ABSTRACT
Practice of Anaesthesia and Surgery in a Rural Clinic: Meeting the Challenge
This is a descriptive prospective study aimed at describing the scope of surgery and anaesthetic practice in a rural clinic in Ngo, Nigeria. All the medical records of patients that fulfilled the inclusion criteria and managed in the clinic were retrieved and analysed. Out of 6911 patients who attended the clinic within the period, 575 (8.32%) medical records of surgical patients were retrieved. Fifteen (2.60%) were referred to tertiary health centres for expert management of their surgical conditions. Of the remaining 560 medical records that were retrieved 551 (98.4%) met the criteria for inclusion and had their surgical pathology treated in 583 procedures. The most common surgical problem encountered in the rural clinic was hernias (39.75%) done mainly using 1% xylocaine local anaesthesia (63.64%). The most common type of anaesthesia used in the clinic was ketamine anaesthesia (53.90%). Mortality recorded within the period was in two (0.4%) women who had eclampsia and severe post partum haemorrhage. The result suggests that adequately trained family physicians can meet the challenge of scarcity of surgeons and anaesthesiologists in the rural areas satisfactorily.

Key Words: Rural clinic, Nigeria, Anaesthesia, Surgery, Personnel

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Introduction
The word 'Anaesthesia' was derived from the Greek word 'Anaistheto,' meaning insensibility. Several approaches were used by surgeons to administer anaesthesia but the most successful was diethyl ether. Its use was successfully demonstrated in the induction of general anaesthesia by William Morton, a surgeon.1 With advances in technology, refinements in anaesthetic equipment and drugs, and a focus on education and training, there have been major improvements in quality and safety in anaesthesia.2 These made surgery much easier, safer and of course painless. Even with this development, anaesthetists working in some developing countries in sub-Saharan Africa and in overseas medical missions have described the poor state of anaesthesia and other medical services in these countries.3

The rural areas, characterized by inadequate infrastructure, communication and essential public utilities such as potable water, electricity supply and access roads4 are the worst hit by this inadequacy. Unfortunately, about 70% of the Nigerian population live in the rural areas and suffer from this shortfall. Trained and quality staffs are often difficult to hire and retain. Regrettably, most of the surgical problems such as hernia, hydrocele, septic wounds, and emergencies like obstructed labour, acute appendicitis, duodenal ulcer perforations, blunt trauma to the abdomen or the thorax, minor and simple fractures5 are common in these areas. To contain the challenge created by lack of staff, reliance on non-physicians who are trained to provide surgical services in rural hospitals has become imperative in some African countries.6 Although they may be able to discharge such functions, they cannot be compared with the professionals in efficiency. The ideal doctor in such locations must be competent enough to handle most of the health problems, including the technique of administering anaesthetic agents as well as inducing regional analgesia.

This article aims to highlight our experience having performed a large number of surgical operations under different types of anaesthesia at the Bethesda Clinic, Ngo town in Andoni Local Government Area of Rivers State over a period of
12 years. The authors are not aware of any previous study in the area.

Materials and Methods

Study design

This is a retrospective study of surgical patients seen in Bethesda Clinic Ngo.

Setting

Bethesda Clinic is a ten bedded facility located in Ngo. Ngo is a rural Niger Delta town in Andoni Local government area of Rivers State. The town is accessed from Port Harcourt after a journey of 1.5 hours by boat or a longer journey by road of about two to three hours depending on the traffic situation, followed by a 30 minutes boat ride. It is a typical rural community. The major occupation of the people is fishing. This has been adversely affected by years of environmental degradation associated with oil exploration and spillages, resulting in a very high level of poverty in the area. The service in Bethesda Clinic is general practice oriented and therefore a wide range of patients (surgical, medical, gynaecological and paediatric) are treated. The clinic is also used by locals from neighbouring fishing communities located on small islands. Transport from the islands to Ngo is mainly by hand-pulled canoes, which is slow and difficult. There is a landing jetty constructed behind the clinic to receive patients brought from neighbouring communities. Bethesda clinic occasionally allowed part-payment of hospital bills if responsible members of the community sign as sureties for them. This enabled occasional use of the facility despite financial hardship.

The practice

Staffing

Primary care team consisted of:
1. A consultant family physician that had his postgraduate training in the National Postgraduate Medical College of Nigeria and the West African College of Physicians while working in rural mission hospitals in Nigeria under the tutelage of experienced surgeons.
2. Six nurse auxiliaries trained by the family physician.
3. A cleaner.

Equipments related to anaesthesia include:
- Ambu bag
- A set of airways
- Foot suction
- Spinal needles of various sizes
- Emergency tray containing necessary drugs.
- Intravenous cannula and butterfly needles of various sizes.

Protocol for safe anaesthesia used was as follows:
1. Thorough history and physical examination of the patient.
2. Basic investigations such as urinalysis and haemoglobin to rule out diabetes and anaemia respectively.
3. Preoperative correction of fluids, electrolytes, loss of blood, shock etc.
4. Proper written consent for surgery and anaesthesia and its complications.
5. The maximum dose of local anaesthetic agents per kg body weight of the patient was pasted on the wall and must be adhered to.
6. Intravenous access must always be secured, preferably in a large vein.
7. Vital signs must be monitored during every procedure under any form of anaesthesia.
8. NG tube must be passed to empty the stomach in emergencies reporting after meal.
9. The following types of anaesthesia were practiced: a) local and regional anaesthesia with xylocaine b) general anaesthesia with ketamine.
10. Most important: Performing surgical procedures on patients in precarious states such as neonates, uncontrolled diabetes etc must be avoided if possible. Such patients should be stabilized and referred.

The choice of which anaesthetic to use depends on a number of factors:
- Patients’ factors
  - Age
  - Pregnancy status
  - History of allergies
  - Other medical conditions such as renal or hepatic failure, cardiac problems
  - Current medications
- Procedure being performed
  - Consider site
  - Consider area involved
  - Consider duration of operation
- Doctor’s own preference and experience.

The dosage of the anaesthetic drugs used was:

Ketamine

Intravenous route: a loading dose of 1.5 to 2.0 mg/kg in children or 1.0 mg/kg in adults was administered over 30 to 60 seconds. Additional incremental doses of ketamine were administered (0.5 to 1.0 mg/kg) in the event of inadequate anaesthesia or if repeated doses were necessary to accomplish a longer procedure. Intramuscular route: dose of ketamine in children was 4 to 5 mg/kg (the IV route was preferred for adults).

Xylocaine

Regional block
For saddle block, 1 ml and 2 ml of 5% xylocaine was used for saddle block and spinal anaesthesia respectively. 

Local infiltration

Maximum dose of plain xylocaine without vasoconstrictor (ie. epinephrine) used for local infiltration was 3-4.5 mg/kg, not exceeding 300 mg (30 ml of 1% xylocaine) at once. Xylocaine with vasoconstrictor was not used in the clinic.

Selection

Using the patients’ attendance register and operations register, the hospital numbers of all the patients who had surgical problems within the study period were compiled. Their medical records were retrieved and reviewed. Information sought included sociodemographic characteristics, type of surgical operation and type of anaesthesia. They were extracted from the records and transferred to a data sheet and finally stored on a computer. The records of the surgical patients who were not operated but were referred to other health facilities were also retrieved. The records that were deficient in these parameters were excluded from the study. The data was analysed using 2010 Microsoft Excel Worksheet and presented as figures and percentages in tables.

Results

Out of a total of 6911 patients who attended the clinic within the period, 575 (8.32 %) medical records of surgical patients were retrieved. Fifteen(2.60%) were referred to tertiary health centres for expert management of surgical conditions such as benign prostatic hyperplasia (4), carcinoma of the prostate (1), hyperthyroidism (1), carcinoma of the cervix (2), carcinoma of the breast(2), head injury(1), penile fracture(1) and gunshot injury(3). Of the remaining 560 medical records that were retrieved 551(98.4%) met the criteria for inclusion and had their surgical pathology treated in 583 procedures. There were 348(63.16%) males and 203(36.84%) females. Their age ranged from two months to 68 years with a mean of 29 ± 12.67 years. Majority of the patients (41.02%) belonged to the 25–44 years age bracket (Table 1). The commonest anaesthesia used in the clinic was ketamine (53.90%). Topical anaesthesia was the least used in only one case (Table 2). Most of the patients (39.75%) had herniorrhaphy which was done mainly using 1% xylocaine local anaesthesia (63.64%). Others included appendectomy (18.01%) and caesarean section (16.81%). The cases classified as others (4.46%) included toe nail avulsion, excision of ganglion, excision of lipoma, suturing of lacerations (Table 3). Mortality recorded within the period was in two (0.4%) women who had eclampsia and severe post partum haemorrhage.

Discussion

Among the components of Primary Health Care (PHC) is the treatment and care of common health conditions in the community. Some surgical conditions such as hernias, though common in the rural areas, are not captured by PHC teams in Nigeria. A possible reason for this deficiency is the severe shortage of surgical skills in the health manpower of local government PHC teams in Nigeria.

The rural population is supposed to be made up of mainly aged people who should have a large percentage of surgical problems. In this study, most of the surgical problems were found in patients within the 25-44 years age bracket. This is similar to the findings by Ojo et al in a rural health outreach in Nigeria. The lower percentage of the elderly surgical patients could be attributed to the low life expectancy which characterise rural populations in most developing countries.

In this study, herniorrhaphy was the commonest surgical procedure encountered. This corroborates with the findings by previous researchers who posited that it constitutes a significant proportion of the work load in rural general surgical practice. The 43.05% incidence of herniorrhaphy in this study is very high when compared with findings in East African countries (175 per 100,000), Ghana (1400 per 100,000) and globally (15%-18%). The large number of cases seen in this study could have been an accumulation of cases over the years due to the absence of any medical facility in the area that could perform any surgical operation prior to 1995 when the clinic was established. Other reasons attributable to this high incidence include high level of poverty, poor attitude of rural people to their health problems, ignorance, not wanting to travel long distances to get routine checkups and screenings in the towns and unpleasant city experience. The occupation of the people which is mainly fishing could have also predisposed them to this pathology. The range of other surgical operations performed in the clinic was similar to that performed in other rural facilities.

Apart from infrastructural deficiencies, one of the major challenges of a rural surgical practitioner is the delivery of safe anaesthesia. He works in a
### Table 1. Age and sex distribution of anaesthesized patients

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Male</th>
<th>Female</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>19</td>
<td>8</td>
<td>27(4.90)</td>
</tr>
<tr>
<td>5-14</td>
<td>49</td>
<td>19</td>
<td>68(12.34)</td>
</tr>
<tr>
<td>15-24</td>
<td>52</td>
<td>30</td>
<td>82(14.88)</td>
</tr>
<tr>
<td>25-34</td>
<td>65</td>
<td>53</td>
<td>118(21.42)</td>
</tr>
<tr>
<td>35-44</td>
<td>61</td>
<td>47</td>
<td>108(19.60)</td>
</tr>
<tr>
<td>45-54</td>
<td>59</td>
<td>28</td>
<td>87(15.79)</td>
</tr>
<tr>
<td>55-64</td>
<td>28</td>
<td>12</td>
<td>40(7.26)</td>
</tr>
<tr>
<td>&gt;65</td>
<td>15</td>
<td>6</td>
<td>21(3.81)</td>
</tr>
<tr>
<td>Total</td>
<td>348</td>
<td>203</td>
<td>551</td>
</tr>
</tbody>
</table>

### Table 2. Types of anaesthesia used in the clinic

<table>
<thead>
<tr>
<th>Type of anaesthesia</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>297</td>
<td>51.7</td>
</tr>
<tr>
<td>1% xylocaine + ketamine</td>
<td>13</td>
<td>2.36</td>
</tr>
<tr>
<td>1% xylocaine local</td>
<td>143</td>
<td>33.21</td>
</tr>
<tr>
<td>Spinal</td>
<td>79</td>
<td>8.53</td>
</tr>
<tr>
<td>Saddle block</td>
<td>15</td>
<td>3.45</td>
</tr>
<tr>
<td>Axillary block</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td>Topical</td>
<td>1</td>
<td>0.18</td>
</tr>
</tbody>
</table>

### Table 3. Types of surgery performed and anaesthesia used in the clinic

<table>
<thead>
<tr>
<th>Types of surgery</th>
<th>Anaesthesia used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ket</td>
</tr>
<tr>
<td>Herniorrhaphy</td>
<td>86</td>
</tr>
<tr>
<td>Appendectomy</td>
<td>105</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>60</td>
</tr>
<tr>
<td>Hydrocelectomy</td>
<td>6</td>
</tr>
<tr>
<td>Vag. Hyst</td>
<td>5</td>
</tr>
<tr>
<td>Myomectomy</td>
<td>5</td>
</tr>
<tr>
<td>Exploratory lap</td>
<td>8</td>
</tr>
<tr>
<td>Anal surgery</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>16</td>
</tr>
</tbody>
</table>
solitary environment and does not have the services of a physician or nurse anaesthetist. For such a practitioner, a safe policy is to become familiar with a limited number of drugs for anaesthesia and analgesia to be able to overcome this challenge. The choice of an appropriate method for the right patient will result in minimal morbidity and mortality.

The commonest anaesthetic agent used in the clinic was ketamine. This has been reported as the commonest anaesthetic agent available in developing countries. Green posited that it is used widely in resource-limited settings because of its excellent safety profile. The use of ketamine on majority of the patients in this study was based on the perception that it is safe and cheap even in the single handed surgeon. Ketamine induces dissociative sedation which is characterized by a trancelike cataleptic state, profound analgesia and amnesia, with retention of protective airway reflexes, spontaneous respirations, and cardiopulmonary stability. It supports maternal blood pressure during maternal hypotension as in post partum haemorrhage. There is a dose dependent rise in maternal blood pressure that makes ketamine less suitable for use in pre-eclampsia. These attributes may explain why ketamine has remained the anaesthetic drug of choice in the developing world.

Although spinal anaesthesia is regarded as a simple and effective anaesthetic technique for appendectomy, ketamine was used in all cases of appendectomy in this clinic. Spinal anaesthesia has some disadvantages for appendectomy which made ketamine more popular in this clinic. These include pain from peritoneal irritation if the block is not high enough, risk of high spinal, chance of anaesthesia wearing off if surgery is prolonged, hypotension and post-dural puncture headache. Furthermore, some patients may not tolerate surgery while awake, even when sedated.

Xylocaine in the form of local or regional anaesthetic was the most frequently used in the clinic. Regional anaesthesia is the recommended anaesthetic technique in resource poor environments. It has the advantages of being simple, effective, safe and requiring inexpensive equipment and is relatively free from toxicity and sensitivity. Xylocaine local and spinal anaesthesia was the commonest used techniques in the cases of herniorrhaphy in the clinic. Xylocaine local anaesthesia was preferable based on the recommendation from previous study that the use of spinal anaesthesia should be reduced in favour of local anaesthesia to enhance recovery and to reduce costs. Adrenaline, when added to local anaesthetics, delay their absorption velocity from the site of injection. Xylocaine spinal anaesthesia was used in some cases because it offers a safe, cheap and easy anaesthesia in poor resource hospitals. Advantages include avoidance of general anesthesia and the airway management concerns that accompany general anesthesia. Additional benefits may include reducing the metabolic stress response to surgery, reduction in blood loss, decrease in the incidence of venous thromboembolism, reduction in pulmonary compromise (particularly in patients with advanced pulmonary disease), and the ability to monitor the patient’s mental status.

Implications for Planning and Training for Medical Practitioners in Rural Areas

This study has exposed the fact that one of the greatest needs in the Nigerian Health sector is the extension of medical services to the rural dwellers. Surgeons and anaesthetists are in extremely short supply in the rural areas in those areas which harbour most of the surgical pathologies.

In some countries, the undergraduate training prepares students for career in rural practice. Curran et al suggested that the population of physicians in the rural communities can be boosted if the medical schools recruit rural students, design rural-oriented medical curriculum, encourage rural practice learning experiences and implement advanced procedural skills training. Unfortunately in most developing countries in Africa, current hospital based medical education and training programs are not adequately preparing junior doctors for rural and remote practice. Furthermore, in Nigeria, the undergraduate family medicine is not popular even though it is embraced by most universities globally. A more comprehensive approach to this problem is to make medical treatment less fragmented by breaking the boundaries between the various medical/surgical specializations. This will promote the relevance of generalist physicians (general practitioners and family physicians) with surgical and obstetric skills which are the mainstay of surgical procedures in many sub-Saharan countries, including Nigeria. The Postgraduate Medical Collegesin Nigeriahas adopted this approach in their residency training programme in general practice/family medicine to give adequate
surgical exposure to residents who will eventually function as gatekeepers in rural and remote communities.

**Strengths and Limitations of this Study**
The strength of this study is that it has been able to prove that with good training family physicians can be able to give satisfactory treatment to patients with surgical complaints in rural areas. The main limitations of this study include the retrospective design which did not allow a more detailed study.

**Conclusion and Recommendations**
There commonly exist surgical pathologies in the rural areas due to inadequacy of surgeons and anesthesiologists. The commonest surgical problem in Bethesda Clinic Ngo was hernias and the commonest anaesthesia used was ketamine anaesthesia. To be able to render simple surgical services to rural populations satisfactorily, it will be necessary to make medical treatment less fragmented by breaking the boundaries between the various medical/surgical specializations and encouraging junior doctors to specialize in general practice/family medicine. Since the general practice/family medicine residents are effectively trained in the faith based hospitals which at present are not functioning optimally, it is therefore necessary for the federal government to formulate policies to assist the faith based hospitals in the training of these specialists. A legislation to compel the Universities to start undergraduate programmes in general practice/family medicine will also prepare young doctors to embrace a career in rural practice.

**References**


