Acute care needs in a rural Sub-Saharan African Emergency Centre: A retrospective analysis

Les besoins en soins aigus dans un service d’urgence en zone rurale en Afrique sub-saharienne: une analyse rétrospective

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KEYWORDS
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Abstract

Introduction: In June of 2008, Karoli Lwanga (“Nyakibale”) Hospital and Global Emergency Care Collaborative (GECC) opened the first functional Emergency Centre (EC) in rural Uganda. GECC is developing a training programme for a new cadre of midlevel Emergency Care Practitioners (ECPs), to increase access to quality emergency care. In order to determine the skills and resources needed, the unique practice demographics and the feasibility of treating patients in this setting must be understood.

Methods: A descriptive cross-sectional analysis of the first 500 consecutive patient visits in the EC’s patient care log was reviewed. Data on demographics, procedures performed, laboratory testing, bedside ultrasounds (USs) performed, radiographs (XRs) ordered, diagnoses, condition upon discharge and disposition were collated. Descriptive statistics were performed.

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Results: Of the first 500 patient visits, there were 275 (55%) male visits and 132 (26.4%) visits for children under five. Procedures were performed in 367 (73.4%) patients. Laboratory testing, XRs and USs were performed in 188 (37.6%), 99 (19.8%) and 45 (7%) patients, respectively. Infectious diseases were diagnosed in 217 (43.4%) patients; traumatic injuries in 140 (28%) patients. Only one patient expired in the ED, and 401 (80.2%) were in good condition after treatment. One person was transferred to another hospital. After treatment, 180 (36%) patients were discharged home. Only five (1.0%) patients went directly to the operating theatre.

Conclusions: This pilot study describes the patient population, resource and training needs of a rural Emergency Centre in SSA. It demonstrates that acute care providers will be required to evaluate a wide variety of patient complaints, effectively utilise laboratory and radiologic testing, and perform numerous focused treatments and therapies. Specialised training programmes, such as GECC’s ECP programme, are needed to create providers able to provide high quality, lifesaving care.

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Résultats: Sur les 500 premières visites de patients, 275 (55%) étaient des visites d’hommes et 132 (26,4%) des visites d’enfants de moins de 5 ans. Des procédures ont été réalisées pour 367 (73,4%) patients. Des tests de laboratoires, des radiographies, des ultrasons ont été réalisés respectivement chez 188 (37,6%), 99 (19,8%) et 45 (7%) patients. Des maladies infectieuses ont été diagnostiquées chez 217 (43,4%) patients; des blessures traumatiques chez 140 (28%) patients. Seul un patient est décédé dans le centre d’urgence, et 401 (80,2%) étaient en bonne santé après le traitement. Une personne a été transférée vers un autre hôpital. Après le traitement, 180 (36%) patients ont pu rentrer chez eux. Cinq patients seulement (1,0%) sont allés directement en salle d’opération.

Conclusions: Cette étude pilote décrit la population de patients, les besoins en ressources et en formation d’un service d’urgence en zone rurale en Afrique sub-saharienne. Elle montre que les prestataires de soins aigus seront requis pour évaluer une grande variété de plaintes des patients, utiliser efficacement les tests de laboratoire et radiologiques, réaliser de nombreux traitements locaux et des thérapies ciblées. Des programmes de formation spécialisés, tels que le Programme pour les médecins urgentistes du GECC, sont nécessaires pour que les prestataires dispensent des soins de bonne qualité et pouvant sauver la vie.

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African relevance

• The Global Emergency Care Collaborative’s Emergency Care Practitioners (ECPs) provide an example of acute care practitioner training in Sub-Saharan Africa (SSA).
• ECPs providing emergency care in SSA will be required to treat a wide variety of patients.
• ECPs must be trained in a broad range of clinical, diagnostic and procedural skills.
• Infectious disease and trauma are the two most prevalent conditions seen in a rural SSA EC.

What’s new?

• Over one third of patients could be discharged after EC management.
• Only one patient was transferred and only five patients required immediate surgery.
• After treatment, most patients were judged to be in “good condition”.
• This sample suggests that it is possible to treat patients in an EC in rural SSA, even in cases where surgical back-up and transfers to higher level of care are limited or unavailable.
Acute care needs in a rural Sub-Saharan African Emergency Centre: A retrospective analysis

Introduction

Background

Emergency medical care is the care delivered in the first few hours after the onset of an acute medical condition. Emergency Care (also known as acute care) is a neglected public health challenge in low income setting, specifically in Sub-Saharan Africa (SSA). Although effective and efficient care is possible, emergency care in low income countries has been underemphasised, due to previous policies focusing on communicable diseases and maternal child health.

Despite the effectiveness of emergency care, poor access to emergency medical services remains a problem in low to middle income settings. This is partially due to lack of specialty trained practitioners. According to the Disease Control Priorities in Developing Countries, “The same personnel might be confronted with severe injuries, emergency paediatrics, or obstetric emergencies, making it necessary to identify training curriculum that best suits the needs of versatile health personnel. And the equipment and supplies sent to each level should match the knowledge and skills of the personnel available to use them.” However, despite this need, there is little understanding and research as to what specific knowledge base and skill sets are needed to provide high quality acute care in the rural resource-limited setting.

While there are published descriptions of the types of patients that present to tertiary hospitals for acute care, a PubMed search (using the terms emergency care or acute care and Sub-Saharan Africa) revealed only two publications that describe the patient population in rural SSA Emergency Centres (ECs). Most published accounts of patient populations seeking care are in higher income countries, urban ECs or tertiary referral centres; there are fewer that describe the patient population at rural EDs. Furthermore, these studies did not include information about the resources or skills required to treat these patients.

In order to establish effective acute care in rural SSA, the unique demographics and patient presentations of this population must be better understood, as well as the knowledge and skills that will be needed to train appropriate clinicians to provide effective acute care.

Context

In June of 2008, Karoli Lwanga “Nyakibale” Hospital and Global Emergency Care Collaborative (GECC) opened the first EC in rural Uganda. Uganda is a growing country with an estimated population of 33 million in the 2010. Eighty-seven percent of its population is rural, compared to an African average of 60%. It is a low income country with an annual GDP per person of $509 in 2010. The Nyakibale Hospital in the Rukungiri District in rural southwest Uganda covers an area of approximately 360,000 people, with more than half under the age of 18. The region has one physician for every 18,500 people, one clinical officer for every 13,500 people, and one nurse for every 895 people. The Nyakibale Hospital serves as one of two district hospitals for the Rukungiri district and the nearest major city with a regional referral hospital is Mbarara, approximately 120 km away. GECC aims to develop a sustainable, scalable model for quality acute care delivery in resource-limited settings. One aspect of this model includes the creation of a train-the-trainer clinical education programme for a new cadre of midlevel health provider that specialises in acute care delivery, Emergency Care Practitioners (ECPs). The train-the-trainer model involves educating providers that will become teachers and promoters of the field in the future. It has been used successfully in multiple situations, including rural Uganda for promotion of prenatal care. Graduated ECPs are mid-level providers (nurses who have received 2 years of post-graduate specialty training in acute care) who independently care for patients in the EC, including all medical decision-making, treatments and procedures. As the programme progresses, ECP training will not be limited to those with nursing training, and ECP training could be sought after clinical officer, anaesthetist officer or equivalent allied health training. At the current time, discussions are underway with the Ugandan Ministry of Health to begin certifying ECPs.

Problem statement

Prior to the initiation of the ECP training programme, a needs assessment was performed to describe the patient characteristics and provider skills needed to care for a consecutive sample of the first 500 patients presenting to Karoli Lwanga “Nyakibale” Hospital’s EC. This needs assessment forms the focus of this paper.

Methods

Study design

This is a retrospective pilot study of the first 500 patients presenting to Karoli Lwanga “Nyakibale” Hospital’s EC. It was designed as a census of all the patients who presented to the EC in order to better describe this population.

Setting

The Nyakibale Hospital EC serves an average of 500 patients per month, although seeing up to 700 per month during the busiest months. It is located next to an outpatient department (OPD). All patients who were clearly sick, obtunded, non-ambulatory, severely injured or who arrive after hours (Monday–Friday 8 am–5 pm, Saturday 8 am–12 pm) are seen primarily in the EC; other patients were seen initially in the OPD. A triage protocol was developed to allow the nursing assistant in the OPD to triage patients with certain complaints directly to the EC. Other providers in OPD could refer a patient to the EC at any point in their course of care.

Population

The population for this study is comprised of the first 500 consecutive patient encounters in the EC at Nyakibale hospital. The sample size was chosen to reflect the monthly population of the EC. All patients who arrived to this EC from June 2nd, 2008 to June 30th, 2008 were registered upon arrival into an administrative electronic database by the primary nurse.
This patient log is kept as part of standard hospital records for each department; all patients are required to be recorded in a log. To enable proper planning of the impending ECP training programme, three GECC American Board of Emergency Medicine Certified Physicians oversaw data entry related to patient visits during this initial period. Prior to analysis for this study, these data were de-identified, and each encounter was assigned a unique visit number; no other personal data were maintained.

Data collection instruments

These data were recorded in a Microsoft Excel file (Microsoft, Redmond, WA, USA), which tracked 31 separate fields. These fields were determined by three GECC Board Certified Emergency Physicians and included demographic information, chief complaint, laboratory studies, radiographs (XR) and ultrasounds (US) performed, medications prescribed and given, final diagnoses, condition on discharge and disposition. The data points were based on standard hospital procedure and extra fields the physicians felt necessary to understand the resources needed and future training topics. Data were charted by the primary nurse upon presentation, and reviewed by the emergency medicine physician upon patient evaluation. Data were imported as a string variable into a STATA 10 (STATA, Chicago, IL, USA) file for further analysis.

Statistics and data analysis

Procedures were individually characterised (for example, all wound care was aggregated and separated from suture placement). Focused physical exams that were noted in the procedure section were included, since they represented specific skills that future ECPs would need to learn. Specific equipment needed was also included. Refusals of care, imaging or procedures were noted in the patient log and tracked. Chief complaints were coded by the primary nurse as a description of the patient’s complaints. Completed XR and US were also noted. Occasionally, if unspecified, the diagnosis was used to retrospectively determine the type of study performed (e.g. Pneumonia diagnosis and a “XR” would be assumed to be a chest X-ray). If the type of study remained uncertain, it was simply noted as an unknown XR or US. Medications were assumed to be inpatient medications unless “script” was written in the patient log. Diagnoses were classified into multiple broad categories to help facilitate analysis. Because primary and secondary diagnoses were not explicitly stated, patients were allowed to have multiple co-diagnoses. Patient condition was subjectively determined by the provider at the time of disposition. Condition was considered “good” if there were 1 or 2 limited problems with a strong likelihood of a good outcome; “fair” if there were numerous problems with a likely good outcome or a single problem with possible good outcome; “serious” if the patient required further stabilisation or had a likely bad outcome; and “poor” if there was a strong likelihood of a bad outcome. Patient dispositions, including discharges and types of inpatient ward admissions, were also noted. Examples of the coding of five patients are shown in Table 1 (data supplement).

Descriptive statistics, including percentages and means, were characterised using STATA version 10.0, Chicago IL USA. Tables were created using Excel, graphs were created in STATA.

Ethical review

This retrospective review was supported by the Medical Superintendent and Hospital Management Team of Karoli Lwanga Hospital and approved by the University of Massachusetts Institutional Review Board. Consent was deemed unnecessary due to the de-identified nature of the study. This review adheres to the Declaration of Helsinki.

Results

Demographic

Of the first 500 patient visits, ten patients did not have all data fields complete. Among those ten, three had uncertain ages, five had no final diagnosis, and five had no disposition or condition. There were 275 (55%) male visits. The average age was 25.2 years (SD ± 22.2), with the age distribution shown in Fig. 1. One hundred and thirty-two (26.4%) visits were for children under five years old.

Approximately half (50.8%) of the patient visits to the EC occurred while the outpatient clinic was open. The emergency physician felt only 19 (3.8%) could have been handled adequately in the clinic, and the rest were properly referred to the EC, per triage guidelines.

Interventions performed

Procedures were performed in 367 (73.4%) patients, including 244 (48.8%) who had IVs placed, 47 (9.4%) who received wound care and 42 (8.4%) who received sutures. One hundred and fifty-two patients had more than one procedure performed. Complex procedures, such as procedural sedations, lumbar punctures, orthopaedic reductions, nerve blocks, and tube thoracostomies, occurred in 49 (9.8%) patients. These data are further described in Table 2.

Laboratory testing was performed in 188 (37.6%) encounters, with the most common test being a blood smear for malaria (132 encounters, 26.4%) (Table 3). An X-ray (XR) was performed in 99 (19.8%) encounters; 63 (12.6%) of these were chest X-Rays. An US was performed in 35 (7.0%) patients, most commonly an abdominal ultrasound (25 encounters, 5.0%).

Fig. 1 Age distribution of patients (n).
The most common diagnostic grouping was infectious disease with 217 (43.4%) patients. Of these, 78 (35.9%) had malaria, and 57 (26.3%) had pneumonia. Traumatic injuries were present in 175 (35%) patients, 77 (44%) of whom had open wounds and 31 (17.7%) who had fractures. Gastrointestinal and neurological diagnoses affected 58 (11.6%) and 27 (5.4%) patients, respectively. Data are shown in Table 4.

### Diagnosis

The most common diagnostic grouping was infectious disease with 217 (43.4%) patients. Of these, 78 (35.9%) had malaria, and 57 (26.3%) had pneumonia. Traumatic injuries were present in 175 (35%) patients, 77 (44%) of whom had open wounds and 31 (17.7%) who had fractures. Gastrointestinal and neurological diagnoses affected 58 (11.6%) and 27 (5.4%) patients, respectively. Data are shown in Table 4.

### Medications

Inpatient medications were administered in 382 (76.4%) patient encounters. The most common single inpatient
Only one patient (0.2%) expired in the ED, and 401 (80.2%) were in good condition after treatment, as subjectively defined by the GECC Emergency Physician caring for the patient. The majority of the remaining patients (81 patient, 16.2%) were in fair condition, seven (1.4%) in poor condition and five (1.0%) in serious condition. One person (0.2%) was transferred to the national referral hospital. This patient was a two-week old baby in critical condition with a working diagnosis of congenital heart disease. Although most patients were in good condition, 313 (62.6%) were admitted to the hospital. Patient dispositions are noted in Table 6. Interestingly, only five (1.0%) patients went directly to the operating theatre. Of these, the diagnoses were peritonitis, testicular torsion, traumatic radial artery transection, small bowel obstruction and urinary retention.

**Discussion**

Our study is unique in its description of a consecutive sample of patients from an EC in rural Sub-Saharan Africa in that it characterises the types of skills and equipment necessary to provide care to this patient population. Understanding these data can help inform resource and training needs in low resource rural settings similar to Nyakibale Hospital.

There is little published information about ECs in rural SSA and only one study from outside of South Africa. In 2007, Wallis et al. published a study on South African ECs and in 2011, Wachira et al. published on the Kenyan EC population. However, neither study commented on the resources needed, nor the skills required for training providers to render effective acute care in the rural district hospital setting.

The number of patients seen in the ECs of SSA varies considerably. A survey of four community health centre ECs surrounding Cape Town, South Africa, had a mean total daily attendance of approximately 300 patients a day per EC, of which 24.1% were paediatric. In a separate study of eight Kenyan hospitals, the ECs saw between 13–186 patients a day (average of 122), of which 30% were paediatric. There were 500 patient encounters in this study seen in 27 days which averages to 18 patients a day, similar to previous studies. It also had a large proportion (26.4%) under the age of 5 years old. Thus, care of paediatric patients will need to be emphasised in training in this setting.

Wachira noted that only 29% of all EC patients received interventions, such as wound care, fluid resuscitation, or treatment of asthma. Cohen studied the skills necessary for treating acute patients and found the top procedures performed were suturing (30.4% of procedures), splinting (15.7%) and lumbar punctures (12.2%). The most common investigations performed were chest radiographs (20.4% of investigations), complete blood counts (15.9%), chemistry panels (17.5%), and ECGs (9.2%). Ultrasounds (US) were performed 4.5% of the time.

In the current study, diagnostic testing (labs, ultrasounds, and X-rays) were ordered in 263 (52.6%) of all patient encounters, indicating that training in interpretation of these tests will be critical. Additionally, consideration can be given to training acute emergency care providers to perform and interpret these tests primarily, in order to eliminate delays in diagnosis and treatment that may stem from out-of-EC laboratory interpretation. Advanced procedural skills, such as wound care and suturing, procedural sedation, lumbar puncture, splinting, and incision and drainage were commonly required.

Given the high burden of infectious disease in this setting, basic laboratory testing is helpful. In particular, haemoglobin testing as well as some form of malaria testing (blood slide or rapid diagnostic testing) is essential to providing effective acute care. Use of radiographs and ultrasound in this patient sample was relatively high, 19.8% and 7% overall. Diagnostic imaging in this setting will also need further analysis. It is possible that training in bedside ultrasound could be helpful and potentially limit the need for radiographs in some cases (e.g. suspected pneumothorax or pleural effusion). However, we are unable to discern, solely based on radiographs actually performed, how many patients may have been treated empirically without radiograph nor how many radiographs were performed that actually affected medical management and treatment decisions for the patients.

Previous studies have shown that 90% of trauma deaths occur in low or middle income countries. Trauma accounted for a significant proportion of emergency visits in previous studies, ranging from 21 to 28%. A study of trauma cases in Kampala stated that patients with injuries were 7% of all patients seen. Assaults and motor vehicle collisions (MVCs) were the most common mechanisms for trauma, accounting for 46% and 22% of all injuries, respectively. Traumatic injuries were seen in 35% of patient encounters in this study, and therefore should be a concentration during teaching basic medical knowledge. The definition of “trauma” was broad in this study and included open wounds and musculoskeletal injuries.

### Table 6 Disposition of patients from the EC.

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expired</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Discharged</td>
<td>180</td>
<td>36.0</td>
</tr>
<tr>
<td>AMA</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td>Did not wait</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Transferred</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Admitted</td>
<td>313</td>
<td>62.6</td>
</tr>
<tr>
<td>Unknown ward</td>
<td>10</td>
<td>2.0</td>
</tr>
<tr>
<td>Isolation</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>Maternity</td>
<td>8</td>
<td>1.6</td>
</tr>
<tr>
<td>Medical</td>
<td>126</td>
<td>25.2</td>
</tr>
<tr>
<td>Paediatric</td>
<td>97</td>
<td>19.4</td>
</tr>
<tr>
<td>Private</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>Surgical</td>
<td>60</td>
<td>12.0</td>
</tr>
<tr>
<td>Missing documentation</td>
<td>5</td>
<td>1.0</td>
</tr>
</tbody>
</table>
complaints. This may explain the slightly higher proportion of trauma compared to other studies.\textsuperscript{13,14}

In previous studies, the discharge rate varied from 71% to 91.5\%\textsuperscript{13,14}. In the current study, 62.6\% of patient encounters resulted in admission to the hospital, mostly to the medical and paediatric wards. This admission rate is substantially higher than other reports\textsuperscript{13,14} and is likely multifactorial. While other studies included all patients presenting to the hospital, a considerable number of patients (50.8\%) who presented to the Nyakibale EC were initially screened in the outpatient department of the hospital, and then referred to the EC. This screening limited the number of non-urgent patients who came to the EC and could instead adequately be cared for in the outpatient clinic. During normal business hours, those who presented directly to the EC were clearly sick, obtunded, non-ambulatory, or with severe traumatic injuries. Another potential reason for a higher admission rate in our study is the fact that rural patients have difficulty accessing hospital level care and often present at more advanced stages of illness.\textsuperscript{23} In addition, these same financial and access-to-care challenges make it difficult for rural patients to return for follow-up care or for worsening of their condition, thus emergency providers at Nyakibale may have chosen to admit patients to ensure follow-up care. In order to further understand this observation, a larger study with short-term patient follow up will be needed.

Transfers were rare in this study, with only one patient transfer to a national referral centre as noted above. However, although socioeconomic data were not collected, there may have been other patients who were not transferred due to family socioeconomic constraints. Only five (1\%) were taken directly to the operating theatre, despite a high proportion of trauma. This suggests it is possible for emergency care practitioners to treat many trauma patients independently, even in settings where surgical back-up is unavailable and referral is difficult. Given that up to 25\% of Emergency care providers cite lack of operating rooms as a reason for poor emergency care, these data could be convincing to other providers in low income settings.\textsuperscript{9}

Limitations

Some minor limitations of these data are discussed within individual sections above. The single largest limitation of this study is the lack of strict definitions for each diagnosis. Additionally, we grouped most diagnoses in larger categories to limit any effect of misdiagnosis on the study conclusions. A second limitation is the lack of patient follow-up. Consistent and comprehensive patient follow-up would help to further characterise the efficacy of the care by determining patient outcome, and would also increase diagnostic certainty. Patients were not given medial record numbers or individual patient numbers, so it is possible that the first 500 patient encounters included some repeat visits.

Conclusions

This pilot study describes the patient population, resource and training needs of a rural EC in Sub-Saharan Africa. Providers specialising in acute care in these resource-limited settings, such as GECC’s Emergency Care Practitioners, will be required to evaluate a wide variety of patient complaints, to effectively utilise laboratory and radiologic testing, and to implement treatment in an efficient and cost-effective manner. Specialised training on a broad range of clinical, diagnostic and procedural skills, specifically in infectious disease and trauma, will be required to create new cadres of acute care specialists able to provide high quality, lifesaving care to hundreds of millions of rural impoverished patients in Sub-Saharan Africa.

Authors contribution

U.P designed the study, and performed data cleaning, statistical analysis and submission of this work. H.H, S.C, M.B inputted the data into the database. M.B and B.D conceived and designed the study and supervised all portions of the study. U.P drafted the manuscript and all authors (U.P, B.D, H.H, S.C, S.N, K.J.B, K.P, M.B) revised it. All authors take responsibility for the paper as a whole.

Appendix A. Short answer questions

Test your understanding of the contents of this original paper (answers can be found at the end of the regular features section).

1. Of the first 500 patients seen in the Nyakibale Hospital EC, what were the two most common diagnoses?
   a. Infectious disease complaints
   b. Traumatic complaints
   c. Gastrointestinal complaints
   d. Neurologic complaints
   e. Dehydration

2. What percent of patients seen were considered in good condition after treatment in the Nyakibale Hospital EC?
   a. 20\%
   b. 40\%
   c. 60\%
   d. 80\%
   e. 100\%

3. Why are specialised training programmes, such as the GECC’s ECP programme, needed to provide treatment in a rural Emergency Department in SSA?
   a. Acute care providers will be required to evaluate a wide variety of patient complaints
   b. Acute care providers will be required to effectively utilise laboratory and radiologic testing
   c. Acute care providers will be required to perform numerous focused treatments and therapies in a cost-effective manner
   d. There is no need for specialised training programmes.
   A. B & C

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.afjem.2012.09.002.
References


