

The economics and improvisation of anaesthetic practice in Enugu, Nigeria

Okafor UV

Department of Anaesthesia, University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria

Correspondence to: Dr UV Okafor, e-mail: uvkafor@yahoo.com

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ABSTRACT

It has been said that the development of surgery has been in tandem with the evolution of anaesthesia. This should hold true all over the world, but in some areas a lack of resources has hindered the growth of both specialities. Most of the work on the economics of anaesthesia in the developing world, especially in Africa, has been by carried out by Western authors. As commendable and factual as they are, little work has been done in the West African sub-region which consists of about sixteen countries, including the most populous nation in Africa, Nigeria.

This review looks at the economics of anaesthetic practice in a major country in the region and how improvisation has helped limit the number of expensive drugs needed for the delivery of safe anaesthesia, whilst maintaining cost effectiveness. The cost of anaesthesia in Nigeria as a percentage of the total hospital cost is higher than that in most parts of the developed world, while the converse is true of total hospital costs in the developed world, which are much higher.

Introduction

There is very little literature on the economics of anaesthesia in West Africa. This may be due to inadequate anaesthesia services.¹ Some of these problems may not be solely dependent on a lack of funds but on government prioritisation of resource management. Because anaesthesia is a technology based speciality, it is particularly vulnerable when resources are limited.²

There are reportedly four commonly used methods for economic analysis in health care,³ and these differ in the types of input measurements (resource consumed) and output measurements (health improvement) which are used. Basically they were divided into four categories namely cost-minimisation analysis, cost-benefit analysis, cost-effectiveness analysis and cost-utility analysis. Studies have shown that most of the work has been done on direct cost comparison or cost-minimisation analysis, without considering the relative cost benefits of other analyses.⁴

Almost all of the federal government-run teaching hospitals in Nigeria have been upgraded with modern anaesthetic machines and multi-channel monitors as part of a programme which includes their maintenance for some years. Since part of the cost and maintenance of equipment, including staff salaries, is borne by the government (few public hospitals make a profit) currently and in the immediate future, drug budgets are usually the target of cost savings. This has been reported in several studies^{5,7} and includes anaesthetic drugs.

Anaesthetic drug availability

Anaesthetic drugs have evolved over the years and it seems that each new drug comes with a higher price tag, for example, the newer halogenated ethers such as sevoflurane and desflurane. Total intravenous anaesthesia (TIVA) is a common area where cost is used as a reason for cutting supplies.⁸

Even supposedly "cheaper" volatile agents like halothane are not that cheap, coming in at about fifty US dollar per 600 mls bottle. Isoflurane (81 US dollars per 600 mls) is mainly used in some tertiary care hospitals but generic brands may contribute to its greater availability due to the cheaper cost. The use of low-flow anaesthetic systems helps to reduce the amount of the agent dispensed, but currently low-flow systems are restricted only to some tertiary care centres such as ours.

Table I shows the relative cost of the available volatile agents and drugs.

Table I: Relative cost of the available volatile agents and drugs

Drugs	Estimated cost (United States Dollars USD)
Halothane (600 mls bottle)	50
Isoflurane (600 mls bottle)	81
Propofol (200 milligram ampoule)	4.4
Fentanyl (250 microgram ampoule)	3
Suxamethonium (100 milligram ampoule)	1.3
Atracurium (50 milligram ampoule)/Pancuronium (4 milligram ampoule)	7/0.8
Atropine (1 milligram ampoule)/glycopyrrolate (0.4 milligram ampoule)	0.9/1
Ketamine (250 milligram ampoule)	2
Neostigmine (2.4 milligram ampoule)	0.9
Diazepam (10 milligram ampoule)	0.8
Bupivacaine (20 milligram ampoule)	7

#Nitrous oxide has not been procured for more than six years, so the current cost to the hospital is unknown.

Fentanyl, the commonly used opiate in our centre, costs approximately 3 US dollars per 250 µg ampoule. Other opiates like sufentanil and remifentanil are not stocked in our pharmacy due to the price.

The available neuromuscular blocking drugs include the depolarising agent suxamethonium and the non-depolarisers pancuronium and atracurium. The expensive “cardio-stable” agent vecuronium is currently unavailable.

Antiemetic agents such as the serotonin antagonists, ondansetron and granisetron, are not stocked either because of the cost. It is understandable that scarce foreign exchange should not be spent on importing drugs when there are cheaper alternatives like prochlorperazine which is reportedly as potent as ondansetron.⁹

The current reality

In terms of cost/benefits and cost-effectiveness, the use of some of the newer expensive agents is not feasible in some developing countries. For instance, a properly conducted halothane-based general anaesthetic for ambulatory surgery may not delay discharge. However in neuro-surgery, the expensive propofol might be considered because of its effect of lowering intracranial pressure and early awakening which is important in many neurosurgical procedures. Adjuvants such as midazolam can be used to reduce the cost of the much criticised propofol anaesthesia.¹⁰⁻¹²

Currently the amounts and types of drugs used in providing anaesthesia depend on the surgical procedure and sadly, the patients' resources. Spinal anaesthesia is becoming the standard technique for Caesarean delivery and lower abdominal and lower limb surgeries. This is obviously not necessarily a bad thing.

Epidural sets are expensive at 25 US dollars per set and as such, epidurals are rarely used for analgesia or anaesthesia. Peripheral nerve blocks are not popular because of a lack of nerve stimulators, as well as the reluctance by anaesthetists to use them because of other alternative ways of providing safe anaesthesia such as spinal anaesthesia and Bier's block.

The cost of spinal anaesthesia with bupivacaine 0.5% and a Quincke spinal needle is approximately 10 US dollars (pencil point needles are more expensive). Use of the Quincke needle is reportedly safe¹³ with a low to moderate incidence of Post Dural Puncture Headache (PDPH).¹⁴ Because of the cost benefit considerations, pencil point needles should be stocked for use only in patients with a history of severe PDPH. Though anaesthetic fees are mainly restricted to the cost of anaesthetic drugs in our public hospitals, the cost of anaesthesia in these hospitals is estimated at about 9% of total hospital fees. This is high compared with 1–4% in some parts of the developed world.¹⁵ This makes improvisation to minimise drug costs important, since most of our drugs are imported.

For general anaesthesia, sodium thiopentone is the induction agent of choice, except in hypovolaemic patients where ketamine is used. In cases where cardiac stability is required, a ketamine/midazolam cocktail may be used for induction. We may also use high dose fentanyl with a sleep dose of sodium thiopentone for induction. Pancuronium is the most commonly used non-depolariser, with atracurium being used in hypertensives or patients with renal disease. Halothane, in the absence of contraindications, is the volatile agent of choice.

Nitrous oxide is expensive here and is used in a small minority of hospitals, since oxygen/air mixtures are cheaper. Also the

availability of opiates such as fentanyl makes the use of nitrous oxide seem unnecessarily extravagant in a developing country like ours. Anti-cholinesterases and anticholinergics for reversal of neuromuscular paralysis are relatively cheap, due to the presence of generic brands.

In rural settings, because of a greater paucity of anaesthetic manpower, ketamine anaesthesia, without endotracheal intubation, anaesthetic machines or monitors, is the mainstay of practice. General practitioners give the anaesthetic or delegate the “task” to poorly trained nurses. There are usually minimal anaesthetic charges in such cases, which do not involve specialised surgery.

The future

The establishment of “theatre revolving funds” may assist in stocking the expensive drugs that are mandatory in certain procedures; for example vecuronium for cardio-thoracic procedures or for cardiac patients coming for non-cardiac surgery. Government's waiver of import duties on imported drugs may help lower costs, and hospitals should eschew buying drugs from contractors. Their supplies are more expensive than those from drug companies and often times not as potent. The production of generic brands of expensive agents should be considered for some developing countries.

In conclusion, it must be remembered that evaluating the cost of anaesthetic drugs is just a part of the process of optimising resource use in anaesthesia.¹⁵ As stated in some of the literature, there is a clear need for more work to be done using more appropriate analysis.^{16-20.}

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