Challenges of anaesthesia in the management of the surgical neonates in Africa

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ABSTRACT

Africa has one of the highest neonatal mortalities in the world, for which the commonest causes do not include surgical conditions such as some congenital anomalies that are amenable to surgery but are not often operated on because of a number of challenges. These challenges include cultural beliefs and practices, dearth of human resource capacity, inadequate laboratory and imaging support and lack of consumables and intensive or high dependency care facilities. Some of these challenges will be examined and highlighted using the acronym "ASKS" in this article.

Key words: Neonatal anaesthesia, neonatal intensive care, neonate, surgical neonate

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INTRODUCTION

Over a million African babies are estimated to die in the neonatal period, that is, during the first 4 weeks of their life.[1] The direct major causes of neonatal deaths globally are from infections (36%) premature birth (28%) and asphyxia (23%).[2]

The overall fertility rate in sub-Saharan Africa is between 4 and 6%; this is high and directly relates to the higher prevalence of congenital anomalies.[3] Most of these unfortunate babies die at home before they are presented to a health facility and are unaccounted for. According to a report, 94.8% of the babies were delivered at home or in a rural setting.[4] However, those who make it to the health facility may die due to a combination of factors including prematurity and dysmaturity,[5] late presentation[5,6] and the complex nature of the anomaly. Some of these factors are discussed in this article.

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NEONATAL SURGICAL CASES IN KORLE BU TEACHING HOSPITAL

The Data were retrospectively collected at the Korle Bu Teaching Hospital (KBTH), Accra, which is the largest Teaching Hospital in Ghana and receives referrals from all over the country including neonates. Over a 30-month period, 278 neonates were referred as shown in the table. Two hundred and forty (86%) of the cases were gastrointestinal pathology which could be dealt with surgically with good outcome. Information was completed on 190 (68.4%) of the patients. One hundred and thirty-six (71.6%) of these neonates were successfully treated and discharged home with the remaining dying in the hospital from various causes.

There are reasons for this reasonably good outcome for these neonates. All these neonates were anaesthetised by consultant physician anaesthetists or senior residents in anaesthesia and were operated on by paediatric surgeons. Lack of trained anaesthetists was one of the challenges cited by Mhando and colleagues.[7] In a survey from Uganda, only 13% of anaesthesia providers could provide safe anaesthesia for children.[8] The hospital

Table 1: Neonatal surgical cases in KBTH during January 2006–June 2008

Anomaly	No.	Percentage
Exomphalous	81	29.0
Atresia	68	24.5
ARM*	45	16.2
Hirshsprung's disease	30	10.8
Oesophageal atresia	16	5.8
Bladder extrophy	8	2.9
Miscellaneous	30	10.8
Total	278	100.0

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currently has four paediatric surgeons at post. Good-quality plain X-rays are usually taken together with the basic laboratory investigations like full blood count and blood urea and electrolytes. Intra-operative and postoperative monitoring are routine and the Recovery Ward serves as the High Dependency Unit. The neonates are therefore kept in the Recovery ward until they are "fit" enough to go back to the ward.

CHALLENGES OF ANAESTHESIA

A number of challenges encountered in the anaesthetic management of the surgical neonates in Africa will be discussed using the following acronym "ASKS."

The letter "A" stands for acceptance, attitude, access and anaesthetic manpower (surgical and nursing manpower). The letter "S" stands for skills; the letter "K" stands for knowledge and the letter "S" stands for supplies.

Acceptance

In the developed countries, the parents choose the names of the babies before delivery and give those names soon after birth. In Ghana and presumably in most African culture(s), the neonate is not considered as a fully fledged human being until after 8 days of survival. Therefore, when babies are born even in the teaching hospitals, they bear the names of the mothers, irrespective of the sex, until they are properly named in a ceremony after 1 week. It is therefore not uncommon to find a male neonate bearing a typical female name. In some instances, the baby bears the mother's name for a long time, especially in the presence of a congenital anomaly.

Since more than half of the women in Africa deliver at home without the presence of a skilled attendant,[2] any baby who requires resuscitation immediately after birth will not receive it. Culturally, the presence of any anomaly leads to neglect and rejection by the mother and family members and sometimes the traditional birth attendant. The baby may be left unprotected and not fed leading to hypothermia and hypoglycaemia on arrival at the health facility. This is done hoping that the baby may die. Outright infanticide may be practiced. It is however known that many of the neonates with congenital anomaly, who were once thought to be incompatible with life, are now living normally.[9]

Attitude

The attitude of the mother who gives birth to a baby with congenital anomaly, is often reinforced by the attitude of neighbours and other family members, thus adding to the suffering of the mother. Furthermore, the babies with gross anomalies sometimes attract unkind comments from even health workers, who should know better, on arrival at the facility.

Access

Mothers or parents who decide to send their "disadvantaged" baby to the hospital face a number of challenges. These include geographical access, transportation and financial constraints. Some of these parents have never travelled beyond the borders of their towns or villages. Asking them to take their babies to one of the two leading teaching hospitals in Ghana, that is Korle Bu Teaching Hospital in Accra and Komfo Anokye Teaching Hospital in Kumasi, creates panic, fear and insecurity. It has been shown in a study that early referral and presentation contributed to a good outcome.[10]

Because most of these babies are transported in ordinary passenger vehicles, they arrive in the hospitals sometimes dehydrated, hypothermic and septic. In the paper cited above, adequate resuscitation also contributed to a good outcome.[10] Financial constraints may further delay arrival at the tertiary hospital. A typical scenario is a 3-day old baby with imperforate anus, who arrives in the hospital with a grossly distended abdomen, respiratory distress due to the splinting of the diaphragm, dehydrated and febrile, due to a Three-day delay in mobilising fare for transportation.

Anaesthetic Manpower

Ghana currently has only one institution for the training of physician anaesthetists. Furthermore, anaesthesia as a specialty is not attractive to young medical graduates for various reasons including poor job satisfaction and lack of appreciation by patients and sometimes colleagues, of the worth of the physician anaesthetists. Most anaesthetics are provided by non-physicians, sometimes under the direct supervision of the surgeon.[11] Anaesthetic complications contributed to the mortality of patients according to a report from southern Nigeria.[12] The kind of care and services that physician anaesthetists are capable of delivering, in proper enabling environment, or facilities that will accrete respect and attractiveness to the specialty, do not often exist in Africa. This has led to the ever increasing poor ratio of surgeons to anaesthetists. Some West African countries have only two or three physician anaesthetists for populations of over 5 million. This small number of physician anaesthetists does not promote sub-specialisation and does not augur well for the development of surgery in general.

These babies are therefore managed by "generalists" with an interest in paediatric and neonatal anaesthesia. The internationally accepted minimum ratio of surgeons to anaesthetists, which promotes sub-specialisation, is one to three. In our environment, one to four may be acceptable; but the specialty must be made attractive to induce and improve recruitment into anaesthesia and, therefore, ultimately into neonatal and paediatric anaesthesia.

Paediatric Surgical Manpower

There are only seven paediatric surgeons in Ghana with a population of over 20 million. Lack of relevant personnel was also cited as a challenge by some authors.[13,14] In a report published from Nigeria in 2006, the ratio was one paediatric surgeon per 2.2 million of the population.[15] Some African countries have fewer or none at all and therefore neonatal surgery is done by general surgeons often without the support of skilled and experienced anaesthetists. Consequently, neonatal surgical problems, difficult as they may be, fall into the hands of overburdened "adult" surgeons.

Some of these general (adult) surgeons are capable of handling some of these life-threatening neonatal problems like imperforate anus. They are, however, sometimes constrained in carrying out procedures such as colostomy because of lack of anaesthetic support in terms of skilled manpower, equipment and drugs. For surgeons not primarily specialised in paediatric surgical management, particular knowledge of certain neonatal surgical emergencies is useful and those competencies must be acquired or taught as a strategy to reduce neonatal surgical mortality.

Shortage of Other Specialists

Comprehensive and total care of the sick neonate requires contributions and support from other specialties such as neonatologists, neurosurgeon, ophthalmologists and critical care/intensive care nurses, in addition to paediatric surgeons and anaesthetists. These specialists are not readily available in most centres for consultation and participation in the team approach to the management of these neonates. In a study which included patients from 1 week to 11 years, 30% had congenital heart disease which could pose anaesthetic challenges.[16] Diagnostic imaging including good-quality plain X-rays, ultrasonography and computerised tomography scans are not readily available in most hospitals in Africa. In places where these imaging facilities are available, there is frequent breakdown due mostly to electricity power outage. The situation is further compounded by shortage of consumables. The high cost of these examinations and investigations are often beyond the means of most parents.

Good laboratory services, providing consistent and reliable results may not be available. Where good facilities are to be found, the long waiting period before the results become available make these laboratory services irrelevant for emergency operations.

Skills

Special skills are required in the management of the neonatal surgical patient. Gaining access to a peripheral vein can sometimes be challenging. The correct sizes of cannulae such as gauges 24 and 22 may not be available even if a vein is visible. Central venous cannulation is rarely done because of the unavailability of central venous catheters. Consequently, most anaesthetists do not have this skill because of lack of opportunity and infrequency of practice. Arterial cannulation is rarely done due to lack of expertise and consumables such as transducers, cannulae and display units.

Intubating a neonate may be difficult because of the relatively large head in relation to the rest of the baby's body and sometimes high hanging epiglottis. The presence of cranio-facial abnormalities increases the incidence of difficult or failed intubation in the neonate even in the hands of experienced anaesthetists.

Regional anaesthetic techniques such as caudal which can be used to provide intra-operative as well as postoperative analgesia are not practiced widely. This is due to lack of experience and the frequent shortages of local anaesthetic drugs. This situation means that the anaesthetists and the trainees do not acquire these necessary skills.

Knowledge

It is worth noting that the neonate is not a "miniature adult". For the holistic management of neonates, the physician anaesthetists, whether specialists or generalists, must understand the physiology and anatomy of the neonate as well as the pharmacology of drugs used in anaesthetising the newborn baby.

Neonates cannot handle excess sodium load, and therefore, the intravenous fluids given must be low in sodium. It takes a little while for the kidneys to mature. The enzyme systems of the neonates are immature, and therefore, neonates do not metabolise drugs as efficiently as older children. It takes up to 3 months for the liver enzymes to mature and for the

liver to start storing glycogen. There is thus a tendency to hypoglycaemia in stressful situations. Newborns are poikilothermic; their bodies easily acquire the temperature of their surroundings. They have poor temperature control and are dependent on their inter-scapular brown fat and high oxygen consumption to generate heat. This must be born in mind and steps must be taken to prevent hypothermia in these surgical neonates. The lung volumes may take up to 7 years to be fully established in relation to body size and activity.

With regard to anaesthetic management, the anaesthetist must know the pharmacokinetics of the anaesthetic agents used in the neonates. Neonates are sensitive to non-depolarising muscle relaxant drugs but are resistant to depolarising muscle relaxants. These drugs are used in neonatal anaesthesia to achieve muscle relaxation. Wrong doses given may lead to prolonged duration of action of these agents. Measures should be taken to prevent the neonate from developing hypothermia and acidosis as these will cause delayed recovery from the non-depolarising muscle relaxant.

The choice of drugs may be influenced by the post conceptual age of the neonate as the anaesthetic agents may have a tendency to induce apnoeic attacks if the post conceptual age is below 50 weeks.

Perioperative analgesia

Before the 1980s and the 1990s, there was a common belief by care givers that neonates experienced no pain or less pain than adults, children and infants who had similar surgical procedures. There is now evidence to show that neonates not only feel pain but also generate considerable stress response to surgery.[17] The health care providers were more concerned about the increased risks of narcotics in causing neonatal respiratory depression, especially if the newborn is less than 50 weeks post conception in age.

The routine use of pulse oximetry and apnoeic alarm devices have made the use of opioids safe in developed countries. These devices, however, are not readily available in most hospitals in Africa. Consequently, there is still the fear of using appropriate aggressive interventions and care givers resort to the use of sub-therapeutic regimen in these neonates. Appropriate use of the correct doses of opioids together with multimodal approaches such as rectal paracetamol and wound infiltration with local anaesthetic agents such as bupivacaine lead to better quality analgesia in the neonate without respiratory depression. There is evidence to show that inadequate pain relief in the neonate may lead to hypersensitivity to noxious stimuli later in life.[17]

Fasting guidelines

Preoperative fasting guidelines may be misinterpreted by the mother or sometimes by the nurse on the ward. Mothers very often get worried about the cry of their babies and may therefore be tempted to feed them at the wrong time. Long periods of fasting, however, without appropriately constituted intravenous fluid administration leads to hypoglycaemia and acidosis in the neonate. One should remember that clear fluids such as water, fruit juices without pulp, are emptied from the stomach within 2 hours.

Supplies

The supply of equipment, drugs and non-drug consumables is not optimal in most countries. Lack of appropriate equipment has been cited as one of the challenges.[13] Coupled with the supply inadequacy is the poor maintenance culture and erratic supply of electricity that shortens the shelf life of drugs and consumables and the life span of the expensive pieces of equipment when they are available. Most hospitals in Africa lack biomedical engineers or technicians to do proactive preventive equipment maintenance. Where these personnel are available, the absence of a properly equipped maintenance workshop renders them ineffective.

In addition to the above, equipment are purchased without discussion and approval of the end users. "Buy the cheapest" motto that permeates the tender processes in Africa including Ghana, means that older versions of equipment, for which the manufacture of spare parts has ceased, are supplied in some instances. It is a common sight, in most hospitals in Africa, to discover rooms or stores set aside for junk, that are full of unserviceable equipment.

Equipments such as incubators, multiparameter monitors, paediatric ventilators and syringe pumps are lacking in most hospitals. These pieces of equipment are very expensive and are beyond the average budget allocation of most hospitals. For example, the cost of one syringe pump ranges between US$750.00 and 2500.00.

Non-drug consumables

Breathing circuits such as Jackson Rees' modification of Ayre's T-piece are absent in some hospitals. This breathing circuit has low internal resistance as it has no expiratory valve and is ideal for a neonate with poor lung compliance. It can be used for both spontaneous

and controlled ventilation. Laryngoscope handle and blades specially designed for neonates are also not readily available. Also, specially designed anaesthetic face masks, Rendall Baker's, with reduced apparatus dead space may not be available either.

Neonatal Intensive Care Unit

Neonatal intensive care units (NICUs) are non-existent in most hospitals in Africa. Where they exist, running the facilities efficiently is constrained by shortage of personnel, essential drugs and non-drug consumables. These constraints make the running of these units far from satisfactory. The absence[14,18] or poor neonatal intensive care[19] facilities is a contributing factor to the poor outcome.

The management of patients in intensive care units is very expensive, especially for most African countries. In countries where there are no health insurance schemes in place, the patients or their relatives have to pay expensive bills for their health care. The cost of the neonatal intensive care management is therefore beyond the means of most parents.

Policy makers have questioned the wisdom of using scarce resources to treat a small number of neonates when money can be used to provide basic survival kits for a larger number of neonates. Neonatal intensive care for low birth weight babies is ranked among the most expensive components of paediatric health care.[20]

Utilisation of NICU in most countries will certainly lead to diversion of resources, both human and material, from the provision of the broad-based health care. It is not uncommon to hear from a mother whose baby has spent days or even weeks in NICU to report of the death of that baby at home after discharge. Some of these babies who survive because of specialist intervention including intensive care management will require long-term hospitalisation and rehabilitation which consumes considerable amount of resources.[21]

CONCLUSION

The major challenges facing health care providers and the neonates have been examined in this article. Very few hospitals have dedicated specialist paediatric/neonatal physician anaesthetists. The few generalist physician anaesthetists working in Africa have to be "all things to all men" and empower themselves with the skills and competencies required to handle a broad spectrum of complex surgical procedures, including neonatal emergencies. Increase in the number of professionals whose clinical practices converge on the critically ill neonate must be encouraged, advocated and planned for.

Reduction in neonatal surgical morbidity and mortality extends beyond the confines of health institutions. Policy makers may have to deal with rationing of scarce resource allocation and its ethical implications.

More involvement of health care providers in advocacy work in the community is required and may result in beneficial changes in some of the harmful cultural beliefs and practices. Early reporting at health facilities will definitely contribute to a better outcome for some of these neonates. Improved techniques for keeping babies warm abound in our culture. It may be worthwhile to advocate their use.

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