

Special Article

Anaesthesia training in Nepal

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The background, organization, problems, and successful implementation of an anaesthesia training program in Nepal are described. Nepali physicians had previously taken their post-graduate anaesthesia training in western countries, especially in Britain. The low pay of anaesthetists, poor maintenance of equipment, and irregular supplies of anaesthetic drugs in their own country has led many of them to stay abroad. In 1985 there were only seven Nepali anaesthetists in Nepal for a population of 16 million.

An alternative approach to training is presented in which a series of Canadian anaesthetists, over a three-year period, are supporting the establishment of a one-year Diploma in Anaesthesiology program in Nepal. They are working with Nepali anaesthetists and the Institute of Medicine in Kathmandu, Nepal. The local anaesthetists supervise most of the clinical training while the Canadians give academic leadership and guidance.

Nepal is an independent country one quarter the size of Alberta, lying between India to the south and China to the north (Figure 1) with a population approaching 16 million. It is divided naturally into a northern belt of high mountains, including Mount Everest; a middle belt called the mid-hill region, whose altitude varies from 300 to 4880 meters, and which accounts for two thirds of the total area; and a southern, lowland belt called the Terai. Two thirds of the people live in the mid-hill region and one third in the Terai. Travel is difficult because much of the country consists of hills and mountains. A way from the few roads and airstrips, transport is nearly all on foot. Mail service is rudimentary outside the capital city of Kathmandu, and telephone service, even in Kathmandu, is unreliable.

Medical services

Some general medical comparisons between Nepal and

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Canada are shown in the Table. Most medical services are provided by employees of His Majesty's Government (HMG). Physicians are salaried employees in hospitals; some of them also work, in private fee-for-service clinics in off-duty hours.

Nepal is divided into 14 administrative zones and 75 districts. It is the goal of HMG to provide one hospital, with a minimum of 15 beds, in each district. In 1985, 18 districts did not have a hospital and ten districts did not even have a physician. Only the most necessary surgery is performed in district hospitals, usually under local anaesthesia, but occasionally with ketamine or ether. It is not expected that these hospitals will ever employ specialist anaesthetists. Zonal hospitals have 50 to 100 beds and

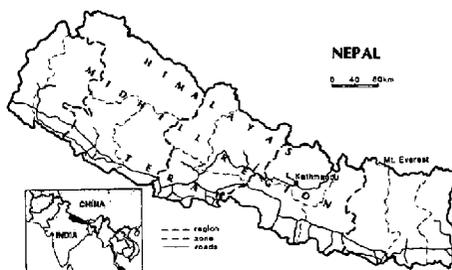


FIGURE 1 Map of Nepal.

require anaesthetic services for elective and emergency surgery similar in scope to that in a Canadian rural 50-bed hospital. There are 14 zones but only nine zonal hospitals. In Kathmandu, which has a population of half a million, there are larger and more sophisticated hospitals which provide referral facilities. Most surgical specialties, including thoracic, paediatric, and neurosurgery are represented.

Anaesthesia manpower

In a review of health manpower in Nepal in 1984 the World Health Organisation (WHO) projected that a

TABLE Comparative health statistics: Nepal and Canada¹

| | Nepal | Canada |
|---------------------------------------|----------------------|-------------------------|
| Average births per woman | 6.2 | 1.7 |
| Infant mortality per 1000 live births | 140 | 9.3 |
| Life expectancy at birth | M 44, F 43 | M 72, F 79 |
| Physicians: population | 1:28,270 | 1:546 |
| Hospital beds: population | 1.5:296 | 1:110 |
| Major causes of death | Infectious diseases* | CVS diseases, neoplasms |

*Tuberculosis, cholera, malaria.

minimum of 27 anaesthetists should be providing services in the country within five years.² In 1985 there were only seven, one of whom had Fellowship in the Faculty of Anaesthetics of the Royal College of Surgeons (FFARCS), and the other six a Diploma in Anaesthesia (DA) from India or Britain. They all worked in hospitals in Kathmandu. With the exception of overseas anaesthetists working in mission or military hospitals, there is no anaesthetist for the rest of the country.

Despite the shortage of anaesthetists there are approximately 80 surgeons. Those who work outside Kathmandu must either perform their own local or regional anaesthesia, or start a general anaesthetic, usually with ether in the EMO system,³ which is then continued by a nurse or other assistant. The discrepancy in numbers between surgeons and anaesthetists has occurred because, in the past, scholarships for postgraduate training abroad have often been awarded in the high-profile specialties like surgery, more as rewards to the individual physician than on the basis of the medical needs of the country. Other reasons include:

Income

Anaesthetists work only in hospitals. Hospital salaries for all physicians are low but account for only 10 to 20 per cent of the income of most specialists. Other specialists including surgeons have consulting practices outside the government hospitals, which gives an income many times that of the hospital salaries. However, there is virtually no surgery performed in the private clinics, and therefore no fee-for-service anaesthesia.

Training abroad

Training and equipment in western countries is often inappropriate for conditions in third world countries. Although all hospitals in Kathmandu have anaesthetic gas machines and vaporisers which depend on compressed gases, this is not so elsewhere in Nepal. Satisfactory general anaesthesia can be administered given with drawover apparatus such as the EMO system^{3,4,*} (Figure 2) and Triservice apparatus^{5*} (Figure 3) which use ambient air as the carrier gas and require minimal

maintenance. However, this equipment is not commonly used in developed countries and may therefore be perceived as inferior.

Internationally recognised qualifications

Nepali doctors who obtain a higher anaesthesia qualification abroad often continue to work in the country of training or elsewhere in the world. Thus attempts to improve anaesthesia standards and service in Nepal by sending more physicians abroad for training are frequently self-defeating.

The University of Calgary Nepal project

The association between the University of Calgary and Tribhuvan University, Kathmandu, began in 1976 when a faculty member from Calgary was a short-term consultant for the WHO on a feasibility study for a medical school in Nepal. The first medical students were enrolled two years later, and graduated in 1984. In 1981 a Generalist program was established to provide selected physicians with three years of postgraduate training in city hospitals and rural practice, of which eighteen months is taken in Canada followed by eighteen months in Nepal.

The University of Calgary was approached in 1982 to advise on training in anaesthesia. The extreme shortage of anaesthetists, the reasons for which were well known, led the postgraduate training committee of the Institute of Medicine (IOM) in Kathmandu to consider the possibility of establishing their own program. Initially it was proposed that there should be a two-year training program, of which one year would be spent in Calgary. This was subsequently modified to one year of training in Kathmandu, leading to a Diploma in Anaesthesiology from Tribhuvan University. The University of Calgary agreed to arrange for a series of Canadian anaesthetists to live and work in Kathmandu to provide continuous leadership for periods of three to six months for a minimum of three years from January 1985. It was hoped that, if training in Nepal were provided, the loss of

*Penlon Ltd, Radley Road, Abingdon, Oxon OX14 3PH, England.

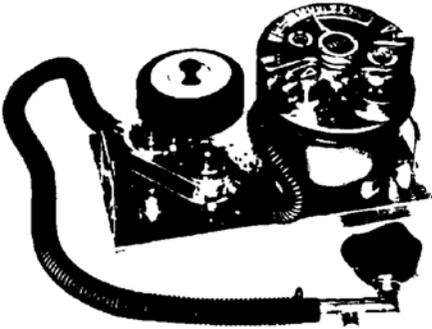


FIGURE 2 EMO drawover apparatus for use with ether.

physicians could be prevented, and that the diploma level of training could eventually be maintained without Canadian assistance.

Diploma in anaesthesiology program

Physicians entering the diploma program must have at least one year's service in Nepal, with a minimum of six months practical experience in anaesthesia. The program runs for 12 months with up to five new candidates enrolling each year. It is similar in scope and standard to the one-year family practice anaesthesia program at the University of Calgary.

Educational objectives stress familiarity with a broad range of anaesthetic techniques so that alternative methods may be safely employed when the choice of equipment and drugs is limited. No hospital beyond the Kathmandu valley has nitrous oxide, and even oxygen in cylinders are scarce. Trainees are also taught how to organise and maintain a hospital anaesthetic service, including the provision and upkeep of essential equipment and drug supplies, the keeping of records, the evaluation of standards of care, and economic costs.

Clinical experience is obtained under the supervision of local faculty members of the approved hospitals in Kathmandu. Each trainee functions as a resident and rotates through two 300-bed general hospitals, which at present are the only ones with full-time anaesthesia services. Training will eventually include rotations in the children's and women's hospitals.

Tutorials relating to the theoretical basis of clinical anaesthesia and the applied basic sciences are held on at least two afternoons per week. Some of these are replaced by case discussions, morbidity and mortality rounds or lectures by visiting anaesthetists.

Interim assessments of candidates, with in-training



FIGURE 3 Triservice apparatus for use with halothane and trichlorethylene.

evaluation, and written and oral examinations, take place at three and six months. Candidates not performing satisfactorily in the first assessment are asked to improve by the next assessment. If this does not occur they may be advised to leave the program because it is important to establish a standard which has the respect of its own participants and the medical profession as a whole.

The final examination consists of two written papers, each containing multiple choice and short essay questions, one clinical oral examination with patients, and a second oral examination on clinical practice with special reference to emergencies. The scope of the examination is similar to that of the British Diploma in Anaesthesia.⁶ At least one external examiner, in addition to the Canadian anaesthetist, helps to set the papers and conduct the examination. Successful candidates are awarded the Diploma in Anaesthesiology of Tribhuvan University, DA(TU).

Anaesthetic equipment and drugs

The quantity and quality of anaesthetic equipment varies among the hospitals in Kathmandu. In the teaching hospital, paid for and equipped by the Japanese and opened in 1985, the anaesthetic machines and ancillary equipment are of a similar standard to those found in Canadian hospitals. Piped oxygen, nitrous oxide, and EKG machines are available in all theatres. The other hospitals in Kathmandu have old but functional Boyle's or similar anaesthetic gas machines which depend on compressed gases.

Spinal and epidural needles are available, but not epidural catheters. Plastic intravenous cannulae and intravenous fluids are easily obtained, but not central venous or Swan-Ganz catheters.

With a government health budget of \$1.00 per person per year in Nepal compared with \$1,000 per person per year in Alberta, the cost of drugs and equipment assumes major importance. There is no manufacturer of anaesthetic drugs in Nepal and foreign currency exchange makes purchases difficult. Most supplies come from India. The manufacturers' requirement of large orders for relatively small numbers of patients means that the variety of drugs is limited. Although oxygen is now manufactured in Nepal, nitrous oxide has to be brought from India and there may be months at a time when it is not available. Outside the Kathmandu valley even oxygen tanks may be difficult to obtain. When nitrous oxide is available, but no soda lime, wastefully high fresh gas flows must be used. If soda lime is available and nitrous oxide is not, closed circuit anaesthesia using a Goldman vaporiser⁷ in the circle is used with basal oxygen flow.

Neither nitrous oxide nor soda lime is essential because the EMO system, using ether, and the Triservice apparatus, using halothane and trichloroethylene, are available. (Figures 2 and 3) These systems incorporate either bellows or a self-inflating bag, so that either spontaneous or controlled ventilation is possible. Air can be supplemented by a flow of up to 3 L·min⁻¹ of 90 per cent oxygen from an oxygen concentrator.⁸

Thiopentone is the only induction agent available. Ketamine is very expensive and not readily available. Succinylcholine, gallamine and d-tubocurarine are the usual neuromuscular blocking agents, with atropine and neostigmine for reversal of the non-depolarisers.

The volatile anaesthetics are restricted to halothane, diethyl ether, and trichloroethylene. Enflurane and isoflurane, because of their high cost, are not imported.

Meperidine, which is cheaper than morphine, is the only narcotic analgesic. Diazepam and promethazine are also commonly used as supplements to a nitrous oxide-narcotic-relaxant technique.

The only local anaesthetic is lidocaine, with or without epinephrine.

Laboratory facilities are available but limited. Most investigations can be performed during normal working hours. However, blood gas measurements are not yet reliable and many investigations, including serum electrolytes, are not performed at night.

Discussion

Some anaesthetists may feel that the standard being set, with deficiencies in anaesthesia equipment and drugs, will demean the status of anaesthesia. Our response is to ask what viable alternatives can be suggested. The problems of supply and maintenance of anaesthetic equipment in developing countries are well known.⁸⁻¹⁰ Graveyards of anaesthetic gas machines lying idle for want of spare parts

or compressed gases are a common sight.⁹ The authors of this paper agree that a high standard of anaesthesia practice depends primarily on the knowledge, training, and skill of its practitioners, and only secondarily on the drugs and equipment used.¹¹

Prolonged training abroad to Fellowship level has too often given trainees the impression that good anaesthesia can only be practised with expensive and complicated equipment. When this is not available, and the income of anaesthetists is a fraction of that of other specialists, it is hardly surprising that they do not always return to Nepal.

Short, intensive courses sponsored by the British Council are given by a visiting British anaesthetist either in Kathmandu or in a zonal hospital. These last for eight weeks and are intended to help physicians who, by force of circumstances, must give anaesthetics. The courses are designed to improve standards in the presence of a desperate shortage of trained anaesthetists and are similar to the one in Malawi described by Eckert.¹² They are complementary to, but not a substitute for, a diploma-level training program.

Another approach would be to train nurse anaesthetists. In many countries nurse anaesthetists are invaluable in helping to supply anaesthetic services, so long as they are supplementary to, rather than substitutes for, physician anaesthetists. Only when there are sufficient physician-anaesthetists in Nepal to meet the WHO's recommendation, which will take a minimum of five years, is the category of nurse-anaesthetist likely to be considered.

A final alternative is to sit in one's ivory tower, insist that Western standards are the only standards, and do nothing. The training we describe, leading to a Nepali Diploma in Anaesthesiology, is an attempt to provide a practical, compromise solution.

During the early months of the program it became obvious to the Canadian representatives that some understanding of the medico-political local situation was necessary, otherwise there might be an excellent program with no applicants. Unless career prospects were improved few physicians would be keen to become anaesthetists. Progress was made when recommendations agreed between the Canadian and senior Nepali anaesthetists for Nepal were presented to the director general for health services and the postgraduate training committee of the IOM. They confirmed that all government hospitals would pay anaesthetists 200 per cent, and the teaching hospital 150 per cent, above the basic salary to provide some compensation for their lack of private clinic earnings enjoyed by other specialists. In addition, all physicians who graduate DA(TU) will be eligible for refresher courses abroad as frequently as other specialists, and some of the graduates will be selected, on merit, for higher training abroad.

Early results from the program justify cautious optimism. The first four trainees received the DA(TU) in January 1986, increasing the number of trained anaesthetists in Nepal by 50 per cent. Four trainees were accepted for 1986, and five for 1987. Credit for the initial success of this program is due to the quality and enthusiasm of the first group of trainees, to the Kathmandu anaesthetists and surgeons for their cooperation, and to HMG and the postgraduate training committee for their unflinching support.

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Résumé

Les données de base, l'organisation, les problèmes, la mise en place et la réalisation fructueuse d'un programme d'entraînement en anesthésie au Népal sont décrits. Les médecins du Népal ont au préalable accompli leur entraînement postgradué en anesthésie dans les pays de l'ouest notamment l'Angleterre. Le faible revenu des anesthésistes, le mauvais entretien de l'équipement et l'apport irrégulier des fournitures et drogues anesthésiques dans leur pays ont conduit plusieurs de ces médecins à demeurer à l'étranger. En 1985 il y avait sept anesthésistes Népalais au Népal pour une population de 16 millions.

Une autre alternative à l'entraînement est présentée dans laquelle un groupe d'anesthésistes Canadiens, pour une période de trois ans, soutiennent l'établissement d'un diplôme d'un an d'entraînement en anesthésie au Népal. Ils travaillent avec des anesthésistes Népalais et l'Institut de Médecine de Kathmandu au Népal. Les anesthésistes locaux surveillent la majorité de l'entraînement clinique alors que les Canadiens fournissent l'entraînement académique de pointe et l'orientation.