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PATIENT CHARACTERISTICS FROM AN EMERGENCY CARE CENTER IN RURAL WESTERN KENYA

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☐ **Abstract—Background: Emergency care is a neglected area of focus in many low- and middle-income countries. There is a paucity of research on types and frequencies of acute illnesses and injuries in low-resource settings. Objective: The primary objective of this study was to describe the demographic characteristics and emergency conditions of patients that presented to a new emergency care center (ECC) at Sagam Community Hospital in Luanda, Kenya. Methods: Patient demographic characteristics, modes of arrival, chief symptoms, triage priorities, self-reported human immunodeficiency virus status, tests performed, interventions, discharge diagnoses, and dispositions were collected for all patients that presented to the Sagam Community Hospital ECC. Results: Between October 1, 2016 and September 30, 2017, 14,518 patients presented to the ECC. The most common mode of arrival to Sagam Community Hospital was by foot (n = 12,605 [86.8%]). There were 8931 (61.5%) female patients and 5571 (38.4%) male patients. Of the total visits, 12,668 (87.3%) were triaged Priority III (lowest priority), 1239 (8.5%) were Priority II, and 293 (2.0%) were Priority I (highest priority). The most common chief symptoms were headache (n = 3923 [15.2%]), hotness of body or chills (n = 2877 [8.8%]), and cough (n = 1827 [5.5%]). The three most common discharge diagnoses were malaria (n = 3692 [18.9%]), acute upper respiratory infection (n = 1242 [6.3%]), and gastritis/duodenitis (n = 1210 [6.2%]). Conclusions: Although opening an ECC in rural Kenya attracted patients in need of care, access was limited primarily to those that could arrive on foot. ECCs in rural sub-Saharan Africa have the potential to provide quality care and support attainment of Sustainable Development Goals.**

☐ **Keywords—emergency care; Kenya; low-resource setting; electronic medical record; triage; chief symptoms; discharge diagnosis**

INTRODUCTION

Emergency care is a neglected area of focus in sub-Saharan Africa (1). There are few emergency medicine training opportunities, emergency care is not usually provided by specialists, national and regional systems for trauma care are uncommon, dispatch and ambulance services are scarce, and most patients are transferred to hospitals by private means (i.e., car, truck, or taxi) (2). Emergency care record keeping is often poor or nonexistent and there has been scant activity on understanding population emergency care needs and the development of emergency care solutions. In response, the African Federation of Emergency Medicine and World Health

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Organization (WHO) have called for data collection and research to support the development of emergency care across sub-Saharan Africa (1).

Industrialization and urbanization are changing the overall spectrum, prevalence, and mortality of the diseases and injuries affecting low and middle-income countries (LMICs) (3). It is predicted that by 2030, road traffic accidents will be the fifth leading cause of death in LMICs, ahead of malaria, tuberculosis, and human immunodeficiency virus (HIV) (4). In 2015, WHO reported that three-quarters of non-communicable disease (NCD) deaths occurred in LMICs (5). Moreover, deaths attributable to NCDs are projected to rise by 15% globally between 2010 and 2020, with the greatest increases in Africa, the eastern Mediterranean region, and Southeast Asia. The development of emergency care systems has the potential to directly address the rising acute care needs of populations in LMICs and thereby support the goals of universal health coverage and attainment of the Sustainable Development Goals (SDG) (6).

The lack of research on types and frequencies of acute illnesses and injuries in low-resource settings is one of the major gaps in global emergency care (7). For example, despite more than half of Kenya's population residing in rural areas, there has been no research on rural communities' emergency care needs (8). It has been described that in these rural communities, as few as 1 in 10 injuries are documented (9). Understanding demographics, chief symptoms, discharge diagnoses, and other health indicators of patients that present for emergency care in resource-limited settings may provide vital insights that inform strategies for development of emergency care programs and systems. The objective of this study was to describe the demographic characteristics and emergency conditions of patients that presented to an emergency care center (ECC) at Sagam Community Hospital (SCH) in Luanda, Kenya over a period of 1 year.

MATERIALS AND METHODS

Setting

Siaya County, Kenya has a population of nearly 1 million, half of whom live in abject poverty (10). SCH is a 100-bed community hospital in Siaya County, with five inpatient wards and two operating theaters. It is the main clinical training site of Kenya's only approved combined family and emergency medicine postgraduate training program, which is based academically out of Maseno University. The 4-year training program is in its third year and was launched coincident to the opening of an ECC at SCH on April 1, 2015. The ECC (Figure 1) is modestly equipped and has 14 beds, which includes 2-bed resuscitation and 2-bed pediatric rooms. Ambulatory and stretcher patients access the ECC through a covered, centrally located hospital entrance. Since August of 2016, demographic and clinical information on all patients that present to the ECC has been captured in an electronic medical record system (MediAide Healthcare, version 11, Netlinx Global System). Triage nurses take a brief history, document patients' chief symptom(s) and vital signs (blood pressure, heart rate, temperature, respiratory rate, and oxygen saturation on room air), and assign a "priority." Priorities are assigned using a simplified version of the Canadian Triage and Acuity Scale (11). Levels I and II are assigned to patients who require clinical evaluation immediately and within 15 min, respectively; while Level III includes all nonurgent patients. Once patients are assigned a priority they are taken into the resuscitation room (Priority I) or the ECC (Priority II and Priority III), where they are evaluated and treated by clinical officers and combined family/emergency medicine postgraduates. The electronic medical record includes history of present illness, medical history, physical examination, assessment and plan, presumed diagnoses, and disposition.

Study Design

Data from all patients that presented to the SCH ECC between October 1, 2016 and September 30, 2017 were

Figure 1. Interior distribution of the emergency care center.

included. Patients who arrived with no signs of life were excluded because data were not consistently captured in the electronic medical record. ECC customer care representatives (receptionists) transcribed demographic information, mode of arrival, priority levels, vital signs, chief symptoms, self-reported HIV status, discharge diagnoses, and dispositions from the electronic medical records into the ECC registry every evening. The registry was based on a secure RedCap web-based database (version 7.4, Research Electronic Data Capture, Informatics Core, Vanderbilt University, Nashville, TN). If patients did not know their exact date of birth, customer care representatives estimated age using the patient's birth year (if available). Discharge diagnoses were categorized using WHO's *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10) (12). Two researchers independently coded the ECC registry and a third researcher reconciled any differences.

Data were exported from Redcap and a database was constructed using Excel 2015 (Microsoft, Redmond, WA). Standard descriptive and frequency analyses were performed with RStudio, version 1.0.153 (RStudio, Boston, MA) and normality for continuous variables was assessed using the Kolmogorov-Smirnov test. This study was approved by the Institutional Review Board of Partners HealthCare (Massachusetts General Hospital, Boston, MA) and the Ethical Review Committee of Maseno University School of Medicine (Maseno, Kenya).

RESULTS

Between October 1, 2016 and September 30, 2017, there were 14,518 unique patient encounters for emergency care at the SCH ECC (Table 1). There were 32,991 chief symptoms among the 14,518 patient encounters (Table 2). Headache (n = 3923 [11.9%]) was the most common presenting symptom, followed by hotness of body or chills (n = 2877 [8.8%]), and cough (n = 1827 [5.5%]). After evaluation and care in the ECC, 12,119 (83.5%) patients were discharged home, 2243 (15.4%) were admitted to an inpatient ward, 50 (0.3%) were taken to the operating room, 4 (0.03%) were transferred to another facility, and 4 left against medical advice. Ten (0.1%) patients died in the ECC, all of whom had been triaged as Priority I patients (Figure 2).

Among the 14,518 ECC visits, 10,105 (51.6%) discharge diagnoses were infectious diseases and 9467 (48.4%) were NCDs. The five most common ICD-10 discharge diagnostic groups were "certain infectious and parasitic diseases" (n = 6006 [30.7%]), "diseases of the respiratory system" (n = 2369 [12.1%]), "diseases of the digestive system" (n = 1783 [9.1%]), "injury" (n = 1539 [7.9%]), and "diseases of the genitourinary system" (n = 1362 [7.0%]). The five most common discharge diagnoses were malaria (n = 3704 [18.9%]), acute upper respiratory infections (n = 1242 [6.3%]), gastritis and duodenitis (n = 1210 [6.2%]), unspecified injuries (n = 828 [4.2%]), and urinary tract infections (n = 764 [3.9%]). Discharge diagnoses varied depending on the patient's age group (Figure 3).

Table 1. Baseline Patient Characteristics

Baseline Characteristics	Data
Age, y, median (IQR)	32 (17–55)
Sex, n (%)	
Female	8,931 (61.5)
Male	5,571 (38.4)
Not recorded	16 (0.1)
Self-reported HIV status, n (%)	
Previously tested	5,672 (39.1)
HIV positive	420 (7.4)
HIV negative	5,252 (92.6)
Never tested or undisclosed	8,846 (60.9)
Mode of arrival, n (%)	
Walking	12,605 (86.8)
Carried to SCH or to the ECC from the parking lot	833 (6.1)
Automobile, minivan or motorbike	264 (1.8)
Wheelchair	236 (1.6)
Ambulance	82 (0.6)
Triage Priority, n (%)	
I	293 (2.0)
II	1,239 (8.5)
III	12,668 (87.3)
Total	14,518 (100)

ECC = emergency care center; HIV = human immunodeficiency virus; IQR = interquartile range; SCH = Sagam Community Hospital.

Table 2. Twenty Most Common Chief Symptoms

Chief Symptoms	n	%
Headache	3923	11.9
Hotness of body or chills	2877	8.8
Abdominal pain	2240	6.8
Cough	1827	5.5
Nausea or vomit	1557	4.7
Chest pain	1324	4.0
Back pain	1318	4.0
General body malaise	1150	3.5
Reduced appetite	1111	3.4
Lower abdominal pain	878	2.7
Joint pain	846	2.6
Diarrhea	693	2.1
Epigastric pain	589	1.8
Lower limb pain	530	1.6
Dizziness	497	1.5
Health check-up	380	1.2
Weakness	312	0.9
Generalized body pain	304	0.9
Rash	289	0.9
Throat pain	278	0.8
Other	10,068	30.4
Total	32,991	100

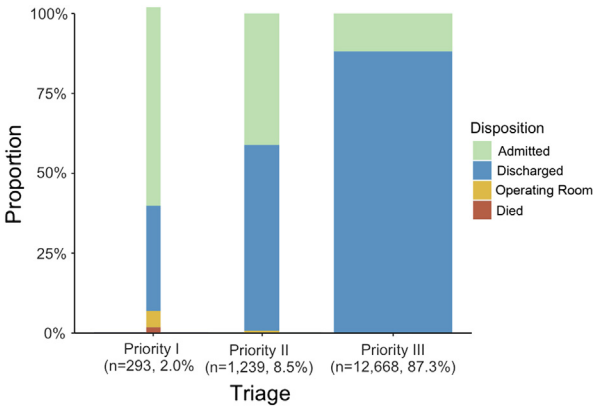

Figure 2. Disposition according to priority level.

DISCUSSION

In the 365 days between 18 and 30 months subsequent to opening the ECC at SCH, the three most common chief symptoms were headache, hotness of body or chills, and cough; and the five most common discharge diagnoses were malaria, acute upper respiratory infections, gastritis/duodenitis, injuries, and urinary tract infections. The overwhelming majority of patients arrived on foot.

The finding that nearly 9 of 10 individuals who sought emergency care at SCH arrived on foot suggests that lack of transportation for emergency care needs to be addressed urgently (13). In Kenya, the existence of only one severely under-resourced public ambulance service and several private ambulance companies that are unaffordable for the poor means that a large proportion of the population does not have access to prehospital care and emergency medical transportation when needed (2). The scarcity of prehospital services and the lack of other means of transportation likely prevented many of the community's sickest patients from accessing the ECC at SCH when they needed it most. If people were too sick to walk, it appears they often had no access to emergency care.

The prevalence of infectious diseases among patients that presented to the ECC at SCH was higher than previously reported in urban emergency care centers elsewhere in Kenya (14,15). Understanding the distribution of chief symptoms and discharge diagnoses is critical to helping guide the development of emergency care system solutions in similar settings across sub-Saharan Africa. For example, given the high disease burden, ECCs in similar settings should ensure their capabilities to effectively diagnose and treat patients with acute malaria, respiratory and gastrointestinal illnesses, and injuries. Additionally, our study population's self-reported HIV rate among the 5672 patients who reported their HIV status was three times below the known local HIV rate of 24.8% (16). This is a reminder that patient self-reporting of HIV status may be inaccurate, and

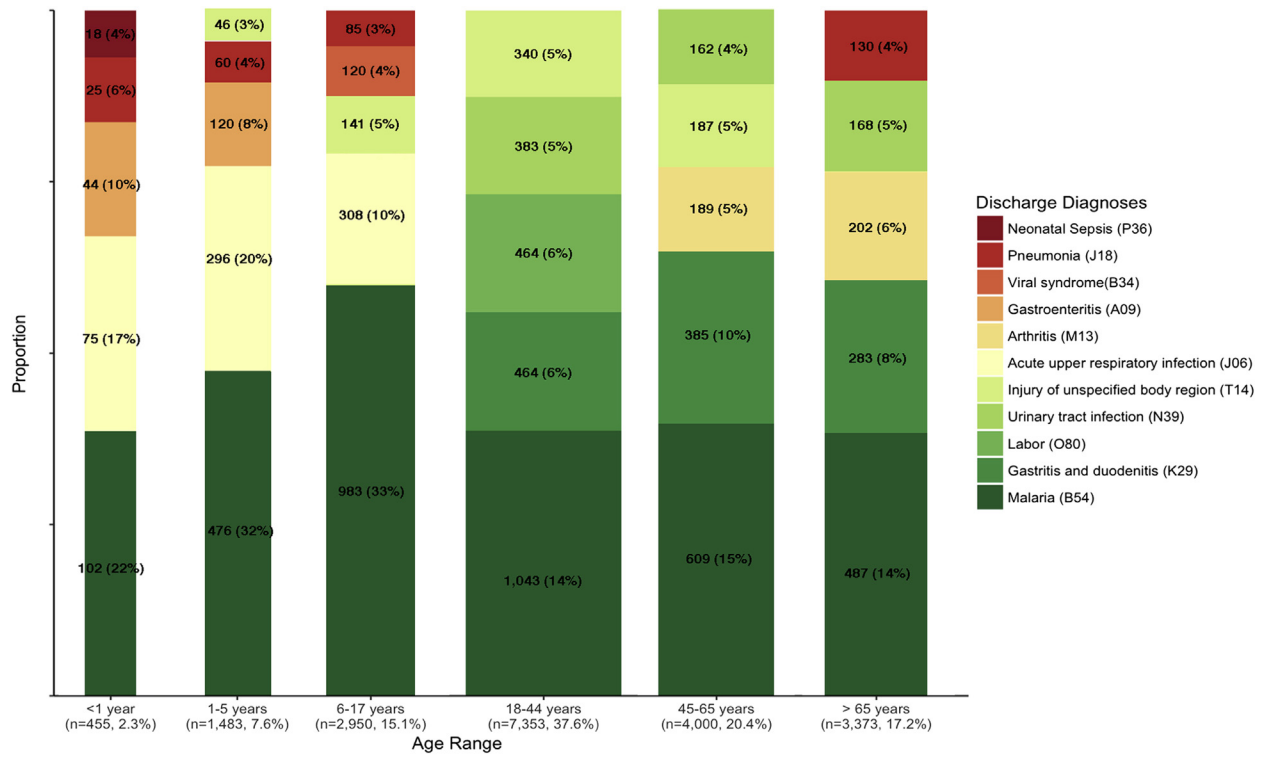

Figure 3. Five most common discharge diagnoses per age group.

underscores the importance of strict adherence to universal precautions among health care providers in these settings.

While self-evident that ECCs worldwide and in rural sub-Saharan Africa should have the capabilities of managing both low- and high-acuity emergency conditions, our database tells us that the SCH ECC has become a point of entry for access to a broad distribution of acute and non-acute health care needs. For example, while the SCH ECC has become a vital community resource for addressing acute infectious diseases, noncommunicable diseases, and injuries, it is interesting to see that it was able to fill certain gaps in preventive and chronic care. Given their unique roles in the community, ECCs of the future can likely play vital roles in rural Africa on issues such as domestic violence, undernutrition, palliative care, and maternal and child health, each of which supports SDG targets (17). This study is one of the first of its kind in its attempt to understand the emergency care needs of a local community in rural western Kenya. The 1-year database may provide a unique window into the local community's urgent and emergent health care needs and its challenges with access to care.

Limitations

The prevalence of acutely ill patients is likely underrepresented, given the lack of emergency medical transportation services. Additionally, diagnoses were often not confirmed with diagnostic tests because of limited resources. Because diagnoses made after admission to the wards were not included in this review, ECC discharge diagnoses may not always reflect the patients' final diagnoses. A fast turnover of patients from the ECC to the wards, in conjunction with low patient acuity, may explain the low death rates documented in this study. Although our study provides a unique glance into a population of patients that presented to a rural ECC in western Kenya, the lack of transportation and the challenges around diagnostic accuracy should caution generalization until further evidence is gained.

CONCLUSIONS

We report on the demographics of patients that presented to an ECC 18 months after opening, over a 1-year period. Although opening an ECC in rural Kenya attracted patients in need of care, emergency care services were primarily used by those who could arrive on foot. The distribution of chief symptoms and discharge diagnoses, as well as lack of prehospital transportation, may help guide the development of ECCs elsewhere. Future research should seek to better understand solutions for improving ECC access for critically ill patients and explore the opportunities for health care improvement utilizing the unique role of ECCs in a community.

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ARTICLE SUMMARY

1. Why is this topic important?

Emergency care systems are either nonexistent or poorly developed in most sub-Saharan African countries, leaving the population's acute and urgent care needs unmet. Understanding demographics, chief symptoms, discharge diagnoses, and other health indicators of patients that present for emergency care in resource-limited settings may provide vital insights for the development of appropriate emergency care systems.

2. What does this study attempt to show?

This study aims to understand the demographics and emergency conditions of patients that presented to a new emergency care center at Sagam Community Hospital in Luanda, Kenya. Data collection and research on emergency care in low-resource settings may allow for future design of interventions in emergency care.

3. What are the key findings?

The five most common discharge diagnoses were malaria, acute upper respiratory infections, gastritis/duodenitis, injuries, and urinary tract infections. Although opening an emergency care center in rural Kenya attracted patients in need of care, access was limited primarily to those that could arrive on foot.

4. How is patient care impacted?

While the emergency care center became a vital community resource for addressing acute infectious diseases, non-communicable diseases, and injuries, it additionally became a place able to fill gaps in preventative and chronic care.