

# Understanding Barriers to Emergency Care in Low-Income Countries: View from the Front Line

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#### Abbreviations:

DALY = Disability Adjusted Life Year  
EMS = emergency medical services  
IV = intravenous  
LIC = Low Income Country  
MIC = Middle Income Countries  
UNDP = United Nations Development Program

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#### Abstract

**Introduction:** Morbidity and mortality due to acute but treatable conditions remain high in the developing world, as many significant barriers exist to providing emergency medical care. This study investigates these barriers in a rural region of Ethiopia.

**Hypothesis:** The limited capacity of frontline healthcare workers to diagnose and treat acute medical and surgical conditions represents a major barrier to the provision of emergency care in rural Ethiopia.

**Methods:** Health providers at a convenience sample of 16 rural health centers in the state of Tigray, Ethiopia completed a questionnaire designed to assess the availability of diagnostic and treatment modalities, the proximity and methods of transportation to referral facilities, and health providers' level of comfort in diagnosing and treating a variety of representative emergency medical conditions.

**Results:** Thirteen (81%) providers had only a very basic level of medical training, and seven (44%) lacked access to any diagnostic equipment. While most providers could offer oral rehydration solution (ORS), anti-pyretic medications, and antibiotics, none of the providers could offer blood transfusions or any form of surgery. Ten (63%) respondents stated that their patients had to travel >10 km from the health center to a referral hospital, with only a minority of patients having access to motorized transport. For the seven emergency conditions assessed, a majority of providers felt comfortable diagnosing these conditions, though fewer felt comfortable treating them.

**Conclusion:** There is a significant need for both health worker training and improvements in transportation infrastructure in order to increase access to emergency medical care in rural areas of the developing world. Low-cost interventions that improve human capacity in a context-appropriate manner are warranted as transportation and hospital network capacity expansions are considered.

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#### Introduction

It is widely recognized that healthcare systems in many developing countries have limited capacity to prevent avoidable morbidity and mortality due to chronic and acute conditions. Indicators such as life expectancy, maternal mortality, and infant mortality are several times worse in the developing world than in more developed countries. In many cases, non-physician healthcare workers with basic medical and general education deliver all health care available to large communities. Medical outposts frequently are distant from more advanced care centers, and motorized transportation often is unavailable. The degree to which the capacities of these frontline health workers directly affect care is unknown.

As part of a long-term partnership between the Ethiopian Ministry of Health and the Institute for International Emergency Medicine and Health at Brigham and Women's Hospital, a pilot assessment of the capacity of

health workers at rural government clinics in Tigray, Ethiopia was conducted to diagnose and treat a wide range of emergency conditions. The results of this assessment will feed into a long-term plan for improving the training of front-line government health workers in emergency care, an area of increasing interest to many low-income countries such as Ethiopia.<sup>1</sup> Already, many of the leading causes of death and lost Disability Adjusted Life Years (DALYs) in developing countries, including ischemic heart disease, lower respiratory infections, diarrheal diseases, and road traffic injuries are amenable to improvements in emergency medical services (EMS).<sup>2</sup> In addition, many of the leading causes of maternal mortality in Middle-Income Countries (MICs) and Low-Income Countries (LICs) only can be addressed through improvements in emergency medical treatment.<sup>3</sup> Several major international health policy actors and donors, such as the World Health Organization, the World Bank, and the United States Agency for International Development have begun to support the development of EMS systems in low- and middle-income countries.<sup>4</sup>

Overall, Ethiopia remains both one of the poorest and most populous countries in sub-Saharan Africa, with a population of 71 million and a rank of 92 out of 95 on the United Nations Development Program (UNDP) Human Poverty Index. Both the under-5-year mortality rate (170/1,000 live births) and maternal mortality ratio (871/100,000 live births) in Ethiopia are strikingly high—even for sub-Saharan Africa—with the major causes of maternal mortality being obstructed labor, eclampsia, hemorrhage, sepsis, and unsafe abortion. In addition to the high rates of communicable diseases, however, prevalence of non-communicable diseases, including hypertension, cardiovascular disease, and diabetes also are increasing, with hypertension ranking as the seventh leading cause of death in 2001.<sup>5</sup> Together, obstetric complications, cardiovascular disease, and trauma, all of which require timely and effective emergency care, account for 20% of lost-life years in Ethiopia.<sup>6</sup>

## Methods

A cross-sectional survey was conducted to assess barriers to emergency care among a convenience sample of rural healthcare delivery sites in Tigray, Ethiopia. Tigray, the northernmost state in Ethiopia, was selected as the setting for this pilot study after consultation with the Ministry of Health. Tigray is one of the most populous rural states in Ethiopia, with >4 million people, and its health indicators largely reflect those of Ethiopia as a whole.<sup>6</sup> Unfortunately, due to both financial and time constraints, only a sample of those rural government health facilities within one day's drive of the regional Ministry of Health office in Mekelle, Ethiopia could be studied. This precluded the selection of a representative sample of health facilities within the province of Tigray. The highest-ranking, available clinician at each site was chosen to complete the questionnaire. To be included in the survey, respondents were required to have had at least a basic level of formal training in allopathic medicine and be involved primarily in delivering health care to rural populations in Tigray. Surveys were

hand delivered to clinicians at each rural health facility by the research team. For those health workers who could not read or write in English, a translator was provided to assist in completion of the survey.

The survey included questions covering five different categories intended to assess the major factors affecting access to emergency care in rural Tigray, including:

1. Provider demographic information;
2. Availability of material resources;
3. Availability and selection of different modes of transportation;
4. Proximity to surgical and obstetrical facilities offering higher levels of care; and
5. Providers' self-assessed level of comfort in diagnosing and treating a representative sample of emergency clinical scenarios likely to be encountered in rural health facilities.

Simple descriptive statistics were used to summarize all data. Data analysis was performed using STATA 8.0 (StataCorp LP, College Station, TX). Charts were created using Microsoft Excel 2003 (Microsoft, Redmond, WA). This study received approval from both the Partners Healthcare (Brigham and Women's Hospital) Institutional Review Board and the Regional Ministry of Health for Tigray, Ethiopia.

## Results

A total of 16 rural health practitioners in Tigray, Ethiopia completed the survey questionnaire. All respondents were actively delivering medical care to patients in their respective communities. The highest level of training for 13 (81%) of the providers was that of Senior or Junior Clinical Nurse, with the remainder trained as field surgeon or nurse professionals. Health centers served an average population of 18,000 people, with populations ranging from 200 to 71,000.

The diagnostic and treatment modalities available to healthcare workers are listed in Figures 1 and 2. Less than half of the providers had access to blood smears for malaria, one of the most common causes of illness in Tigray. Just over half had access to microscopes to evaluate for stool ova and parasites or urinalysis. Just one provider surveyed had access to blood analysis, and none of the providers interviewed had access to any form of radiology, including simple x-ray and ultrasound. Seven (44%) providers lacked access to any laboratory diagnostic equipment. In terms of treatment, all providers surveyed could provide oral rehydration solution (ORS), anti-pyretics, and antibiotics by mouth. In addition, the majority had access to intravenous (IV) fluids, pain medicine (both oral and intravenous), anti-emetics, and IV antibiotics. None of the providers could offer blood transfusions or any form of surgery on-site.

Lack of transportation was a significant barrier for patient referral from the health center to a referral hospital that could provide surgical and obstetric services or advanced medical care. As illustrated in Figure 3, the only forms of transportation available from the rural health facility to a referral hospital for the vast majority of patients were walking or being carried by family members. Only three (19%) respondents had access to motorized trans-

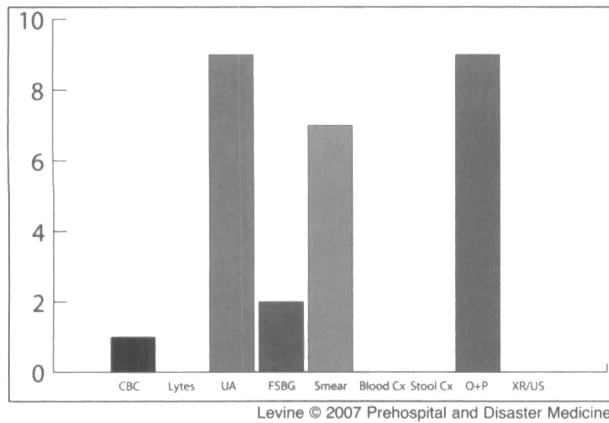


Figure 1—Diagnostic capability

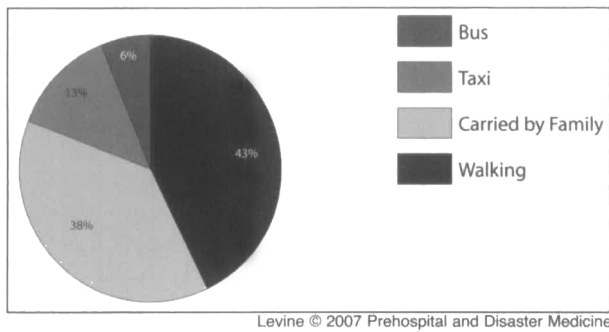


Figure 3—Transportation modalities

portation, such as buses, taxis, or ambulances. This statistic is particularly significant because of the distance that most patients had to travel to reach a referral hospital. Ten (63%) respondents stated that their patients had to travel more than 10 km, and six (38%) stated that their patients had to travel >20 km.

To assess clinical capacity, each front-line health worker was asked to indicate his or her ability to diagnose and treat a range of common emergency conditions (Table 1). Providers indicated moderate capacity to diagnose these conditions, ranging from nine (56%) for femur fracture or pneumonia to 12 (75%) for obstructed labor. In contrast, fewer providers felt comfortable treating these conditions in their facilities, ranging from zero for obstructed labor or ectopic pregnancy to nine (64%) for gastroenteritis.

**Discussion**

Barriers to emergency care in developing countries have previously been assigned into three categories: (1) care in the community; (2) during transportation; and (3) on arrival at the receiving health facility.<sup>2,3</sup> Barriers to care in the community include both those that affect an individual's decision to seek emergency care, and those that affect the care an individual receives in their community.<sup>2,3,7</sup> Care during transportation may be affected by the distribution of health facilities, the availability of appropriate vehicles and roads, the ability to pay for transport, and the care provided during that transport.<sup>2,3,8</sup> Finally, barriers to emergency care at the receiving health facility include: (1) human factors, such as the availability and training of health workers; (2) structural

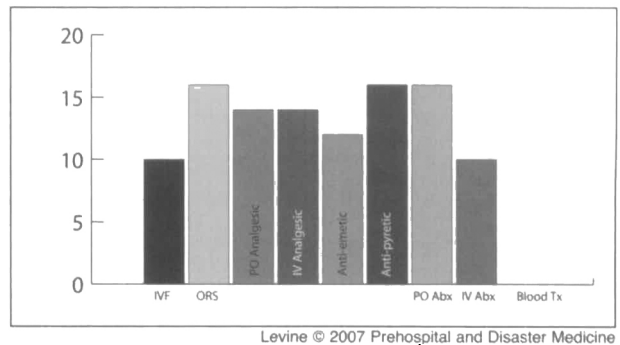


Figure 2—Treatment capacity

factors, such as availability of medications and equipment; and (3) management factors, including mechanisms for the triage of patients.<sup>2,3</sup> Though the barriers to emergency care in developing countries have been identified, much controversy remains concerning their relative importance.<sup>3,8,9</sup>

In terms of its health system, Ethiopia suffers from severe under-funding and a dearth of resources. In 2002, per capita total expenditure on health was only \$21, with only 7.6% of total government expenditure going to the health sector.<sup>10</sup> Human resources for health are spread especially thin, with only 2.8 physicians, 18.8 nurses, and 1.6 midwives for every 100,000 people.<sup>11</sup> As a result, front-line health workers in rural clinics tend to be individuals with limited formal medical training. In the current study, 13 of the 16 respondents were either senior or junior clinical nurses, a level of medical training similar to that of an assistant nurse in the United States. A smaller number were nurse professionals (with the equivalent of a bachelor's degree in nursing) or field surgeons (trained as army medics). Front-line health workers reported that for the common, potentially life-threatening conditions studied, only 9–12 of the respondents felt comfortable even making a diagnosis. Most providers, though, did have access to basic treatments for the most common emergency conditions. The relatively small percentage of health workers that felt comfortable treating non-surgical emergencies such as pneumonia or gastroenteritis, however, suggests that many health workers lacked the skills necessary to use these treatment modalities appropriately.

In addition to health worker training, transportation presented a major barrier to emergency care for the communities studied. Two-thirds of rural providers in Tigray reported that their patients live >10 km from the nearest referral center providing obstetric or surgical services, which can represent more than a day's journey for an ill or injured patient. However, while improving transportation infrastructure remains a high priority for developing countries, the high cost of construction and difficult geography of these regions require that this option remain a very long-term solution in most rural areas of LICs and MICs. In the meantime, continuing educational programs can be used to maximize the capacity of front-line rural health providers to use the tools available to them to diagnose and treat emergent conditions in their communities. The results of this study will help feed into ongoing training activities for rural health workers in Ethiopia.

Condition	Able to Diagnose n (%)	Able to Treat n (%)
Surgical Abdomen	10 (63)	1 (7)
Ectopic Pregnancy	9 (56)	0 (0)
Malaria	11 (69)	4 (29)
Pneumonia	9 (56)	3 (21)
Femur Fracture	9 (56)	1 (7)
Obstructed Labor	12 (75)	0 (0)
Gastroenteritis	10 (63)	9 (64)

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Figure 3—Ability to diagnose and treat selected emergency conditions

There are several notable limitations to this study. Due to the inaccessibility of many rural communities in Tigray, a convenience sample was used that included limited numbers of health workers, thereby limiting internal validity. It is expected, however, that those surveyed would have greater capacities than the more remote practitioners excluded from this study. Thus, this study most likely overestimated practitioner training and diagnostic capabilities and underestimated distances for patient referral. There is no reason to believe that studies of greater numbers of providers in this environment would find significantly different results, though a larger study to validate these initial findings is planned. Given that the health workers' self-assessed capacities were the objectives of this study, there was no attempt to directly measure the knowledge or skill levels of providers. Again, it would be expected that the bias of self-reporting would tend to overestimate capacities. While the region surveyed typifies conditions found in the remainder of Ethiopia and much of the developing world, external validity is limited as each country and region has unique medical needs and health system capacities. Finally, the correlation between diagnostic ability or treatment availability and the actual provision of treatment was not

attempted. It is not clear, for example, that patients receive available treatments regardless of their ability to pay.

### Conclusions

Hurricanes, earthquakes, tsunamis, and war—these public health emergencies are large-scale and well-publicized. Yet, morbidity and mortality from common acute medical and surgical conditions occur on an even larger scale with minimal attention. From this study in rural Ethiopia, it is clear that even the fortunate residents who have access to a local healthcare facility often will see providers who feel uncomfortable diagnosing and treating life-threatening conditions. Given the extent of this problem and the lack of attention and resources to respond, interventions for which the marginal cost is low and benefit is high must be prioritized. While advocating and planning for structural changes to improve transportation to and capacities of referral hospitals are underway, there exists an obligation to train and equip front-line health workers with the knowledge and basic supplies that can save lives at a minimal cost. Health training is inexpensive and rapid. It should proceed under local direction as requested by practitioners and health officials, and, as with any intervention, its methods and outcomes should be studied further.

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