</td>
</tr>
<tr>
<td>Basic Sciences (chemistry, physics, etc)</td>
<td>2 semester hours</td>
<td>0 semester hours</td>
</tr>
<tr>
<td>Anesthesia equipment and patient monitoring</td>
<td>8 semester hours</td>
<td>0 semester hours</td>
</tr>
<tr>
<td>Anesthesia Sciences</td>
<td>18 semester hours</td>
<td>16 semester hours</td>
</tr>
<tr>
<td>Clinical Anesthesia</td>
<td>52 semester hours (2556 contact hours)</td>
<td>26 semester hours</td>
</tr>
</tbody>
</table>

### Appendix V

**Perceived advantages/disadvantages of CRNA’s and AA’s**

**Advantages:**
- Provide enormous flexibility in covering the service
- Allow allocation of residents to specific cases to achieve required portfolio of experience
- Provide large source of manpower to replace shortage of physician anesthesiologist
- Free up attending anesthesiologist to participate in out-of-theatre activities including preoperative visiting, ICU, pain clinics, administration, research and teaching

**Problems:**
- National shortage of nurses and recruitment into CRNA programmes is declining – consequently there may be some agitation for enhanced salaries
- Tension between physicians and CRNA’s
- Regular working hours – additional work requires premium overtime payments
- The MSc is seen to be of lower quality than that of other university MSc degrees
- CRNA’s are very unionised – have caused severe problems in some hospitals
- CRNA’s are very expensive in comparison with residents

### Appendix VI

**Publications on quality of care delivered by CRNA**

The most widely quoted paper in this area is that by Silber and colleague (Anesthesiology 2000;93:152–163). In this study of 245 hospitals, death rate within 30 days of admission and in-hospital complication rate in elderly patients undergoing general surgical or orthopaedic procedures were analysed according to whether anesthesia care was directed by anesthesiologists or by non-anesthesiologists (a licensed physician). It was concluded that both 30-day mortality rate and complications were lower when anesthesiologists directed anaesthesia care in these Medicare patients. A major problem with this study is that there was no randomisation of cases according to patient characteristics although this was corrected statistically. What this study does not address of course is whether CRNA’s supervised by an attending anesthesiologist have a significantly higher complication rate than anesthesia undertaken by anesthesiologists alone.

The authors commented that their data were consistent with other large studies of anaesthesia outcomes; one study widely quoted suggested that the best outcome occurs when anesthesia is provided by an anesthesia care team directed by an anesthesiologist (Aubenstein and Warner Anesth Analg 1996;82:1273–1283).
Visit to The Netherlands

Structure of the visit
The personnel were:

For the College:  Dr P J Simpson (Senior Vice-President)  
Professor G Smith (Past Junior Vice-President, Member of Council, RCA)

For the DoH:  Dr J Moore (SMO Strategic Medical Workforce Issues)  
Mr N McKellar (Workforce Development Confederation)  
Mr G Bennett (Changing Workforce Programme, Modernisation Agency)

The visit to The Netherlands lasted from Wednesday, 26 June to Friday, 28 June 2002.

Wednesday
Arrival in Amsterdam late evening.

Thursday
Visit to Leiden University Medical Centre:
➤ Morning – conference with medical personnel.
➤ Afternoon – visit to operating theatres and conference with Nurse Anaesthetists.

Friday
Visit to Leyenburg Ziekenhuis, The Hague
➤ Morning – conference with medical and anaesthetic nurse personnel.
➤ Afternoon – visit to polyclinic and A&E department.
➤ Late afternoon – return to UK.

Anaesthesia services in The Netherlands
Holland has a population of approximately 15 million.

There are approximately 140 hospitals all of which have anaesthesia services. Eight centres are teaching hospitals and nine in total have an anaesthesia residency-training programme. Anaesthetic residents do not rotate to other hospitals (apart from training requirements for major paediatrics or neurosurgery) and so approximately 130 hospitals are staffed for anaesthesia solely by consultants and anaesthetic nurses. Medical and surgical residents rotate to a larger number of non-teaching hospitals.

There are approximately 1000 Consultant Anaesthetists. The 150–200 Residents undertake a five year training programme, thus producing 25–35 trained specialist anaesthetists per year.

In addition to medically qualified anaesthetic personnel, there are approximately 1400 anaesthetic nurses in the Netherlands. Anaesthetic nurses (AN’s) are drawn from both nursing and non-nursing backgrounds and are sometimes referred to as Anaesthetic Assistants. However the official term for this type of staff is anaesthetic nurse, the official name of their national organisation is the Dutch Society of Anaesthetic Nurses, and so throughout this paper, the term Anaesthetic Nurse is used, although it is interchangeable with Anaesthetic Assistant.

Funding of healthcare in the Netherlands is based upon an insurance type of scheme with a few different levels of provision being available. Consultants in the academic hospitals are salaried. In the past, in the non-teaching hospitals, consultants’ income may have been derived from billing individual patients, (a fee for item of service system), but in the last five to ten years there has been a gradual shift to a system whereby hospitals bill patients and consultant staff are employed on a salaried structure.

Leiden University Medical Centre (LUMC)
At LUMC, we met:
Professor Jack van Kleef – Chairman of the Department  
Professor Jim Bovill – Cardiac and Research Anaesthetist  
A young consultant anaesthetist  
A resident anaesthetist

In the afternoon we met:
An anaesthetic nurse and teacher at LUMC  
A trainee anaesthetic nurse

LUMC is an extremely large teaching hospital with residents in every speciality. All types of surgery are undertaken excluding, at the moment, cardiac transplantation.

Number of operations per year – 12,000
Number of consultant anaesthetists – 28/29
Number of residents – 35 training and 1/2 non-training
Number of Anaesthetic Nurses – 40 trained and 24 in training
Number of Operating rooms – 20

Leyenburg Ziekenhuis Hospital, The Hague
At Leyenburg we met:
Dr Gert de Ruiter – Chairman of the department of anaesthesia  
Ms Yvonne Kersten – An anaesthetic nurse and the unit coordinator for anaesthesia  
Mr Pieter van Lieshout – An anaesthetic nurse and teacher at LUMC

Leyenburg Ziekenhuis is a non-teaching hospital in The Hague. There are no residents in anaesthesia but there are residents in surgery, gynaecology, and medicine.
Types of staff who take part in anaesthesia delivery

Consultant anaesthetists

Consultant anaesthetists in Holland tend to work only in one hospital and they supervise two operating rooms in which each is an Anaesthetic Nurse (AN). Rooms cannot be used in the absence of a trained AN. At LUMC there is usually a resident also allocated to each OR.

The number of rooms/AN’s a consultant can supervise is determined by national regulations laid down by the Dutch Society of Anaesthetists (DSA). Very occasionally this rule may be relaxed and three or even four rooms may be supervised when lesser degrees of supervision are required, e.g. local blocks in eye lists.

At LUMC there is a slight variation in the pattern of work of consultants, some spending their whole time in specialist areas such as paediatrics or cardiac anaesthesia, and some have time allocated for specific out of theatre teaching, or for undertaking research.

At the non-teaching hospital (LZ) consultants are scheduled to work every day 8.00 am till 4.00 pm in the operating theatre and the average working week is 46 hours per week. Of the seven consultants, three will be covering routine theatre lists, one covering ITU (supervising a medical or surgical resident) and one will be off duty following on-call. Only two theatres continue beyond 4.00 pm with emergency cases being added to the end of theatre lists. The on-call anaesthetist is usually onsite all evening, and is likely to be called back overnight two to three times per week usually for LSCS or ITU. All consultants are off the day after a night on call. All consultants cover every type of anaesthetic practice.

The fixed age of retirement for consultants is 65 but the majority retire at 60–62 years of age.

At LZ, consultants have 30 working days per year holiday with ten days per year for CME purposes.

Salaries of all consultants in all specialities are identical where hospitals employ staff on a fulltime salaried basis but there may be small variations between hospitals in different regions of The Netherlands and salaries of staff at teaching hospitals are lower than those at non-teaching hospitals.

The official hours of work of consultants is 40 hours per week although in practice at both LUMC and LH it amounts to 46 hours per week.

Residents (Registrars)

The total number of residents in the country is recommended by the Dutch Society of Anaesthetists and each training centre is visited at regular periods of approximately five years.

A large number of hospitals, approximately 131, do not have residents in anaesthesia although residents in other specialities may be present.

After qualifying as a doctor in the Netherlands, individuals may take up posts as non-training residents. Not all graduates enter a non-training post before starting a recognised training programme, although in practice most do. This situation has arisen because of the restrictions on the number of official training posts in anaesthesia and the fact that the number of graduates wishing to enter the specialty currently exceeds the number of official posts. Because some hospitals may allow employment of more residents than the allocated number of official training posts, extra posts may be filled with graduates from a waiting list who have been selected as potential ‘official’ residents. They normally spend about 12–18 months before entering the official training programme, but there is no formal period for the non-training residency.

In anaesthesia residents undertake five years training for a CCST. Non-training residents do no on-call whilst training residents do participate in the on-call rota. The hours of work of both types is 46 hours per week in comparison with 36 hours per week for an AN and 40 hours for a consultant. All the training of residents is confined to one centre unless rotation is required for specific specialist experience, e.g. major paediatrics or cardiac. At LUMC, residents remain within the LUMC complex throughout their five year period. There is an examination set by the Dutch Society of Anaesthetists comprising a primary during the second year and a final during the fourth year; progress is not possible unless the examinations are passed but the drop out rate is not high.

Residents are not required for the provision of anaesthetic services; they are supernumerary. At LUMC each operating theatre is always staffed by an AN and a resident; when an AN trainee is also allocated to the room, this produces some frustration as both resident and AN trainee are competing to obtain experience in practical procedures and management of the patient.
At LUMC there are three residents on duty at night – two to provide anaesthetic cover and one to support the postoperative ward and provide an acute pain service.

Resident anaesthetists are not required to reside in the hospital when on call at night. Medical input into cardiac arrest teams is provided by residents from other specialties, e.g. ICM. There appears to be a general rule for all staff (including AN’s and consultants) that providing it is possible to get from home into the operating theatre, changed and ready to work, within twenty minutes, then residence within the hospital is not necessary.

**Anaesthetic nurses (AN’s)**

The total number of AN’s in Holland is approximately 1400. They have a national society (Dutch Society for Anaesthetic Nurses, DSAN) with its own journal and CPD programme. AN’s with a nursing background are on a professional register and the DSAN has a list of rules governing the activities of these AN’s. There is no formal relationship between the DSAN and the Dutch Society of Anaesthetists.

There are 19 schools training anaesthetic nurses in the Netherlands. They currently produce around 150 ‘graduates’ a year. The syllabus and mode of delivery are set nationally and the standard of the schools is checked regularly by the Federation of Dutch Hospitals (NZA). The final qualification is equivalent in academic attainment to that of a specialised nursing diploma in intensive care.

Schools will have trainees in several surrounding hospitals, which contribute financially to the running of the school. In Leiden, the school is part of the LUMC (but off campus) and it provides training for assistants in a range of different specialities, e.g.

- Anaesthetic Nurse.
- Operating Assistants.
- Intensive Care.
- Paediatric Nurse.
- Perfusion.
- Dialysis.

For AN’s the course lasts three years for entrants without a nursing background and two years for nurses. The overall dropout rate is approximately 5%. Recruitment is currently strong after some loss of popularity in recent years, but there is a perceived shortfall in output and retention. At the present time, approximately 60% of the intake is from candidates with a nursing background and 40% are students from school with A levels of a standard not quite matching university entrants. The additional preliminary six months training for the latter group comprises 15 weeks of basic science with the remainder spent on practical instruction. The two groups follow the same training programme for the remaining two years. Over this period, they spend 15 weeks on classroom teaching and the remainder on practical instruction in the operating theatre.

AN students are assessed on an ongoing competency basis and have to be signed up for practical and theoretical work in a large highly detailed book. It is a joint responsibility of the trainee and the trainers to ensure that all topics have been covered appropriately. In addition AN’s take annual exams and a final written and oral examination at which a representative from the NZA is present. Each student must pass every examination with the possibility of only three resits.

Students do not pay tuition fees. School leavers are paid a salary of 500 euros per month with nurses being paid 1,500 euros per month (following a non-detrimental clause). School leavers may be entitled to subsidised hospital housing.

The total training cost per person per year in the Leiden School of Anaesthetic Nurses is 50,000 euros per annum. This funding is derived from the several hospitals within the training scheme. Hospitals wish to be part of a training scheme as it improves their recruitment prospects.

**Classroom teaching**

The trainee AN’s receive detailed teaching in physiology, pharmacology, physics and anatomy from academic staff in the University of Leiden. In addition they receive teaching on theories of anaesthesia from consultant anaesthetists and on anaesthetic techniques from the anaesthetic nurses who are designated teachers.

**Practical teaching**

For most of their time, trainee anaesthetic nurses accompany trained AN’s in the operating theatre. For the first two years of their training they are always directly supervised by a trained AN. In the third year, they begin to work independently with selected cases and consultants. They have a detailed manual that the teacher has to certify for completion of practical activities.

**Comparison of salaries of anaesthesia staff**

<table>
<thead>
<tr>
<th>Category</th>
<th>Salary Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultants in non-teaching hospitals</td>
<td>160–200,000 euros pa</td>
</tr>
<tr>
<td>Academic consultants</td>
<td>100–150,000 euros pa</td>
</tr>
<tr>
<td>Residents</td>
<td>30–48,000 euros pa</td>
</tr>
<tr>
<td>Anaesthetic Nurses</td>
<td>34,000 euros pa (same as specialised nurses after ten years)</td>
</tr>
<tr>
<td>Trainee Anaesthetic Nurse (nurse)</td>
<td>18,000 euros pa</td>
</tr>
<tr>
<td>Trainee Anaesthetic Nurse (School leaver)</td>
<td>6,000 euros pa</td>
</tr>
</tbody>
</table>


**Practical work of the anaesthetic nurse**

Trained AN’s, whilst on duty, may carry the cardiac arrest pager and may also go out on special ambulances for emergencies outside the hospital, otherwise they spend the whole of the remainder of their time in the operating theatre complex and work in eight hour shifts.

They are not involved in preoperative assessment clinics, obstetric epidurals, postoperative pain cover, pain clinics etc.

**Practical duties**

1. Staffing the operating theatre is efficient by British standards. There is no equivalent of a UK ODP and the theatre may utilise only a circulating nurse, a scrub nurse and the anaesthetic nurse together with surgical staff and a consultant anaesthetist supervising two rooms.

   Thus the anaesthetic nurse has to ensure initially that:
   - a The anaesthetic cart is fully stocked.
   - b All equipment is checked and in working order.
   - c Patients are brought from the holding area to the operating theatre.

2. Each patient is allocated an anaesthetic prescription by the consultant anaesthetist at the preoperative assessment clinic. Based upon this, the anaesthetic nurse draws up all the drugs required into labelled syringes. This includes opioids (and interestingly, neither the equipment nor drugs are double checked by the physician anaesthetist).

3. There are no anaesthetic rooms and an IV infusion is set up by the AN in a holding area or the OR.

4. Anaesthetic nurses do not perform any type of regional anaesthesia. Local anaesthetic blocks are performed by the consultant in either the OR or a holding area.

5. The consultant anaesthetist must be present during induction and recovery from anaesthesia.

6. According to the experience of the AN and the practice of the consultant, the AN may be allowed to pass a tracheal tube, a laryngeal mask, etc.

7. The consultant anaesthetist agrees with the AN physiological variations around which the nurse may operate before summoning the consultant. Thus the AN will adjust concentrations of volatile agents, administer additional muscle relaxant or opioid, adjust ventilator settings etc. Agreement is reached on the classes of drugs that may be administered, and outside any prearranged limits, the nurse will normally ask the anaesthetist.

Other duties of the anaesthetic nurse include:
- a Ordering drugs.
- b Coaching of students.
- c Looking after anaesthetic equipment and determining when specialised technicians are required for equipment servicing purposes.

**Anaesthetic nurse registration and CME**

There is a professional register for all AN’s. Currently registration is permanent but there are discussions on whether or not to introduce regular revalidation. AN’s are responsible for their own actions and are indemnified by the employer. However the current legal framework encompasses only AN’s with a nursing background.

CME for AN’s comprises annual attendance one day per year at the local training school and the possibility of attending for one day at the annual meeting of the Dutch Society of Nurse Anaesthetists (NVAN). NVAN also produces a journal, which comprises predominantly CME articles written either by physician anaesthetists or AN’s.

During the meetings attended by AN’s, it may be necessary to cancel surgical lists but often attempts seem to be made to hold meetings on Saturdays to minimise disruption of surgical activity. AN’s are appraised regularly by the unit coordinator for anaesthesia. On this occasion any critical incidents or accidents are reviewed.

**Recruitment and retention**

There is currently a shortage of AN’s in the Netherlands. It is not as severe as it was a few years ago when job opportunities at higher salaries existed particularly in the IT sector, but clearly schools for anaesthetic nurses are competing in the labour market. Turnover of AN’s at LUMH is high because of the fact that 50% of AN’s are female and many leave to start a family, others move to northern Holland where the cost of housing is cheaper and there is some loss to pharmaceutical and equipment manufacturers.

At Leyenburg Hospital the AN’s are a more stable workforce. On balance it is thought that staff retention is quite good and that the job provides high levels of job satisfaction because of:
- a A high level of responsibility.
- b It is enjoyable.
- c It appeals to individuals who enjoy the technical aspects of the work.
- d Although a highly responsible post, it is very well supervised.
- e For those who remain within the nursing profession, the salaries are those at the highest level achieved by a clinical nurse who does not move into managerial positions.

Both departments emphasised the harmonious relationship and lack of conflict which exists between medical and nurse anaesthetic personnel and how well the system works both for themselves and more importantly, patient care. AN’s were satisfied with their role and not frustrated by the systemised nature of their work. They were appreciative of the additional responsibilities of the medical anaesthetic staff.
Organisation and management of operating department activity

The two hospitals that we visited in Holland are modern with centralised operating department suites. There are no anaesthetic rooms but there are several holding areas in which it is possible to set up intravenous infusions and perform regional blocks. The operating theatres are larger than those in the United Kingdom and there is an overall impression of a lack of clutter and a degree of tidiness that suggests efficiency and a high level of organisation.

There are no equivalents of porters or ODP's. Patients are brought to the theatre suite by nurses from the ward and transfer from reception and holding areas to the operating theatres is undertaken by anaesthetic nurses. Operating theatres run from 8am until three or 4pm but from 3pm onwards consultant anaesthetists perform preoperative assessment of patients and check an anaesthetic prescription form detailing the techniques that will be undertaken when the patient undergoes surgery. At LUMC, the preoperative anaesthetic assessment clinic constitutes a consultant anaesthetist, two residents, a cardiologist, and a specialist in internal medicine and this obviates the necessity for additional outpatient consultations.

The operating theatres function all day, without scheduled breaks for lunch, and this depends upon the fact that staff work in only one hospital without duty or obligations to other activities or other hospital sites. All consultant anaesthetists have offices either within the theatre complex or adjacent to it situated so that it is possible to move from the office to the operating theatre without changing. Offices are connected by intercom to the theatre so that assistance can be summoned immediately if necessary.

As consultant anaesthetists supervise two theatres and as they must be present both at induction of anaesthesia and recovery from anaesthesia, it is necessary for them to control the scheduling of patients. Thus the order of patients on lists may be determined by the anaesthetists rather than the surgeon although in practice compromise is occasionally necessary when surgeons are required for outpatient consultations, management meetings, etc. Pragmatically, it seems to operate best when a list of ‘difficult’ cases is teamed up with a list of ‘long, easy cases’ for supervision by the same consultant anaesthetist.

The use of automated computerised anaesthesia systems has several advantages. It reduces the administrative tasks of the anaesthetic nurse during conduct of anaesthesia by eliminating the necessity for manual recording of physiological data throughout anaesthesia and surgery. It also provides the ability to assess the activity of the anaesthetic nurse in responding to fluctuations in physiological status and also records the number of critical incidents per individual.

The use of large anaesthetic trolleys containing a complete range of drugs and equipment, which may be required during anaesthesia, ensures that it is not necessary for the anaesthetic nurse to exit theatre frequently into an anaesthetic room and total standardisation of the anaesthetic trolleys provides an element of safety. Another factor which enhances anaesthetic safety is that there is a relatively limited range of anaesthetic techniques used and the standardised ‘conveyor belt’ practice ensures that anaesthetic nurses may be left without direct supervision for prolonged periods of time during conduct of anaesthesia and surgery. This also allows consultant anaesthetists to spend time in their offices undertaking business and administration.

Consultant anaesthetists have no allocated contractual time for business, paperwork and administration. However distant supervision of AN's from their offices within the theatre suite allows consultant anaesthetists to undertake office work around clinical commitments. Collective departmental and business meetings are held in the evenings rather than during the working day. There are no joint meetings between consultant anaesthetists and AN’s.

Safety and outcomes

All the physician anaesthetists encountered during our visit to the Netherlands indicated a considerable degree of satisfaction with the Dutch system of providing anaesthesia services. A recent large-scale study (Arbouth et al 2001) suggested that outcomes in the Dutch system were similar to those in the United Kingdom, Australia, or the United States. Dr de Ruiter indicated that the standard of anaesthetic nurses was uniformly very good with a high level of safety. Although there had been some problems in recruiting anaesthetic nurses a few years ago, this had now improved. The number of individuals who had been dismissed was negligible: no one had left the anaesthesia assistant service because they were unsafe or could not be trained and such problems as had unfurled in LZ were because of difficulty in human relationships rather than technical or intellectual problems.

Summary

➢ All anaesthetic patients in the Netherlands are cared for by an anaesthetic nurse. Anaesthesia is not permitted in the absence of an AN.

➢ Consultant anaesthetists supervise two (very occasionally three and rarely four) operating theatres, each containing an anaesthetic nurse.

➢ Anaesthetic nurses are not involved in patient assessment, postoperative care, ICU or obstetric epidural services.

➢ Anaesthetic nurses do not perform regional blocks and they must be accompanied by a consultant during induction and recovery from anaesthesia.
Resident (trainee) anaesthetists are entirely supernumerary and are not required for maintaining anaesthesia services either elective or emergency. They do not form part of cardiac arrest teams.

The functioning of the Dutch system is greatly assisted by:
- consultants working with all day lists
- consultants being committed to a single hospital
- operating theatres being grouped into modern operating theatre suites
- consultant anaesthetists being able to control theatre scheduling
- The use of modern computerised anaesthetic recording systems allows the anaesthetic nurse to concentrate on patient monitoring without the distraction of clerical work; it also permits analysis of the AN’s response to changes in the physiological status and provides data for the purposes of recording audit and critical incident data.

The safety of the Dutch system of using anaesthetic nurses is dependent on:
- high entrance requirements into anaesthetic nurse training school
- extensive training programmes for AN’s
- relatively restricted and regimented use of a small range of anaesthetic techniques.

The workload in obstetric anaesthesia is relatively much lighter than that in the UK because of a smaller demand for obstetric epidurals and a lower rate of LSCS.

Reference

Visit to Sweden
Structure of the visit
The personnel were:
For the College:
- Dr P J Simpson (Senior Vice-President)
- Professor G Smith (Past Junior Vice-President, Member of Council, RCA)
For the DoH:
- Dr J Moore (SMO Strategic Medical Workforce Issues)
- Mr N McKellar (Workforce Development Confederation)
- Mr P Shuttleworth (Changing Workforce Programme, Modernisation Agency)
The visit to Sweden lasted from Wednesday, 28 August to Friday, 30 August 2002.

Wednesday
Arrival in Stockholm late evening.

Thursday
Visit to Karolinska Hospital (KS):
- Morning – departmental meeting followed by parallel visits to operating theatres and facilities.
- Afternoon – Astrid Lindgrens Children’s Hospital: conference with medical and nursing personnel.

Friday
Visit to South Stockholm General Hospital (SOS):
- Morning – departmental meeting followed by parallel visits to operating theatres and clinical facilities.
- Late afternoon – return to UK.

Karolinska Hospital (KA)
At KA, we met:
- Professor Per-Arne Lonnqvist
- Dr Per Gannedahl
- Dr Ulrike Otterstedt
Several consultant, trainee and nurse anaesthetists
In the afternoon we met:
Two trainers from the Karolinska Institute School of Nursing
- E Fältström, Anaesthetic nurse
- H Selldén, Swedish College of Anaesthetists
L Guudmundson, National Board of Health and Welfare
Dr G Karlemä, Director of Anaesthesia, SÖS Hospital
*Dr B Cleaver, Senior trainee, SÖS Hospital
Additional medical and nursing anaesthetic staff
At SÖS Hospital we also met:
Professor R Hahn, academic and research lead for SÖS
*Dr M Rolfs, senior anaesthetic trainee
The role of non-medical staff in the delivery of anaesthesia services

The Royal College of Anaesthetists

Dr Cleaver and Dr Rolfs have experience of medical/anaesthetic training in the UK.

KA is a large university hospital complex.

Separate anaesthetic divisions are responsible for the different elements of clinical services:

➢ Central operating suite (14 theatres) – general surgery, urology, O&G, trauma and acute. Includes delivery suite cover for 5000 births per annum.
➢ Intensive care – neuro ITU and general ITU.
➢ Orthopaedics (six theatres).
➢ Neurosurgery (four).
➢ ENT (six, with three to four in use).
➢ Cardiac and vascular (six theatres).
➢ Paediatric (Astrid Lindgren’s Children’s Hospital).

SÖS Hospital

SÖS Hospital is a large city emergency hospital of approx 550 beds, serving a population of 500K. Admissions are predominantly emergencies (85%). There are around 5000 births per annum.

- Number of operations = 12,400 (2001 data)
- Number of consultant anaesthetists = 30
- Number of residents = 20
- Number of Anaesthetic Nurses = 70 trained and 10 vacancies
- Number of Operating rooms = 23

Swedish health care system

Sweden has a population of approximately 8.7 million, with Greater Stockholm accounting for 1.6 million. The population is sparsely distributed over an area approximately twice the size of the UK, with many small rural communities in addition to cities of varying size. Consequently, hospitals vary greatly in size and complexity. There are now five large and seven smaller university hospitals, and the majority are non-university hospitals.

In 1990 there were 89 emergency hospitals. Rationalisation over the last decade has led to a reduction in the number providing emergency surgery, coronary care and maternity services. Since 1992 the number of hospital beds has fallen from 58,000 to 32,000. There has been a 25% fall in health care employees, although the number of doctors and nurses increased over this period by 9% and 5% respectively.1

Swedish healthcare is funded from direct taxation levied at community or regional level, with consequent variation in local taxes. In an attempt to control demand for care, Swedish citizens are required to pay from personal income the first £1000 for the cost of attendance at a GP’s surgery (£20 per visit) and also the first £1000 of the costs of drugs each year. Self-referral to hospital A&E also costs £20 per visit within the former budget.

Anaesthesia services in Sweden

The first full time medical anaesthetists were appointed in the 1940s and there was little increase in medical staffing until the 1960s. The concept of anaesthetic nurses was introduced at the same time and it was common for most district hospitals to be staffed by one medical anaesthetist and several anaesthetic nurses.

Undergraduate medical education is provided at six medical schools, which together admit 1000 students per annum. After graduation, doctors compete for places on a 21 month rotation, which provides broad generic training and fulfils their registration requirements. If they are then unable to obtain a specialty training post, they can take a one year training post in a specialty such as anaesthesia, working effectively as a trainee, but this period is not recognised formally as part of specialty training. After a three month induction, these individuals work as full members of the department, which uses these posts to attract graduates to the specialty.

After obtaining a specialty post, formal training in anaesthesia and intensive care takes five years, which includes eighteen months spent in related specialties (e.g. respiratory medicine, A&E, research). Anaesthesia trainees are based in one location for the whole of their training. The number of trainees in anaesthesia is determined nationally, based on advice from the Swedish Association of Anaesthesia and Intensive care (SFIA).

After completion of training, the trainee becomes a specialist. This is a permanent position. At this stage of clinical experience and training, the specialist equates broadly to SpR 2 with FRCA. In all but the largest training institutions (where trainee output exceeds employment opportunities) the trainee would expect to remain with the organisation in which they trained, although some follow market forces and move.

As a specialist, the doctor may negotiate additional sub-specialty training, and many specialists eventually become senior consultants. These posts are filled competitively and tend to include a greater commitment to administration, management, teaching or research.

For the purposes of this report, ‘trainee’ includes both unrecognised and formally approved anaesthetic trainees; ‘consultant’ includes both specialists and seniors.

In addition to medically qualified anaesthetic personnel, Sweden employs anaesthetic nurses (AN’s) recruited exclusively from a nursing background. On average a hospital has approximately two-and-a-half AN’s per medical anaesthetist.
Types of staff who take part in anaesthesia delivery

Swedish health care is very deregulated. There is no legislation setting limitation on the clinical practice of individuals or groups of professionals. Decisions are currently left to the employer, although national norms for professional competence are under discussion.

Salaries for both medical and non-medical staff are negotiated at hospital level, and departmental heads have discretion to vary salary levels somewhat in order to attract and retain staff. In practice salaries are broadly similar across similar organisations, although those in private hospitals are higher than in the public sector. Doctors are contracted to work exclusively in one hospital, either in the public or private sector, but in practice many work for a second organisation during their free time.

Consultant anaesthetists

In Sweden, consultants tend to work in only one hospital on any given day. They supervise several theatres, in each of which is an anaesthetic nurse (AN) or anaesthetic trainee. There appear to be no national or local regulations which determine the number of operating theatres that a consultant anaesthetist may supervise.

Rates of supervision vary according to surgical complexity, the ASA status of the patient, consultant assessment of the competence and experience of the AN, type of hospital (teaching v non-teaching), location of the theatres (isolated unit v central operating suite) and geography (city v rural). In the major hospitals we visited, a consultant might supervise up to six rooms, although the more commonly applied policy was for one physician to supervise two AN's. A physician was always directly involved in the care of complex cases, e.g. cardiac, paediatric, ASA 3 and 4. Despite the number of rooms supervised, support was such that a solitary AN would have immediate access to appropriate medical assistance in an emergency.

Possible scenario (four theatres supervised)

Consultant

Trainee

AN in theatre*

AN in theatre*

Trainee

AN in theatre*

AN in theatre*

* A trainee can be substituted for the AN in theatre.

Consultants are scheduled to work every day from 8.00 am to 4.00 pm, with duties being allocated the previous afternoon. Consultants work a 40 hour week, plus on-call. They spend their working week in theatre, preoperative assessment or other direct anaesthetic services, with no protected time for administration or management. Departmental meetings are usually held at the beginning or end of the normal working day. Formal arrangements for protected research time, in the form of full-time blocks, may be obtained following competitive application. Consultants are usually resident on call, for which they receive additional pay and compensatory rest. With two weekday nights on call, a consultant could fulfil a week’s contract without any other duties. Large institutions may also have an additional non-resident consultant on-call.

Trainees (Residents)

The majority of large hospitals employ anaesthetic trainees, who may or may not be in a recognised specialty-training programme. After three months induction they take an active part in the work of the department. Trainees work a 40 hour week, plus on-call. Shift rota's are the norm, with compensatory rest for antisocial hours and unplanned overtime.

When resident at night, the trainee's main responsibility is to the general and trauma emergency services, and cardiac arrests. There is no dedicated obstetric epidural or emergency service and this work is factored into the general emergency workload. Intensive care tends to be covered directly by the consultant on-call. In conjunction with their resident consultant(s) they will prioritise demands and deploy anaesthetic nurses and physician anaesthetists appropriately.

Training is delivered both by consultants and by experienced anaesthetic nurses, with whom the trainees work closely. Trainees may be responsible for two theatres simultaneously and this provides additional educational opportunities. A trainee may administer anaesthesia without an AN present. In this case they would be supported either by a nursing assistant or a consultant anaesthetist.

There are no formal joint educational meetings for anaesthetic trainees and anaesthetic nurses. Tensions sometimes arise because of competition for training opportunities between trainee anaesthetic nurses, anaesthetic trainees and medical students.

Anaesthetic nurses (AN’s)

All hospitals in Sweden employ anaesthetic nurses, 95% of whom are female. In conjunction with ITU nurses, they have developed their own Association within the General Assembly of Nurses. This professional organisation has its own journal and annual congress. There is no formal relationship between the Association and SFAI.

All anaesthetic nurses are registered nurses. Registration does not currently require renewal. There is no separate registration for anaesthetic nurses, although the diploma and its associated title ‘specialist nurse’ are protected by law.

There are ten to 15 training schools for anaesthetic nurses in Sweden. All anaesthetic nurses have a primary nursing degree, which involves three years training. Some training schools require two years of subsequent general nursing practice before entry into the graduate diploma, anaesthetic nurse training, but this is not mandatory.
Anaesthetic nurse training takes one year. The duration of the course is defined nationally, but individual universities and colleges determine their own curriculum. The quality of each course is approved by the Department of Education and successful completion may be used towards a nursing Masters degree.

The course is based on a system of educational credits and the first semester (20 weeks) is a common programme for nurses following anaesthetic nurse, intensive care, operating room and pre-hospital nurse training. After this the training programmes diverge and the second semester (20 weeks) is exclusive to anaesthesia. Should they wish to move to a different discipline after the first semester.

The course is a combination of classroom based and hospital based learning, with 60% theory and 40% practical work. In the first semester three weeks are spent in hospital, in the second semester this increases to ten weeks. The modes of education combine problem-based learning with small group work and lectures. Supervision and mentoring are intensive and are given by AN's who have undergone a one-semester supervisor course. This intensive supervision limits hospitals' capacity to increase the number of trainees.

Examinations are practically based with a high pass rate. The drop out rate from the course is low and most trainees who leave AN training do so in the early weeks.

Anaesthetic nurse trainees may be funded under sponsorship arrangements from a current or future employer, or by loans for university education.

Anaesthetic nurse training is popular and there is competition for training places. After qualification, AN's enjoy a good salary for a clinical nurse, with hours of employment better than those of an ITU nurse. However, long-term retention is a problem as the job is perceived as hard work and many nurses later return to general nursing before retirement. This opportunity to move sideways is perceived to be an advantage of an entirely nurse-focussed recruitment policy.

After qualification, the anaesthetic nurse works for 38.5 hours a week. Paid overtime is permitted up to a maximum of 200 hours per year, after which the individual must apply for permission to do more.

Most hospitals provide an induction period for newly appointed AN's. Further training and experience is achieved by internal rotations. Annual appraisal and assessment is being developed and most anaesthetic nurses are line managed by a head anaesthetic nurse, with ultimate responsibility resting with the Head Nurse at Hospital Board level. Whilst many anaesthetic nurses are employed and managed by the Department of Anaesthesia, this is not universal.

There is no defined career ladder. Promotion depends on obtaining a post in administration or education, or the development of specialist skills (e.g. paediatrics, dialysis).

**Nurse assistant**

In addition to the anaesthetic nurse, there is a post of nurse assistant. This requires six months training and prepares the individual to assist the AN in theatre. On occasion a nurse assistant may monitor a stable patient's vital signs and administer a limited range of pre-prepared drugs under oral directions (e.g. during spinal anaesthesia) whilst awaiting the return of a more experienced member of staff.

**Comparison of basic salaries of anaesthesia staff**

<table>
<thead>
<tr>
<th>Role</th>
<th>Salary Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seniors</td>
<td>50–65,000 SwK/month</td>
</tr>
<tr>
<td>Specialists</td>
<td>35–45,000 SwK/month</td>
</tr>
<tr>
<td>Post-reg trainee</td>
<td>24,000 SwK/month</td>
</tr>
<tr>
<td>Pre-reg trainee</td>
<td>18,000 SwK/month</td>
</tr>
<tr>
<td>AN</td>
<td>22–24,000 SwK/month</td>
</tr>
<tr>
<td>Newly qualified AN</td>
<td>18–21,000 SwK/month</td>
</tr>
<tr>
<td>Newly registered nurse</td>
<td>17–19,000 SwK/month</td>
</tr>
</tbody>
</table>

**Practical work of the anaesthetic nurse**

Anaesthetic nurses work a shift pattern encompassing morning, afternoon and evening sessions. In some organisations a separate night staff rota operates. Depending on local circumstances they may attend cardiac arrests and also go out on special ambulances for emergencies outside the hospital. Otherwise they spend their time in the operating theatre. They are not involved in preoperative assessment clinics, obstetric epidurals or labour ward duties, postoperative pain cover, pain clinics, intensive care etc.

**Practical duties**

The anaesthetic nurse:

- Stocks the anaesthetic cart.
- Checks all equipment.
- Verifies the patient's status when they are in the theatre reception. The AN evaluates.
- The proposed anaesthetic management and either proceeds to anaesthesia or discusses.
- The patient's care with the supervising medical anaesthetist.
- Brings the patient from the reception area to the operating theatre.

Anaesthetic prescriptions follow set rules, determined by the head of the anaesthetic department or clinical area. The appropriateness of the prescription for an individual patient is reviewed by a consultant or trainee anaesthetist at the preoperative assessment clinic. Minor procedures and healthy patients (ASA 1 and 2) may have been reviewed only by the surgical team.
There are no anaesthetic rooms. Patients are handed over from a ward nurse to an AN in a holding area. The ward nurse then returns to the ward. In the holding area the AN may site an IV cannula and attach basic, non-invasive monitoring.

For ASA 1 and 2 patients a medical anaesthetist does not need to be present during induction of, or emergence from, anaesthesia, including LSCS under general anaesthesia. Under these circumstances the AN will be assisted either by a second AN or by a nursing assistant. The AN will induce anaesthesia, perform tracheal intubation and maintain anaesthesia according to set guidelines.

The AN can perform IVRA but does not undertake any other type of regional anaesthesia. Medical anaesthetists would also be involved in difficult or fiberoptic intubation, and insertion of CVP catheters.

Service contribution and medico-legal status

AN’s are perceived differently between university hospitals and non-university hospitals. In university hospitals, doctors play a more major role in the operating room, supervising AN’s, whilst in non-teaching hospitals AN’s are given a much greater degree of independence.

AN’s are responsible for their own actions, if they are working independently of a medical anaesthetist. The employer has group indemnity and Sweden operates a system of no fault compensation.

Organisation and management of operating department activity

The two hospitals that we visited in Sweden were large sites with multiple operating department suites. Operating theatres run from 8am to 4pm, although the majority of the work is normally completed by 2pm. Preoperative assessments may be carried out opportunistically in an area near to the theatres, or in separate pre-assessment clinics.

The order of patients on the lists is determined the previous afternoon by the surgeons, anaesthetists and theatre manager, to maximise capacity and match staff availability and expertise with demand. A final early morning anaesthetic departmental meeting makes any necessary changes to staff deployment. Surgeons do not have fixed lists or dedicated theatres and attend theatre when their patient is ready.

Some theatres use large anaesthetic trolleys containing a complete range of drugs and equipment, which may be required during anaesthesia. If AN’s need additional equipment during the procedure they contact staff in the theatre corridor or the supervising anaesthetist by telephone/intercom. There is a relatively limited range of anaesthetic techniques used and anaesthetic nurses may be left without direct supervision for prolonged periods of time during conduct of anaesthesia and surgery.

Consultant anaesthetists have no allocated contractual time for business, paperwork and administration. However distant supervision of AN’s from their offices allows consultant anaesthetists to undertake office work around clinical commitments. Collective departmental and business meetings are held in the evenings rather than during the working day. There are no joint meetings between consultant anaesthetists and AN’s.

Summary

- The provision of anaesthetic services is designed for maximum flexibility. Whilst a patient always has two members of the anaesthetic team present during induction this may be any combination of anaesthetic nurse, nursing assistant, trainee or consultant.
- Anaesthesia nurses may act virtually as independent practitioners when anaesthetising ASA 1 and 2 patients.
- Consultant anaesthetists supervise from one to four theatres, depending on the complexity of the cases and on whether or not there are anaesthetic trainees present.
- Anaesthetic nurses are not involved in patient pre-assessment, postoperative care, ICU or obstetric epidural services.
- Anaesthetic nurses do not perform regional blocks, apart from IVRA.
- One emergency team of anaesthetic staff covers all areas of the hospital at night. This is made possible by senior staff involvement, strict prioritisation of out-of-hours work and theatre utilisation protocols.
- In Sweden, as the private surgical sector develops, anaesthetic nurses trained in the public sector are increasingly gravitating to private hospitals.

Reference