BMJ Open  Defining measures of emergency care access in low-income and middle-income countries: a scoping review

Sarah Hirner,1 Jyotshila Dhakal,2 Morgan Carol Broccoli,3 Madeline Ross,4 Emilie J Calvello Hynes,5 Corey B Bills 6

ABSTRACT

Background Over 50% of annual deaths in low-income and middle-income countries (LMICs) could be averted through access to high-quality emergency care.

Objectives We performed a scoping review of the literature that described at least one measure of emergency care access in LMICs in order to understand relevant barriers to emergency care systems.

Eligibility criteria English language studies published between 1 January 1990 and 30 December 2020, with one or more discrete measure(s) of access to emergency health services in LMICs described.

Source of evidence PubMed, Embase, Web of Science, CINAHL and the grey literature.

Charting methods A structured data extraction tool was used to identify and classify the number of ‘unique’ measures, and the number of times each unique measure was studied in the literature (‘total’ measures). Measures of access were categorised by access type, defined by Thomas and Penchansky, with further categorisation according to the ‘Three Delay’ model of seeking, reaching and receiving care, and the WHO’s Emergency Care Systems Framework (ECSF).

Results A total of 3103 articles were screened. 75 met full study inclusion. Articles were uniformly descriptive (n=75, 100%). 137 discrete measures of access were reported. Unique measures of accommodation (n=42, 30.7%) and availability (n=40, 29.2%) were most common. Measures of seeking, reaching and receiving care were 22 (16.0%), 46 (33.6%) and 69 (50.4%), respectively. According to the ECSF slightly more measures focused on prehospital care—inclusive of care at the scene and through transport to a facility (n=76, 55.4%) as compared with facility-based care (n=57, 41.6%).

Conclusions Numerous measures of emergency care access are described in the literature, but many measures are overaddressed. Development of a core set of access measures with associated minimum standards are necessary to aid in ensuring universal access to high-quality emergency care in all settings.

INTRODUCTION

The past 20 years have been called a golden age of public health.1 A dramatic increase in global health funding has expanded healthcare resources in low-income and middle-income countries (LMICs).2–4 As a result, significant reductions in infectious disease-related, neonatal and maternal mortality have been achieved in line with the United Nations Millennium Development Goals.5 Further reductions in global mortality attributable to non-communicable diseases and trauma have been far less substantial.6 While a shift from disease-specific programmes to health system strengthening, equity and social protection has been an important first step, progress on current Sustainable Development Goals remains lacking and has been further hampered by existing health inequities made worse by the COVID-19 pandemic.7 Improvements in both prehospital and facility-based emergency care have the potential to impact many of the SDGs, lead to marked improvements in healthcare systems and reduce deaths across multiple disease categories.8 Estimates suggest that over 50% of annual deaths in LMICs could be averted by the implementation of quality emergency care systems.9–12 The increasing mortality burden of non-communicable diseases, including injury and chronic conditions, coupled with the acute medical needs of emerging pandemics, such as SARS-CoV-2,
requires the development of robust emergency care systems. In 2018, the World Health Assembly passed resolution 72.16, ensuring the role of emergency care in all health systems. In order to provide further clarity to practitioners and policy-makers on the role of emergency care, the WHO developed the Emergency Care System Framework (ECSF). The Framework defines a set of core essential functions of an emergency care system at the scene of illness, during transport and within health facilities. Unfortunately, many who live in resource-limited settings lack access to the human resources, equipment and information technologies needed for a capable high functioning emergency care system.

Previous descriptions of known measures of emergency care quality and barriers to emergency care access have highlighted gaps in emergency care in LMICs, but no comprehensive review on measures of emergency care access in LMICs has been completed to date. The aim of this scoping review is to categorise all known measures of emergency care access in LMICs in order to help standardise and prioritise emergency care development.

**MATERIALS AND METHODS**

**Search strategy**

A rigorous search strategy was employed with the goal of identifying all peer-reviewed studies that described measures of access to emergency care in LMICs. For this review, we use the term measure to describe indicators, metrics and other measurable components of access to emergency care. We performed a scoping review using the following databases: PubMed, Embase, Web of Science and CINAHL. A subsequent grey literature search was conducted via both Google and Google Scholar, with searches targeted towards organisations that work on global emergency care.

The initial search strategy (online supplemental appendix 1) was developed within PubMed and adapted for the remaining databases. Search terms included various iterations of access, emergency care and LMICs. Free-text terms and standardised MeSH headings/subheadings were used to optimise sensitivity for relevant literature while minimising excess search results. The reference lists of relevant primary studies and reviews likely to meet inclusion criteria were also reviewed manually to both verify search sensitivity and identify other potentially relevant studies that were not identified by the electronic search. The initial search was performed in 2020, with a subsequent updated search in November 2022.

The grey literature search was completed via Google and Google Scholar. We performed targeted searches using similar terms relevant to access, including affordability and barriers to care. The search was targeted towards government ministries of health, professional organisations specific to emergency care and among well-established non-governmental organisations, including development agencies and those specific to healthcare policy. There were no initial regional or income-level specifications given to this search.

Studies published between 1 January 1990 and 30 December 2020, English-language, and describing at least one discrete measure of access to emergency care services in at least one LMIC were included. LMICs were defined by World Bank economic definitions as the gross national income per capita of the year the research was performed. Articles were excluded that were clearly irrelevant to the topic, did not involve emergency care, did not describe a measure of access or measurable barrier to emergency care, or did not include data from at least one LMIC. For the purposes of this review, we excluded data specific to emergency obstetric and newborn care seeking (we anticipate a separate forthcoming review on the subject).

**Patient and public involvement**

Given the nature of this study it was not possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

**Data processing**

Manuscripts meeting initial broad search criteria were imported into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Initial title and abstract review were performed by two independent authors (SH and JD). Disagreements were resolved by a third reviewer (CBB). The same procedure was followed for full-text review.

Data from included manuscripts were extracted and included the following: author(s) and full citation, publication date and study time frame, location, study type, setting, methodology, access measure(s) reported, and the primary outcome(s). Countries under study were categorised by income level, WHO region, whether the study was local, regional, national or multinational in scale, and whether the populations under study were rural or urban.

**Data analysis**

A structured data extraction tool was used to identify and classify both the number of ‘unique’ measures, and the number of times a unique measure was studied in the literature. In this manuscript, the summation of all of the times each unique measure was studied is referred to as ‘total’ measures. Unique access measures were aggregated and categorised by access type.

The term ‘access’ is often used as shorthand for distance, leading to a focus on individual patient proximity, either spatial or temporal, to a given health service. While vital, proximity is but one component of accessibility and may not correlate with the true ability to receive quality emergency care. For this scoping review, we revert back to a more expansive definition of access, one rooted in a rights-based approach to emergency care and reflecting the spectrum of fit between user and service and inclusive of five dimensions of access—availability, accessibility, accommodation, affordability and acceptability—as
described by Penchansky and Thomas (Table 1). We also reference a modified version of this framework which includes awareness. In Penchansky and Thomas’ framework, access is examined through the ‘fit’ of the patient with the healthcare system. For example, a healthcare facility may be available (ie, it exists), but not accessible because of transportation barriers. In addition, the healthcare facility may not have necessary measures to accommodate a patient (such as 24-hour-access or child-care), may be unaffordable, or may be unacceptable (ie, due to poor quality or corruption). While dated, and originally validated in the consumer patient satisfaction literature, multiple recent studies on healthcare access in low-income and middle-income studies have shown utility and validity for this framework, including among geriatric healthcare in Southeast Asia, on HIV treatment access during Covid in Ghana, and among displaced in the Lake Chad region of Cameroon, Chad, Niger and Nigeria.

More recently, other models have emerged that may provide greater applicability to emergency care. With this in mind, we provide analyses and categorise access measures via two additional frameworks. The ‘Three Delay’ model was originally conceptualised to understand delays in care leading to increased maternal mortality but has been more recently applied to emergency care. The Three Delay model defines three critical phases of timely care: seeking, reaching and receiving care. The WHO’s ECSF provides another method of understanding emergency care access. The ECSF defines the human resources, equipment and functions necessary for a fully functioning emergency care system at the scene of illness, during transport to a health facility (prehospital) and within healthcare facilities.

All extracted access measures were collected, with similar measures collapsed into singular unique measures. We report the number of unique measures and the total number of times a measure is reported as a number and per cent. Each measure was then categorised according to the three frameworks listed above. Given the heterogeneity of study methods and types, a qualitative analysis

<table>
<thead>
<tr>
<th>Access type</th>
<th>Definition from penchansky and thomas</th>
<th>Adapted definition for emergency care</th>
<th>Proposed sample emergency care access measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>The relationship of the volume and type of existing services to the clients’ volume and types of needs</td>
<td>The relationship between EU services and those seeking EC.</td>
<td>No of EC beds per catchment area</td>
</tr>
<tr>
<td>Accessibility</td>
<td>The relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost</td>
<td>The proximity (in time and space) of a patient to EU care.</td>
<td>Presence of drug, technology or interventions specific to EC</td>
</tr>
<tr>
<td>Affordability</td>
<td>The relationship of prices of services and providers’ insurance or deposit requirements to the clients’ income, ability to pay and existing health insurance.</td>
<td>The cost of EU services and care, relative to patient’s household income and ability to pay.</td>
<td>Presence of EC clinicians 24 hours a day</td>
</tr>
<tr>
<td>Accommodation</td>
<td>The relationship between the manner in which the supply resources are organised to accept clients (including appointment systems, hours of operation, walk-in facilities, telephone services) and the clients’ ability to accommodate to these factors and the clients’ perception of their appropriateness</td>
<td>The manner in which EU services are organised (time of operation, level of training and services able to be rendered) relative to a patient’s need.</td>
<td>Per cent of clinicians with EC training</td>
</tr>
<tr>
<td>Acceptability</td>
<td>The relationship of clients’ attitudes about personal and practice characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients</td>
<td>The relationship between a patient’s individual belief system and larger sociocultural attributes and their willingness to seek EC.</td>
<td>Cost to access initial EC service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cost of individual services specific to EC (specific to individual care type)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Overall EC cost per visit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Distance to closest emergency care facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time to closest emergency care facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Available transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time associated with transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cost of transport to emergency care</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hours of operation of EU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No of transfers per patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average EU time to provider</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Training provided per specific EU interventions</td>
</tr>
</tbody>
</table>

EC, Emergency Care; EU, Emergency Unit.
and narrative synthesis was undertaken. Thematic analyses focused on the number and general quality of the measures used. Trends and ranges among studies with comparable numeric measures are reported where appropriate. We did not perform a grading of the literature given the overall observational nature of most studies. Criteria proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews statement were adhered to in reporting.

RESULTS

A total of 3103 articles were identified for screening via database searches, and 30 were included from the grey literature and hand searches of relevant literature (figure 1). After removal of 993 duplicates, 2140 articles were screened by title and abstract, 203 articles met criteria for full text screening, after which 128 articles were excluded. In sum, 75 articles met full criteria for inclusion (online supplemental eTable 1).

All but 1 of the 75 studies were published in peer-reviewed journals. The majority (n=44, 58.7%) of studies examined access related to general emergency care; 22 (29.3%) were relevant to prehospital care, 10 (13.3%) were specific to trauma care and 1 (1.3%) article focused on paediatric patients (table 2). Geographically, publications included data from all six WHO regions, with the majority from the African Region (n=35, 46.7%). The majority of included studies originated from lower-middle-income countries (n=37, 49.30%), with additional studies from upper-middle-income countries (n=15, 20.0%) and low-income countries (n=11, 14.7%). Twelve articles (16.0%) included data from multiple-income groups.

Methodologically, all studies were descriptive and relied on key informant interviews (n=14, 18.7%), surveys (n=13, 17.3%) or cross-sectional data (n=43, 57.3%). No manuscript reported a comparator group, and the majority of studies were qualitative in nature (n=47, 62.7%). Studies varied in the number and type (patients, clinical providers, administrators) of participants. The majority of studies (n=48, 64.0%) used cross-sectional data and did not specify the number of participants. Participant enrollment ranged from 11 to 32,774 individuals. The types of health facilities under study also varied, and included emergency care as accessed at clinics, district hospitals, referral hospitals (with access to intensive care) and more formal emergency units or departments.

Measures by access type

In sum, 137 unique measures of access were described in the 75 studies (table 3). Of the 75 total studies, most (n=49, 72.1%) reported more than one unique measure.
Based on Penchansky and Thomas’ categories, the highest number of discrete measures of access described accommodation (n=42, 30.7%), followed by availability (n=40, 29.2%). In many instances, a single measure was studied reported more than once leading to a total of 306 total measurements. Among total measures, measures of availability (n=120, 35.7%) were disproportionally over-represented while measures of affordability were under-represented (n=34, 10.1%).

### Availability

Unique measures of availability, defined as the relationship of the volume and type of existing services to the clients’ volume and types of needs, totalled 40 (29.2%; table 3). Total measures of availability were studied most often (n=120, 35.7%). Of the unique availability measures, most (n=29, 72.5%, table 4) focused on receiving care. Measurements on receiving care often measured the presence or lack of basic emergency health facilities and resources relevant to emergency care. There was heterogeneity when describing resource service availability, such as the availability of emergency radiologic services (eg, CT and MRI) and emergency laboratory service (eg, 

### Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>n=75</td>
</tr>
<tr>
<td>Multinational</td>
<td>12 (16.0)</td>
</tr>
<tr>
<td>Ghana</td>
<td>7 (9.3)</td>
</tr>
<tr>
<td>Pakistan</td>
<td>6 (8.0)</td>
</tr>
<tr>
<td>Kenya</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>India</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>South Africa</td>
<td>4 (5.3)</td>
</tr>
<tr>
<td>Brazil</td>
<td>3 (4.0)</td>
</tr>
<tr>
<td>Other*</td>
<td>32 (42.7)</td>
</tr>
<tr>
<td>WHO region</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>35 (46.7)</td>
</tr>
<tr>
<td>Americas</td>
<td>7 (9.3)</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>European</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>15 (20.0)</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>7 (9.3)</td>
</tr>
<tr>
<td>Multiple WHO regions</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>Income level</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>11 (14.7)</td>
</tr>
<tr>
<td>Lower middle</td>
<td>37 (49.3)</td>
</tr>
<tr>
<td>Upper middle</td>
<td>15 (20.0)</td>
</tr>
<tr>
<td>Multiple</td>
<td>12 (16.0)</td>
</tr>
<tr>
<td>Settings</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>9 (12.0)</td>
</tr>
<tr>
<td>Regional</td>
<td>34 (45.3)</td>
</tr>
<tr>
<td>National</td>
<td>20 (26.7)</td>
</tr>
<tr>
<td>Multinational</td>
<td>12 (16.0)</td>
</tr>
<tr>
<td>Setting if local or regional†</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>8 (18.6)</td>
</tr>
<tr>
<td>Rural</td>
<td>32 (74.4)</td>
</tr>
<tr>
<td>Both</td>
<td>3 (2.3)</td>
</tr>
<tr>
<td>Article type</td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>24 (32.0)</td>
</tr>
<tr>
<td>Qualitative</td>
<td>47 (62.7)</td>
</tr>
<tr>
<td>Mixed</td>
<td>4 (5.3)</td>
</tr>
<tr>
<td>Methodology</td>
<td></td>
</tr>
<tr>
<td>Descriptive (interview)</td>
<td>14 (18.7)</td>
</tr>
<tr>
<td>Descriptive (survey)</td>
<td>13 (17.3)</td>
</tr>
<tr>
<td>Cross-sectional</td>
<td>43 (57.3)</td>
</tr>
<tr>
<td>Mixed methods</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>Observational pre/post (cohort, RCT)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Population focus</td>
<td></td>
</tr>
<tr>
<td>General EM care</td>
<td>44 (58.7)</td>
</tr>
<tr>
<td>Prehospital care</td>
<td>22 (29.3)</td>
</tr>
<tr>
<td>Trauma care</td>
<td>10 (13.3)</td>
</tr>
</tbody>
</table>

*Awareness accounted for four of the unique measures.
<table>
<thead>
<tr>
<th>Table 4</th>
<th>Unique access measures categorised by type and delays in care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability N=40</strong></td>
<td><strong>Accessibility N=19</strong></td>
</tr>
<tr>
<td><strong>Seeking N=22</strong></td>
<td><strong>N=3</strong></td>
</tr>
<tr>
<td>Presence of community (lay) responders (62)</td>
<td>Patient access to a telephone (6, 11, 63)</td>
</tr>
<tr>
<td>Presence of dispatchers (68)</td>
<td>Presence of a national universal toll-free emergency no (6, 9, 10, 13, 14, 28, 43, 62, 71)</td>
</tr>
<tr>
<td>Median time from onset of patient symptoms to contact with provider (13, 57)</td>
<td>Patients and families responsible for arranging their transportation to the higher-level facility (14)</td>
</tr>
<tr>
<td><strong>Reaching N=46</strong></td>
<td><strong>N=9</strong></td>
</tr>
<tr>
<td>Basic building (ie, structural) resources specific and purpose built to emergency care (28)</td>
<td>Dispatcher training provided (6)</td>
</tr>
<tr>
<td>EU radio/communication devices available for EMS handoff (30)</td>
<td>Geography limits access: rural locations (1); mountainous terrain (10)</td>
</tr>
<tr>
<td>Fuel available for ambulances (14)</td>
<td>Calculated accessibility by 2SFCA method (24)</td>
</tr>
<tr>
<td>Fuel for general (non-ambulance) transport (14)</td>
<td>Per cent of patients who sought care or made it to a facility within 60 min of onset of symptoms (59)</td>
</tr>
</tbody>
</table>

Continued
### Table 4: Continued

<table>
<thead>
<tr>
<th>Availability N=40</th>
<th>Accessibility N=19</th>
<th>Accommodation N=42</th>
<th>Affordability N=17</th>
<th>Acceptability N=19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of any healthcare facility (14)</td>
<td>Response time from initial call to scene (3, 7, 14, 22, 33, 63, 70)</td>
<td>General maintenance issues with vehicles (11)</td>
<td>Payment required before treatment (34)</td>
<td></td>
</tr>
<tr>
<td>Presence and no of ambulances for interfacility transport (20)</td>
<td>Roadways limits access: traffic (1); poor or narrow roads (11, 14, 20, 52)</td>
<td>No of separate modes of transportation (per patient) to reach care at facility (20)</td>
<td>Preauthorisation fee (64)</td>
<td></td>
</tr>
<tr>
<td>Presence and no of ambulances with basic life support capabilities (46)</td>
<td>System to access EC from trained first responders and the scene and urgent transport to a health facility (49)</td>
<td>Patients taken to the police station before taking them to the hospital (13, 14)</td>
<td>Fees are equitable (64)</td>
<td></td>
</tr>
<tr>
<td>Presence and no of ambulances without medical capabilities/transport only (52)</td>
<td>Transport time from a location to a facility with specific EU capabilities (ie, PCI-capable hospital, trauma centre, obstetric emergencies, tertiary hospital; 36, 45, 48, 55)</td>
<td>Per cent of missed or prolonged pick-ups due toprehospital provider misunderstanding of location (8)</td>
<td>Private vehicle transport fees (27)</td>
<td></td>
</tr>
<tr>
<td>Presence and no of helicopters for transport (68)</td>
<td>Transport time from home to hospital (2, 36, 46, 48, 51, 54)</td>
<td>Presence of drivers willing to respond to patient request (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport time from scene to hospital (13, 29, 33, 35, 74)</td>
<td>Private ambulance services control rooms linked to cellular networks (68)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel distance (5, 13, 14, 21, 20, 22, 27, 32, 51, 57, 59, 66, 71, 72)</td>
<td>Regulations governing EMS (43)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel time from home to national ambulance service station (67)</td>
<td>System for care during transfer to a facility or between facilities that has the capability to handle the case (20, 49)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather/climate limits access: rainy season (11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving N=29</td>
<td>N=3</td>
<td>N=24</td>
<td>N=8</td>
<td>N=4</td>
</tr>
<tr>
<td>Absolute no of EU providers (stratified by type: physicians, nurses and EMS providers; 6, 10, 13, 14, 17, 18, 30)</td>
<td>No of (trauma) fatalities within and outside the first hour (70)</td>
<td>Presence of disaster plan including, additional staffing for disasters (49, 68)</td>
<td>Absolute cost of EC treatment (5, 13, 17, 21, 23, 34, 47, 53, 71, 72)</td>
<td>Acceptable providers conduct and attitudes towards patients (13, 14, 57)</td>
</tr>
<tr>
<td>Advanced cardiac life support or resuscitation equipment available in ambulances or no of ACLS ambulances (28, 30, 46, 56)</td>
<td>Fatality rate per patient kilometre from facility (70)</td>
<td>Availability of 24-hour ambulance care (no night hours, 52)</td>
<td>Copayment for care (65)</td>
<td>EC in line with patient's human rights (58)</td>
</tr>
<tr>
<td>Availability of basic EU medications available (13, 15, 47, 50)</td>
<td>Able to access and receive care in last 12months (81)</td>
<td>Availability of 24-hour emergency care (13, 26, 57)</td>
<td>Cost of facility treatment (19)</td>
<td>Providers/per cent of providers deemed corrupt (13)</td>
</tr>
<tr>
<td>Availability of basic EU resources/ equipment (9, 13, 14, 18, 20, 26, 30, 50, 71, 72)</td>
<td>Availability of 24-hour staff availability (20)</td>
<td>Cost of medical investigations and radiography (19)</td>
<td>Sought care for wounds/ trauma (5)</td>
<td></td>
</tr>
<tr>
<td>Availability of EU infection control materials including) soap (26, 77)</td>
<td>Care provided during transport (14)</td>
<td>Cost of medicines (17, 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of EU procedures: Needle thoracostomy (15); chest tube (15); pelvic binding (15); defibrillation (15); cardioversion (15); pericardiocentesis (15); external cardiac pacing (15); blood transfusions (15, 32)</td>
<td>Care provided at lower-level facility before transfer (14)</td>
<td>Cost of treatment by a bonesetter (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of EU specific supplies and equipment: 49, suture and wound care supplies (15); gloves (15); oxygen (15, 45); stethoscopes (20); glucometer (15); pulse oximetry; ECG machine (15); resuscitation equipment (8)</td>
<td>Legal protections for ambulance providers distributing and providing care (28)</td>
<td>Hospital costs beyond scope of patient (eg, proportion of cost to individual finances) (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of imaging (general: 17, X-ray: 15, CT: 30, 68, ultrasound or MRI: 30)</td>
<td>Miscommunication or mistriage of patient acuity (6)</td>
<td>Payment required in cash for imaging (34)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued
Table 4 Continued

<table>
<thead>
<tr>
<th>Availability N=40</th>
<th>Accessibility N=19</th>
<th>Accommodation N=42</th>
<th>Affordability N=17</th>
<th>Acceptability N=19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of laboratory/diagnostic testing material (general blood/urine tests: 17, 30, 32, 57; malaria smears: 32)</td>
<td>No of transfers per patient (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of potable (sterile) water (20, 73)</td>
<td>No and per cent mistriple (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of prehospital providers with standardised training (9, 22, 28, 52, 56)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of sanitation (toilet, 73)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of specified care: trauma care (4); orthopaedic (fracture) care (8, 15, 15); obstetrical emergencies (20); HIV care (20); cholera (20); tuberculosis care (20); general surgical services (20); dental care (20); critical care (20); ophthalmological care (20)</td>
<td>Presence of overcrowding (49)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity available (20, 26, 45)</td>
<td>Presence of a standardised EMR (13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency equipment list available (20)</td>
<td>Protocols for patient transfers (20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First aid received on scene by lay providers (ie, members of the public, other motorists or the less injured casualties; 34, 49)</td>
<td>Protocols specific to trauma care (15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First aid received on scene by trained providers (34)</td>
<td>Safe passage for health providers to the hospital at night (72)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of doctors staffing EU (appropriate for size; 68)</td>
<td>Staff comfort in treating EU conditions (32, 34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of EU-specific area beds (20)</td>
<td>Training for community members and police: first aid and triage (72)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of hospital-facility (non-EU specific) rooms or beds (10, 19, 57)</td>
<td>Training for providers: adult triage (18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of EU with resuscitation bed/zone (49, 50)</td>
<td>Training for providers: EU-specific (13, 14, 27, 46, 71)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of EU (within facility; 2, 68)</td>
<td>Training for providers: paediatric triage-specific (18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of EU dedicated nursing personnel (18)</td>
<td>Time to lab tests (75); by patient GCS (75)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of facility burn unit (2)</td>
<td>Time to provider (eg, wait time; 25, 75)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of triage (13, 14, 49, 50)</td>
<td>Utilisation and access to standardised clinical care guidelines: general approach (15, 48); condition-specific (sepsis, DKA, anaemia, 15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff qualified to utilise EU equipment (26)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff qualified to treat EU conditions (27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff with EC training: ACLS or BLS training (30, 71, 72); ATLS, PALS (80, 72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff with specialised training relevant to EC: 49, adult critical care (18); continuing education (18); EU equipment use (20); neonatal care (50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ACLS, Advanced Cardiovascular Life Support; ATLS, Advanced Trauma Life Support; BLS, Basic Life Support; DKA, Diabetic Ketoacidosis; EC, Emergency Care; EMR, Emergency Medical Record; EU, Emergency Unit; GCS, Glasgow Coma Scale; PALS, Pediatric Life Support.
blood smears for malaria). Measures owing to the presence or absence of clinical providers with qualifications relevant to emergency care were described in 9 of the 75 studies (12.0%).

**Accessibility**

Unique measures of accessibility—the location of supply and the location of clients—totalled 19 (13.9%), with a disproportionate number of measures studied more than once, leading to 66 total measurements (19.6%). The majority of the unique measures of accessibility corresponded to the process of reaching care (n=13, 68.4%) with most measures on the distance or time to a health service (n=11, 64.7%). Among the 13 studies reporting time, travel times to emergency care ranged from 5 min to 2 hours. The range of distances to health facilities demonstrated similar variability, though most (n=13) measurements were in kilometres. An additional study (n=1) reported on the percentage of the population living within a given distance or time, while other studies (n=4) reported on a range of distances or times to specific EU care (eg, trauma, referral, cardiac). Other qualitative barriers to accessibility were also provided, including the effects of terrain, weather and road quality.

**Accommodation**

Accommodation measures are those that assess the manner in which emergency care resources are organised to accept patients. Measures of accommodation made up the greatest number of unique measures (n=42, 30.7%), but they were rarely studied more than once (total n=62, 19.6%). Adequacy of child care, concerns over personal safety and difficulties in getting through to prehospital providers were described as significant barriers in the process of seeking emergency care. The majority of unique measures on accommodation dealt with the process of receiving care (n=25, 59.5%). Among measures categorised as receiving care, facility-based measures (n=11, 44.0%) included measures of provider timeliness and availability, provider training, overcrowding and protocols for care. Among the unique measures of accommodation, 4 (8.9%) described the use of standardised protocols (3 related to prehospital care and 1 on facility-based care).

**Affordability**

Measures of affordability or assessing the cost of services relative to a patient or caregivers finances, were the least studied. While 17 (12.4%) unique measures were similar to the numbers for accessibility and acceptance, measures were rarely studied more than once (n=34, 10.1%). Of the unique metrics reported, most reported on different aspects of the cost of transportation in reaching care (n=8, 47.1%) and the cost of receiving treatment (n=5, 29.4%). Types of costs varied, including the cost of an ambulance ride, cost of deposit before treatment and total hospital bills. A single study described the lack of emergency care affordability based on lost wages from missing work.

**Acceptability**

Acceptability measures uncovered how well patient’s attitudes toward emergency care matched those of providers or systems. Seventeen (12.4%) unique measures of acceptability were described in the literature. The majority were related to the process of care seeking (n=11, 64.7%). Measures largely described patient’s understanding, acceptability, willingness and fears in activating and navigating emergency care systems.

**Awareness**

Lastly, some have argued for inclusion of awareness as a sixth category of access. There were five unique measures of awareness, which largely overlapped with the previous five other categories, most specifically acceptability. These five measures were reported a total of 18 times.

**Access measures by frameworks of emergency care**

Individual metrics were also mapped to the Three Delay model, and categorised as either, seeking, reaching or receiving care (table 4). Unique measures of seeking care (N=22, 16.1%) largely dealt with prefacility care and included individual thought processes, the sociocultural forces underlying care seeking behaviour or systematic structural barriers to seeking care. Measures of reaching emergency care (N=46, 33.6%) largely measured the adequacy of out of hospital care, including the presence, number and proportion of ambulances to population, the time from community to care, the cost of ambulance services and distribution and systems of ambulance-based care. The majority of unique access measures described the processes of receiving care (n=69, 50.4%). Most measures dealt with the availability of facility-based care services.

Measures were also mapped to the WHO ECSF (table 5). The WHO Framework ‘captures essential emergency care functions at the scene of injury or illness, during transport, and through to emergency unit and early inpatient care’. Roughly equal proportions of measures were focused on prehospital care—inclusive of care at the scene and during transport to a facility (n=76, 55.5%) and facility-based emergency care (n=57, 41.6%). However, given the largely linear nature of the framework, a total of 4 (2.9%) unique measures could not be defined by this framework and were neither specific to prehospital nor facility-based care. The majority of out of hospital care measures focused on the transfer process (n=45 of 76, 59.2%), while most facility-based measures dealt with EU-based care (n=51 of 57, 89.5%). None of the included manuscripts measured EU disposition or elements of early inpatient care.

**DISCUSSION**

Increased global access to quality emergency care has the potential to reduce mortality associated with non-communicable illness and trauma as well as infectious disease and pregnancy related complications. Analysis
of emergency care access measures in detail elucidates gaps in health systems—made worse by the COVID-19 pandemic—that can guide strategies to address existing inequities in care. To date, this is the first review of access measures specific to emergency care in LMICs. This review revealed several common themes. The majority of unique emergency care access measures focus on availability and accommodation, but total measures of accessibility appear to be more frequently described in the literature. This has led to the disproportionate emphasis on distance and time to a health facility as demonstrative of emergency care access. In reality, on arrival to a health facility with an emergency condition, most patients are met with limited, ineffective or non-existent emergency care provision.

Relative to other categories of access reviewed, measures of affordability were the least studied in the literature. These measures often lacked information to contextualise data relative to the gross domestic product of the study population’s cost of living. Cost is known to play a significant role in patient’s overall healthcare expenditure in all health systems, not just LMICs. Costs associated with emergency health services are known to exist as times of higher risk to patients, measures of this risk were not adequately described in this study. Several areas of this framework had no associated measures described in the literature.

According to the ECSF, considerably few studies described measures related to the emergency unit (EU) reception process (eg, registration, screening and triage) or the transfer of care between prehospital and facility-based providers. In addition, no measures described the process of EU disposition or transfer of care to the inpatient ward. Though disposition, transfer, referrals and transition of care from one provider to another are often cited as times of higher risk to patients, measures of this risk were not adequately described in this study. Several WHO initiatives have sought to strengthen EU quality globally. Future efforts should seek to define and refine a core set of measures specific to emergency care access to aid in the monitoring and evaluation of those efforts. The further validation of a core set of measures with minimum standards across low-income, middle-income and high-income contexts can help to further increase access to high quality emergency care and the expansion of universal health coverage.

**Limitations**

This study makes an initial attempt to describe measures of access to emergency care, but it is restricted in scope and possesses several limitations. First, this study is limited to English language articles only and does not include articles in other languages widely spoken in many LMICs, including French, Portuguese and Arabic. Second, while

<table>
<thead>
<tr>
<th>Site</th>
<th>Primary function</th>
<th>N=133 (%)</th>
<th>Access type</th>
<th>N=39 (%)</th>
<th>N=18 (%)</th>
<th>N=42 (%)</th>
<th>N=17 (%)</th>
<th>N=19 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out of hospital care</td>
<td>76 (57.1)</td>
<td>11 (28.2)</td>
<td>17 (24.4)</td>
<td>25 (59.5)</td>
<td>9 (29.9)</td>
<td>14 (73.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bystander response</td>
<td>17 (12.8)</td>
<td>1 (2.6)</td>
<td>3 (16.7)</td>
<td>3 (7.1)</td>
<td>1 (5.9)</td>
<td>9 (47.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMS dispatch</td>
<td>3.23</td>
<td>1 (2.6)</td>
<td>1 (5.6)</td>
<td>1 (2.4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provider response</td>
<td>11 (8.2)</td>
<td>2 (5.1)</td>
<td>2 (11.1)</td>
<td>6 (14.3)</td>
<td>1 (5.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer</td>
<td>45 (33.8)</td>
<td>7 (17.9)</td>
<td>11 (61.1)</td>
<td>15 (35.7)</td>
<td>8 (47.1)</td>
<td>4 (21.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility-based care</td>
<td>57 (42.9)</td>
<td>28 (71.8)</td>
<td>1 (5.6)</td>
<td>17 (40.5)</td>
<td>8 (47.1)</td>
<td>3 (15.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reception and triage</td>
<td>6 (4.5)</td>
<td>2 (5.1)</td>
<td>4 (9.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU care</td>
<td>51 (38.3)</td>
<td>26 (66.7)</td>
<td>1 (5.6)</td>
<td>13 (31.0)</td>
<td>8 (47.1)</td>
<td>3 (15.8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Total is out of 133, as 4 measures could not be defined by ECSF.

ECSF, Emergency Care Systems Framework; EMS, Emergency Medical Services; EU, Emergency Unit.
a grey literature review was conducted, we are likely missing measures in use by health facilities, global health organisations and health ministries. Further attempts at key informant interviews or focus groups with those in LMICs, undoubtedly would uncover other measures, but were beyond the scope of this review. Third, given the limitations in study data, there was no attempt made to rank-order measures based on feasibility, nor the degree to which they correspond to specific patient outcomes. We recognise that not all measures have equal utility, with some better reflecting access to care issues and serving as more significant correlates of patient outcome. Fourth, though the actual corresponding outcome measures were collected (and described in online supplemental eTable 2), given the heterogeneity of measures and limitations of the search strategy, we were unable to provide reference (or minimum) standards for the access measures described. Future efforts hope to describe further the actual measurements. Other fields have attempted, at times with similar difficulty, to establish reference standards (eg, the Lancet Commission on Global Surgery has recommended a maximum 2-hour travel time to surgical services, while similar measures of time to surgery remain controversial). 37 38 However, very few consensus derived standards exist for measuring access to emergency care. 39 This lack of consensus makes further facility, regional, and national comparisons difficult and limits effective understanding of care. Similar to previous consensus work on measures of emergency care quality in LMICs, future efforts should aim to define a core list of indicators of access to emergency care. 19 Lastly, risk of bias assessment was not performed given the descriptive nature of most studies. Other methodologic and search strategy sought to limit bias in the initial selection of articles.

CONCLUSIONS

Increasing access to quality emergency care is a key step in strengthening health systems in LMICs. This scoping review demonstrates that while existing literature examines a wide breadth of access metrics, many gaps remain in our understanding of emergency care access in LMICs. As researchers continue to examine access and barriers to emergency care, special attention should be paid to those dimensions of access less commonly examined, such as affordability. Standardised, consensus-based measures of emergency care access in line with the ECSF should be developed to allow for more universal comparisons of healthcare functions.

Twitter Corey B Bills @CoreyBBills

Contributors CBB, EJCH and SH contributed to the conception and design of the work. SH and JD contributed to data collection and review. SH and CBB contributed to data analysis and interpretation and drafting of the article. MCB, MR and EJCH contributed to critical revisions of the article. All named authors have approved of the version to be published and agreed to be accountable for all aspects of the work. CBB is the guarantor and accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval As a scoping review, this manuscript does not involve human subjects and is exempt from ethics review based on the corresponding author’s IRB.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iD Corey B Bills http://orcid.org/0000-0002-3456-6008

REFERENCES


29 Oginni SO, Opoku MP, Nketsia W. Crisis at the intersection of four countries: healthcare access for displaced persons in the lake Chad Basin region. Ethn Health 2022;27:1698–717.


38 Lerner EB, Moscati RM. The golden hour: scientific fact or medical “urban legend”? Acad Emerg Med 2001;8:758–60.

Appendix 1

Search Strategy: PUBMED
Initial Search: Feb 4 2020; Follow up search date: 11/22/2020; Second Follow up search date: 11/30/2020, revised for CINAHL performed on 11/20/2022

Emergency med terms

AND
“Access”[tw]) AND (“availability” OR “available” OR “affordable” OR “cost” OR “distance” OR “spatial” OR “barrier” OR “barriers” OR “quality”)

AND
LMIC: based on Cochrane Foundation PubMed Filter
(“developing country”[tw] OR “developing countries”[tw] OR “developing nation”[tw] OR “developing nations”[tw] OR “developing world”[tw] OR “less developed country”[tw] OR “less developed countries”[tw] OR “less developed nation”[tw] OR “less developed nations”[tw] OR “less developed populations”[tw] OR “less developed world”[tw] OR “lesser developed country”[tw] OR “lesser developed countries”[tw] OR “lesser developed nation”[tw] OR “lesser developed populations”[tw] OR “lesser developed world”[tw] OR “least developed country”[tw] OR “least developed countries”[tw] OR “least developed nation”[tw] OR “least developed populations”[tw] OR “least developed world”[tw] OR “under developed country”[tw] OR “under developed countries”[tw] OR “under developed nation”[tw] OR “under developed populations”[tw] OR “under developed world”[tw])
Samoa Islands[tw] OR Navigator Island[tw] OR Navigator Islands[tw] OR
Union[tw] OR Union of Soviet Socialist Republics[tw] OR Uzbekistan[tw] OR Uzbek OR
region OR Pacific island

OVID, Global Health (CABI):
Used identical terms as Embase

Embase:
Date of Search: Feb 6 2020
Access terms
('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'prehospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies')
AND 'Access' AND ('availability' OR 'available' OR 'affordable' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') AND ('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'prehospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies')
'access' AND ('availability' OR 'availabil*' OR 'affordab*' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') AND ('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR...
‘emergency medical service’ OR ‘emergency medical services’ OR ‘emergency medicine’ OR ‘emergency health service’ OR ‘emergency health services’ OR ‘emergency care’ OR ‘emergency healthcare’ OR ‘emergency treatment’ OR ‘emergency treatments’ OR ‘emergency department’ OR ‘emergency departments’ OR ‘emergency room’ OR ‘emergency rooms’ OR ‘emergency ward’ OR ‘emergency wards’ OR ‘emergency unit’ OR ‘emergency units’ OR ‘emergency hospital’ OR ‘emergency hospitals’ OR ‘emergency clinic’ OR ‘emergency clinics’ OR ‘emergency setting’ OR ‘emergency staff’ OR ‘emergency response’ OR ‘emergency medical technician’ OR ‘emergency medical technicians’ OR ‘paramedic’ OR ‘paramedics’ OR ‘ambulance’ OR ‘ambulances’ OR ‘er’ OR ‘first responder’ OR ‘first responders’ OR ‘rescue work’ OR ‘rescue worker’ OR ‘rescue workers’ OR ‘relief work’ OR ‘relief worker’ OR ‘relief workers’ OR ‘firefighter’ OR ‘firefighters’ OR ‘fire fighter’ OR ‘fire fighters’ OR ‘trauma center’ OR ‘trauma centers’ OR ‘trauma unit’ OR ‘trauma units’ OR ‘critical care’ OR ‘critical illness’ OR ‘critical illnesses’ OR ‘resuscitation’ OR ‘shock’ OR ‘sepsis’ OR ‘septicemia’ OR ‘septicaemia’ OR ‘acute care’ OR ‘acute disease’ OR ‘acute diseases’ OR ‘prehospital’ OR ‘pre hospital’ OR ‘wound’ OR ‘wounds’ OR ‘tissue’ OR ‘pregnancy complication’ OR ‘pregnancy complications’ OR ‘obstetric complication’ OR ‘obstetric complications’ OR ‘obstetric emergency’ OR ‘obstetric emergencies’ AND (‘developing country’ OR ‘middle income country’ OR ‘middle income countr*’ OR ‘low income country’ OR ‘global medicine’ OR ‘third world’ OR ‘underserved countr*’ OR ‘resource limited country’ OR ‘lmic*’ OR ‘low income economy’ OR ‘middle income economy’ OR ‘underdeveloped countr*’ OR ‘underdeveloped economy’ OR ‘poor countr*’ OR ‘poor nation’ OR ‘world health’ OR ‘middle-income countr*’ OR ‘transitional countr*’ OR ‘lower middle income countr*’ OR ‘underdeveloped countr*’ OR ‘upper middle income’ OR ‘less developed countr*’ OR ‘lesser developed countr*’ OR ‘developing countr*’ OR ‘developing nation’ OR ‘lower-middle income countr*’ OR ‘upper-middle income countr*’ OR ‘low-income countr*’ OR ‘deprived countr*’ OR ‘low gdp’ OR ‘lami countr*’ OR ‘poorer nation’ OR ‘under served countr*’ OR ‘under served nation’ OR ‘lower income population’ OR ‘low income population’ OR ‘developing world’ OR ‘africa’ OR ‘asia’ OR ‘caribbean’ OR ‘armenian’ OR ‘aruba’ OR ‘byelorussian’ OR ‘belarus’ OR ‘belorussian’ OR ‘belorussia’ OR ‘bosnia’ OR ‘herzegovina’ OR ‘hercegovina’ OR ‘brasil’ OR ‘comoro islands’ OR ‘comores’ OR ‘mayotte’ OR ‘zaire’ OR ‘ivory coast’ OR ‘slovak republic’ OR ‘french somaliland’ OR ‘east timur’ OR ‘timor leste’ OR ‘united arab republic’ OR ‘gabonese republic’ OR ‘gaza’ OR ‘georgia republic’ OR ‘georussian republic’ OR ‘gold coast’ OR ‘guiana’ OR ‘maldives’ OR ‘isle of man’ OR ‘zakazakh’ OR ‘kiribati’ OR ‘kirghizia’ OR ‘kyrgyz republic’ OR ‘kazakhstan’ OR ‘malagasy republic’ OR ‘malaya’ OR ‘malay’ OR ‘sabah’ OR ‘sarawak’ OR ‘syndal’ OR ‘marshall islands’ OR ‘agalega islands’ OR ‘moldovia’ OR ‘moldovian’ OR ‘ifni’ OR ‘myanmar’ OR ‘burma’ OR ‘northern mariana islands’ OR ‘muscat’ OR ‘palestine’ OR ‘philippines’ OR ‘phillipines’ OR ‘rwanda’ OR ‘sao tome’ OR ‘ceylon’ OR ‘solomon islands’ OR ‘surinam’ OR ‘tadzhikistan’ OR ‘tadzhiy’ OR ‘togo’ OR ‘togo republic’ OR ‘turkmen’ OR ‘turkmen republic’ OR ‘turkmenistan’ OR ‘u.s.s.r.’ OR ‘union of soviet socialist republics’ OR ‘uzbek’ OR ‘new hebrides’ OR ‘viet nam’ OR ‘west bank’ OR ‘rhodesia’ OR ‘africa’ OR ‘africa, northern’ OR ‘africa south of the sahara’ OR ‘africa, central’ OR ‘africa, eastern or africa, southern’ OR ‘africa, western or asia’ OR ‘asia, central’ OR ‘asia, southeastern’ OR ‘asia, western’ OR ‘caribbean region’ OR ‘west indies’ OR ‘south america’ OR ‘latvia’ OR ‘latvia republic’ OR ‘central america’ OR ‘albania’ OR ‘algeria’ OR ‘american’ OR ‘argentina’ OR ‘anguilla’ OR ‘aruba’ OR ‘brazil’ OR ‘bulgaria’ OR ‘cape verde’ OR ‘central african republic’ OR ‘chad’ OR ‘chile’ OR ‘china’ OR ‘colombia’ OR ‘comoros’ OR ‘congo’ OR ‘côte d’ivoire’ OR ‘croatia’ OR ‘cuba’ OR ‘cyprus’ OR ‘czech republic’ OR ‘czechoslovakia’ OR ‘djibouti’ OR ‘dominican republic’ OR ‘east timor’ OR ‘ecuador’ OR ‘egypt’ OR ‘el salvador’ OR ‘eritrea’ OR ‘estonia’ OR ‘ethiopia’ OR ‘fiji’ OR ‘gabon’ OR

gambia OR georgia OR ghana OR greece OR grenada OR guatemala OR guinea OR 'guinea-bissau' OR guam OR guyana OR haiti OR honduras OR hungary OR india OR indonesia OR iran OR iraq OR jamaica OR jordan OR kazakhstan OR kenya OR korea OR kosovo OR kyrgyzstan OR laos OR latvia OR lebanon OR lesotho OR liberia OR libya OR lithuania OR macedonia OR madagascar OR malaysia OR malawi OR mali OR malta OR mauritania OR mauritius OR mexico OR micronesia OR 'middle east' OR moldova OR mongolia OR morocco OR mozambique OR myanmar OR namibia OR nepal OR 'netherlands antilles' OR 'new caledonia' OR nicaragua OR niger OR nigeria OR oman OR pakistan OR palau OR panama OR 'papua new guinea' OR paraguay OR peru OR philippines OR poland OR portugal OR 'puerto rico' OR romania OR russia OR rwanda OR 'saint lucia' OR 'saint vincent' OR grenadines OR samoa OR 'saudi arabia' OR senegal OR serbia OR montenegro OR seychelles OR 'sierra leone' OR slovenia OR 'sri lanka' OR somalia OR 'south africa' OR sudan OR suriname OR swaziland OR syria OR tajikistan OR tanzania OR thailand OR togo OR tonga OR trinidad OR tobago OR tunisia OR turkey OR turkmenistan OR uganda OR ukraine OR uruguay OR ussr OR uzbekistan OR vanuatu OR venezuela OR vietnam OR yemen OR yugoslavia OR zambia OR zimbabwe OR 'burkina faso' OR 'upper volta' OR burundi OR urundi OR cambodia OR 'khmer republic' OR kampuchea OR cameroon OR cameroons OR 'cameron or') AND cameroons OR 'cape verde' OR 'central african republic')
Web of Science:
Date of Initial Search: Feb 6, 2020; Date of second search: Nov 30 2020
TS= ‘Access’ AND (‘availability’ OR ‘availab*’ OR ‘affordab*’ OR ‘cost’ OR ‘distance’ OR ‘spatial’ OR ‘barrier’ OR ‘barriers’ OR ‘quality’) ANDAND
(emergency responder” OR “emergency responders” OR “emergency doctor” OR “emergency doctors” OR “emergency clinician” OR “emergency clinicians” OR “emergency physician” OR “emergency physicians” OR “emergency personnel” OR “emergency medical personnel” OR “emergency service” OR “emergency services” OR “emergency medical service” OR “emergency medical services” OR “emergency medicine” OR “emergency health service” OR “emergency health services” OR “emergency care” OR “emergency healthcare” OR “emergency treatment” OR “emergency treatments” OR “emergency department” OR “emergency departments” OR “emergency room” OR “emergency rooms” OR “emergency ward” OR “emergency wards” OR “emergency unit” OR “emergency units” OR “emergency hospital” OR “emergency hospitals” OR “emergency clinic” OR “emergency clinics” OR “emergency setting” OR “emergency staff” OR “emergency response” OR “emergency medical technician” OR “emergency medical technicians” OR “paramedic” OR “paramedics” OR “ambulance” OR “ambulances” OR “ER” OR “first responder” OR “first responders” OR “rescue work” OR “rescue worker” OR “rescue workers” OR “relief work” OR “relief worker” OR “relief workers” OR “firefighter” OR “firefighters” OR “fire fighter” OR “fire fighters” OR “trauma center” OR “trauma centers” OR “trauma unit” OR “trauma units” OR “critical care” OR “critical illness” OR “critical illnesses” OR “resuscitation” OR “shock” OR “sepsis” OR “septicemia” OR “septicaemia” OR “acute care” OR “acute disease” OR “acute diseases” OR “prehospital” OR “pre hospital” OR “wound” OR “wounds” OR “triage” OR “pregnancy complication” OR “pregnancy complications” OR “obstetric complication” OR “obstetric complications” OR “obstetric emergency” OR “obstetric emergencies”)
AND
TS=(“developing countr*” OR “developing nation*” OR “developing population*” OR “less developed countr*” OR “less developed nation*” OR “less developed population*” OR “lesser developed countr*” OR “lesser developed nation*” OR “lesser developed population*” OR “lesser developed world” OR “least developed countr*” OR “least developed nation*” OR “least developed population*” OR “least developed world” OR “under developed countr*” OR “under developed nation*” OR “under developed population*” OR “under developed world” OR “underdeveloped countr*” OR “underdeveloped nation*” OR “underdeveloped population*” OR “underdeveloped world” OR “middle income countr*” OR “middle income nation*” OR “middle income population*” OR “low income countr*” OR “low income nation*” OR “low income population*” OR “lower income countr*” OR “lower income nation*” OR “lower income population*” OR “underserved countr*” OR “underserved nation*” OR “underserved population*” OR “underserved world” OR “under served countr*” OR “under served nation*” OR “under served population*” OR “under served world” OR “deprived countr*” OR “deprived nation*” OR “deprived population*” OR “deprived world” OR “poor countr*” OR “poor nation*” OR “poor population*” OR “poor world” OR “poorer countr*” OR “poorer nation*” OR “poorer population*” OR “poorer world” OR “developing econom*” OR “less developed econom*” OR “lesser developed econom*” OR “underdeveloped econom*” OR “middle income econom*” OR “low income econom*” OR “lower income econom*” OR “low gdp” OR “low gnp” OR “low gross domestic” OR “low gross national” OR “lower gdp” OR “lower gnp” OR “lower gross domestic” OR “lower gross national” OR “Imic OR Imics OR “third world” OR “lami countr*” OR “transitional countr*” OR “Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR...
Benin OR Byelarus OR Belorussian OR Belarus OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Herzegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Uruguay OR Cambodia OR Khmer Republic OR Kampuchea OR Cambodia OR Cameroon OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Congo OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Georgia OR Georgia OR German Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraqi OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizistan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Malaysia OR Maldives OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldavia OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philippines OR Phillipines OR Phillipines OR Poland OR Portugal OR Puerto Rico OR Romania OR Romania OR Roumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR Navigator Island OR Navigator Islands OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe

TS=(Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response"
OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "firefighter" OR "firefighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies") AND 
("developing countr*" OR "developing nation*" OR "developing population*" OR "less developed countr*" OR "less developed nation*" OR "less developed population*" OR "lesser developed countr*" OR "lesser developed nation*" OR "lesser developed population*" OR "lesser developed world*" OR "least developed countr*" OR "least developed nation*" OR "least developed population*" OR "least developed world" OR "under developed countr*" OR "under developed nation*" OR "under developed population*" OR "underdeveloped countr*" OR "underdeveloped nation*" OR "underdeveloped population*" OR "underdeveloped world*" OR "middle income countr*" OR "middle income nation*" OR "middle income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "low income countr*" OR "low income nation*" OR "low income population*" OR "middle income countr*" OR "middle income nation*" OR "middle income population*" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR "Imic OR Imics OR "third world" OR "lami countr*" OR "transitional countr*" OR "Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khormer Republic OR Kampuchea OR Cameroon OR Cameroon OR Cameroon OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR
Global Index Medicus:
Initial Search Date: Feb 6, 2020
Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response" OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "fire fighter" OR "fire fighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies")
## eTable 1. Baseline information on included articles.

<table>
<thead>
<tr>
<th>Reference No</th>
<th>Primary Author</th>
<th>Citation</th>
<th>Country</th>
<th>WHO Region*</th>
<th>World Bank**</th>
<th>Location</th>
<th>Setting type*</th>
<th>Setting**</th>
<th>Article type</th>
<th>Methodology</th>
<th>Study year(s)</th>
<th>Participant numbers</th>
<th>Participant type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Bast HE, Jenkins JL. Challenges to Prehospital Care in Honduras. Prehosp Disaster Med. 2018;33(6):637-9.</td>
<td>Honduras</td>
<td>Americas</td>
<td>Lower-middle</td>
<td>Honduras</td>
<td>National</td>
<td>N/A</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>2018</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Country</td>
<td>Location</td>
<td>Region</td>
<td>Setting</td>
<td>Methodology</td>
<td>Year</td>
<td>Access</td>
<td>Type</td>
<td>Results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------</td>
<td>---------</td>
<td>----------</td>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bigdeli M, Khorasani-Zavareh D, Mohammadi R</td>
<td>Iran</td>
<td>Eastern Mediterranean</td>
<td>Urban</td>
<td>Quant</td>
<td>Cross-sectional</td>
<td>2005</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Broccoli MC, Calvello EJ, Skog AP, Wachira B, Wallis LA</td>
<td>Kenya</td>
<td>African</td>
<td>Lower-middle</td>
<td>National</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>2015</td>
<td>528</td>
<td>Focus group members</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Broccoli MC, Cunningham C, Twomey M, Wallis LA</td>
<td>Zambia</td>
<td>African</td>
<td>Lower-middle</td>
<td>National</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>2016</td>
<td>183</td>
<td>Focus group members</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Burke TF, Hines R, Ahn R, Walters M, Young D, Anderson RE, et al.</td>
<td>Kenya</td>
<td>African</td>
<td>Lower-middle</td>
<td>Western Kenya</td>
<td>Both</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>2013</td>
<td>60</td>
<td>Key informants</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Chunga R, Bruijnis SR, Hendrikse C</td>
<td>Multinational</td>
<td>N/A</td>
<td>N/A</td>
<td>International</td>
<td>N/A</td>
<td>Qual</td>
<td>Descriptive Survey</td>
<td>2016</td>
<td>382</td>
<td>Healthcare Providers</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Comery B, Perry WRG, Young S, Dare A, Matalavea B, Bissett IP, Windsor JA</td>
<td>Samoa</td>
<td>Western Pacific</td>
<td>Lower-middle</td>
<td>Both</td>
<td>Descriptive Interview</td>
<td>2016</td>
<td>N/A</td>
<td>Key informants</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Coyle RM, Harrison HL</td>
<td>Sierra Leone</td>
<td>African</td>
<td>Low</td>
<td>Freetown, Sierra Leone</td>
<td>Regional</td>
<td>Qual</td>
<td>Cross-sectional</td>
<td>2015</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>De Wulf A, Otchi EH, Soghoian S</td>
<td>Ghana</td>
<td>African</td>
<td>Lower-middle</td>
<td>Urban Ghana</td>
<td>Local</td>
<td>Qual</td>
<td>Descriptive Survey</td>
<td>5-Jul</td>
<td>18</td>
<td>EU staff members</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>De Wulf A, Aluisio AR, Muhfelder D, Bloem C</td>
<td>Haiti</td>
<td>Americas</td>
<td>Low</td>
<td>Fort Liberté District, Haiti</td>
<td>Regional</td>
<td>Qual</td>
<td>Cross-sectional</td>
<td>2012</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>El Tayeb EI Tayeb A, Abdalla S, Van den Bergh G, Heuch I</td>
<td>Sudan</td>
<td>Eastern Mediterranean</td>
<td>Urban</td>
<td>Qual</td>
<td>Descriptive Survey</td>
<td>2010</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Elbashir K, Gore RJ, Abuaraaki T, Robin P, Botha M, Yousif M, Ostrovskiy G, Bloem C, James SA</td>
<td>Sudan</td>
<td>African</td>
<td>Low</td>
<td>National</td>
<td>Qual</td>
<td>Cross-sectional</td>
<td>2008</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Emerick IC, Luiza VL, Camacho LA, Ross-Degnan D</td>
<td>Multinational</td>
<td>Americas</td>
<td>N/A</td>
<td>International</td>
<td>Both</td>
<td>Qual</td>
<td>Cross-sectional</td>
<td>2013</td>
<td>2,761</td>
<td>Households</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Hashtarkhani H, Nasr SH, Kiani B, Bergquist R, Bagheri N, Vafaeenejad R, Tara M</td>
<td>Iran</td>
<td>Eastern Mediterranean</td>
<td>Urban</td>
<td>Quant</td>
<td>Cross-sectional</td>
<td>2016</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Last Name</td>
<td>First Name</td>
<td>Title</td>
<td>Journal</td>
<td>Country</td>
<td>Region</td>
<td>Income</td>
<td>Study Type</td>
<td>Setting</td>
<td>Study Description</td>
<td>Year</td>
<td>N/A</td>
<td>Interviewed/Individuals</td>
</tr>
<tr>
<td>----</td>
<td>-----------</td>
<td>------------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td>------------</td>
<td>---------</td>
<td>--------------------</td>
<td>------</td>
<td>-----</td>
<td>-----------------------</td>
</tr>
<tr>
<td>27</td>
<td>Jacobs</td>
<td>B, Men C, Sam OS, Postma S</td>
<td>Ambulance services as part of the district health system in low-income countries: a feasibility study from Cambodia. InterNational Journal of Health Planning and Management. 2016;31(4):414-29.</td>
<td>Cambodia</td>
<td>South-East</td>
<td>Lower-middle</td>
<td>Cambodia</td>
<td>National</td>
<td>N/A</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>2013</td>
<td>N/A</td>
</tr>
<tr>
<td>28</td>
<td>Khan</td>
<td>AN, Rubin DH</td>
<td>InterNational pediatric emergency care: establishment of a new specialty in a developing country. Pediatric Emergency Care. 2010;19(3): 0181</td>
<td>Kosovo</td>
<td>European</td>
<td>Region</td>
<td>Pristina University Hospital</td>
<td>Local</td>
<td>Urban</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2002</td>
<td>N/A</td>
</tr>
<tr>
<td>30</td>
<td>Kirsch</td>
<td>T, Hilwig W, Holder Y, Smith G, Pooran S, Edwards R</td>
<td>Epidemiology and practice of emergency medicine in a developing country. Annals of Emergency Medicine 26(3): 361–367.</td>
<td>Trinidad and Tobago</td>
<td>Americas</td>
<td>Lower-middle</td>
<td>Local</td>
<td>Urban</td>
<td>Qual</td>
<td>Descriptive Interview</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>31</td>
<td>Kumar</td>
<td>S, Chaudhary S, Kumar A, Agarwal AK, Misra MC</td>
<td>Trauma care - a participant observer study of trauma centers at Delhi, Lucknow and Mumbai. Indian J Surg. 2009;71:133–41.</td>
<td>India</td>
<td>South-East</td>
<td>Lower-middle</td>
<td>Delhi, Lucknow, Mumbai</td>
<td>Regional</td>
<td>Urban</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2009</td>
<td>N/A</td>
</tr>
<tr>
<td>32</td>
<td>Levine</td>
<td>AC, Presser DZ, Rosborough S, Ghebreyesus TA, Davis MA</td>
<td>Understanding barriers to emergency care in low-income countries: view from the front line. Prehospital Disaster Med. 2007;22(5):467-70.</td>
<td>Ethiopia</td>
<td>African</td>
<td>Low</td>
<td>Tigray</td>
<td>Regional</td>
<td>Rural</td>
<td>Qual</td>
<td>Descriptive Survey</td>
<td>2006</td>
<td>N/A</td>
</tr>
<tr>
<td>33</td>
<td>Luo</td>
<td>W, Yao J, Mitchell R, Zhang X</td>
<td>Spatiotemporal access to emergency medical services in Wuhan, China: accounting for scene and transport time intervals. Int J Health Geogr. 2020;19(1):52</td>
<td>China</td>
<td>Western</td>
<td>Pacific</td>
<td>Wuhan</td>
<td>Regional</td>
<td>Urban</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2020</td>
<td>N/A</td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Year</td>
<td>Country(s)</td>
<td>Region(s)</td>
<td>Population Type</td>
<td>Study Design</td>
<td>Country(s) of Data Collection</td>
<td>Number of Participants</td>
<td>Type of Data Collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------</td>
<td>------</td>
<td>------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------------------------</td>
<td>------------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Mock</td>
<td>1995</td>
<td>Ghana</td>
<td>Lower-middle</td>
<td>National</td>
<td>Qual</td>
<td>Interview</td>
<td>21105</td>
<td>Interviewed individuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Mock</td>
<td>2001</td>
<td>Ghana</td>
<td>Lower-middle</td>
<td>National</td>
<td>Qual</td>
<td>Interview</td>
<td>9442</td>
<td>Interviewed individuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Mock</td>
<td>2006</td>
<td>Multinational</td>
<td>N/A</td>
<td>International</td>
<td>Qual</td>
<td>Interview</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Authors</td>
<td>Title</td>
<td>Setting</td>
<td>Methodology</td>
<td>Data Source</td>
<td>Participants</td>
<td>Year</td>
<td>Patients</td>
<td>Sample Size</td>
<td>Findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>-------</td>
<td>---------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------------</td>
<td>------</td>
<td>----------</td>
<td>-------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Razzak</td>
<td>Razzak J, Cone D, Rehmán R.</td>
<td>Emergency medical services and cultural determinants of an emergency in Karachi, Pakistan. Prehospital Emergency Care 5(3): 312–316.</td>
<td>Pakistan</td>
<td>Descriptive Interview</td>
<td>Karachi</td>
<td>2001</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Author(s)</td>
<td>Title</td>
<td>Comments</td>
<td>Journal/Conference</td>
<td>Year</td>
<td>Location</td>
<td>Level of Income</td>
<td>Type of Access</td>
<td>Method</td>
<td>Quality</td>
<td>Authors</td>
<td>Participants</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------</td>
<td>-------</td>
<td>----------</td>
<td>-------------------</td>
<td>------</td>
<td>-----------</td>
<td>--------------</td>
<td>---------------</td>
<td>--------</td>
<td>---------</td>
<td>---------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Siddiqui</td>
<td>Factors delaying hospital arrival of patients with acute stroke</td>
<td>Pakistan</td>
<td>South-EastLower-Asia</td>
<td>Karachi</td>
<td>Local</td>
<td>Urban</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2006-2007</td>
<td>165</td>
<td>Patients</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Sodemann</td>
<td>A medical doctor is associated with reduced mortality among sick children consulting a paediatric ward in</td>
<td>Guinea-Bissau</td>
<td>African</td>
<td>Guinea-Bissau Local</td>
<td>Urban</td>
<td>Quant</td>
<td>Descriptive Interview</td>
<td>2001</td>
<td>1572</td>
<td>Patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Sohaya</td>
<td>Accessibility of the Immigrants to the Healthcare Services in Shah Alam, Malaysia: A Pilot Study</td>
<td>Malaysia</td>
<td>Western Pacific</td>
<td>Shah Alam</td>
<td>Local</td>
<td>Urban</td>
<td>Quant</td>
<td>Descriptive survey</td>
<td>2020</td>
<td>300</td>
<td>Survey participants</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Stein</td>
<td>Access to out-of-hospital emergency care in Africa: Consensus conference recommendations.</td>
<td>MultiNational</td>
<td>African</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2015</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Sultan</td>
<td>Trends and barriers of emergency medical service use in Addis Ababa; Ethiopia</td>
<td>African</td>
<td>Low</td>
<td>Ethiopia</td>
<td>National</td>
<td>N/A</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2017</td>
<td>429</td>
<td>survey participants</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Suriyawongpaisal</td>
<td>Closing the Equity Gap of Access to Emergency Departments of Private Hospitals in Thailand</td>
<td>South-EastUpperAsia</td>
<td>Thailand</td>
<td>National</td>
<td>N/A</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2017</td>
<td>20,206</td>
<td>patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Suriyawongpaisal</td>
<td>Copayment and recommended strategies to mitigate its impacts on access to emergency medical services under universal health coverage: a case study from Thailand.</td>
<td>South-EastUpperAsia</td>
<td>Thailand</td>
<td>National</td>
<td>N/A</td>
<td>Qual</td>
<td>Mixed methods</td>
<td>2012</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Tansley</td>
<td>Spatial Access to Emergency Services in Low- and Middle-Income Countries: A GIS-Based Analysis.</td>
<td>Multinational</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>International</td>
<td>N/A</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2015</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>67</td>
<td>Tansley</td>
<td>Population-level spatial access to prehospital care by the national ambulance service in Ghana.</td>
<td>Ghana</td>
<td>African</td>
<td>Ghana</td>
<td>National</td>
<td>N/A</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2016</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Thomson</td>
<td>Emergency medical services in Zimbabwe.</td>
<td>Zimbabwe</td>
<td>African</td>
<td>Zimbabwe</td>
<td>National</td>
<td>N/A</td>
<td>Qual</td>
<td>Cross sectional</td>
<td>2005</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Treleaven</td>
<td>Referral patterns, delays, and equity in access to advanced paediatric emergency care in Vietnam.</td>
<td>Western Pacific</td>
<td>Lower-middle</td>
<td>Hanoi</td>
<td>Local</td>
<td>Urban</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2013</td>
<td>557</td>
<td>Patients</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Vanderschuren</td>
<td>Emergency care facility access in Rural areas within the golden hour?: Western Cape case study.</td>
<td>South Africa</td>
<td>African</td>
<td>South Africa</td>
<td>Regional</td>
<td>Rural</td>
<td>Quant</td>
<td>Cross sectional</td>
<td>2015</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>Author(s)</td>
<td>Title</td>
<td>Country</td>
<td>Region</td>
<td>Type</td>
<td>Setting</td>
<td>Period</td>
<td>Sample Size</td>
<td>Findings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>-----------</td>
<td>-------</td>
<td>---------</td>
<td>--------</td>
<td>------</td>
<td>---------</td>
<td>--------</td>
<td>-------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Wesson HK, Stevens KA, Bachani AM, Mogere S, Akungah D, Nyamari J, Masasabi Wekesa J, Hyder AA</td>
<td>Trauma systems in Kenya: a qualitative analysis at the district level.</td>
<td>Kenya</td>
<td>Lower-middle</td>
<td>Qualitative Interview</td>
<td>2015 May;25(5):589-99.</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Supplemental material placed on this supplemental material which has been supplied by the author(s) BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance thereof. doi: 10.1136/bmjopen-2022-067884.
<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Author (year)</th>
<th>Measures</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adewole (2012)</td>
<td>Geographic barriers</td>
<td>Rural population has less access, traffic impedes access</td>
</tr>
<tr>
<td>2</td>
<td>Ahmed (2019)</td>
<td>Percent of slums that have 1 EU per 50,000 population</td>
<td>Percent of slums that have 1%</td>
</tr>
<tr>
<td>3</td>
<td>Ali (2006)</td>
<td>Average response time to accident</td>
<td>10 min</td>
</tr>
<tr>
<td>4</td>
<td>Alibhai (2019)</td>
<td>Resource issues</td>
<td>LMICs have less resources for trauma care</td>
</tr>
<tr>
<td>5</td>
<td>Amparo (2018)</td>
<td>Awareness of where to go for care</td>
<td>7.4%</td>
</tr>
<tr>
<td>6</td>
<td>Anest (2016)</td>
<td>Training issues</td>
<td>Dispatchers lack training</td>
</tr>
<tr>
<td>7</td>
<td>Anyumba (2019)</td>
<td>Drive time from University of Venda Clinic to scene of accident</td>
<td>5-7 minutes</td>
</tr>
<tr>
<td>8</td>
<td>Aries (2007)</td>
<td>Reason that patients do not seek hospital care</td>
<td>Lack of specialized fracture treatment</td>
</tr>
<tr>
<td>9</td>
<td>Bachani (2017)</td>
<td>Training issues</td>
<td>Lack of training of pre-hospital and in-hospital providers</td>
</tr>
<tr>
<td>10</td>
<td>Bast (2018)</td>
<td>Staffing issues</td>
<td>Lack of sufficient room and staffing</td>
</tr>
<tr>
<td>11</td>
<td>Bhopal (2013)</td>
<td>Barriers to seeking care</td>
<td>Poor roads, rainy season inaccessibility, no mobile phone coverage, patient must buy petrol and pay driver, Awareness of ambulance service</td>
</tr>
</tbody>
</table>
2. Pre-hospital system issues
1. Mean transport times from the scene to the hospital for interurban incidents compared to city areas

12 Bigdeli (2010)

1. Characteristics that made it easier for patients to access care
2. Barrier to care
3. Training issues
4. Transportation issues
5. Health system issues
6. Financial issues
7. Pre-hospital system issues
8. Communication issues
9. Resource issues
10. Staffing issues
11. Systems issues that generate delays
12. Barriers to seeking care

13 Broccoli (2015)

1. Drivers willing to respond, maintenance issues
2. When patients were dressed well, had a good attitude, showed patience, had personal financial resources or insurance or personally knew a healthcare provider
2. Many providers were unfriendly towards patients or unmotivated to provide care. Participants were also concerned about corruption.
3. Healthcare providers lack training in the basics of emergency care.
4. Difficulty obtaining transportation, long distances required for travel.
5. Lack of emergency care after business hours, required paperwork before emergency care is provided and poor medical records systems, lack of triage
7. Officers take patients to the police station before taking them to the hospital, creating delays.
8. Unavailable emergency phone lines
9. Lack of healthcare provider
10. Lack of resources and critical medications at facilities
1. Lack of accessible healthcare facilities
2. No functional emergency phone number
3. Lack of necessary equipment
4. No standard national protocols for mass casualty incidents, no triage
5. Staff shortages
6. Lack of specific training in emergency care
7. The distance to travel to reach a facility
8. The time it takes for transportation to arrive, lack of fuel for vehicles and poor road conditions
9. Money was a barrier when trying to obtain transportation
10. Certain patients are required to be seen at the police station prior to receiving healthcare, which creates delays. Transferring patients to a higher-level facility with no care or stabilisation at the lower-level facility or during transport. Patients and families are responsible for arranging their transportation to the higher-level facility.
11. Lack of community knowledge about medical emergencies and emergency care. Participants felt that facility staff had bad attitudes, and thought they should be quicker to provide emergency care.

14 Broccoli (2016)

Percent of Level 2 and 3 Trauma facilities that:
1. had a specific approach to a trauma patient
2. refer trauma immediately
3. provide first aid and then refer trauma patients
4. are poorly equipped to handle broken bones
5. had suture and wound care supplies
6. had gloves
7. had oxygen
8. had splinting/casting supplies
9. had blood for transfusion
10. refer patients with a possible heart attack
11. refer patients with a possible heart attack immediately
12. treat symptoms and then refer patients with a possible heart attack
13. check vitals and then refer patients with a possible heart attack
14. had sublingual nitroglycerine

15 Burke (2014)

Percent of Level 2 and 3 Trauma facilities that:
1. 0%
2. 87%
3. 13%
4. 70%
5. 87%
6. 90%
7. 23%
8. 10%
9. 0%
10. 100%
11. 60%
12. 27%
13. 13%
14. 3%
<table>
<thead>
<tr>
<th>Percentage/Number of Facilities</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. 93%</td>
<td>are ill prepared to handle possible diabetic ketoacidosis (DKA) and must refer all cases</td>
</tr>
<tr>
<td>16. 20%</td>
<td>had a glucometer</td>
</tr>
<tr>
<td>17. 17%</td>
<td>had insulin</td>
</tr>
<tr>
<td>18. 50%</td>
<td>refer cases of potential sepsis immediately</td>
</tr>
<tr>
<td>19. 37%</td>
<td>provide treatment for cases of potential sepsis without referral</td>
</tr>
<tr>
<td>20. 13%</td>
<td>did not know an approach to sepsis</td>
</tr>
<tr>
<td>21. 80%</td>
<td>had antibiotics</td>
</tr>
<tr>
<td>22. 30%</td>
<td>had an organised approach to trauma</td>
</tr>
<tr>
<td>23. 13%</td>
<td>are notified in advance of patients arriving to the hospital</td>
</tr>
<tr>
<td>24. 97%</td>
<td>had gloves</td>
</tr>
<tr>
<td>25. 93%</td>
<td>had suture and wound care materials</td>
</tr>
<tr>
<td>26. 83%</td>
<td>had oxygen</td>
</tr>
<tr>
<td>27. 57%</td>
<td>did not have access to a trained provider who can administer general or Regional anaesthesia</td>
</tr>
<tr>
<td>28. 50%</td>
<td>had morphine</td>
</tr>
<tr>
<td>29. 20%</td>
<td>had a functioning ECG machine</td>
</tr>
<tr>
<td>30. 20%</td>
<td>had nitroglycerine</td>
</tr>
<tr>
<td>31. 13%</td>
<td>had a defibrillator</td>
</tr>
<tr>
<td>32. 33%</td>
<td>are well prepared to manage DKA</td>
</tr>
<tr>
<td>33. 93%</td>
<td>had a glucometer</td>
</tr>
<tr>
<td>34. 80%</td>
<td>had insulin</td>
</tr>
<tr>
<td>35. 97%</td>
<td>provided some treatment for sepsis</td>
</tr>
<tr>
<td>36. 0%</td>
<td>had standardised clinical care guidelines</td>
</tr>
<tr>
<td>37. 70%</td>
<td>do not have a standardised approach to trauma</td>
</tr>
<tr>
<td>38. 20%</td>
<td>had nitroglycerine and a functioning ECG machine</td>
</tr>
<tr>
<td>39. 13%</td>
<td>had a defibrillator</td>
</tr>
<tr>
<td>40. 100%</td>
<td>had chest tubes and X-ray capability</td>
</tr>
<tr>
<td>41. 80%</td>
<td>had splinting and casting supplies</td>
</tr>
<tr>
<td>42. 100%</td>
<td>had blood available for transfusion</td>
</tr>
<tr>
<td>43. 100%</td>
<td>gave oxygen to patients with suspected AMI</td>
</tr>
<tr>
<td>44. 60%</td>
<td>gave aspirin to patients with suspected AMI</td>
</tr>
<tr>
<td>45. 40%</td>
<td>gave morphine to patients with suspected AMI</td>
</tr>
<tr>
<td>46. 20%</td>
<td>gave epinephrine to patients with suspected AMI</td>
</tr>
<tr>
<td>47. 100%</td>
<td>had vasopressor agents</td>
</tr>
<tr>
<td>48. 100%</td>
<td>had antibiotics</td>
</tr>
<tr>
<td>49. 12%</td>
<td>had chest tubes</td>
</tr>
<tr>
<td>50. 48%</td>
<td>had X-ray capability</td>
</tr>
<tr>
<td>51. 64%</td>
<td>had blood available for transfusion</td>
</tr>
<tr>
<td>52. 80%</td>
<td>refer someone presenting with a possible acute myocardial infarction immediately</td>
</tr>
<tr>
<td>53. 44%</td>
<td>stabilize and then refer someone presenting with a possible acute myocardial infarction</td>
</tr>
<tr>
<td>54. 30%</td>
<td>provides diagnostic and treatment services without referral to someone presenting with a possible AMI</td>
</tr>
<tr>
<td>55. 44%</td>
<td>had vasopressor agents</td>
</tr>
<tr>
<td>56. 92%</td>
<td>had antibiotics</td>
</tr>
</tbody>
</table>
### Chunga (2019)

| Access to a pre-hospital service in HIC | 4% |
| Access to a pre-hospital service in LMIC | 21% |
| Access to a national emergency number in HIC | 4% |
| Access to a national emergency number in LMIC | 21% |

### Comery (2020)

| Lack of symptom awareness | Qual |
| Cost of transport to EC | Qual |
| EC Facility access to radiology | Qual |
| EC facility access to laboratory | Qual |
| Cost of EC | Qual |
| Cost of Medications | Qual |
| Lack of staff | Qual |

### Coyle (2015)

| Percent of hospitals with adult triage training | 43% |
| pediatric triage training | 57% |
| formal training in adult critical care | 86% |
| in-house acute care courses for continuing education | 14% |
| a dedicated EC nurse | 71% |
| out-of-hours clinician cover | 71% |
| intravenous (IV) gentamicin | 100% |
| IV penicillin and quinine | 86% |
| Oral rehydration solution and IV fluids | 100% |
| insulin | 29% |
| equipment required to carry out IV procedures | 100% |
| oxygen concentrators or cylinders available in the EC | 43% |
| with light unsuitable for clinical examination | 57% |
| a system in place to identify ward patients whose clinical condition was deteriorating | 29% |
| guidelines for paediatric critical care | 71% |
| guidelines for adult critical care | 57% |
| Emergency care guidelines for children | 57% |
| Emergency care guidelines for adults | 43% |
| Paediatric triage guidelines | 43% |
| adult triage guidelines | 29% |
| guidelines for oxygen therapy | 29% |
| facilities to check haemoglobin and blood glucose | 100% |
| ability to measure renal function | 71% |
| radiography | 57% |
| had a system in place for delaying registration and payment until after the receipt of emergency treatment for critically unwell adults | 29% |
| had a system in place for delaying registration and payment until after the receipt of emergency treatment for critically unwell children | 43% |

**Percent of public facilities with**

| adult triage training | 0% |
| pediatric triage training | 2% |

**Percent of private facilities with**

| resuscitation facilities for adults | 100% |
| all of the six infrastructure indicators | 100% |
31. all 23 indicator drugs and all 34 equipment indicators
   For public facilities, average number of
   32. infrastructure indicators
   33. drug indicators
   34. equipment indicators
   Percent of district hospital with
   35. access to x-ray facilities
   36. emergency blood transfusion
   Percent of district hospital with

19 De Wulf (2017)

1. Financial barriers
2. Health system issues

20 De Wulf (2015)

Percent of hospitals with
1. emergency care area beds
2. Supervisory level physicians consistently available during the entire 24 hours
3. with potable water
4. a list of emergency equipment
5. emergency equipment was available intermittently
6. no formal training of staff for the use of this equipment
7. surgical services and dental care
8. critical care or ophthalmological services
9. a protocol for the transfer of patients requiring a higher level of care
Percent of clinics with
10. electricity
11. a list of emergency equipment
12. basic equipment to manage obstetrical emergencies or imminent deliveries
13. pulse oximetry and glucometers
14. stethoscopes
15. HIV care
16. cholera and tuberculosis care
17. a protocol for the transfer of patients requiring a higher level of care
Percent of health facilities with
18. respiratory isolation area
19. maintenance of records for patients seen in the acute care setting
20. existence of an additional staffing resource list to be used in event of disaster or emergency situations
21. access to an ambulance for interfacility transport
22. use of a protocol or phones for the transfer of patient
23. Resource issues
24. Geographic barriers
25. Referral issues

21 El Tayeb (2015)

1. Demographics likely to use formal services
2. Financial barriers
3. Geographic barriers

1. The inability to pay for transportation or medications, laboratory investigations, and radiography
2. Limited bed capacity

Percent of hospitals with
1. 67%
2. 67%
3. 0%
4. 67%
5. 100%
6. 100%
7. 67%
8. 0%
9. 33%

Percent of clinics with
10. 20%
11. 0%
12. 0%
13. 20%
14. 60%
15. 0%
16. 60%
17. 80%

Percent of health facilities with
18. 0%
19. 100%
20. 13%
21. 13%
22. 0%
23. Hospitals had increased access to equipment, materials, and medications compared to community clinics. No computed tomography existed in the region.
24. Some of the health centers required multiple modes of transportation, not being passable consistently by 4-wheeled vehicles.
25. Patients were referred to the closest hospital, regardless of whether that facility had the capability to handle the case.

Male were almost twice as likely as females
2. Affordability of the formal health service
3. Distance
1. **Training issues**
   - No standardized training for EMS providers, dispatchers, or ambulance crew.
   - Average emergency response time
   - Geographic barriers
   - Pre-hospital issues
   - Financial barriers

2. **No standardized training for EMS providers, dispatchers, or ambulance crew.**
3. **45 minutes**
4. **Few citizens reside where services exist**
5. **Single emergency response number is not well publicized**
6. **ambulances are paid either by cash on a fee for service basis or via an insurance option**

---

1. **Emerick (2013)**
   1. Percent of individuals who perceived their condition as severe and sought health care in the formal system
      - 57.4%
   2. Percent of individuals who perceived their condition as non-severe and sought health care in the formal system
      - 36.2%
   3. Demographics associated with increased seeking of formal health care
      - Geographic location less than 30 minutes from a health facility, household head having a secondary school education, patient age under 15, and having health insurance
   4. Percent of individuals who received medicines free of charge
      - 26.1% in Guatemala, 29.1% in Honduras, and 34.2% in Nicaragua
   5. **“Do not have money” was the most frequent reason for not seeking care in Nicaragua and Honduras**

---

1. **Hashtarkhani (2020)**
   1. Calculated accessibility by 2SFCA method
      - Peripheral areas in Mashhad city have low access to EMS. Actual accessibility in the city center is low compared with potential accessibility.
      - Concerns over personal safety
      - 23.1%
      - 5.1%
      - EMS delays
      - 0% in Tanzania
      - 14% in health centres and 18% in hospitals in Tanzania
      - 4% in Tanzania
      - Fewer than half
      - less than 65%

---

1. **Hsia (2012)**
   1. Percent of hospitals
      - 78% in Tanzania
      - 41% in Tanzania to 61% in Kenya
      - 14% in health centres and 18% in hospitals in Tanzania
      - 0% in Tanzania
      - Fewer than half
      - less than 65%
   2. **Fee associated with**
      - 7% to 35% of facilities.
      - Fee associated with
      - KHR25 000 ($6.25)
      - KHR45 000 ($11.3)
      - KHR30 000 ($7.5)
      - KHR137 697 ($34.4)
      - General population did not have the contact number of the ambulance services.
      - 32%
      - 9%
      - Few health district staff received training in emergency medicine
      - 59%
   3. **Percent of clinics**
      - 7% to 35% of facilities.

---

1. **Jacobs (2016)**
   1. Training issues
      - 1. **No formal training in emergency medicine**
      - 2. Ambulances lack advanced cardiac life support equipment
      - 3. Equipment issues
      - 4. Financial issues
      - 5. pre-hospital issues
      - 6. Training issues
      - 7. Percent of health centre staff members who were insufficiently qualified to successfully deal with the condition

---

1. **Khan (2003)**
   1. Training issues
   2. Equipment issues

---

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s).
3. Health system issues

- There is no physical location for advanced pediatric care or pediatric resuscitation.

4. Pre-hospital issues

- An organized emergency medical response system does not exist, no emergency number

1. Mean time from occurrence of injury to arrival in the ER

- 4.7 h

2. Range of time from occurrence of injury to arrival in the ER

- Range 0.8–48 h

3. Patients who arrived in the ER after 1 hour of injury

- 675 (69%)

4. Patients who reached the ER within 1 hour of injury

- 303 (30.9%)

Khan (2010)

Kirsch (1995)

Percent of physicians who

1. had taken an Advanced Trauma Life Support course

- 30%

2. had taken an Advanced Cardiac Life Support course or Advanced Pediatric Life Support training

- 0%

Percent of physicians who believed they could perform

3. intubation

- 18%

4. tube thoracostomy

- 15%

5. venous cutdown

- 15%

6. tracheostomy

- 5%

7. Staffing issues

7. Nursing shortages reported in emergency departments. Trained staff were not available during many nights or weekends. IV line supplies, backboards, or cervical collars are not carried in ambulances.

8. Resource issues

8. Specialized blood tests are not easily obtained. Limited supplies of banked blood. Limited availability of CT, ultrasound, and MRI.

9. Health system issues

9. Lengthy delays in response from consulting specialties. Legal restrictions prevent ambulance drivers from starting IV lines or giving medication.


10. The EDs do not have radios.

Kumar (2009)

Levine (2007)

Percent of patients that have access to motorized transport

1. 20%

2. reported that their patients had to travel more than 10 km for surgical or obstetric services

- 62.5%

3. had access to blood smears for malaria

- Less than half

4. lacked access to any laboratory diagnostic equipment

- 44%

5. could offer blood transfusions

- 0%

6. felt comfortable diagnosing the 7 emergency conditions assessed

- 63%

7. felt comfortable diagnosing femur fracture or pneumonia

- 56%

8. felt comfortable diagnosing obstructed labor

- 75%

9. felt comfortable treating the 7 emergency conditions assessed

- 19%

10. felt comfortable treating obstructed labor

- 0%

11. felt comfortable treating gastrointestinal

- 64%

Levine (2007)

Luo (2020)

Standardized E-2SFCA access scores

1. 75% of shequis having a value lower than 0.4 for single trip and 0.8 for the total trip.

2. Over 50% and again a patient can be transported from his/her shequ to the nearest hospital within 9 min.

Macharia (2009)

1. Health facilities demanded cash deposits or letters of guarantee of payment before providing treatment to road traffic injury patients

- 14.6%

2. Cost of deposit before treatment

- US $6.7-667

Luo (2020)
<table>
<thead>
<tr>
<th>Study</th>
<th>Percent of cases in which the ambulance response time was</th>
<th>Percent of the population residing within half-an-hour travel distance from a PCI-capable hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahmood (2010)</td>
<td>1. less than 10 minutes</td>
<td>3. 69.84%</td>
</tr>
<tr>
<td></td>
<td>2. 15-20 minutes</td>
<td>4. 21.87%</td>
</tr>
<tr>
<td></td>
<td>3. 30-45 minutes</td>
<td>5. 8.28%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Percent of districts that</th>
<th>Percent of respondents reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathew (2017)</td>
<td>had more than 80% of the population residing within half-an-hour travel distance of a PCI-capable hospital</td>
<td>1. 8%</td>
</tr>
<tr>
<td></td>
<td>had more than 90% population having timely (within 1h) access to some mode of reperfusion therapy for STEMI, either thrombolysis and/or primary PCI</td>
<td>2. 37%</td>
</tr>
<tr>
<td></td>
<td>Percent of the population residing within half-an-hour travel distance from a PCI-capable hospital</td>
<td>3. 69.84%</td>
</tr>
<tr>
<td></td>
<td>had access to a thrombolysis-capable hospital within 1h travel time</td>
<td>4. 21.87%</td>
</tr>
<tr>
<td></td>
<td>would have had to travel more than an hour to access a reperfusion-capable hospital</td>
<td>5. 8.28%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Percent of survey respondents reporting barriers to care:</th>
<th>Percent of respondents reporting barriers to care:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mock (2001)</td>
<td>preference for other treatments</td>
<td>1. 20%</td>
</tr>
<tr>
<td></td>
<td>financial</td>
<td>2. 53%</td>
</tr>
<tr>
<td></td>
<td>health care utilization when health care was available in the user’s town</td>
<td>3. 59%</td>
</tr>
<tr>
<td></td>
<td>health care utilization when health care was not available in the user’s town</td>
<td>4. 41%</td>
</tr>
<tr>
<td>Mock (2006)</td>
<td>Training issues</td>
<td>Lack of training for trauma care, including in-service training for doctors, lack of training to use equipment</td>
</tr>
</tbody>
</table>
2. Staffing issues
3. Resources issues
4. Health system issues
   1. Demographics associated with significant pre-hospital delay
   2. Barriers to seeking care
   3. Percent of hospitals with ECG availability
   4. Percent of outpatient facilities with ECG availability
   Percent of patients
   5. to whom a hospital was the nearest medical aid
   6. to whom a clinic was the nearest medical aid
   7. presented with more than 6 hours of prehospital delay
   Development of:
   1. Tiers of Providers
   2. Recruitment and Retention of providers
   3. Continuing Education
   4. Initial Education
   5. Team Training
   6. Equipment and Medication
   7. Toll-free Number
   8. Call processing and dispatch
   9. Primary Transportation and Inter-facility Transfers
   10. Communication
   11. Community Integration
   12. Healthcare System Integration
   13. EMS Legislature, Rules and Regulation
   14. Sustainable Resources
   15. Public Knowledge
   16. Quality Assurance and

Percent of survey respondents that:
1. believe EMTs offer high-quality care
2. believe it is “better” to go by ambulance
3. believe taxis are faster than ambulances in Accra
4. believe government ambulances were free or affordable
5. believe private ambulances were too expensive
6. knew the existence of a public access medical emergency telephone number
7. knew that the emergency number was a toll-free call
8. would be more likely to call the emergency number if they knew the call was toll free
9. knew about the government ambulance service
10. indicated it would take a government ambulance 15 minutes or less to arrive at the location
11. indicated it would take 60 minutes or more

Percent of systems that utilized:
2. Lack of surgical coverage.
3. Resources for acute resuscitation were limited. Difficulties in the procurement process exist. Lack of laboratory tests, imaging, oxygen, fluids, chest tube equipment, pulse oximetry, ventilators, prostheses for amputees, medications.
4. Lack of trauma registry or quality improvement programs.
   1. Elderly, rural, and illiterate populations
   2. Recognizing symptoms as cardiac in origin
   3. 96.4%
   4. 83%
Mould-Millman (2017)

1. tier-one (layperson responders trained in first aid) 1. 48%
2. tier-two (professional or medically-trained) 2. 96.0%
3. Basic emergency medical technicians (EMTs) 3. 84%
4. advanced providers more often 4. 60%
5. basic providers more often 5. 84%
6. prehospital nurses 6. 28%
7. used only advanced providers 7. 4%
8. EMS physicians 8. 40%
9. quality assurance programs 9. 44%
10. research 10. 12%
11. Basic Life Support - capable vehicles 11. 84%
12. Advanced Life Support - capable vehicles 12. 68%
13. vehicles posted at ambulance stations 13. 72%
14. vehicles posted at health care facilities 14. 56%
15. motorcycle ambulances 15. 12%
16. fixed wing air transport 16. 32%
17. rotary wing (helicopter) ambulances 17. 32%
18. water-craft 18. 12%
19. Total number of EMS systems identified 19. 25

Percent of countries in which
20. EMS systems existed in Africa 20. 29.6%
21. EMS systems existed in West Africa 21. 12.5%
22. no EMS systems existed 22. 9.3%
23. the questionnaire was not returned 23. 51.8%
24. some form of regulations governing EMS or ambulance operations existed 24. 100%
25. an established toll-free emergency telephone number existed 25. 26%

Nagata (2011)

Median direct distances between injury sites and the trauma centers were
1. Viet Duc Hospital 1. 5.65 (3.19 - 8.64) km
2. Bach Mai Hospital 2. 5.31 (2.89 - 8.54) km
3. Saint Paul Hospital 3. 5.11 (3.11 - 8.72) km

Natuzzi (2011)

1. Percent facilities with running water 1. 80%
2. Percent facilities with electricity without outages 2. 55.6%
3. Percent of facilities with consistent oxygen source 3. 88.9%

Nielsen (2012)

1. Access to emergency care services within 1 hour 1. 100 percent in Urban Brazil, Colombia, and Maharashtra State to very low in Kenya, Pakistan, Sri Lanka, and Vietnam
2. To whom advanced life support capabilities during transport was available 2. A significant number of persons in two of the upper middle income sites
3. To whom basic life support capabilities during transport was available 3. More than half of people only in South Africa and Gujarat State, India.
4. Training issues 4. Varying levels of training of providers, including no emergency medicine training

Ntabaye (1998)

1. Resource issues 1. Lack of medicines
2. Percent of respondents who did not have the ability to pay for health services 2. 45%
3. Financial barriers 3. Fare for transportation
4. Demographics more likely to seek care 4. Those who had a higher number of missing teeth, were educated and aged more than 40 years
5. Percent of respondents who indicated fear of dental treatment 5. 6.5%
Ouma (2018)

1. Percent of people living within 2-hour travel time of the nearest public hospital
   1. 71%
2. Percent of women of child bearing age living within 2-hour travel time of the nearest public hospital
   2. 71.8%
3. Percent of people living more than 2-hour travel time of the nearest public hospital
   3. 29%
4. Percent of women of child bearing age living more than 2-hour travel time of the nearest public hospital
   4. 28.2%
5. Percent of the population within 2-hour travel time of a public hospital
   5. Less than 25% in South Sudan to more than 90% in Nigeria, Kenya, Cape Verde, Swaziland, South Africa, Burundi, Comoros, São Tomé and Príncipe, and Zanzibar.
6. Countries with less than 50% of the population within 2-hour travel time of a public emergency care hospital
   6. South Sudan, Mauritania, Eritrea, Niger, Sudan, Madagascar, and Chad.
7. Countries with more than 90% of their respective population living within 2-hour travel time of a hospital
   7. Nigeria, Kenya, and South Africa
8. Number of countries with more than 80% of the population within 2-hour travel time of a hospital
   8. 16

Phillips (2020)

1. Percent with EC training
   1. 5.4% report none
2. Purpose built EU with resus
   2. 4.1 report none
3. EU overcrowding
   3. 17.6% report none
4. EU specific equipment
   4. 18.4% report none or limited
5. Presence and use of triage
   5. 39.3% report none or limited
6. Use of EU guideline
   6. 11.6%
7. Presence of System for access to EC and first aid from trained first responders
   7. 13.9% report no system
8. Presence of system to provide EC during transport between scene and facility, or between facilities
   8. 13.9% report no system
9. System to access EC from trained first responders and the scene and urgent transport to a health facility (overall system of pre-hospital care)
   9. 19.0% report no system

Pigoga (2020)

1. Training issues
   1. Training related to critical trauma and airway interventions, and neonatal care; issues with treating malnutrition or severe anaemia; inability to perform the following procedures; intraosseous access or venous cutdown, apply three-way dressings for sucking chest wounds or perform fasciotomies or escharotomies
2. Health system issues
   2. Only one facility with a dedicated resuscitation area
3. Resource issues
   3. Lack of medications, equipment, and tests, including: pulse oximetry, airway management, needle thoracostomy, chest tube, pelvic binders, ECG, ultrasound, thrombolytics, blood transfusion, defibrillation, cardioversion, pericardiocentesis, external cardiac pacing, procedural sedation, IV antibiotics, IV vasopressors, uterotonic drugs
4. Quality issues
   4. Lack of: clinical protocols, protocols for communicating critical lab results for infection control infection, triage

Radjou (2013)

1. Mean distance and time travelled by direct group
   1. 31.4 km, 90 min
2. Mean distance and time travelled by referred group
   2. 52.81 km, 279 min
3. Percent of referred cases that clocked unnecessary distance to reach care
   3. 54%
4. Percent of direct cases that clocked unnecessary distance to reach care
   4. 14.2%
5. Median unnecessary distance clocked by referred cases to reach care
6. Median unnecessary distance clocked by direct cases to reach care
1. Training issues
2. Percent of ambulance services that carry only a stretcher
3. Cost of transport for non-air-conditioned ambulances
4. Cost of transport for air-conditioned ambulances
5. Percent of ambulance services that operate only during day hours
Percent of patients that said
6. the streets in their area were too narrow for an ambulance
7. they did not use ambulances due to high cost
8. they preferred using taxis or cars due to easy access
9. the patient was not sick enough to call an ambulance
10. they used a taxi because the patient was too sick to wait for anything else
11. patient was sick enough to come to the ED
12. they did not come to the ED because of the slow response of the ambulance service
13. they did not come to the ED because they did not know how to find one
14. they would call an ambulance only if they are unable to walk
15. they would call an ambulance only if they were very sick or near death
16. they were not sure when to call an ambulance
17. they knew of at least one ambulance service
18. they knew of two ambulance services
19. they did not know of any ambulance service
20. they knew the phone number of any ambulance service

Percent of respondents that reported financial reasons for not seeking health care were:
1. 37.2%
2. 22.2%
3. 8.7%
4. 5.7%
5. 4.6%
6. People whose mean income was below moderate levels, those who lived far from a teaching hospital or close to a district hospital

Percent of respondents that reported primary reasons for not seeking health care were:
1. 37.2%
2. 22.2%
3. 8.7%
4. 5.7%
5. 4.6%
6. People whose mean income was below moderate levels, those who lived far from a teaching hospital or close to a district hospital
1. Percentage of small hospitals that were in municipalities that had also high complexity centers
2. Percentage of municipalities located within less than 60 km from the closest city with a high complexity center with an adult ICU
3. Number of people that were at least 120 km away from a high complexity center with an adult ICU
4. Percent of the population who were more than 120 km away from a health facility with a neonatal ICU

26% of small hospitals
63%
14 million
12%

1. Lack of training of ambulance attendants
2. No resuscitation equipment in the ambulance

Odds ratio of likelihood the following groups would receive prehospital care:
3. road traffic accident victims
4. arriving by government ambulance
5. arriving by taxi
6. being transferred from other medical facilities for “medico-legal reasons”

2.3
10.83
0.54
0.1

1. Lack of laboratory testing
2. Conduct of health professional does not meet the expectations of the patients
3. Hours of operation and bed limitations
4. Geographic relationship to care

1. Mean of patient’s rights observed
Percent of patients who
2. came late who were referred
3. presented within 60 minutes of onset of symptoms
4. were first taken to another hospital mainly cardiac hospital and then referred here
5. first opted for alternative medicines
6. thought stroke symptoms would resolve spontaneously
7. did not know a single symptom of stroke
8. knew at least one stroke symptom
9. hemiplegia was the most familiar stroke symptom
10. speech disturbance was the most familiar stroke symptom
11. Median time from onset of symptoms and contact with general practitioner

130.3 (SD: 40.1)
56.75km±123km.
63%
86.5%
60.6%
12.7%
28%
32%
10.9%
67%
61%
30 minutes

1. Odds ratio associated with mortality risk within 30 days of first consultation for those acquainted with a medical doctor
2. Those whom were less likely to present a severely ill child

0.55
Mothers belonging to Muslim ethnic groups

1. Accessed EC in last 12 months
2. Aware of EC services

5%
Very good: 67.7%

1. Lack of a single toll-free emergency number, knowledge of the emergency number, available community first responders, 24-hour EMS availability.
2. Acceptability of EMS to the community

Amharic speaking, previous ambulance use
2. Odds ratio associated with the ambulance use and police as a patient companion
   2. 1.53

3. Pre-hospital issues
   2. Long arrival time for ambulance, not enough distribution of ambulance stations, and difficulty of accessing the phone

1. Financial barriers
   2. Females were less likely to have preauthorization

1. Copayment

1. Percent of the population within 50 km of road travel distance to tertiary care
   2. Proportion of a region’s population within a 50-km service area of a Level C facility

1. Proportion of Ghana’s landmass that is serviceable within 60-minutes of an National Ambulance Service station (from 2004 to 2014)
   2. Proportion of the population within a 60-minute catchment area of a N/AS station (from 2004 to 2014)
   3. Population within a 30-minute catchment area of a N/AS station
   4. Ambulances per 100,000

Percent of facilities in Namibia found to be capable of providing care level:
   5. A
   6. B
   7. C
   8. X (unsuitable for providing emergency care)

Percent of facilities in Haiti found to be capable of providing care level:
   9. A
   10. B
   11. C
   12. X

1. Health system issue
   2. Training issue
   3. Staffing issue
   4. Resource issues
   5. Financial barriers
   6. Pre-hospital system issues

1. Rural, district and small Urban hospitals have no emergency department
   2. No emergency medicine training
   3. EDs are staffed by only one doctor
   4. Lack of CT availability after hours
   5. Patients must pay cash for any imaging
   6. Ambulances have to travel up to 200 miles, lack of helicopters, private ambulance services have tried to link their control rooms to cellular networks, which has delayed response to major accidents and incidents by the responsible authorities, lack of dispatchers

1. Percent of fatalities that were outside of the Golden Hour
   2. Fatality rate within the service areas
   3. Fatality rate within the service gaps

1. Financial barriers
   2. Percent of individuals who were prevented from receiving treatment due to lack of payment
   3. Pre-hospital system issues
   4. Geographic barriers
   5. Resource issues

1. Payment is requested at the time of care
   2. one-third
   3. Lack of prehospital care
   4. Hours of travel are required in remote areas
   5. Lack of resources, including electricity and equipment
### Training issues

1. No formal or trauma-specific training, very few providers are trained in BLS or ACLS.
2. Lack of basic trauma equipment.
3. Distance to a facility
4. A publicly available ambulance system did not exist, lack of community awareness of emergency phone number, lack of function of emergency phone number
5. Lack of transport to the health care facility.
6. It is not safe for the medical officers to report to the hospital at night

### Resource issues

2. Lack of basic trauma equipment.

### Geographic barriers

3. Distance to a facility

### Pre-hospital issues

4. A publicly available ambulance system did not exist, lack of community awareness of emergency phone number, lack of function of emergency phone number

### Transportation issues

5. Lack of transport to the health care facility.

### Staffing issues

6. It is not safe for the medical officers to report to the hospital at night

### Financial issues

7. Inability to pay hospital fees and transport

### Respondents' opinion on how to improve pre-hospital care

8. Provide first aid and triage trauma training to community members and the police

### Factors affecting the decision to seek care

9. Severity of the injury, traditional medicine and religion

### Availability of potable water

1. Globally: 62%, AFRO: 58%, AMRO: 70%, SEARO: 78%

### Availability of sanitation

2. Globally: 81%, AFRO: 84%, AMRO: 57%

### Availability of hand hygiene (soap)

3. Globally: 65%, AFRO: 64%, AMRO: 65%

### Median travel time to ER

1. From Hyderabad: (20 minutes), from Mansehra (120 minutes).
2. Peshawar: 144.45, Bahawalpur: 131.36, Abbottabad - 5.12, Hyderabad - 6.87

### Percent of patients who waited the following times to evaluated by a physician in the ED

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 15.0 minutes</td>
<td>69.2%</td>
</tr>
<tr>
<td>15.1 to 30.0 minutes</td>
<td>19.0%</td>
</tr>
<tr>
<td>more than 45.0 minutes</td>
<td>7.8%</td>
</tr>
<tr>
<td>30.1 to 45.0 minutes</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

### Percent of patients who waited the following times to receive lab tests

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 1.0 hours</td>
<td>48.4%</td>
</tr>
</tbody>
</table>

### Percent of severe GCS patients who received lab tests within 1.0 hours of physician evaluation

6. 56.1%

### Percent of mild GCS patients who received lab tests within 1.0 hours of physician evaluation

7. 52.0%

### Percent of moderate GCS patients who received lab tests within 1.0 hours of physician evaluation

8. 53.0%