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Clinical emergency care quality indicators in Africa: a scoping review and data summary

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ABSTRACT

Objectives Emergency care services are rapidly expanding in Africa; however, development must focus on quality. The African Federation of Emergency Medicine consensus conference (AFEM-CC)-based quality indicators were published in 2018. This study sought to increase knowledge of quality through identifying all publications from Africa containing data relevant to the AFEM-CC process clinical and outcome quality indicators.

Design We conducted searches for general quality of emergency care in Africa and for each of 28 AFEM-CC process clinical and five outcome clinical quality indicators individually in the medical and grey literature.

Data sources PubMed (1964—2 January 2022), Embase (1947—2 January 2022) and CINAHL (1982—3 January 2022) and various forms of grey literature were queried.

Eligibility criteria Studies published in English, addressing the African emergency care population as a whole or large subsegment of this population (eg, trauma, paediatrics), and matching AFEM-CC process quality indicator parameters exactly were included. Studies with similar, but not exact match, data were collected separately as 'AFEM-CC quality indicators near match'.

Data extraction and synthesis Document screening was done in duplicate by two authors, using Covidence, and conflicts were adjudicated by a third. Simple descriptive statistics were calculated.

Results One thousand three hundred and fourteen documents were reviewed, 314 in full text. 41 studies met a priori criteria and were included, yielding 59 unique quality indicator data points. Documentation and assessment quality indicators accounted for 64% of data points identified, clinical care for 25% and outcomes for 10%. An additional 53 'AFEM-CC quality indicators near match' publications were identified (38 new publications and 15 previously identified studies that contained additional 'near match' data), yielding 87 data points.

Conclusions Data relevant to African emergency care facility-based quality indicators are highly limited. Future publications on emergency care in Africa should be aware of, and conform with, AFEM-CC quality indicators to strengthen understanding of quality.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Each of the 28 African Federation of Emergency Medicine consensus conference (AFEM-CC) process clinical and five outcome clinical quality indicators were individually searched in the medical and grey literature to maximise identification of relevant data points outside of quality-specific publications.
⇒ 570 exhaustive searches of the medical and grey literature showed zero studies explicitly presenting data as emergency care quality metrics but yielded 59 data points meeting AFEM-CC quality indicators precisely enough to enable comparison between sites and studies.
⇒ Despite the exhaustive search strategy, no data matching the AFCEM-CC quality indicators was found for 55% (18/33) of the indicators, likely representing limitations of existing data rather than limitations of the search methods.
⇒ Publications were limited to those available in English due both to the enormous number of individual searches (570 performed in total) required for a single language as well as limitations in language capacity of the author team.
⇒ Extensive searches of the grey literature (WHO databases, Ministry of Health and non-governmental organizations websites, Google and Google Scholar) were undertaken; however, these searches likely still have limited ability to identify unpublished data available at the facility or regional level.

INTRODUCTION

Emergency care can address much of the excess morbidity and mortality from acute illness and injury in Africa.[1–3] However, to achieve this impact emergency care services must be both timely and high quality. Emergency care services (including prehospital, facility-based and interfacility networks) are rapidly developing in Africa.[4 5] While health outcomes are improving in Africa, it is widely recognised that health development in the Sustainable Development Goals era must focus on improving care quality rather than just access.[6] Measuring quality of emergency care delivery, however, has not been a significant focus for emergency care researchers or policymakers in Africa to date.

In 2013, the International Federation for Emergency Medicine issued a consensus

statement suggesting a framework for the delivery of safe and high-quality emergency care globally.[7] In response, the African Federation of Emergency Medicine (AFEM) held a consensus conference of experts in 2018. The conference produced a series of consensus-based emergency care quality indicators specific to the African context, with interventions and measures obtainable in most African emergency care settings.[8] These quality indicators, referred to here as the AFEM Consensus Conference Quality Indicators (AFEM-CC-QI), consisted of outcomes, processes and structural measures. The consensus methods used were similar to other published efforts to define quality indicators for emergency medicine.[9–11]

The only review of emergency care quality in low and middle-income countries (LMIC) to date was a 2015 ecological review that described the regional distribution and types of indicators.[12] It acknowledged the lack of established clinical quality indicators for emergency care in LMICs to date. This review did not define the indicators found nor provide or summarise the quality data identified. Neither this review nor others to date have focused specifically on Africa.

We undertook the following review with the presupposition that the AFEM-CC-QI provided the most logical starting point for a common language of emergency care quality for Africa. We had two objectives for this scoping review. First, to execute a rigorous review of the medical and grey literature looking for quality indicators for emergency care that have been proposed and/or put into practice in Africa. Second, to execute an exhaustive review of the medical and grey literature looking at all published clinical data from African facility-based emergency care settings that contain data relevant to the measures the AFEM consensus conference identified as quality indicators, even if that data were not published explicitly referring to quality. It is our hope that by collating and presenting this data in an accessible form, we can provide a starting point for future research, development and benchmarking efforts for emergency care quality for health facilities in Africa.

METHODS

This scoping review was developed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) scoping review guidelines.[13] It aims to identify and compile all documents:

1. Pertaining to quality indicators for facility-based emergency care in Africa.
2. Containing specific data on the AFEM-CC process clinical and/or outcome quality indicators, even if they do not explicitly report on quality of emergency care or quality indicators.

A scoping review was chosen to map the spectrum of applicable documents. Due to the diversity of potentially relevant documents, a broad search was undertaken to maximise inclusivity. Electronic searches were performed across multiple databases and African emergency care journals. The WHO database, national ministries of health websites, non-governmental organizations databases/websites were queried, Google and Google Scholar were used to assist in identifying pertinent grey literature.

A study protocol was established and documented *a priori*, however was not formally published. Any deviations from the pre-established protocol are specifically noted. The study was reported according to the PRISMA scoping review guidelines.[13]

Eligibility criteria

All publicly available studies and documents relevant to quality indicators for facility-based emergency care in Africa and the AFEM-CC process clinical and outcome quality indicators were included, with no limitation based on year of publication, if:

1. The data were collected in Africa.
2. The text was published in English.
3. The emergency care population as a whole or large subsegment of this population (eg, trauma, paediatrics) was studied.

For inclusion, studies containing AFEM-CC process clinical and outcome quality indicator data had to comply with the exact parameters as stated in *Defining quality indicators for emergency care delivery: findings of an expert consensus process by emergency care practitioners in Africa* by Broccoli *et al*[8] and outlined in online supplemental appendix 1. These studies are compiled in online supplemental appendix 2. All studies with data that were similar but not an exact match for the AFEM-CC-QI definitions were collected separately as 'AFEM-CC quality indicators near match' studies, online supplemental appendix 3. Documents on emergency care quality not relating to quality indicators, prehospital emergency care, inpatient (wards, ICU, theatre, labour and delivery, etc) and disease-specific study populations were excluded; see figure 1 for a full list of exclusion criteria.

AFEM-CC produced structure quality indicators (both intrafacility and health systems) and time-based process indicators alongside the process clinical and outcome clinical quality indicators that this review centres on. An *a priori* decision was made to focus the review on clinical care; structure quality indicators were not reviewed. While the time-based process indicators, focusing on timeliness of assessment or treatment provided at an EC facility, apply to clinical care, these were excluded as they are largely unattainable due to the limitations of documentation in most low-resource African emergency care settings.

Information sources and searches

A medical librarian at Stanford University was engaged to assist in identifying relevant databases and creating the search strategy. PubMed (1964-present), Embase (1947-present) and CINAHL (1982-present) were selected based on providing international, medical, allied health and conference publications. Databases searches were

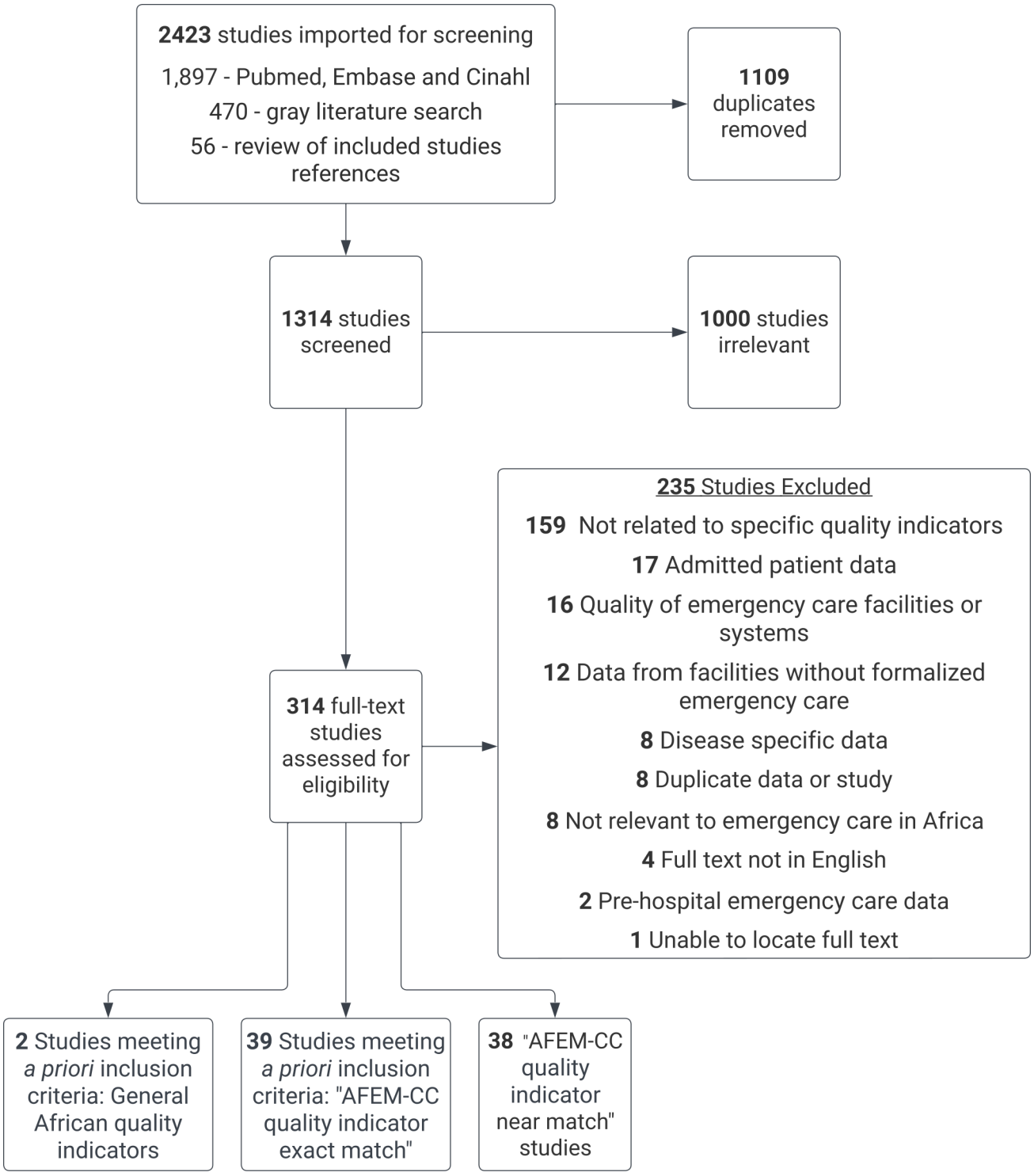

Figure 1 PRISMA diagram. AFEM-CC, African Federation of Emergency Medicine consensus conference; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

executed in January 2022, covering the exact date ranges: PubMed (1964—2 January 2022), Embase (1947—2 January 2022), CINAHL (1982—3 January 2022).

First, an overarching search for facility-based emergency care quality literature was performed on each database and source of grey literature was used. This search included *Emergency Care AND Africa AND Quality* terms and database-specific controlled language. As an example, the PubMed *Quality* terms used were: ("quality indicator*" [tw] OR "performance indicator*" [tw] OR "quality measure*" OR (quality [ti] AND (perform* [ti] OR measure* [ti] OR indicator* [ti])) OR "quality indicators, health care" [mesh]). See online supplemental appendix 4 for full search terms.

Second, each of the 28 AFEM-CC process clinical and five outcome clinical quality indicators were queried

individually with *Emergency Care AND Africa AND Process Clinical or Outcomes Clinical Quality Indicator* keywords and database-specific controlled language. These searches did not contain quality terms as they sought to obtain AFEM-CC process clinical and outcome quality indicator data from any source, even those not explicitly related to emergency care quality. This yielded a total of 33 independent searches (28 searches for process clinical quality indicators and five for clinical outcome quality indicators) in each database and source of grey literature. Note, the adult and paediatric morality from lower respiratory tract infection, outcome quality indicators were combined due to overlapping search terms. See online supplemental appendix 4 for full documentation of the database search strategy and yield of each search.

A second tier of similar—general quality and AFEM-CC process clinical and outcomes clinical quality indicators specific—searches was performed by hand between 4 January 2022 and 13 February 2022 to query the grey literature. The African Journal of Emergency Medicine was searched directly for relevant publications published prior to PubMed indexing. Sources of grey literature were queried: the WHO website and IRIS database (including separate searches of IRIS Subjects: Emergencies, EMS, EM, Emergency Nursing, Emergency Responders, Emergency Service, Emergency Service-Hospital, Emergency Services-Psychiatric, Disaster Medicine), national ministries of health websites, Google, Google Scholar and the public health NGO PATH's database of publications, presentations and resources. References from included publications were reviewed and any additional relevant documents included. See online supplemental appendix 5 for details of these searches.

Policy and clinical experts working in African emergency care development, identified through published works on emergency care quality and quality indicators, were contacted. They provided insights into unidentified published, grey literature and unpublished documents.

Study selection

All identified documents were imported into Covidence.[14] Title and abstract screening was performed independently and in duplicate by AEP and PM. Full texts were then screened for eligibility and relevance by AEP and PM in the same manner. Exclusions were based on criteria determined *a priori*. Conflicts were adjudicated by BR. During the full-text review, 'AFEM-CC quality indicators near match' publications—documents with data points relevant to but not an exact match for the AFEM process clinical and outcome clinical indicators—were identified as potentially useful. The decision was made to exclude these studies as per the *a priori* protocol but to extract and compile the data.

The data differences that defined studies as 'near match' instead of 'exact match' fell into three categories: differences in exclusion or inclusion criteria for populations (too narrow or too broad), differences in variable definition or differences in the timing of interventions or follow-up. For 'clinical care' and 'documentation and assessment', near match quality indicators most differences were due to population and/or variable definitions, while for 'clinical outcomes' most differences were due to the timing of mortality follow-up data.

Data charting

AP extracted data from included 'AFEM-CC quality indicators exact match' (online supplemental appendix 2) and separately from the 'AFEM-CC quality indicators near match' (online supplemental appendix 3) documents using a data extraction form in Microsoft Excel[15] spreadsheet that was developed *a priori* by the authors. AFEM-CC process clinical and outcome quality indicators data points were extracted, either singularly or pre/post in studies describing an intervention. Additionally, information on the publication, location and type of emergency care facility, study objective, years of data collection, number of participants, subpopulation included and any intervention studied were noted. Extracted data were reviewed for quality and completeness by PM and BR. Any discrepancies were adjudicated through consensus.

Data analysis

Data were categorised by AFEM-CC process clinical and outcome quality indicators as defined in online supplemental appendix 1. Variations between groups and within groups were analysed by quality indicator, country, date of publication, emergency care facility type (university, referral hospital, etc), subpopulation and trauma registry derived data. Descriptive statistics were used, and figures were produced with Microsoft Excel[15] and Adobe Photoshop.[16]

Patient and public involvement

None.

RESULTS

Selection of sources of evidence

A total of 1314 unique documents were included in the review. After title and abstract screening, 1000 of these studies were deemed irrelevant. This left 314 studies for full-text review. Of these, 41 studies met the *a priori* inclusion criteria with data on quality indicators in Africa in general or 'AFEM-CC quality indicators exact match' data. Another 53 studies (38 new studies and 15 previously identified studies that contained additional quality indicator data) identified during the search process had data which closely aligned with the AFEM-CC-QI but did not exactly match case or variable definitions. These variations in case and variable definitions made the data too heterogeneous to include and compared directly with the AFEM-CC quality indicators. However, because this corpus of studies contained important data and was similar in size to the group of studies exactly matching AFEM-CC-QI definitions, the *a posteriori* decision was made during the review process to organise and report

these studies separately as 'AFEM-CC quality indicators near match' data. Figure 1 provides the detailed flowchart for the selection of sources of evidence.

Characteristics of evidence

Geographic distribution of evidence

The 41 included studies represent data from only 26% (14 of 54) of African countries, with no relevant publications identified from the other 74% (40 of 54) countries. Just four countries produced 61% (25 of 41) of included studies: South Africa (27%, 11 of 41), Tanzania (15%, 6 of 41), Ethiopia (10%, 4 of 41) and Uganda (10%, 4 of 41). Regionally, 37% (15 of 41) of studies were produced in Southern Africa, 42% (17 of 41) in East Africa, 7% (3 of 41) in West Africa, 7% (3 of 41) in Central Africa and 5% (2 of 41) in North Africa. Online supplemental appendix 6 graphically depicts the distribution of included quality indicator studies by country.

Temporal distribution of evidence

The earliest study was published in 2001. A significant uptrend in publication of relevant studies was seen over time, with 67% of included studies published in the last 7 years (2015–2022). Online supplemental appendix 7 graphically depicts the temporal distribution of included studies.

Characteristics of the general African quality indicator evidence

Two studies were identified that focused explicitly on facility-based emergency care quality indicators for Africa.[8 17] One was the manuscript by Broccoli *et al*, which published the AFEM-CC process clinical and outcome quality indicators used in this review.[8] The other study by Maritz *et al* contained quality indicators developed specifically for emergency care in South Africa and focused on indicators relating to time, process, structure, training, equipment and availability.[17] This manuscript contained a number of quality indicators overlapping with the AFEM-CC quality indicators but did not contain any additional clinical care or outcome quality indicators that would supplement the AFEM-CC quality indicators in this review. Neither of these studies contained patient-level data points data for process clinical and/or outcome quality indicators to be included in this review.

Characteristics of the 'AFEM-CC quality indicators exact match' evidence

In total, 39 studies were seen to contain 'AFEM-CC quality indicators exact match' data for process clinical and/or outcome quality indicators.[18–56] Only 8% (3 of 39) of these studies explicitly mentioned quality in the stated research objectives. The 39 studies contained patient-level data across 15 distinct quality domains: five clinical care domains, six assessment and documentation domains, four outcomes. Because some studies contained data pertaining to more than one quality indicator, 59 total quality data points were identified. Five of the 39 studies had pre and postintervention data accounting for 13 total data points. Table 1 contains summary data for all included studies, while more detailed information on each study is available in online supplemental appendix 2.

Distribution of data by emergency care setting

Overall, 59% (23 of 39 studies) providing 'AFEM-CC quality indicators exact match' data were conducted at national, quaternary or tertiary care facilities. Twenty-one per cent (8 of 39) of studies contain data from regional hospitals and 15% (6 of 39) from district-level facilities. Two studies were multicentre, with facilities of differing designations. Furthermore, 38% (15 of 39) studies identified the facility where data were collected as a teaching or university hospital. These details are again provided on a study-by-study basis in online supplemental appendix 2.

Results of individual sources of 'AFEM-CC quality indicators exact match' evidence

The AFEM-CC-QI were grouped into three categories: clinical care, documentation and assessment, and clinical outcomes. The full listing of indicators and their definitions are presented as online supplemental appendix 1. Overall, 59 quality indicator data points were identified and are displayed in figure 2.

Documentation and assessment quality indicators account for 64% (38 of 59) of all data points identified in the scoping review with a single-quality indicator (documentation of disposition) yielding 29% (17 of 59) of all data compiled. Clinical care accounted for 25% (15 of 59) of data points and outcomes were only 10% (6 of 59) data points.

Results of individual sources of 'AFEM-CC quality indicators near match' evidence

The 53 studies containing 'AFEM-CC quality indicators near match' evidence were split between two groups of publications. The first group included 38 publications which were identified as containing only 'AFEM-CC quality indicators near match' data.[57–94] The second group included 15 publications which were cited above as containing 'AFEM-CC quality indicators exact match' data, but which contained additional 'AFEM-CC quality indicators near match' data.[22 25 26 28 29 31 33 34 39 41 45 46 54–56] This brings the total number of publications containing 'AFEM-CC quality indicators near match' data to 53 and the total number of data points identified within those publications to 87. Tables 2 and 3 contain summary 'AFEM-CC quality indicators near match' data, while further detail about each included publication is provided in online supplemental appendix 3.

Results of individual sources of 'AFEM-CC quality indicators near match' evidence

The 53 studies containing 'AFEM-CC quality indicators near match' evidence were split between two groups of publications. The first group included 38 publications, which were identified as containing only 'AFEM-CC

Table 1 AFEM-CC quality indicator exact match studies

Quality indicators: data							
Clinical care							
Title	**Author**	**Year**	**Antibiotics for sepsis**	**Blood transfusion for anaemia**	**Corticosteroids for asthma**	**Bronchodilator for asthma**	**Analgesia for pain**
Emergency Care of Sepsis in Sub-Saharan Africa: Incidence, Mortality and Non-Physician Clinician Management of Sepsis in rural Uganda from 2010 to 2019	Rice[19]	2022	82%				
Pediatric sepsis interventions and in-hospital mortality in a resource limited emergency medicine department	Lau-Braunhut[21]	2021	46%				
Transfusion, mortality and hemoglobin level: Associations among emergency department patients in Kigali, Rwanda	Moretti[25]	2020		67%			
The epidemiology of sepsis in a district hospital emergency centre in Durban, KwaZulu natal	Ndadane[30]	2019	89%				
Assessment of Acute Pain Management and Associated Factors among Emergency Surgical Patients in Gondar University Specialized Hospital Emergency Department, Northwest Ethiopia, 2018: Institutional Based Cross-Sectional Study	Andualem[32]	2018					66%
Clinical Presentation and Outcomes among Children with Sepsis Presenting to a Public Tertiary Hospital in Tanzania.	Kortz[37]	2017	54%				
Emergency blood transfusion practices among anaemic children presenting to an urban emergency department of a tertiary hospital in Tanzania.	Shari[38]	2017		23%			
Analysis of acute pain management in the emergency department of a large private hospital in Cape Town, South Africa	Stander[42]	2016					71%
Audit of acute asthma management at the Paediatric Emergency Department at Wad Madani Children's Hospital, Sudan.	Ibrahim[48]	2012			75%		
The proportion of asthma and patterns of asthma medications prescriptions among adult patients in the chest, accident and emergency units of a tertiary health care facility in Uganda	Kirenga[49]	2012			44%	21%	
Evaluation of pain incidence and pain management in a South African paediatric trauma unit.	Thiadens[51]	2011					58%
Severe sepsis in two Ugandan hospitals: a prospective observational study of management and outcomes in a predominantly HIV-1 infected population	Jacob[53]	2009	83%				

Continued

Table 1 Continued

Quality indicators: data								
Acute asthma in a children's emergency room: a clinical audit and management guideline proposal.	Okoromah[54]	2006			80%	80%		
Assessment and Documentation								
Title	**Author**	**Year**	**Complete vital signs recorded**	**Documentation of demographics and chief complaint**	**Documentation of disposition**	**Documentation of diagnosis**	**Received triage score**	**Received triage level categorization**
Monitoring of characteristics of the patients visiting an emergency center in Cameroon through the development of hospital patient database	Jeong[18]	2022			87%			95%
One in four die from acute infectious illness in an emergency department in Eastern Cape Province, South Africa	Jenson[20]	2021	6%					
Completeness of medical records of trauma patients admitted to the emergency unit of a university hospital, upper Egypt	Mohammed[22]	2021			99%			
We need to target trauma: a prospective observational study in Eastern Cape Province, South Africa	Clark[23]	2020						93%
What presents to a rural district emergency department: A case mix.	Meyer[24]	2020			99%	84%		
Development and pilot implementation of a standardised trauma documentation form to inform a national trauma registry in a low-resource setting: lessons from Tanzania.	Sawe[26]	2020			63% 100%			
Evaluation of a modified South African Triage Score as a predictor of patient disposition at a tertiary hospital in Rwanda.	Uwamahoro[28]	2020			85%			
Mixed methods process evaluation of pilot implementation of the African Federation for Emergency Medicine trauma data project protocol in Ethiopia	Laytin[29]	2019			71%	97%		
The burden of trauma at a district hospital in the Western Cape Province of South Africa.	Zaidi[31]	2019			92%			93%
A quality improvement study of the emergency centre triage in a tertiary teaching hospital in northern Ethiopia	Abdelwahab[33]	2017					42%	76%
Key findings from a prospective trauma registry at a regional hospital in Southwest Cameroon	Chichom-Mefire[34]	2017			45% 98%			
Saving children's lives with colours	Dekker-Boersema[35]	2017						86%

Continued

Table 1 Continued

Quality indicators: data								
Task Shifting: The Use of Laypersons for Acquisition of Vital Signs Data for Clinical Decision Making in the Emergency Room Following Traumatic Injury	Haac[36]	2017	4% 91%					
An evaluation of the use of the South African Triage Scale in an urban district hospital in Durban, South Africa	Soogun[39]	2017			97%			76%
Head injury is the leading cause of presentation and admission to a tertiary care center in Kenya: A descriptive analysis of emergency department patients at Kenyatta national hospital	Ekernas[40]	2016					85%	
Evaluation of trauma patient presentations and outcomes at a Ugandan regional referral hospital	Schriger[41]	2016	3%					
Enhancing emergency medicine initiatives with a quality improvement program: lessons learned in the emergency department of Tikur Anbessa Hospital, Addis Ababa Ethiopia.	Azazh[43]	2014					20% 96%	
Reduced overtriage and undertriage with a new triage system in an urban accident and emergency department in Botswana: a cohort study	Mullan[44]	2014			88% 96%			98%
Epidemiology of injuries, outcomes, and hospital resource utilisation at a tertiary teaching hospital in Lusaka, Zambia	Seidenberg[45]	2014			95%			
Hospital-based injury data from level III institution in Cameroon: Retrospective analysis of the present registration system	Chichom-Mefire[47]	2013		78%	42%			
Vital signs for children at triage: a multicentre validation of the revised South African Triage Scale (SATS) for children.	Twomey[47]	2013			98%			99%
Emergency medicine in Paarl, South Africa: a cross-sectional descriptive study	Hanewinckel[52]	2010						54%
Trauma at a Nigerian teaching hospital: pattern and documentation of presentation.	Thanni[55]	2006			97%			
Injury registration in a developing country. A study based on patients' records from four hospitals in Dar es Salaam, Tanzania	Mutasingwa[56]	2001				100%		
Outcomes								
Title	**Author**	**Year**	**Trauma mortality (24 hours)**	**LRTI mortality (24 hours)**	**Asthma mortality (24 hours)**	**Left without being seen**		
The burden of trauma in Tanzania: Analysis of prospective trauma registry data at regional hospitals in Tanzania.	Sawe[27]	2020	3%					

Continued

Table 1 Continued

Quality indicators: data						
Reduced overtriage and undertriage with a new triage system in an urban accident and emergency department in Botswana: a cohort study	Mullan[44]	2014			0.01% 0.05%	
Pattern of respiratory diseases seen among adults in an emergency room in a resource-poor nation health facility	Desalu[50]	2011	7%	4%		
Emergency medicine in Paarl, South Africa: a cross-sectional descriptive study	Hanewinckel[52]	2010			7%	

AFEM-CC, African Federation of Emergency Medicine consensus conference; LRTI, lower respiratory tract infection.

quality indicators near match' data.[57–94] The second group included 15 publications, which were cited above as containing 'AFEM-CC quality indicators exact match' data, but which contained additional 'AFEM-CC quality indicators near match' data.[22 25 26 28 29 31 33 34 39 41 45 46 54–56] This brings the total number of publications containing 'AFEM-CC quality indicators near match' data to 53 and the total number of data points identified within those publications to 87. Tables 2 and 3 contain summary 'AFEM-CC quality indicators near match' data, while further detail about each included publication is provided in online supplemental appendix 3.

The distribution of 'near match' studies was less heavily skewed towards documentation and away from outcomes than the 'exact match'. Documentation and assessment quality indicators account for 41% (36 of 87) of all 'near match' data points. Clinical care accounted for 24% (16 of 87) of data points and outcomes were 40% (35 of 87) data points.

Summary of 'AFEM-CC quality indicators exact match' and 'AFEM-CC quality indicators near match' evidence

Of the 18 'clinical care' quality indicators defined by AFEM-CC, 17% (3 of 18) had 'exact match' and 'near match' data identified, 11% (2 of 18) had 'exact match' data only identified, 17% (3 of 18) had 'near match' data only identified, and 56% (10 of 18) had no data identified. Of the 10 'documentation and assessment' quality indicators defined by the AFEM-CC, 40% (4 of 10) had both 'exact match' and 'near match' data identified, 20% (2 of 10) had 'exact match' data only identified, 20% (2 of 10) had 'near match' data only identified, and 20% (2 of 10) had no data. Finally, of the five 'clinical outcome' quality indicators defined by AFEM-CC, 60% (3 of 5) had both 'exact match' and 'near match' data identified, 20% (1 of 5) had 'exact match' only, and 20% (1 of 5) had no data identified. The full listing of identified quality indicators is presented as online supplemental appendix 1.

DISCUSSION

The above scoping review demonstrates that limited data about emergency care quality in Africa do exist, but these data are rarely presented explicitly as quality metrics and exist in the absence of any organising framework. This scoping review represents a first time this data have been organised in a single location and will hopefully provide synergy with AFEM efforts to establish a quality framework to support future quality improvement and research efforts.

Our methodological approach was comprehensive but required a very large number of searches. The searches of the medical literature required 128 individual searches of the medical literature (including PubMed, CINAHL, Embase and the African Journal of Emergency Medicine) and 442 individual searches of the grey literature (including Ministry of Health websites, WHO, Google, Google Scholar, Path). These 570 searches yielded 1314

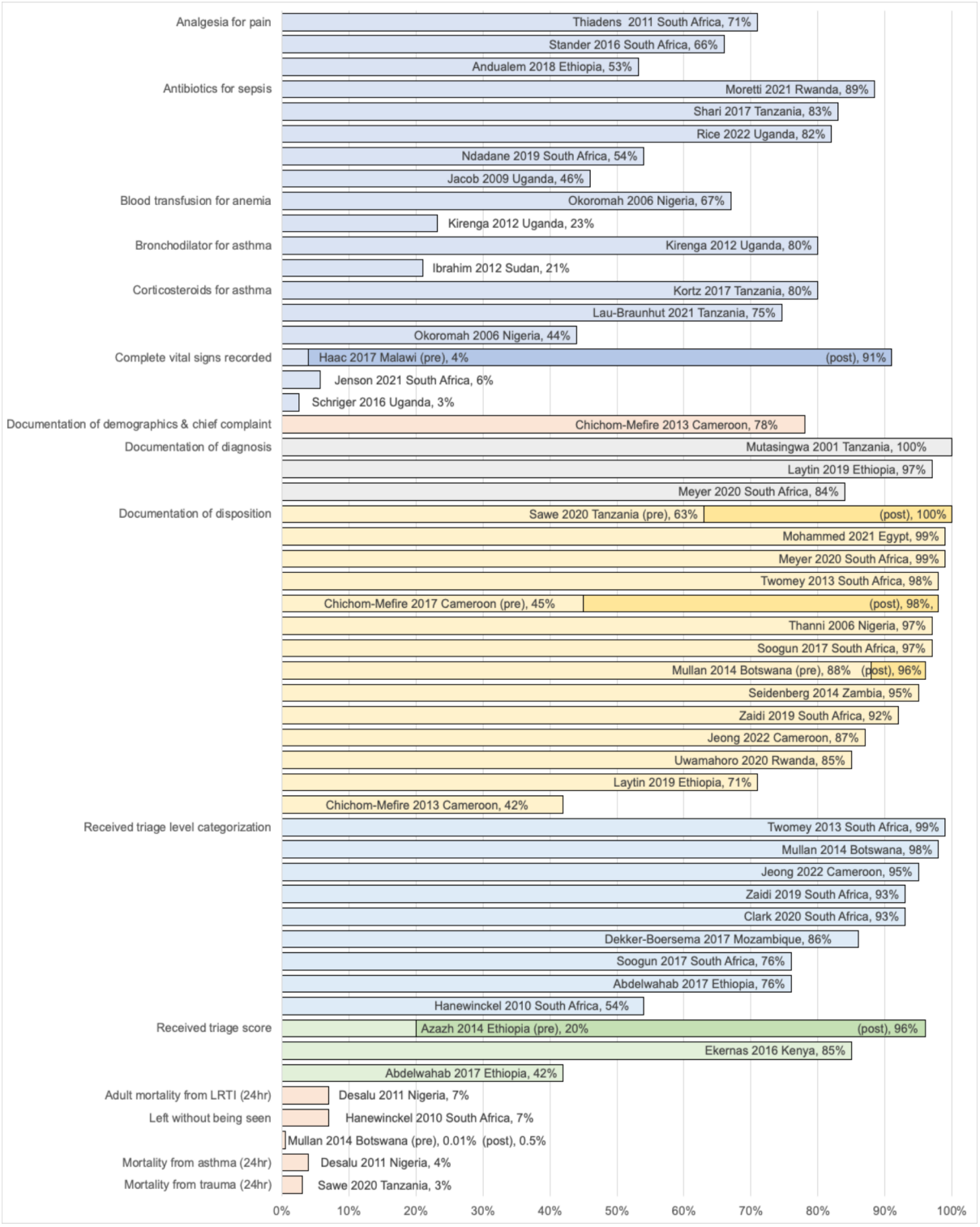

Figure 2 Quality indicator data published to date. LRTI, lower respiratory tract infection.

unique results and 314 of which warranted full-text review. This large volume of work only identified 146 total data points published to date in Africa that can be directly applied to the AFEM-CC-QI. Furthermore, only 59 of those data points met AFEM-CC-QI precisely enough to enable comparison between sites and studies. Producing this work has required a large investment in time but also internet connectivity and institutional access to medical libraries, which represent structural barriers to replicating this sort of search in many low-income settings in Africa. Notably, these areas most directly benefit from obtaining and disseminating this data.

Our extensive review identified no literature focused on defining quality indicators applicable to low-income

Table 2 Clinical care and outcomes near match quality indicators

AFEM-CC quality indicator	First author	Year	Country	Data difference 1	Data difference 2	%
Clinical Care Near Match Quality Indicators						
Blood glucose checked in patients with change in mental status: % of patients with documented change in mental status who have blood glucose checked	Berends[57]	2021	South Africa	Too narrow—first time seizures		91%
	Smith[58]	2013	South Africa	Too narrow—sentinel conditions		79%
	Yusuf[59]	2013	Tanzania	Too narrow—acute psychosis		82%
Oxygen for patients with hypoxia—% of patients with SaO_2<92% who had supplemental oxygen given	Berends[57]	2021	South Africa	Too narrow—sentinel conditions	Variable definition—O_2 for respiratory distress	100%
	Muhanuzi[60]	2019	Tanzania	Variable definition—O_2 for respiratory distress		87%
	Kuti[61]	2015	Nigeria	Variable definition—O_2<90%		96%
	Kiwango[62]	2014	Tanzania	Too narrow—traumatic brain injury		36%
Corticosteroid treatment given for asthma patients: % of patients with documentation of asthma who receive corticosteroid treatment	Shirani[63]	2018	South Africa	Too narrow—triaged red		83%
	Nantanda[64]	2013	Uganda	Variable definition—med prescribed NOT given		43%
Bronchodilator treatment given for asthma patients: % of patients with documentation of asthma who receive bronchodilator treatment	Shirani[63]	2018	South Africa	Too narrow—triaged red		100%
	Nantanda[64]	2013	Uganda	Variable definition—med prescribed NOT given		88%
Analgesia given to patients reporting pain: % of patients with documentation of pain who receive pain medications	Berends[57]	2021	South Africa	Too narrow—sentinel conditions	Variable definition—pain meds given WITHOUT requiring pain complaint	86%
	Oluwaniyi[65]	2020	Nigeria	Too narrow—trauma	Variable definition—pain meds given WITHOUT requiring pain complaint	92%
	Haonga[66]	2011	Tanzania	Too narrow—fractures	Variable definition—pain meds given WITHOUT requiring pain complaint	53%
	Mattson[67]	2019	Rwanda	Too narrow—fractures	Variable definition—pain meds given WITHOUT requiring pain complaint	52%
Long bone splinting for patients presenting w/ extremity fracture: % of patients w/ extremity fracture get splinted	Haonga[66]	2011	Tanzania	Variable definition—included patients splinted in EU and pre-hospital		>100%
Clinical Outcomes Near Match Quality Indicators						
Mortality from trauma—24 hour	Bundu[72]	2019	Sierra Leone	Wrong timing—inpatient deaths		23.0%
	Demirel[73]	2019	Somalia	Wrong timing —EU deaths		1.3%
	Gallaher[71]	2019	Malawi	Wrong timing—inpatient deaths		1.8%
	Ndung'u[74]	2019	Kenya	Wrong timing—inpatient deaths		2.1%
	Saleeby[75]	2019	Kenya	Wrong timing—inpatient deaths		6.6%

Continued

Table 2 Continued

AFEM-CC quality indicator	First author	Year	Country	Data difference 1	Data difference 2	%
	Zaidi[31]	2019	South Africa	Wrong timing—EU deaths		0.5%
	Lampi[76]	2018	Kenya	Wrong timing—inpatient deaths		1.8%
	Richards[77]	2018	South Africa	Wrong timing—inpatient deaths		6.3%
	Botchey[78]	2017	Kenya	Wrong timing—EU deaths		0.9%
	Sanyang[79]	2017	The Gambia	Wrong timing—EU deaths		0.9%
	Getachew[80]	2016	Ethiopia	Wrong timing—EU deaths		1.0%
	Schriger[41]	2016	Uganda	Wrong timing—inpatient deaths		7.0%
	Chamberlain[81]	2015	Uganda	Wrong timing—72 hours		1.2%
	Ndukwu[82]	2015	Nigeria	Wrong timing—EU deaths		5.1%
	Juillard[83]	2014	Cameroon	Wrong timing—EU deaths		1.0%
	Seidenberg[45]	2014	Zambia	Wrong timing—inpatient deaths		3.0%
	Hsia[84]	2010	Uganda	Wrong timing—inpatient deaths		2.0%
	Thanni[55]	2006	Nigeria	Wrong timing—EU deaths		2.1%
	Solagberu[85]	2003	Nigeria	Wrong timing—EU deaths		4.4%
	Taye[86]	2003	Ethiopia	Wrong timing—EU deaths		0.5%
Mortality from lower respiratory tract infection (adult)—24 hour	Chamberlain[81]	2015	Uganda	Wrong timing—72 hours		3.3%
	Onwuchekwa[87]	2008	Nigeria	Wrong timing—72 hours		1.3%
Mortality from lower respiratory tract infection (child)—24 hour	Ibraheem[88]	2020	Nigeria	Too broad <18 yo		8.3%
	Negash[89]	2019	Ethiopia	Wrong timing—EU deaths	Too broad <15yo	2.4%
	Richards[77]	2018	South Africa	Too narrow—patients needing resuscitation	Too broad <12yo	8.6%
	Ambaye[90]	2016	Ethiopia	Wrong timing—EU deaths	Too broad <15yo	5.4%
	Chamberlain[81]	2015	Uganda	Wrong timing—72 hours		4.1%
	Ndukwu[82]	2015	Nigeria	Wrong timing—EU deaths	Too broad <18yo	6.8%
	Ezeonwu[91]	2014	Nigeria	Wrong timing—inpatient deaths	Too broad <15yo	2.2%
	Abhulimhen-Iyoha[92]	2012	Benin	Wrong timing—EU deaths	Too broad <16yo	1.9%
	Muluneh[93]	2007	Ethiopia	Wrong timing—EU deaths	Too broad <15yo	15.6%
	Ibeziako[94]	2002	Nigeria	Wrong timing—EU deaths	Too broad—all paediatric	5.1%

Continued

Table 2 Continued

AFEM-CC quality indicator	First author	Year	Country	Data difference 1	Data difference 2	%
Mortality from asthma—24 hour	Ibraheem[88]	2020	Nigeria	Wrong timing—inpatient deaths		0.0%
	Ndukwu[82]	2015	Nigeria	Wrong timing—EU deaths		0.0%
	Okoromah[54]	2006	Nigeria	Wrong timing—inpatient deaths		3.3%

Data Problem: Population too narrow.
Data Problem: Variable differently defined.
Data Problem: Timing incorrect.
Data Problem: Population too broad.
AFEM-CC, African Federation of Emergency Medicine consensus conference; EU, Emergency Unit.

settings throughout Africa other than the Broccoli *et al* AFEM-CC publication.[8] The paper by Maritz *et al* did discuss quality directly but did not focus on facility-level clinical indicators for low-resource setting due to South Africa's much higher level of emergency care and health system development.[17] Failing to find further applicable indicators despite rigorous search methods supports our *a priori* methodological decision to base our search strategy on the AFEM-CC process clinical and outcome clinical quality indicators.

The authors believe that publication of this scoping review is an important first step in organising and disseminating this widely scattered data in a format that is usable for clinicians, researchers and policymakers to assist with subsequent development efforts. This data build on AFEM's efforts and can provide a starting point for benchmarking efforts and a common language for quality. The lack of existing focus on quality within emergency care research was highlighted by only 3 of the 39 studies included as 'exact match' even mentioning quality in their stated research aims.

This lack of focus on the specific quality indicators also produced highly variable data, necessitating our creation of a 'near match' category to attempt to include relevant research efforts more broadly. One of the goals of quality indicators is to provide references for comparing between sites and targeting quality improvement efforts. These aims are severely hampered by the lack of standardisation in data measures and reporting. This problem was most clearly highlighted in the mortality outcome data presented in table 2. The abundance of mortality studies in the 'near match' category suggests strong interest from researchers. This contrasts with the dearth of 'exact match' mortality data and underlines how even subtle differences in age groups and/or outcome variables severely limits generalisability of data and comparison between studies. Moving towards standard definitions for inclusion criteria and outcomes will greatly increase the collective impact of this existing research interest. It is hoped that this scoping review can provide a reference point for efforts to standardise quality research and generate quality benchmarks in African emergency care.

As well as being variable, the data were highly asymmetrical. A disproportionate number of the included studies were from a handful of countries and especially from urban academic centres. This highlights the challenge facing emergency care development in Africa where a huge knowledge gap exists about the emergency care needs of most countries and for rural populations across the continent. This gap brings into question the utility and applicability of the current evidence base for emergency care in many African settings.

Finally, much of the data came from trauma registries. This creates asymmetry in the knowledge base as more is understood about the quality of emergency care for injuries than medical emergencies. However, these efforts are to be lauded as the registries appear to facilitate research efforts around quality indicators. Hopefully, these successes can encourage efforts to start or maintain emergency unit registries in Africa. These studies reporting on trauma registry data highlight the high level of training, clinician buy in and time commitment that have already been invested and we needed to collect, analyse and disseminate this data. To date, trauma registry research efforts tended to focus disproportionately on documentation as compared with clinical care and outcomes. While documentation is an important facet of quality, its over-representation is likely tied to documentation variables being easily obtained from registry reviews. This in turn highlights the need for deliberate development of any emergency unit registries to include important data on diagnostics, treatments and outcomes to support the breadth of quality research.

There are several limitations to this scoping review. Most fundamentally, the review was limited to English-language documents. We acknowledge that English is an official language in only approximately half of African countries, but that the use of English as a medical and academic language and publications in multiple languages may increase the availability of relevant publications in English to some extent. One reason for limiting our searches to English was that our exhaustive search strategy required 570 individual queries even for a single language. Multiplying these efforts with additional languages was beyond

Table 3 Documentation and assessment near match quality indicators

AFEM-CC quality indicator	First author	Year	Country	Data difference 1	Data difference 2	%	Multiple % (if applicable)
Recording of initial complete vital signs	Berends[57]	2021	South Africa	Variable definition— individual NOT complete vitals			SpO_2 99%, RR 100%, HR 100%, BP 42%, Temp 98%
	Elbaih[68]	2021	Egypt	Variable definition—individual NOT complete vitals			RR 4%, HR 23%, Temp 28%
	Mohammed[22]	2021	Egypt	Variable definition—vital signs AND GCS		55%	
	Moretti[25]	2020	Rwanda	Variable definition—individual NOT complete vitals			HR 38%, SBP 38%, RR 39%, SpO_2 36%
	Motsumi[69]	2020	Botswana	Too narrow—road traffic accidents	Variable definition—individual NOT complete vitals		RR 100%, SpO_2 74%, HR 92% BP 89%, Temp 40%*
	Mwandri[70]	2020	Tanzania	Variable definition—individual NOT complete vitals			SpO_2 97%, RR 69%, HR 72%, BP 75%
	Sawe[26]	2020	Tanzania	Variable definition—individual NOT complete vitals			HR 25%, SBP 29%, RR18%, SpO_2 13%†
	Laytin[29]	2019	Ethiopia	Variable definition—individual NOT complete vitals			SBP 77%, HR 86%
	Abdelwahab[33]	2017	Ethiopia	Variable definition—individual NOT complete vitals			HR 98%, BP 93%, Temp 87%, RR 83%
	Chichom-Mefire[34]	2017	Cameroon	Variable definition—two different data sources			BP: 13%, RR: 2%
	Soogun[39]	2017	South Africa	Variable definition—individual NOT complete vitals			RR 99%, HR 99%, BP 99%, Temp 99%
	Chichom-Mefire[47]	2013	Cameroon	Variable definition—individual NOT complete vitals			BP 13%, HR 7%, RR 2%
	Yusuf[59]	2013	Tanzania	Wrong timing—any time in EU	Too narrow—acute psychosis	88%	
Recording of demographics and chief complaint	Motsumi[69]	2020	Botswana	Variable definition—not BOTH variables	Too narrow—road traffic accidents		Demographics 96%, injury mechanism 95%*
	Mwandri[70]	2020	Tanzania	Variable definition—not BOTH variables		86%	
	Sawe[26]	2020	Tanzania	Variable definition—not BOTH variables			Name 99%, age 82%, gender 70%, address 84%, injury location 14% injury mechanism 45%†
	Uwamahoro[28]	2020	Rwanda	Variable definition—not BOTH variables		>99%	
	Gallaher[71]	2019	Malawi	Variable definition—not BOTH variables			Demographics 100%, injury mechanism 100%, injury location 94%
	Laytin[29]	2019	Ethiopia	Variable definition—not BOTH variables			Age 96%, gender 99%, injury mechanism 60%
	Zaidi[31]	2019	South Africa	Variable definition—not BOTH variables			Gender 99%, age 98%
	Abdelwahab[33]	2017	Ethiopia	Variable definition—not BOTH variables		95%	
	Chichom-Mefire[34]	2017	Cameroon	Variable definition—not BOTH variables			Gender 99%, age 98%, injury mechanism 99%
	Seidenberg[45]	2014	Zambia	Variable definition—not BOTH variables			Gender 100%, age 94%, injury mechanism 97%
	Mutasingwa[56]	2001	Tanzania	Variable definition—not BOTH variables			Gender 100%, age 96%, injury mechanism 76%
Documentation of diagnosis	Motsumi[69]	2020	Botswana	Too narrow—road traffic accidents		99%*	
Documentation of disposition	Motsumi[69]	2020	Botswana	Too narrow—road traffic accidents		100%*	
Primary survey performed for all trauma patients	Mwandri[70]	2020	Tanzania	Variable definition—each but not ALL variables			Airway and breathing 33%, circulation 60%, disability 20%
	Motsumi[69]	2020	Botswana	Too narrow—road traffic accidents		66%*	

Continued

Table 3 Continued

AFEM-CC quality indicator	First author	Year	Country	Data difference 1	Data difference 2	%	Multiple % (if applicable)
Initial assessment for all patients	Berends[57]	2021	South Africa	Too narrow—sentinel conditions	Variable definition—each but not ALL variables		Breathing 100%, SpO_2 99%, pulse 100%, cap refill 35%, expose 34%

Data Problem: Timing incorrect.
Data Problem: Variable improperly defined.
Data Problem: Population too narrow.
*Preintervention and postintervention data at two sites available within study.
†Preintervention and postintervention data available within study.
AFEM-CC, African Federation of Emergency Medicine consensus conference; BP, blood pressure; EU, Emergency Unit; GCS, Glasgow coma scale; HR, heart rate; RR, respiratory rate.

the capacity of this scoping review. Additionally, despite having two team members (PM and JN) who are Africans currently working in the USA, no one on the team was adequately fluent in other languages spoken in Africa to review literature in those languages. This study is unfunded and, thus, we could not procure professional translation services. We chose to focus instead on an extensive search of the English-language literature. Additionally, there may be local data (eg, conference presentation, quality improvement projects, regional meetings) that has been published, but it is not available outside of local or regional settings and would not be found by our search strategy.

CONCLUSIONS

This review serves as a starting point for national and international African quality indicator benchmarking and system development efforts. Although our results indicate that a number of publications on African emergency care facility-based quality indicators exist, it is crucial that future publications reporting on emergency care in Africa be aware of—and consider conforming with—the AFEM-CC-QI in order to strengthen interfacility, regional, national and international reporting on quality.

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