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PRE-ASSESSMENT *Surgical Anesthesia Delivered by Non-physicians*

Before CCOHTA decides to undertake a health technology assessment, a pre-assessment of the literature is performed. Pre-assessments are based on a limited literature search; they are not extensive, systematic reviews of the literature. They are provided here as a quick guide to important, current assessment information on this topic. Readers are cautioned that the pre-assessments have not been externally peer reviewed.

Introduction

Anesthesiology is defined as “the practice of medicine dealing with, but not limited to, procedures for rendering a patient insensible to pain and emotional stress during surgical, obstetrical, and certain medical procedures.”¹ Both physician specialists (anesthesiologists) and non-physicians (specially trained nurses or technicians) are involved in delivering anesthesia.

Different terms are used to describe the roles of professionals involved in anesthesia. The term “anesthetist” or “anaesthetist” is used in the UK and elsewhere to describe “one who administers an anaesthetic” (including nurses, technicians and doctors).² In the US, the term “anesthetist” applies only to “a nurse or technician trained to administer anesthetics” and the term “anesthesiologist” (anaesthesiologist) applies only to a physician or dentist who specializes in anesthesiology.³ The Canadian Anesthesiologists’ Society (CAS) uses the term “anaesthesiologist” to distinguish physician providers from other professionals.²

In Canada, the responsibility for administering anesthesia is reserved for physician anesthesiologists, but the execution of certain tasks may be delegated to anesthesia assistants (AAs) or technicians. For example, in Quebec, anesthesia technicians work under the supervision of the anesthesiologist and do not administer anesthesia. AAs’ responsibilities range from clinical tasks (e.g., providing assistance to the anesthesiologist during induction of and recovery from anesthesia, monitoring and registering vital signs) to technical tasks (e.g., checking and preparing the supplies and drugs used in anesthesia).⁴ In the US, nurse anesthetists may administer anesthetics, whereas anesthesiologist assistants, anesthesia technicians and technologists cannot.

Research Questions

This topic was raised by a CCOHTA Devices and Systems Advisory Committee member from the Ontario Ministry of Health and Long-term Care, who asked about technician-based models for the provision of surgical anesthesia. The delivery of surgical anesthesia by non-physicians has been discussed for years. The main questions are:

1. What are the most effective models for the delivery of surgical anesthesia?
2. Which professionals are involved; and how and where are they used?
3. How should the quality of services be measured?
4. What are the risks and benefits of involving non-physicians in anesthesia delivery?
5. What is the economic impact of using non-physicians in anesthesia care?



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Assessment Process

References to literature on anesthesia and non-physicians (nurses, technicians, assistants) were obtained from searches of PubMed (1966-September 2003), The Cochrane Library (Issue 3, 2003) and specialized databases such as those of the NHS Centre for Reviews and Dissemination (CRD), performed in September 2003. Web sites of health technology assessment and other agencies were also searched for grey literature. A narrower search arising from an earlier question on anesthesia delivered by technicians was performed on the same sources and on the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database in April 2003.

Summary of Findings

The preliminary searches retrieved 960 published studies on surgical anesthesia delivered by non-physicians. No health technology assessments, systematic reviews or randomized controlled trials were found. Most of the evidence came from cross-sectional studies (based on observations at one point in time). Dr. Andrew Smith is leading a UK review of the advantages and disadvantages of using AAs. This study will provide a systematic review of the evidence on this topic.⁵

Delivery Models

Nurse Anesthetists

Nurse anesthetists have been providing anesthesia care in the US for over 100 years.⁶ A certified registered nurse anesthetist (CRNA) is a registered nurse who has received two years of specialized training and has earned a master's degree in the delivery of anesthesia.⁷ CRNAs may work with or without an anesthesiologist.⁸ A 1996 membership survey by the American Association of Nurse Anesthetists (AANA) found that 39% of CRNAs were employees of hospitals; 36% were employed by anesthesiology groups; 15% were employed by CRNA groups or were self-employed; and 10% were employed by a university, the military, a physician's office or a surgery centre. Nurse anesthetists were the sole anesthesia provider in more than 70% of rural US hospitals.⁹

The results of an international survey of the practice, education and regulation of nurse anesthetists¹⁰ showed that nurses practised anesthesia in over 100 countries. The authors found that nurse anesthetists, working with or without anesthesiologists, provided anesthesia in two-thirds of developed, developing and least developed countries.¹⁰ Most nurse anesthetists had six to 15 years of experience in anesthesia care. Their responsibilities included delivery of general anesthesia, epidural and spinal blocks, tracheal intubation and extubation.¹¹

The US Centers for Medicare and Medicaid Services (formerly the Health Care Financing Administration) allows Medicare payment for the anesthesia services and related care provided by nurse anesthetists.¹²

Nurse anesthetists practise under the authority of state licensure, with national professional certification and recertification. No states have instituted regulations requiring that nurse anesthetists be supervised by anesthesiologists.¹³ Individual hospital boards may specify the boundaries applied to the duties performed by nurse anesthetists.¹⁴ General standards and scope of practice for CRNAs have been defined by the AANA.¹⁵

Two US studies compared the characteristics of nurse anesthetists working with or without anesthesiologists. A 1983 study by Grundy *et al.* showed that nurse anesthetists working without anesthesiologists were more likely to work in rural areas compared with nurse anesthetists working with anesthesiologists.¹⁶ CRNAs working without anesthesiologists were more likely to be male and older, less likely to hold a baccalaureate degree and less likely to use invasive monitoring techniques compared with those working with anesthesiologists.¹⁶ A study by Shumway *et al.* showed that in 1996, CRNAs working as part of an anesthesia care team (ACT) had fewer years of experience and were younger than non-ACT nurse anesthetists.¹⁷ The CRNAs working in an ACT were more often female, more likely to have a master's degree and more likely to practise in urban locations. The scope of practice for CRNAs working as part of an anesthesia care team tended to be broader than that of CRNAs who worked independently.¹⁷

Miller *et al.* described the effect of nurse anesthetists on anesthesiology in Sweden.¹⁸ The nurse anesthetists worked under the supervision of the senior anesthetist, who carried the legal responsibility for anesthesia administered in his or her department.¹⁸

Anesthesia Assistants and Technicians

The role of AAs and anesthesia technicians has developed informally across Canada, except in Quebec, where provincial legislation has defined their responsibilities.¹⁹ In 1997, the Federal/Provincial/Territorial Advisory Committee on Health Human Resources decided not to support funding of a project for the development of a competency profile for AAs in Canada. The CAS, however, has approved a new membership category for AAs.¹⁹ Perrault *et al.* concluded that, although physician anesthesiologists were relieved from performing certain time-consuming tasks, it was impossible to measure the contribution of this system to patient safety.⁴ No other study on the practice of AAs in Quebec was found.

In the US, the anesthesiologist assistant belongs to a new category of professionals included in ACTs since 1995.²⁰ Anesthesiologist assistants undergo at least two years of specialized training in the delivery of anesthesia and earn a master's degree.⁷ They work under the supervision of an anesthesiologist. About 800 anesthesiologist assistants were practising in the US in 2002.²⁰

Quality of care

In a US study, Pine *et al.* examined the effect of the type of anesthesia provider on mortality rates in 404,194 Medicare patients undergoing eight surgical procedures.²¹ Risk-adjusted mortality rates were compared for anesthesiologists working alone, nurse anesthetists working alone and ACTs. No statistically significant difference was found between types of providers. Hospitals with only nurse anesthetists had results similar to those of hospitals where anesthesiologists provided or directed anesthesia care.

In another US study, Jordan *et al.* investigated 223 closed malpractice claim files dated from 1989 to 1997 that involved insured nurse anesthetists.²² They showed that preoperative physical status, patient age, surgical procedure, type of anesthetic, age of anesthesia provider and type of anesthesia provider (nurse anesthetists working alone versus nurse anesthetists working with anesthesiologists) did not have a statistically significant effect on adverse outcomes.²²

Economic effect

In 1990, Cromwell *et al.* developed a US model for anesthesia productivity.²³ Anesthesiologists working in hospitals with nurse anesthetists were at least 20% more productive than anesthesiologists working alone. The authors estimated that the US would save almost US\$500 million annually if all anesthesiologists worked with nurse anesthetists.

In a more recent study, Cromwell *et al.* compared anesthesia team arrangements in four US hospitals.¹⁴ The authors concluded that “given the substantial difference in the cost of training an anesthesiologist versus a CRNA, team anesthesia is highly cost effective. CRNAs cost less than half as much as MDAs [physician anesthesiologists] and are trained to perform all the anesthesia procedures....”¹⁴

Conclusion

Nurse anesthetists and AAs or anesthesia technicians are non-physician anesthesia providers. Nurse anesthetists are most common in the US and most of the evidence on nurse anesthetists has been gathered there. In the US, the role of nurse anesthetists is outlined in government regulations and in the guidelines of relevant associations. In Canada, with the exception of Quebec, the role of AAs has developed informally. There are few published studies on the use of non-physicians in anesthesia care in Canada.

Regarding the quality of anesthesia delivery by non-physicians, two US studies showed that there was no association between mortality rates and closed claims with the type of anesthesia provider. Researchers in US economic studies found that anesthesiologists working with nurse anesthetists were more cost-effective than anesthesiologists working alone. The forthcoming UK systematic review will provide a basis for further investigation of these topics. There is no need for the Canadian Coordinating Office for Health Technology Assessment (CCOHTA) to undertake a full assessment at this time.

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