REPUBLIC OF UGANDA

MINISTRY OF HEALTH

Emergency Care Systems in Uganda:

A Comprehensive Facility-Based Assessment for Emergency, Critical and Operative care

December 2024

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Operational Definitions

1. **Emergency Medical Services (EMS):** In Uganda, EMS encompasses both out-of-hospital and hospital-based services, including triage, emergency clinical care, observational medicine, and specialized emergency and trauma services. It involves the medical care, assessment, monitoring, treatment, transportation, and observation provided in response to emergencies, aiming to prevent or protect against loss of life, deterioration in physiological or psychological condition, or address pain or morbidity associated with a person's condition (MOH 2021).

2. **Emergency**: The sudden onset of a medical condition manifesting itself by acute symptoms of sufficient severity (including severe pain) such that the absence of immediate medical attention could reasonably be expected to result in: placing the patient's health in serious jeopardy, serious impairment to bodily functions, or serious dysfunction of any bodily organ or part (MOH, 2021)

3. **Assessment Definition of Emergency**: Any case documented in the emergency register.

4. **Critical Care Services:** In Uganda, critical care services are multidisciplinary and interprofessional services dedicated to the comprehensive management of patients having, or at risk of developing acute, life-threatening organ dysfunction (Marshall et al., 2017).

5. **Intensive Care Unit:** An intensive care unit (ICU) is an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of acute organ system insufficiency (Marshall et al., 2017).

6. **High dependency Unit:** A High Dependency Unit (HDU) is a specialized area within a hospital designed to provide an intermediate level of care between the general ward and the Intensive Care Unit (ICU). It's particularly suitable for patients who require more intensive observation, treatment, and nursing care than can be provided in a standard ward, but who do not need the full resources of an ICU (Ohbe et al., 2021, Boots and Lipman, 2002).

7. **Emergency Unit:** This is a treatment area within a health facility/hospital, specializing in acute care of patients who present without prior appointment, either by their means or by ambulance.

8. **Ambulance:** is a vehicle licensed under the Uganda Traffic & Road Safety Act and as such, designed or adapted for the treatment and conveyance of patients in an emergency, marked as such, appropriately equipped, and deployed with a minimum of two emergency care providers in accordance with Ministry of Health set standards (MOH, 2021).

9. **Emergency Healthcare Workers:** These include medical professionals who provide emergency care, both in pre-hospital settings (such as EMS responders) and in hospital-based emergency units.

10. **Emergency and Critical Care Infrastructure:** Refers to the arrangement of personnel, facilities, and equipment for effective and coordinated delivery of EMCC services in Uganda. This includes pre-hospital first responders, emergency and critical care units in health facilities, and the necessary infrastructure for these services.

11. **Emergency and Critical Care coordination and governance:** In Uganda, this involves leadership and governance structures at various levels of health service delivery, coordinating activities and resources, and ensuring the effective functioning of EMS.

12. **Availability of a Service or Equipment:** This refers to the presence and accessibility of emergency medical services and equipment within the Ugandan healthcare system, ensuring that necessary tools and services are accessible when needed.

13. **Adequacy of a Service or Equipment:** In the context of Uganda, this would refer to the quality, suitability, and effectiveness of emergency medical services and equipment to meet the healthcare needs they are intended to address.

14. **Study operation areas:** the study area was divided into five study areas each consisting of selected Ministry of Health, health sub-region that is Albertine (Northcentral, Tooro, and Bunyoro); Eastern (Northcentral, Busoga, Bugisu, Bukedi, and Karamoja); North and West Nile (Northcentral, Bunyoro, West Nile, Acholi, and Lango); Southwest (Southcentral, Ankole); Central (Kampala, Southcentral).

Abbreviations and Acronyms

ABCDE	Assessment, Airway, Breathing, Circulation, Disability, Exposure
ACLS	Advanced Cardiovascular Life Support
ALS	Advanced Life Support
ATLS	Advanced Trauma Life Support
AVPU	Alert, Voice, Pain, Unresponsive
BEC	Basic Emergency Care
BLS	Basic Life Support
CDC	Centers for Disease Control and Prevention
CPAP	Continuous Positive Airway Pressure
CPR	Cardiopulmonary Resuscitation
CT	Computed Tomography
D&C	Dilatation and Curettage
EDs	Emergency Departments
EMS	Emergency Medical Services
EMTs	Emergency Medical Technicians
ETAT	Emergency Triage Assessment and Treatment
FB	Foreign Body
GCS	Glasgow Coma Scale
HDUs	High Dependency Units
HMIS	Health Management Information System
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
IV	Intravenous
IQR	Interquartile Range
KCCA	Kampala Capital City Authority
MDAs	Ministries, Departments, and Agencies
MMed (EM)	Master of Medicine in Emergency Medicine
MOH	Ministry of Health
MVA	Manual Vacuum and Aspiration
NDP	National Development Plan
NMS	National Medical Stores
NRH	National Referral Hospital
OPD	Outpatient Department
PALS	Pediatric Advanced Life Support
PFP	Private for Profit
PNFP	Private Not for Profit
PPH	Postpartum Hemorrhage
RDT	Rapid Diagnostic Test
RRH	Regional Referral Hospital
SARA	Service Availability and Readiness Assessment
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
STATA	Data Analysis and Statistical Software
UCC	Uganda Communication Commission
UHC	Universal Health Coverage

UTAT	Uganda Triage and Treatment Algorithm
VHTs	Village Health Teams
X-rays	Radiographic Imaging
eHMIS	Electronic Health Management Information Systems

Foreword

This Comprehensive Facility-Based Assessment for Emergency, Critical and Operative care represents a significant step forward in the Ministry of Health' collective mission to expand EMS provision across the country. It aligns with national priorities outlined in the **National Development Plan III** and the **Ministry of Health's Strategic Plan 2021-2025**, providing critical insights for strengthening emergency care systems. The collaborative effort between Seed Global Health and the Ministry of Health has enabled a robust, national-level needs assessment—an essential foundation for enhancing the delivery of emergency medical services.

The report provides a detailed analysis of key aspects of EMS, including **the burden of emergencies, infrastructure, human resources, workforce knowledge, data management, and coordination.** Notably, the establishment of a **dedicated Department of Emergency Medical Services within the Ministry of Health** marks a pivotal commitment from senior leadership toward strengthening emergency care.

The assessment highlights progress in several areas:

- **Infrastructure**: Many health facilities now have **clean water, electricity, oxygen, and 24-hour laboratory services,** which are critical for emergency care delivery.
- **Human Resources:** Regional EMS Coordinators and Senior Medical Officers were appointed at 33.3% of the facilities, with significant full-time Emergency presence and BEC training. Medical Officers had a 77.8% appointment rate, with 71.4% full-time in Emergency and 42.9% trained in BEC at the Regional Referral Hospitals.
- **Workforce Knowledge**: A significant proportion of healthcare workers have prior experience in emergency care, enhancing their ability to respond effectively to emergencies.

Despite these advancements, the report also identifies **key challenges** that must be addressed such as; **Frequent stock-outs** of essential emergency supplies, including norepinephrine and salbutamol, affecting the consistency of care and **Data management gaps**, including outdated reporting forms, limited emergency reporting sections in electronic health systems, and inadequate training in electronic data management, impacting data quality and policy planning.

This assessment offers invaluable guidance for overcoming these challenges and improving **health service delivery, policy development, and patient care in Uganda.**

Dr Charles Olaro

Ag Director General Health Services

Ministry of Health

Acknowledgements

This report is a result of the collective efforts and contributions of numerous individuals and organizations. The Ministry of Health Uganda, particularly the Department of Emergency Services, would like to express our sincere gratitude to all those who played a vital role in the successful completion of this comprehensive assessment of Emergency Medical Services in Uganda.

First and foremost, we extend our deepest appreciation to Rinecynth Advisory Ltd. for their expertise and dedication in conducting this detailed assessment. Their meticulous work has provided invaluable insights that will significantly impact the improvement of emergency medical services in Uganda.

We are profoundly grateful to Seed Global Health for financing this assessment. Your financial support and partnership have been instrumental in making this assessment possible. We also acknowledge the collaborative efforts of the Ministry of Health Uganda and Seed Global Health, whose shared vision and commitment have driven this project forward.

Special thanks go to the various health facilities and their staff across Uganda who participated in the assessment. Your cooperation and willingness to share information have been crucial to the success of this study. We also appreciate the Hospital Directors, District Health Officers and health facility in-charges for their support and for granting the necessary approvals to conduct the assessment.

Our heartfelt thanks to all the key informants and stakeholders, including policymakers, healthcare providers, EMS coordinators, and community members, who provided valuable insights and shared their experiences. Your contributions have enriched the findings of this report.

We also wish to recognize the efforts of the data collection teams, research assistants, and all those involved in the data management and analysis process. Your hard work and commitment to maintaining high standards of quality and accuracy are commendable.

Lastly, we extend our gratitude to our funding partners, implementing partners, National Medical stores, Joint Medical Stores, health administrators, and health workers for their invaluable support and collaboration.

This report would not have been possible without the collective efforts and dedication of everyone involved. We hope that the findings and recommendations of this assessment will guide the continued improvement and expansion of emergency medical services in Uganda, ultimately enhancing the health and well-being of all Ugandans.

Dr John Baptist Waniaye

Commissioner Emergency Medical Services

Ministry of Health

Executive Summary

Introduction

The Government of Uganda, through the Ministry of Health and its partners, has demonstrated a strong commitment to advancing Emergency Medical Services (EMS) as part of a broader strategy to improve health outcomes in line with the National Development Plan III, the Ministry's Strategic Plan 2021-2025 and the National Emergency Medical Services Policy 2021. Despite these advancements, significant challenges persisted in the EMS service delivery. Baseline and midterm studies revealed gaps in coordination, infrastructure, and regional EMS coverage, with unmet targets and inconsistent hospital care quality. Key areas for improvement included better coordination, developing emergency care professionals, integrating training into curricula, upgrading facilities, and ensuring essential supplies. Adequate funding and integrating EMS data into the HMIS were vital for sustainable service delivery and continuous quality improvement. Regular performance reviews and stakeholder meetings were necessary to address emerging issues promptly. While the baseline and midterm studies clearly articulated these needs, they did not provide in-depth granular operational data to aid in addressing the areas of improvement. The current assessment aims to provide comprehensive operational data to fill this gap. The main objective of this assessment was to understand the state of emergency care in Uganda, including the identification of challenges and opportunities, and to guide how to best improve the quality of health services, health policy, and patient care.

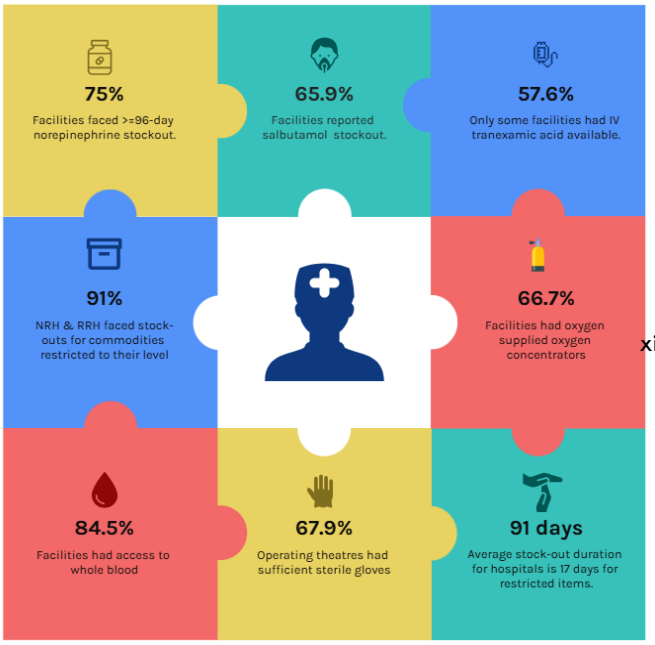
Methodology

The assessment employed a mixed-methods approach that combined qualitative and quantitative data collection techniques. This included a thorough desk review of existing policies and literature on EMS in Uganda, in-depth interviews with key stakeholders such as policymakers, healthcare providers, and EMS coordinators, and quantitative surveys administered to healthcare facilities, EMS providers, and coordinators. The assessment covered 33 districts across various regions of Uganda. In the North & West Nile region, assessments were conducted in Amuru, Arua, Gulu, Kiryandongo, Koboko, Kole, and Luwero. The Eastern region included Bugiri, Buikwe, Busia, Buvuma, Iganga, Jinja, Kamuli, Kween, Mbale, and Nabilatuk. Southwestern districts assessed were Bukomansimbi, Lwengo, Lyantonde, Masaka, Mbarara, Mpigi, Ntungoma, and Ssembabule. The Albertine region comprised Fort Portal City, Hoima, Kasese, Kiboga, Kyenjojo, and Mubende. Lastly, assessments were conducted in Kampala and Wakiso districts within the Central region. The study covered a total of 74 facilities, including 3 National Referral Hospitals (NRHs), 9 Regional Referral Hospitals (RRHs), 27 General Hospitals (GHs), 25 Health Centre IVs (HCIVs), and 10 Health Centre IIIs (HCIIIs). The data was analyzed using NVivo for qualitative data and STATA for quantitative data, ensuring rigorous quality control throughout the process. The assessment team obtained administrative clearance from the Ministry of Health and approval from district health officers of the respective districts and health facility directors and In-charges. Participation was voluntary, and informed consent was obtained from all study participants.

Results

Emergency Cases

Emergency medicines and supplies



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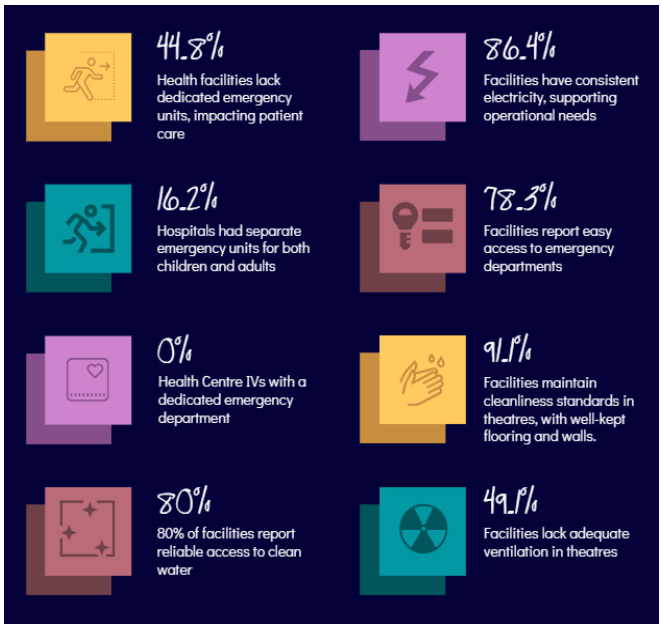
Knowledge assessment

Emergency department infrastructure



Human Resource: The findings on demographics and capabilities of human resources in emergency care revealed a mixed landscape: while more than 50% of HCIVs surveyed had various medical cadres appointed, the percentage with these cadres deployed full-time in the emergency unit ranged from 9.1% to 43.5%. Notably, 66% of these facilities had a senior nursing officer stationed full-time in the unit. However, significant gaps existed in training, with only 33.3% of health workers trained in Basic Emergency Care (BEC) at the Health Centre IV level. In general hospitals, medical officers were more widely appointed, with varying rates of full-time deployment in emergency departments. Training in BEC was more prevalent, with an average of 47% of health workers trained at this level. Regional referral hospitals showed similar trends, with appointment rates varying across medical cadres and BEC training reaching 75% for some positions. Only 34% of ICU staff across the assessed facilities had received specialized training in critical care.

Data Management: Most regional referral hospitals (87.5%) had emergency registers, but only 30.4% of HC IVs, 43.5% of general hospitals, and none of the national referral facilities did, as they were transitioning to electronic systems. The majority (73.7%) of facilities lacked essential emergency forms, though those that had them used them effectively. Approximately 49.1% of facilities had dedicated emergency data staff, but only 28.1% provided training on data collection tools to all staff, highlighting a need for further training. Additionally, limited internet access and inconsistent availability of data management tools pose obstacles to data storage and quality assurance, with only 45.6% of facilities having a data system and reported internet access. While most facilities have protocols for data review, reporting and utilization of emergency data, only 54.4% of facilities were analyzing and presenting collected emergency unit data to staff and stakeholders for quality improvement. Data collection faced challenges, including absent or outdated EMIS registers and report forms and inadequate training, affecting data accuracy.

Conclusions and Recommendations

The assessment noted a reduction in trauma and injuries and a 50% decline in emergency death rates compared to a study done two decades ago. Several challenges were noted in the delivery of EMS, including frequent stock-outs, inadequate staffing and training, low percentages of healthcare workers trained in essential emergency procedures, and insufficient data management tools. Facilities often lacked dedicated emergency units, proper ventilation, and reliable backup power systems. Poor pre-hospital communication, resource shortages, and undefined protocols further hindered EMS coordination. The Ministry of Health, with partner support, should enhance EMS data collection, improve medicine availability, ensure full-time staffing, increase training coverage, upgrade infrastructure, and standardize pre-hospital coordination and protocols.

1. Introduction

The Government of Uganda, through the Ministry of Health and partners, has prioritized the expansion of Emergency Medical Service provision in the country. In alignment with the government priorities under the National Development Plan 111 and MOH strategic plan 2021-2025, Seed Global Health collaborated with the Ministry of Health to conduct a national-level needs assessment for the effective delivery of emergency medical services.

The Emergency Medical Services (EMS) in Uganda have seen significant development and challenges in recent years. The efforts to improve these services can be contextualized through various aspects, including governance, financing, coordination, workforce training, and infrastructure improvements.

The Ugandan Ministry of Health established a dedicated Department of Emergency Medical Services, reflecting the government's commitment to improving emergency medical services. Despite this progress, there has been a persistent challenge of resource allocation, emphasizing the need for greater funding and support from development partners (Ningwa et al., 2020)

Financing: Emergency Medical Services financing has seen significant progress with the inclusion of a funding stream in the Ministry of Health's budget planning. Predominantly funded (68%) by development partners, with the Government of Uganda contributing 32% through the Ministry of Health, EMS has achieved notable objectives. At the regional level, eight out of 14 regions have dedicated budget lines for EMS in their local government budgets. However, a comprehensive financial contributor profile is lacking, and EMS funding integration into private insurance schemes is still pending. (Ministry of Health, 2023)

Coordination: Effective coordination between various governmental and non-governmental entities is crucial for the success of Emergency Medical Services. However, in Uganda, there has been an overlap of roles and ambiguity in mandates between the Ministry of Health, the Office of the Prime Minister's National Emergency Coordination and Operations Center, the Police, and the armed forces. This has led to challenges in establishing a coherent and efficient EMS system (Ningwa et al., 2020).

Health Workforce: The training and deployment of healthcare professionals in EMS have been areas of significant advancement. Educational initiatives at tertiary institutions are focusing on both health facility-based and pre-hospital emergency care. These efforts are critical in building a skilled workforce capable of responding effectively to emergencies (Emergency Physicians International, 2020).

Medical Products and Equipment: In 2019, a major hurdle in the provision of EMS in Uganda was the widespread lack of essential equipment and medicines in ambulances and emergency units. This shortage hindered the ability to deliver effective emergency care, particularly in government-owned facilities, which are often less equipped than private ones (Ningwa et al., 2020). As of 2023, Uganda was in the process of adding essential emergency medicines to its

health supplies list, with 71% of regions then equipped with oxygen and EMS refill systems in ambulances. However, stockouts of crucial emergency supplies remain a challenge, and only 36% of regions have adequately equipped facilities (Ministry of Health, 2023). This impacts the quality of Emergency Medical Services in the country.

Development of Emergency Medicine: The inception of emergency medicine residency programs at institutions like Mbarara University of Science and Technology and Makerere University marks a significant step in advancing emergency medical care in Uganda. These programs are not only training emergency physicians but are also contributing to the COVID-19 response and other emergency situations (Ningwa et al., 2020).

Triage and Treatment: The introduction of the Uganda Triage and Treatment Algorithm (UTAT) with support from the U.S. CDC has been a milestone in improving patient management in emergency situations. This system allows for the prioritization of patients based on the severity of their condition, ensuring that those in most need receive timely care (CDC Global Health, 2023)

Despite these advancements, significant challenges remain. The baseline study and midterm review of the EMS strategic plan (2020/21–2024/25) revealed several critical gaps in the current EMS system. The baseline assessment indicated a severe lack of coordination and infrastructure to support effective EMS delivery (MOH, MUSPH; 2018). The midterm review further highlighted that the targets set for the first three years of the strategic plan had not been fully achieved (MOH, World Bank; 2023). Moreover, the midterm review showed disparities in EMS coverage across different regions. For instance, the percentage of patients accessing care within one hour varied significantly, with some regions showing alarmingly low rates. Additionally, the quality of EMS hospital care was inconsistent, with only a few hospitals meeting the required standards for emergency response and care (MOH, World Bank; 2023).

The baseline and midterm reports identified several areas for improvement, including enhancing coordination and leadership for effective stakeholder collaboration; human resource development to address the shortage of trained emergency care professionals; integrating emergency care training into medical curricula and ensuring continuous professional development; upgrading health facilities to meet EMS standards and ensuring the availability of essential emergency medicines and supplies. Securing adequate funding was vital for sustainable service delivery. Additionally, integrating EMS data into the HMIS was necessary for data-driven decision-making and continuous quality improvement, with regular performance reviews and stakeholder meetings to address emerging issues promptly. While the baseline and midterm studies clearly articulated these needs, they did not provide in-depth granular operational data to aid in addressing the areas of improvement.

Therefore, the purpose of this assessment was to provide an in-depth understanding of the state of emergency medical services in Uganda, including the identification of challenges and opportunities, and to guide how to best improve the quality of health services, health policy, and patient care. The assessment took into consideration the various stakeholders of the emergency medical services in Uganda, including MOH (emergency medicine department), health facilities at all levels and ownership, ambulance coordinators and dispatch centres, Uganda Police force, Uganda Red Cross, health workers, other EMS training institutions, Funding partners, MDAs and implementing partners, health administrators, and beneficiaries.

In this report, we present the methodology of the assessment, including the target population, sample size, and analysis. We also present and discuss the results, from the data abstraction, facility assessment, knowledge assessment, and key informant interviews.

1.1 Background

Emergency Medical care (EMS) is an essential element of Universal Health Coverage. It covers a spectrum of activities, including pre-hospital care and transport, initial evaluation, diagnosis and resuscitation, and in-hospital care(MOH, 2021). EMS is critical to the improvement of outcomes in patients with obstetric, medical, and surgical emergencies, and other serious time-sensitive illnesses. The burden of medical emergencies varies across different regions of Uganda, influenced by factors such as geographical location, climate, and local health challenges (Dowhaniuk, 2021). It encompasses communicable diseases, non-communicable diseases, obstetrics, and trauma. According to the 2022/23 World Bank study on the Ugandan EMS, a total of 297,498 emergency cases were reported, with 53% being female and 47% male. The South-Central region recorded the highest number of cases (17.4%), followed by Kampala region (14.6%), while Karamoja had the lowest (1.4%). Across all regions, 82.9% accessed care within one hour, and 2.1% developed complications within 24 hours. The overall proportion of deaths at emergency units was 1.1% with Bunyoro recording the highest (5.9%) and Bugisu the lowest (0.3%)(Ministry of Health, 2023).

Trauma and surgical emergencies pose a significant challenge, with road traffic accidents accounting for a high number of injuries and fatalities (Ministry of Health, 2020). Obstetric and neonatal emergencies contribute substantially to the disease burden, with an estimated 16 maternal deaths per day and obstetric hemorrhages being a leading cause (Ministry of Health, September 2023). Mental health emergencies are prevalent, making Uganda one of the top six countries in Africa for mental health disorders, often arising from alcohol/substance use, depression, and schizophrenia (Butabika National Referral Hospital, 2018). Non-communicable diseases, including cardiac, diabetic, and hypertensive emergencies, are on the rise in Uganda (Mark Kaddumukasa, 2017). Additionally, the country faces increasing public health threats and disasters, such as Ebola, Marburg, Cholera, and Covid-19, necessitating effective emergency medical services and coordinated response efforts.

Data from the 2014 Service Availability and Readiness Assessment (SARA) survey on emergency medical services (EMS), covering the availability and adequacy of equipment, supplies, and ambulances for emergency services across various health facility levels in Uganda, collected from 152 hospitals and 193 health centres (HC4s), revealed a generally high availability of emergency services in hospitals and health centres, with 96% of facilities offering such services (MOH, 2014). However, variations were observed across geographical zones, with Central and Western Uganda having more accessible services. Blood transfusion services fell short of targets, particularly in Eastern Uganda, where stockouts were reported due to regional blood bank shortages and transportation issues.
Readiness for 24-hour emergency services was generally poor, with only 5% and 25% of facilities classified as having very good and good capacity, respectively. Eastern Uganda exhibited lower readiness compared to other regions. Severe shortages of medicines and modest availability of laboratory services were also highlighted, emphasizing the need for comprehensive improvements in equipment, supplies, and capacity across various healthcare levels in Uganda's EMS system (MOH, 2014).

Ambulance services adhere to Ministry of Health standards, requiring vehicles licensed under the Uganda Traffic & Road Safety Act, designed for emergency care, appropriately equipped,

and staffed by a minimum of two emergency care providers (Ministry of Health, 2020). Seven types of medical emergency vehicles exist, including Patient Transport, Basic Life Support/Emergency Ambulance, Advanced Life Support/Intensive Care Unit Ambulance, Isolation Ambulance (for highly infectious diseases), Air Ambulance, Marine Ambulance and Ambulance command Vehicle. Community emergency transporters vary from taxis and boda-bodas to ambulances in urban areas, while rural regions rely on multi-purpose ambulance pick-up trucks and motorcycles for obstetric emergencies. The national ambulance coverage is 1 vehicle per 100,000 population, but distribution is uneven, with Kampala Metropolitan Central and Southwestern Uganda hosting the majority. Most existing ambulance vehicles lack equipment, categorizing them as Type A (patient transport ambulances).

The human resources needed for Uganda to deliver emergency care services in terms of numbers, skill set, and quality are inadequate. With only around 13 registered Emergency Physicians and approximately 80 nurses trained in Emergency care, concentrated mainly in urban areas, rural regions face a shortage of skilled personnel (Atuhairwe et al, 2023). According to the 2018/19-2024/25 National Emergency Medical Services Strategic Plan, professional EMS training started in Uganda, contributing to the rapid increase in availability of trained EMS skills and numbers. Universities like Makerere University College of Health Sciences, Mbarara University of Science and Technology, and Uganda Martyrs University Nkozi have started emergency medicine specialty training programs (Master of Medicine in Emergency Medicine - MMed (EM). Scholarships were awarded for 14 MMed (EM) and 15 Diploma in Emergency Medicine. Rubaga Hospital Training School also started a certificate program for Emergency Medical Technicians-EMTs. Hence these cadres are available to offer the nucleus for regional and hospital EMS service systems in the country as well as implementing in-service training, quality improvement, and research. However, the EMS cadres are yet to be included in the national civil service staffing structure.

Numerous obstacles hinder the establishment of efficient emergency care. Although the country has excellent coverage of mobile telecommunication network and an emergency number (912) was allocated by the Uganda Communication Commission (UCC) for EMS, it has been redundant due to the lack of an established medical call and dispatch system (Ministry of Health, February 2019) As of 2018, only 16% of districts had an EMS office, and merely 13% had allocated budgets for EMS. At the community level, limited knowledge of first aid hindered the capacity for immediate response. Trained first responders were scarce, and the absence of a legal framework, such as a Good Samaritan Law, contributed to bystanders' reluctance to provide assistance. In both congested urban areas and remote rural regions, formal care was absent (Makerere University School of Public Health, 2018). Additional challenges include a huge donor-funded budget with restricted allocations limiting government priority including emergency services, poor EMS data reporting by most health facilities, inadequate human resource for Emergency Medical Services in health facilities, limited resources such as shortage of ambulances and other necessary medical equipment and supplies, making it difficult for emergency services to respond effectively to emergencies.

Types of

Several opportunities exist to enhance the readiness of health facilities in Uganda to deliver Emergency Medical Services (EMS). Prioritizing the funding for the construction of the National Call and Dispatch Centre is crucial for improving coordination. The establishment of the Emergency Care HR Structure at all levels and thorough training of district biostatisticians and data officers are essential steps to enhance EMS reporting. Additionally, increasing the training

of medical personnel, including doctors, nurses, and paramedics, would address the shortage of trained professionals in emergency services. The strategic objectives outlined in the EM Q2 report for 2023, such as increasing access to on-scene emergency medical care, ensuring timely ambulance responses, and enhancing the availability of quality EMS hospital care in various healthcare facilities, provide a clear framework for improvement and sustained operations of the National EMS system.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2. Methodology

2.1 Objectives and Scope of the Assessment

The main objective of the assessment was to understand the state of emergency care in Uganda, including the identification of challenges and opportunities, and to guide how to best improve the quality of health services, health policy, and patient care.

As part of this effort, the assessment specifically sought to;

1. *Explore the burden of disease by identifying the most common types of medical and surgical emergencies, and their associated outcomes in different regions in Uganda and their dispositions from the Emergency unit for both adult and pediatric populations.*

2. *Evaluate the availability and adequacy of supplies and drugs for emergency services across various health facility levels in Uganda.*

3. *Understand the Human Resource demographics by determining the quantity, type, and distribution of emergency care workers across health facilities in Uganda*

4. *Understand the Human Resource competencies by exploring current basic emergency care knowledge of emergency care workers working in emergency units and ambulances.*

5. *Evaluate data systems for emergency services, including data collection, reporting, and utilization at all levels of the health system.*

6. *Assess the availability and functionality of infrastructure, diagnostic equipment, emergency services, and management protocols for operational effectiveness and efficiency in Emergency Departments in Uganda.*

2.2 Design

The assessment employed a descriptive cross-sectional study design using a highly participatory, inclusive, and mixed methods/data collection approach. Both the qualitative and quantitative methods of data collection were used.

Primary data was collected using key informant and stakeholder interviews, quantitative surveys, observation, and photography while secondary data was collected using document review.

2.3 Assessment Sites and Participants

The assessment was conducted in five regions of Uganda including; the central, South Western, Eastern, North and West Nile and Western Albertine regions, covering 33 districts and 73 health facilities ranging from National referral to health centre IIIs (**Table 1**, **Table 2**).

Key: **Facilities Assessed**

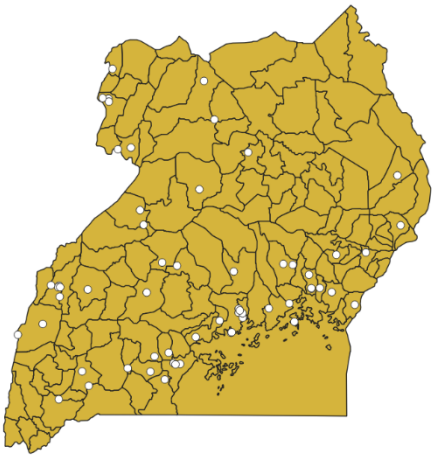


Figure 1: Facilities Assessed in the Different Districts in Uganda

In the North & West Nile region, assessments were conducted in Amuru, Arua, Gulu, Kiryandongo, Koboko, Kole, and Luwero. The Eastern region included Bugiri, Buikwe, Busia, Buvuma, Iganga, Jinja, Kamuli, Kween, Mbale, and Nabilatuk. Southwestern districts assessed were Bukomansimbi, Lwengo, Lyantonde, Masaka, Mbarara, Mpigi, Ntungoma, and Ssembabule. The Albertine region comprised Fort Portal city, Hoima, Kasese, Kiboga, Kyenjojo, and Mubende and the central region comprised of Kampala and Wakiso districts.

2.4 Data Collection Methods

Desk Review

The data collection process commenced with an in-depth review of documents, including, Baseline and Midterm assessments of EMS, MOH quarterly and annual reports, National EMS policy, EMS strategy plan, and Health sector service standards for Emergency Medical Services (EMS) and critical care in Uganda. This desk review provided contextual information that guided the development of the data collection tools.

In-depth interviews with key informants/stakeholders

Interview guides were designed to elicit detailed responses on specific topics relevant to the study, ensuring that all important aspects were covered systematically. In-depth interviews were conducted using the designed interview guides with selected key informants/stakeholders including district and City Health Officers, MOH EMS department, KCCA EMS officials, National and Joint Medical Stores Emergency unit in-charges, HDU and ICU in-charges, EMS and critical care providers such as clinical officers, nurses, medical officers, EMS, facility's store persons, human resource officers, records persons, pharmacists, and biostatisticians.

Survey Questionnaire

Quantitative data was collected using programmed tools on the Kobo toolbox. The respondents for the survey questionnaire included theatre and ICU In-charges, emergency department In-charges, health workers, and records persons. Secondary data was abstracted from emergency registers, OPD registers, and HMIS reports.

2.5 Data Management and Analysis

Qualitative Data

All audio recordings were transcribed, entered, and coded using NVivo 14. A coded structure was developed to analyse the views of the respondents and to ensure that themes were consistently organized. For quality control, the developed codes were validated by an independent person who was different from the one who created the codes. Codes were categorized into themes and subthemes. The final report included selected quotes from the interviews to illustrate the accuracy of interpretation and enrich the findings of the assessment.

Quantitative Data

Data was electronically collected using kobo collect and uploaded onto the Kobo toolbox server, downloaded, and reviewed by the data team on a daily basis. The output was delivered as clean-coded and labelled Excel. STATA Texas College Station Version 16 was used to analyse the data and produce frequency tables for univariate analysis and percentages for categorical variables. Means and standard deviations were used for summarising normally distributed continuous variables, while medians and interquartile ranges were used for summarising continuous variables with skewed data.

2.6 Quality Assurance

Quality was prioritized at every stage of the assessment through the following measures:

Developing and Pre-testing Data Collection Tools:

The data collection tools were developed through a collaborative effort involving the consultancy team, Seed Global Health, the Ministry of Health's EMS and critical care departments, stakeholders from Makerere School of Public Health, and Mulago Hospital, among others. This process included a series of consultative workshops. The consultancy team then pre-tested the tools at Naguru General Hospital (China-Uganda Friendship Hospital) and Kawaala HC IV.

Training of Research Assistants:

To ensure quality, the consultancy team selected and trained a group of research assistants experienced in healthcare data collection. This team included EM coordinators, general doctors, nurses, and qualitative experts. Each regional team was required to have at least one general doctor and an EMS coordinator. The tools, modified after the initial pre-test, were used to train the research assistants and were pre-tested again after being programmed in Kobo Collect prior to the data collection exercise. Any additional errors identified during this phase were corrected.

Daily Fieldwork Coordination:

During fieldwork, zoom meetings were held at the end of each data collection day for the data collection teams. The purpose of these meetings was to identify daily challenges, troubleshoot errors, provide updates on the progress of data collection, and improve general data quality.

2.7 Limitations

Incomplete and Missing Records: Generally, EMS data was unavailable due to poor record-keeping practices. Many facilities lacked emergency HMIS tools, which made data abstraction challenging in some facilities. To mitigation this challenge we utilised OPD registers and electronic medical records, especially for health centre IVs and private facilities.

Non-response and Participation Issues: Health workers in the emergency departments were often too busy and others were reluctant to participate in the knowledge assessment, a challenge faced especially in the Central region. Some critical key informants were reluctant to respond to requests for interviews during and after data collection notably key staff from KCCA and Mulago Hospital were unavailable, affecting the data collection efforts.

Approval and Administrative Delays: Some hospitals in the central region required approval from independent research committees of Nakasero and Nsambya hospitals, delaying the data collection process.

Operational limitations: Some of the HCIV facilities especially in the South-Central region lacked emergency departments, limiting data collection opportunities.

3. Results

3.0 Facility characteristics

A total of 74 facilities were surveyed, comprising 3 National Referral Hospitals (NRH), 9 Regional Referral Hospitals (RRH), 27 General Hospitals (25 fully assessed), 25 Health Centre IVs, and 10 Health Centre IIIs. (**Table 1**, **Table 2**.)

All the 3 NRHs assessed were in the central region and public. Of these three facilities, only Kawempe and Mulago NRH had a separate emergency unit for children and adults. **Table 2**. All the 9 RRHs were public with 3 out of 9 having a separate emergency unit for children and adults: Arua, Mbale, and Jinja RRHs.

Among the 27 hospitals assessed; the majority were public (48.1%). Eastern region had the highest proportion of public hospitals assessed (67%), followed by Albertine region (60%). Both the North & West Nile region and the Southwestern region had an equal representation of public facilities, accounting for 50% each. In the Central region, 4 hospitals were assessed two being PFP and two being PNFP. (**Table 1**) Furthermore, only 2 out of 25 hospitals (8%) had a separate emergency unit: Mityana Hospital in the central region and Lacor Hospital in Gulu district, Northern region.

Of the 25 health center IVs assessed: 79% were public, 8% PFP, and 12% PNFP. The Eastern region had 7 facilities (all public), Albertine had 6 (67% public, 16.7% PFP, 16.7% PNFP), North & West Nile had 5 (80% public, 20% PNFP), Southwestern had 5 (80% public, 20% PNFP), Central had 2 (1 public, 1 PFP)**Table 1**.
None of the Health Centre IVs had a separate emergency unit for children and adults or a well-established emergency unit. All emergency cases at Health Centre IVs were initially seen in the Outpatient Department (OPD) and then admitted to the inpatient ward.

Eleven (11) facilities with Intensive Care Units (ICUs) were assessed during the survey. These included the 3 NRHs: Kiruddu, Kawempe, and Mulago NRH; 3 RRHs: Mbale, Jinja, and Mbarara RRH; and 5 hospitals: IHK, Mengo, Nakasero, Lacor, and Nsambya Hospital. Among these facilities, seven had High Dependency Units (HDUs).

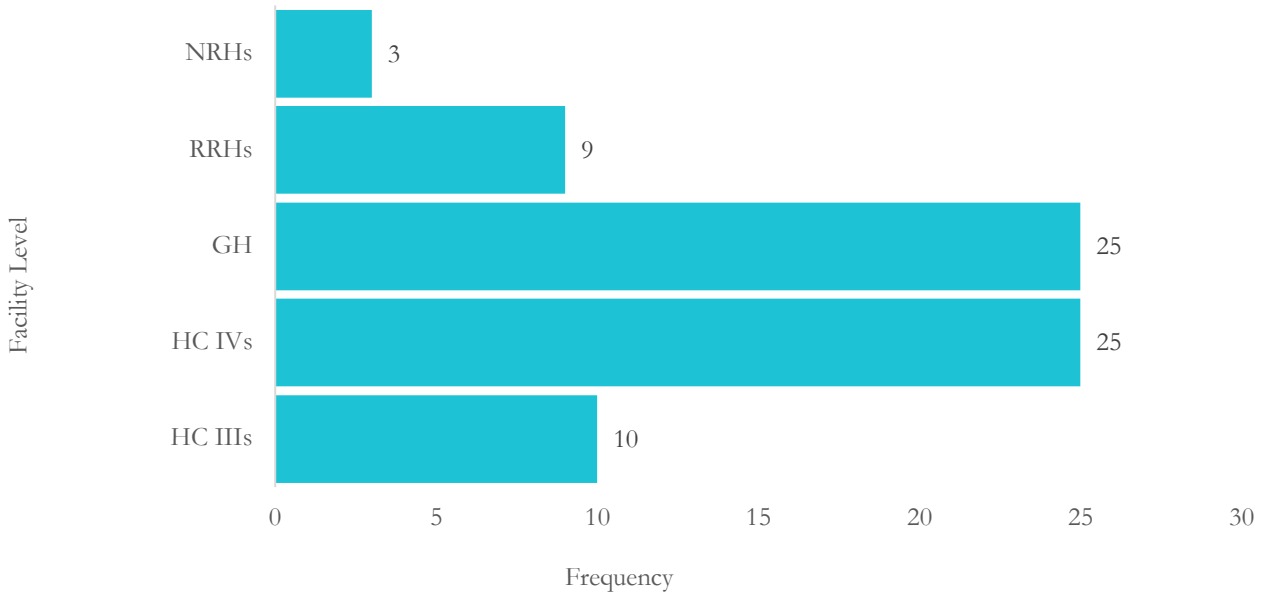


Figure 2: Distribution of Facilities Assessed

Objective 1: **To identify the most common types of medical and surgical emergencies and their associated outcomes for both adult and pediatric populations at the different levels of healthcare.**

3.1 Distribution of Emergency Cases

The total number of emergency cases between January and December 2023 was 133,935, with May having the highest number of cases. The Albertine region accounted for the highest number of emergency cases, with 37,240 (27.8%), followed by the Southwestern and Central regions at 21.4% and 21% respectively. The North & West Nile region had the lowest emergency cases at 10.4% (**Table 3**).

3.1.1 Common emergencies

The common emergencies included trauma injuries and infections at 17% and 14.3% respectively. While the least emergencies were ophthalmic cases with 0.06%. It should be noted that the figures provided may not represent all the cases seen in the facilities for the reporting period. This is because much of the data was not adequately documented (**Table 4**).

3.1.2 Emergencies outcomes

The assessment revealed that the majority (35.8%) of emergency cases received at the emergency departments between January and December 2023 were admitted to the ward, while 31.5% were discharged and, 2.1% of the emergency cases resulted in death. Southwestern region had the highest percentage of emergencies death at 33.1% followed by eastern region (28.4%). Other outcomes assessed included ICU admission, cases transferred to theatre, and those transferred out (**Table 5**).

It's important to note that much of this data was extracted from the emergency and outpatient department registers of the assessed facilities. And a significant portion of the data (25.6%) was missing regarding the outcomes.

Distribution of Cases per 100,000 Population (Jan-Dec 2023)

The assessment revealed variations in case distribution across different regions. The Southwestern region, with a population of 2,065,647, reported the highest number of cases per 100,000 population, standing at 1,385. This was followed by the Albertine region, which had 1,237 cases per 100,000 population out of a total population of 3,011,564 and 37,240 absolute cases. The Eastern region, home to 3,199,672 people, recorded 815 cases per 100,000 population, with 26,065 absolute cases. In contrast, the North and West Nile region reported 649 cases per 100,000 population among its 2,137,667 residents, with 13,870 absolute cases. Lastly, the Central region, the most populous with 4,564,846 people, had the lowest rate, reporting 617 cases per 100,000 population and 28,160 absolute cases.

Objective 2: **To evaluate the availability and adequacy of medicines, diagnostics, blood, oxygen, and supplies for emergency services across various health facility levels in Uganda.**

3.2 Medicines and Supplies

3.2.1 Availability of medicines

On average, 51% of national, regional referrals and general hospitals assessed for commodities restricted to only that level experienced stockouts for ninety-one (91) days or more in the four (4) months prior to the assessment. (**Table 6**) At the time of the assessment, dobutamine IV was not available at any of the 2 NRHs. At Kawempe NRH dobutamine IV had been redistributed since it was not being used.

Emergency respiratory medicines were available in over 65% of the surveyed facilities. These respiratory medicines included norepinephrine injection, which is stocked in national and RRHs, as well as adrenaline, hydrocortisone injection, and salbutamol aerosol inhalation 100, which was found to be available at different facility levels (**Table 7**).

Seventy-five percent (6/8) of the facilities experienced stockouts of norepinephrine injection in the last four months before the survey, with an average stockout period of 96 days. Additionally, 65.9% of the facilities experienced stock outs of salbutamol aerosol inhalation, as seen in **Table 7**.

On average, the assessment revealed that 76.9% of the facilities had emergency medicines for shock management, including Phyto menadione (vitamin K), sodium lactate (Ringer's lactate), and tranexamic acid IV.
Phyto menadione (vitamin K) and sodium lactate (Ringer's lactate) were available in 83.3% and 89.9% of the facilities, respectively. However, tranexamic acid IV was available in only 57.6% of the facilities. It is important to note that tranexamic acid IV was out of stock in over 91% of the facilities that stocked the commodity (see **Table 8**)

Over 80% of the health facilities surveyed had diazepam rectal and insulin injections for managing altered mental status. However, only 48.3% of the assessed facilities had Haloperidol IV, and of these, 56.5% had experienced stockouts of Haloperidol for 91 days or more (**Table 9**).

Regarding the availability of pain management medicine, over 80% of the surveyed facilities had diclofenac injection, ketamine, lidocaine injection, and paracetamol rectal, while 69.5% of the facilities had pethidine injection. However, less than half of the facilities had Morphine IV and paracetamol IV in stock at the time of the visit (**Table 10**).
The average stock-out duration for all these commodities in the four months preceding the survey was 80.6 days. It's important to note that over 95.7% of the facilities experienced stock-outs of paracetamol IV, and 66.7% experienced stock-outs of Morphine IV. (See **Table 10**)

Over 80% of the facilities had emergency medicines for maternal health, including magnesium sulfate, misoprostol tablets, and oxytocin. The percentage of facilities experiencing stockouts was minimal, ranging from 16.3% for oxytocin to 33.3% for misoprostol tablets (**Table 11**).
The assessment revealed that atropine was present in 49 (83.1%) of the facilities, including National Referral Hospitals, Regional Referral Hospitals, General Hospitals, and Health Centre

IVs. Calcium gluconate was found in 42 (70%) of the facilities, and naloxone in 30 (50.8%) of the facilities. The stockout rate for these three commodities was less than 40% across the facilities (see **Table 11**).

On average, emergency antimicrobial medicines were available in over 76.5% of the facilities. This included Ampicillin injection, which was found in 68.3% of the facilities, Artesunate in 88.3%, Ceftriaxone in 79.7%, Amphotericin B in 42.9%, and gentamicin injection in 69.5% of the facilities. However, 70.7% of the health facilities experienced stockouts of Ampicillin injection, and 78% experienced stockouts of gentamicin injection. (**Table 12**)

Most of the facilities had emergency cardiac medicines available at the time of the visit. The cardiac medicines assessed at different facility levels included Furosemide injection, found in 90% of the facilities, oral Furosemide in 50%, Hydralazine injection in 76.7%, and Labetalol injection in 75% of the facilities, as seen in **Table 14**. Additionally, over 91.7% of the facilities that stocked furosemide experienced its stock out in the last four months prior to the survey.

Other emergency medicines, such as 0.9% normal saline, Dextrose IV infusion 50%, whole blood, and anti-tetanus immunoglobulin, were available in over 75% of the facilities (**Table 15**).

3.2.2 Medicine Stockouts

Frequent stock-outs of emergency medicines significantly hampered timely and effective emergency care. For instance, Bwera Hospital and Hoima Regional Referral Hospital experienced frequent stock-outs, impacting patient care and emergency procedures due to NMS not adhering to supply schedules. Bukuku Health Center IV and Fort Portal Regional Referral Hospital consistently faced shortages, affecting their preparedness and responsiveness in handling emergencies.

> *"Stockouts are frequent because NMS doesn't stick to their schedule."* ***Hoima Regional Referral Hospital Facility Staff***

"They would be there and would be adequate if NMS would deliver our supplies as they are requested for in the procurement plan but unfortunately at times, NMS takes like a month or two even three without supplying some of these products. So, it becomes challenging at times but if they can supply the way we request for them, there wouldn't be any challenges with stock outs" – ***Mulago NRH store staff***

a) Coping Strategies during stockouts

When supplies were out of stock, patients were often told to buy them outside the facility, causing delays, especially during emergencies. In critical conditions, caretakers had to buy supplies, but some patients arrived without caretakers, leaving the facility without essentials. Health workers improvised by mobilizing from other departments, borrowing from other patients, seeking help from other patients' caretakers, or using their own money. Inadequate availability extended beyond medicines to necessary equipment like blood pressure machines, glucometers, and trolleys, which were often unavailable, non-functional, or insufficient. Health workers sometimes had to share devices between wards, complicating emergency responses.

Some facilities placed emergency orders with NMS but faced challenges in receiving them. Some used funds from Results-Based Financing (RBF) to buy medicines from private providers with short lead times, though this was no longer an option due to new guidelines. Facilities often redistributed supplies among themselves, supported by district health offices. For example, Kigorobya Health Center IV and Bukuku HCIV redistributed medicines, and Hoima Regional Referral Hospital maintained a buffer supply for emergency outbreaks. Mityana General Hospital reported receiving 87% to 95% of their orders from NMS, reducing stock-outs. Bukuku HCIV also highlighted the role of partnerships in supplementing emergency maternal and newborn care medicines.

> *"Yes, I budget for it in using RBF though the guideline for this financial year running was actually not buy essential medicines, but given my setting, it's a hard to reach, NMS has not been supplying us with some drugs so we needed to purchase them. I had to put aside small budget for the emergency ones." –* ***Buvuma HCIV in charge***

"Redistribution from other facilities in case of stock-outs at Kigorobya HCIV." "It's not particularly the warehouse, it's mostly the district health office that offers the support." "Majority of equipment for vitals was purchased through Results-Based Financing money at Kigorobya HCIV." ***Kigorobya Facility In-charge.***

"When we have stock outs we send patients to buy and it delays our service delivery because in an emergency I assume that everything should be set to reduce delays." – ***Arua RRH Emergency department facility staff.***

"Sometimes police brings patients with no caretakers and you have to spend your own money to buy supplies when there are stock-outs." – ***Mbale RRH Emergency Department Facility staff.***

b) Ordering process of emergency medical supplies

The ordering process for EMS drugs and supplies varied across facilities. Some pooled EMS supplies with other medical supplies, streamlining procurement but risking oversight of emergency-specific needs. Others adopted a more structured approach led by a senior pharmacist, starting with a planning meeting, followed by the director's endorsement and submission to the National Medical Stores (NMS), overseen by a committee including an emergency representative to ensure EMS requirements were met. Some facilities followed a standardized yearly procurement plan with bi-monthly orders, ensuring regular supplies but lacking flexibility for sudden emergencies. In other cases, emergency medicines were ordered bi-monthly through the mainstream NMS system, with supplies distributed from central stores to various departments.

Many facilities lacked a dedicated emergency department, integrating emergency management within other departments. Facilities stocked emergency supplies based on the types of emergencies they frequently encountered, such as trauma from accidents and carbon monoxide poisoning, and adjusted their stock based on seasonal patterns and surges in demand during festive seasons and weekends. Once NMS delivered supplies, they were catalogued in central stores using paper, electronic, or hybrid systems, with departments placing weekly orders and provisions for urgent needs.

“

Ordering of EMS drugs and supplies is made in a pool alongside other drugs and supplies of other units (collectively).” ***Kigorobya HCIV Facility Staff.*** *“Ordering for supplies is headed by the senior pharmacist. A planning meeting is held, decisions are made and the director endorses the order and sends it to NMS. There is a committee available for ordering medicines on which has an emergency representative.”* ***Hoima RRH Senior Pharmacist.***

The supplies of medicines and emergency items were consistently insufficient at all levels in most public facilities due to several reasons. Patient numbers exceeded the supplies catered for, and budgets were based on allocated funds rather than actual needs. Most facilities did not prioritize the emergency department, resulting in shortages that affected every department when essential medicines ran out. Planning for emergencies was challenging due to their inconsistency, and inadequate stock management made forecasting needs difficult. Public facilities also reported inconsistent supply from the National Medical Stores (NMS), with delays in supply cycles leading to inevitable stock-outs.

c) Challenges regarding the availability and adequacy of emergency medical supplies

Several health facilities reported significant gaps in the availability of essential emergency equipment and supplies. Patient monitors, crucial for effective emergency care, were often lacking. Irregular supplies from the National Medical Stores (NMS) led to frequent stock-outs, with many hospitals facing persistent shortages due to NMS not adhering to supply schedules. The inconsistency in deliveries exacerbated the mismatch between supply and demand, causing shortages and affecting emergency preparedness. Shortages of PPEs, essential for healthcare worker safety, were also reported.

Storage challenges were prevalent, with many facilities lacking dedicated spaces, leading to improvised and unsafe storage solutions. Congestion in storage areas often forced staff to use open spaces, compromising the safety of medical supplies. Inadequate temperature control further compromised medicine quality, with many facilities lacking proper cooling systems and refrigerators, leading to unsafe storage practices.

Financial constraints forced patients to purchase drugs themselves, highlighting insufficient funds for emergency medicines. Manual stock monitoring and poor documentation made planning difficult, especially with newly introduced electronic systems that were not department-level and lacked provisions for certain units of measure. Facility in-charges cited the need for system strengthening and capacity building in logistics management.

Private facilities generally did not face stockout challenges due to their ability to place emergency orders and their established electronic monitoring systems, allowing accurate stock level estimation and proper planning.

“

The main store is congested, only two fridges available, so they mix lab supplies with EMS supplies in the fridge. There is no fan to cool down the temperature; they offload from the sunshine because there is no offloading bay.” ***Hoima RRH Facility Staff****.*

"We use a manual stock management system, and because it is manual, most times it's unable to monitor stock levels." ***Fort Portal RRH Facility Staff.***

"Oftentimes we are alerted by the absence of stock, and then that's when we call for emergency procurement, so there's a lag." ***Mulago NRH Acting Head of Emergency.***

"We have an electronic stock management system from the Ministry of Health. It was rolled out just at the beginning of February, and so we are still at the infancy stage of using it, and you can imagine the challenges there." ***Entebbe RRH (Respondent: Facility Staff)***

3.2.3 Oxygen assessment

A small percentage of only 16 out of 60 (26.7%) of the facilities surveyed had oxygen supplied through a central piped system. These included all national referrals (3 out of 3), 6 out of 9 regional referral hospitals (66.7%), 5 out of 23 general hospitals (21.7%), and 2 out of 25 Health Centre IVs (8%). **Table 16**.

However, most of the facilities (66.7%) had oxygen supplied by oxygen concentrators stored in the emergency unit. And over 65% of the facilities had oxygen supplied in cylinders stored in the emergency unit.
It is also important to note that 14 out of the 15 (92.9%) of the facilities with an existing oxygen plant had a functional oxygen plant. **Table 16**

3.2.4 Laboratory services

Seventy-eight-point three percent (78.3%) of the facilities assessed had 24-hour in-hospital access to a laboratory, with most laboratory tests available across all the facility levels. However, renal function tests and liver functional tests were unavailable in most Health Centre IVs (68), and the CSF analysis machine was unavailable at one of the national referral hospitals (**Table 17**).

The assessment revealed that only 16 out of 60 (26.7%) assessed facilities had an electronic laboratory result reporting system, with only one national referral hospital having such a system. Also, rapid HIV testing was available at only two national referral hospitals. Mulago NRH did not have HIV testing available in the emergency department because they rely on implementing partners for HIV testing (**Table 17**).

Figure 3: Crash Trolley

3.2.5 Advanced equipment

For the advanced equipment, only 35% of the assessed facilities had functional stationary X-rays, and only 11.9% had functional portable X-rays in the emergency unit. Furthermore, only 22.8% had functional point-of-care ultrasound, and 21.7% had a functional CT scan (**Table 18**).

Objective 3: **To understand the human resource demographics by determining the quantity, type, distribution, and competencies of emergency care workers across health facilities in Uganda.**

3.3 Human Resource

3.3.1 Human resource of emergency health care workers in NRHs.

There was no Senior Consultant Emergency Medicine appointed in all the facilities (0/3). Medical Officers Special Grade (SG) - Surgery were appointed in 66.7% of facilities, all full-time in the emergency unit. One out of the 3 NRH had a Medical Officers SG - Emergency Physicians. Two out of the 3 NHR had general Medical Officers with full-time presence in Emergency.

One NRH had a senior nursing officer deployed full-time in the ED, while the other two lacked this role. Two NRHs had nursing officers fully deployed. Assistant nursing officers were fully staffed across all NRHs, averaging eight per facility. However, none of the NRHs had emergency medical technicians, and only one had a call and dispatch officer, though not deployed in emergency roles. Theatre assistants were present in two NRHs but were not assigned to emergency departments, while only one NRH had a theatre attendant.

Senior Consultants, Consultants, and other specialized medical cadres showed varying levels of appointment and presence, with most specialized roles having low appointment rates but full-time presence when appointed (**Table 19**).

3.3.2 Human resource of emergency health care workers in RRH

Consultant Emergency Medicine and Medical Officer Special Grade (SG) - Emergency Medicine were each appointed at only 11.1% of the facilities, both fully present in Emergency. General Medical Officers were widely appointed at 88.9%, with 14.3% full-time in Emergency and 75% trained in BEC.

Principal Nursing Officers and Senior Nursing Officers had lower appointment rates at 12.5% and 22.2%, respectively, with the latter having 50% full-time presence in Emergency and the same percentage trained in BEC. Nursing Officers were appointed at 22.2% of the facilities, with 50% full-time in Emergency. Assistant Nursing Officers were prevalent at 88.9%, with 50% full-time in Emergency and trained in BEC.

Regional EMS Officers and Senior Medical Officers were appointed at 33.3% of the facilities, with significant full-time Emergency presence and BEC training. Medical Officers had a 77.8% appointment rate, with 71.4% full-time in Emergency and 42.9% trained in BEC.

IT Officers, Medical Dispatchers, Assistant Secretaries for Logistics, and Call Agents had low appointment rates (11.1%). In the Children's Emergency Department, all Consultant Intensivists, Medical Officers SG - Intensivists, and Medical Officers SG - Emergency Medicine were not appointed, while Medical Officers SG - Anesthesia were appointed at 33.3%. Senior Nursing Officers and Nursing Officers were appointed at 66.7% and 100% respectively, with some full-time in Emergency. Respiratory Technicians were not appointed. (**Table 20**)

3.3.3 Human resource of emergency health care workers in general hospital

Medical Officers Special Grade (SG) - Surgery were appointed at 44% of the facilities, with 18.2% full-time in Emergency. Medical Officers SG - Medicine were less common, at 28%, but had a higher full-time presence in the emergency unit (57.2%). Senior Medical Officers were appointed at 64% of the facilities, with 25.1% full-time in the emergency unit and 50% trained in BEC. General Medical Officers were highly prevalent, at 96%, with 58.3% full-time in the emergency unit and 60.9% trained in BEC.

Senior Clinical Officers were present in 60.9% of facilities, with 28.6% full-time in Emergency and 42.9% trained in BEC. Clinical Officers were appointed at 92% of the facilities, with 43.5% full-time in the emergency unit and 30.4% trained in BEC. Emergency Medical Technicians and Emergency Care Assistants were rare, appointed at 12% and 8% respectively, with minimal full-time presence in the emergency unit.

Drivers were highly appointed (92%), with 78.3% full-time in the emergency unit. Senior Nursing Officers were present in 32% of the facilities, with 37.5% full-time in the emergency unit and 25% trained in BEC. Senior Anesthetic Officers were appointed to 32% of the facilities, with 25% full-time in the emergency unit and 75% trained in BEC. Anesthetic Officers were more common (80%), with 30% full-time in the emergency unit and 55% trained in BEC.

Nursing Officers were present in 56% of the facilities, with 50% full-time in the emergency unit and 42.3% trained in BEC. Assistant Anesthetic Officers and Assistant Nursing Officers were appointed at 24% and 84% of the facilities respectively, with 50% and 61.9% full-time in the emergency unit, and 40% and 45% trained in BEC.

For the Children's Emergency Department, Medical Officers Special Grade - Emergency Medicine were present in 50% of the facilities, while Medical Officers Special Grade - Anesthesia and Senior Nursing Officers were not appointed. Nursing Officers and Respiratory Technicians were fully appointed (100%), with Nursing Officers fully engaged in the emergency unit. (100%). (see **Table 21**)

3.3.4 Human resource of emergency health care workers in HC IVs

Out of the 24 Health Centre IVs surveyed, more than 50% of these facilities had at least one appointed senior medical officer, medical officer, senior clinical officer, clinical officer, nursing officer, assistant nursing officer, enrolled nurse, anesthetic officer, and theatre assistant. However, the percentage of Health Centre IVs with different cadres deployed full-time at the emergency department (OPD) ranged from 9.1% to 43.5%.

Senior Medical Officers were appointed at 66.7% of the facilities, with 18.8% of facilities having them full-time at the emergency unit or OPD and only 33.3% had been trained in BEC. Medical Officers were more widely appointed in 87.5% of the facilities, with 23.8% full-time in the emergency unit and only 36.8% trained in BEC. Senior Clinical Officers were present in 66.7% of facilities, with only 15% full-time in the emergency unit and 40% trained in BEC. Clinical Officers were appointed at 79.2% of the facilities, with 36.9% full-time in the emergency unit and the same percentage trained in BEC.

Senior Nursing Officers were less frequently appointed (45.8%), with 9.1% full-time in the emergency unit and 27.3% trained in BEC. Nursing Officers had a 54.2% appointment rate, with 30.8% full-time in the emergency unit and 23.1% trained in BEC. Assistant Nursing Officers were present in 58.3% of facilities, with 14.3% full-time in the emergency unit and 28.6% trained in BEC. Senior Enrolled Nurses were the least frequently appointed (12.5%), with 66.6% full-time in the emergency unit and none trained in BEC.

Enrolled Nurses were nearly ubiquitous (95.8%), with 43.5% full-time in the emergency unit and 18.2% trained in BEC. Anesthetic Officers were appointed at 58.3% of the facilities, with 50% trained in BEC, whereas Assistant Anesthetic Officers were less common (29.2%), with 42.9% trained in BEC. Senior Theatre Assistants were rarely appointed (8.3%), with none trained in BEC, while Theatre Assistants were present in 75% of facilities, with 29.4% trained in BEC. (See **Table 22**)

3.3.5 Human resource challenges

Severe staffing shortages in public healthcare facilities led to long hours, fatigue, and burnout among healthcare professionals. Many reported 12-hour shifts with only one to two staff members on duty. Kiruddu NRH operated at 35% staffing, affecting all departments, while Bugiri Hospital had single-person shifts from 8:00 am to 9:00 pm. Staff rotations and inadequate specialist availability, such as anesthetists, further compounded issues. Koboko Hospital's emergency-trained doctor was reassigned to maternity, and a Central Uganda hospital reported a single anesthetist managing multiple operating tables. Referral policies requiring doctors caused delays if no dedicated emergency doctor was available.

High patient volumes and critical care demands strained limited staff, leading to overwork and mistakes, as reported at Mulago National Referral Hospital. Annual staff rotations disrupted care continuity, reducing effectiveness, as noted at Arua RRH. The demanding conditions impacted morale and motivation, with many feelings undervalued and lacking adequate resources or amenities. Despite efforts at Koboko Hospital, the lack of promotions and support led to a desire to leave emergency units.

Bwera Hospital struggled with high patient loads due to inadequate staffing. Frequent personnel transfers further exacerbated issues, exemplified by a hospital with 160 staff against a required 341. Kiboga Hospital had only three anesthetists for the entire hospital. Facilities like Bukuku HCIV lacked dedicated emergency personnel, relying on staff from other departments. Nyendo HCIII reported insufficient EMS training among staff. Poor incentives at Itojo Hospital affected morale, with no salary increments or promotions despite training. Private facilities offered higher pay and training but faced high staff attrition as trained workers sought better opportunities. A PNFP in Kampala highlighted retention challenges, noting that trained staff often left for more attractive positions.

> *"At the moment the hospital is staffed at 35%, which means that even the emergency department is affected like all the other departments are affected." –* ***Kiruddu NRH***

"Most times there is only one person on duty because of shortage of human resources. People work from morning to evening coming in at 8:00 am and leaving at 9:00 pm so you can imagine the fatigue" – ***Bugiri Hospital****.*

"We have one doctor who is trained in emergency care but not attached to emergency because of demand elsewhere, he's been attached to maternity leaving emergency under the care of the clinicians and the nurses." – ***Koboko Hospital****.*

"When you look at the load, the load is too much they seem to be even working beyond what they are supposed to be and these can easily cause some mistakes when they are over-stressed because of working overtime" – ***Mulago NRH Hospital****.*

"The other challenge is that we have annual rotations where we rotate to other units annually so the staff that are trained in handling emergencies are rotated to other units and they bring new people who don't know what happens in this unit. So it becomes a very big challenge to continue with them." – ***Arua RRH****.*

"We don't have specific people allocated to handle emergencies like other facilities have people mainly working in the emergency department. Here, we do not have personnel to handle emergency." ***Bukuku HCIV.***

"Inadequate staffing.""No salary increment or job promotion even after training or upgrading – anaesthesia staff." ***Itojo Hospital.***

3.3.6 Capacity-building mechanisms for emergency medicine staff

Emergency departments faced significant challenges due to insufficient training and professional development opportunities. The high demands of emergency units hindered participation in crucial training programs, and knowledge transfer through continuous medical education (CME) was often ineffective. Sporadic CME sessions and internal training programs did not fully address the specific needs of emergency care staff, with many facilities reporting inadequately trained heads of departments.

Bwera Hospital emphasized CME but struggled to sustain programs after the Annabel project ended in 2018/2019. Support supervision at Bwera and experienced personnel at Hoima Regional Referral Hospital improved staff competency. Teamwork and quick response efforts were notable at Hoima and Fort Portal Regional Referral Hospitals, supported by volunteers. Fort Portal RRH provided emotional support and housing to retain staff, while Mityana Hospital focused on on-the-job training. Virika Hospital benefited from Ministry of Health and Baylor-supported training sessions, and Itojo Hospital maintained functional equipment through volunteer efforts. However, reliance on external projects for training highlighted limitations in sustaining long-term educational programs for emergency staff.

"I was never trained as an emergency nurse I was just deployed here. I use general knowledge as a nurse. We are seven nurses and I think they trained 2 nurses." – ED health worker Jinja RRH.

"They trained two of our colleagues and even gave them certificates. We have tasked them to transfer the knowledge, but they have never trained us. So maybe they should train some people who are permanent at the department" – Bugiri Hospital.

"We have good teamwork, so it has not been like an individual kind of work." "The working environment is conducive." "We have had two trainings, one by the Ministry of Health and another through the support of Baylor. We attended both but we are in touch with the DHOs to get more trainings." Virika Hospital (Respondent: Facility Staff)

Objective 4: To understand the human resource competencies by exploring current basic emergency care knowledge of emergency care workers working in emergency units

3.4 Knowledge Assessment

A total of 251 health workers were assessed for their emergency knowledge levels. Out of this total, 243 (96.8%) were included in the analysis, with 3.2% excluded due to missing data on important variables. The assessment encompassed various healthcare professionals including medical doctors, nurses, clinical officers, specialists/consultants such as anesthesiologists, and other staff like orthopedic officers and theatre assistants. The majority comprised Nurses (134, 55.2%), followed by medical officers (46, 18.9%) and Clinical officers (44, 18.1%). The median (IQR) years of experience was 5 (2-10) years, with 197 (84.6%) having previous experience in emergency care. Furthermore, only 129 (53.1%) had received prior training in emergency care.

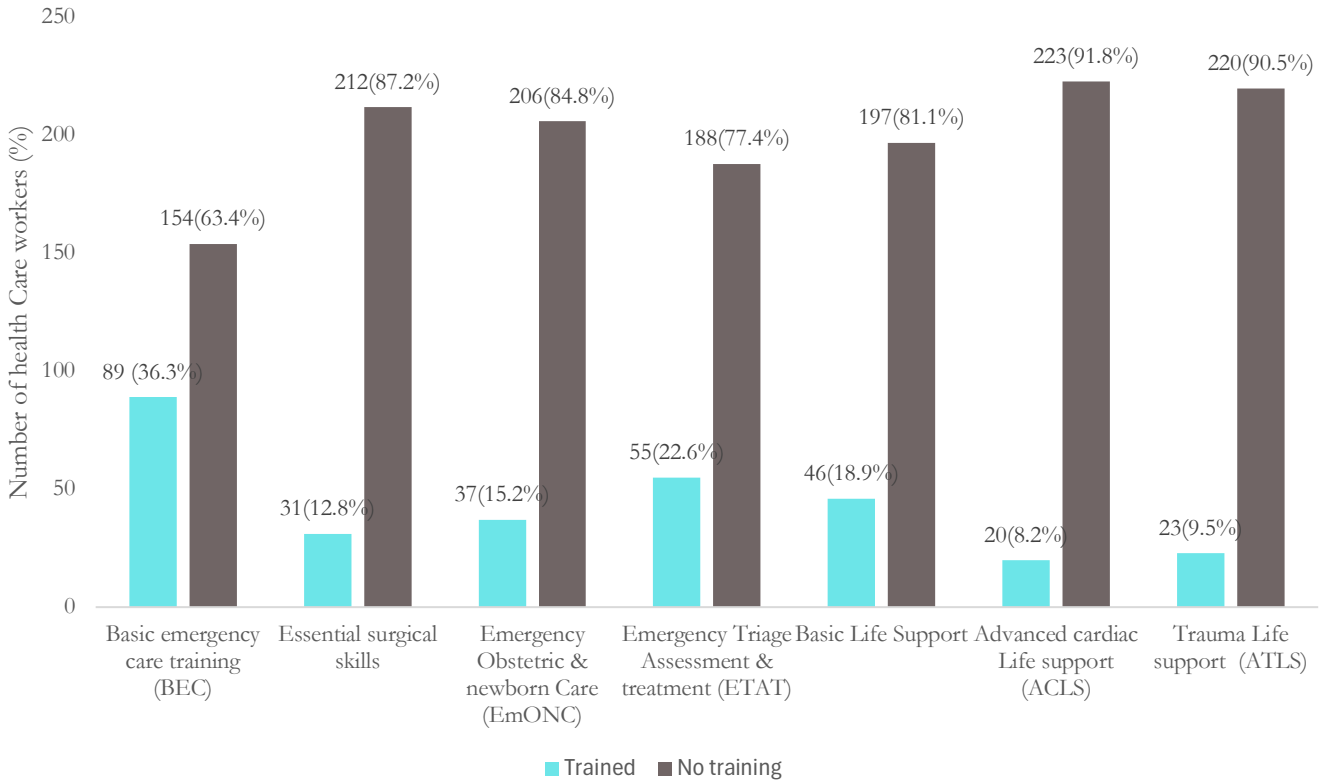


Figure 4: Emergency health care workers' training levels.

Figure 4 reveals that only 36.3% of healthcare workers in the emergency department had undergone training in Basic Emergency Care (BEC), while 22.6% had received training in Emergency Triage Assessment and Treatment (ETAT). Other emergency trainings showed even lower percentages, with less than 20% of health workers trained.

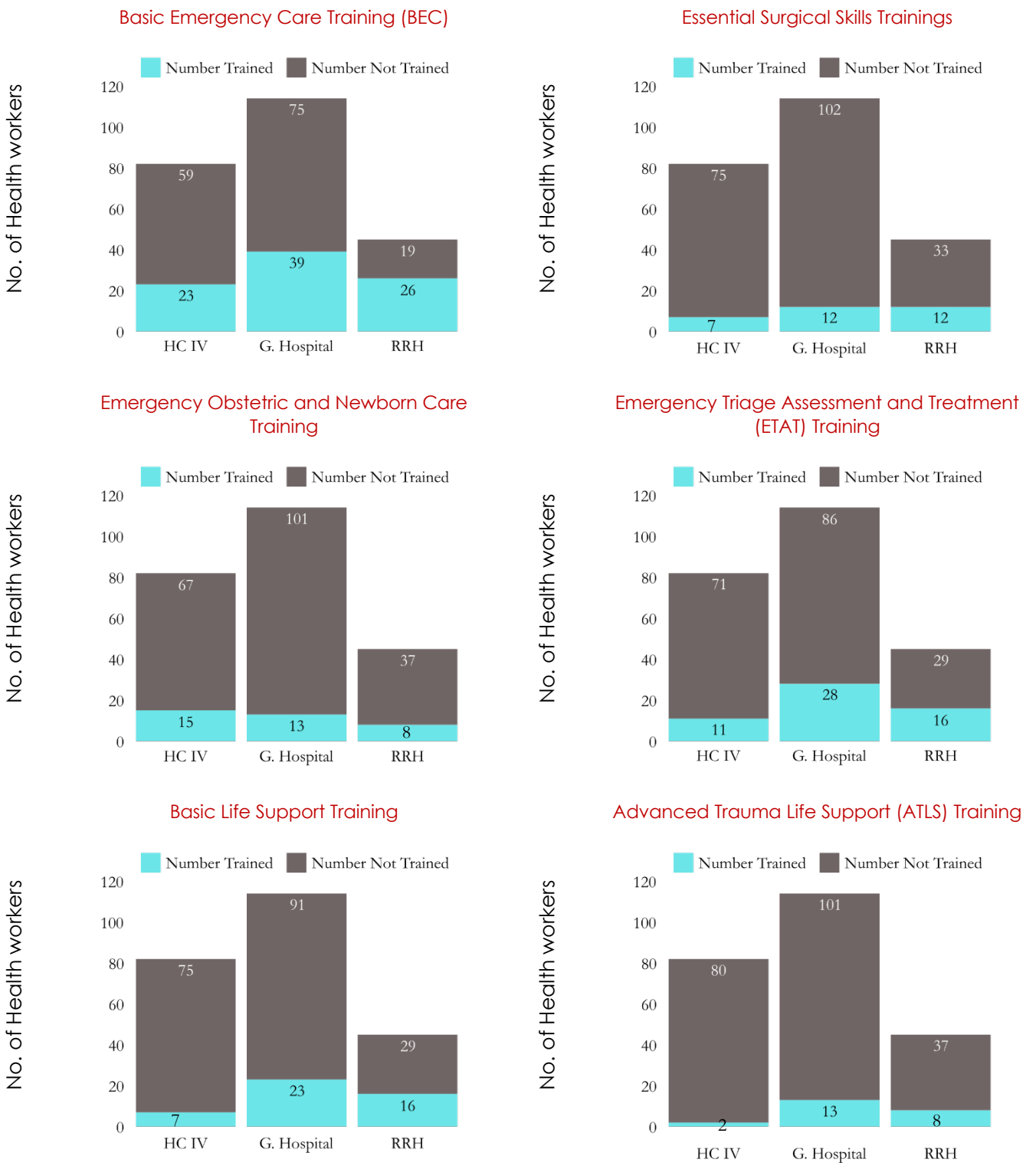
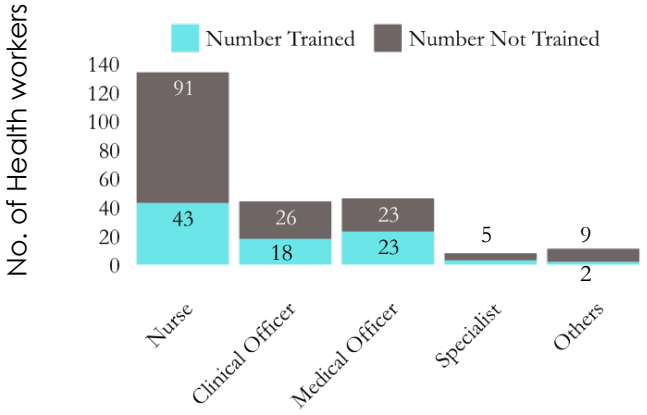


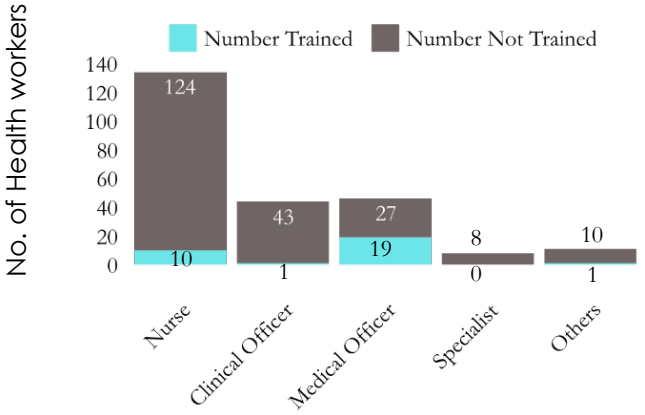
Figure 5: Health workers trained in different emergency care trainings by facility level

Figure 5 shows that the percentage of health workers trained in the different emergency care services across the different facility levels (HC IV, General hospital, and regional referral hospital) is still very low. However, this was varying depending on the training and facility level.

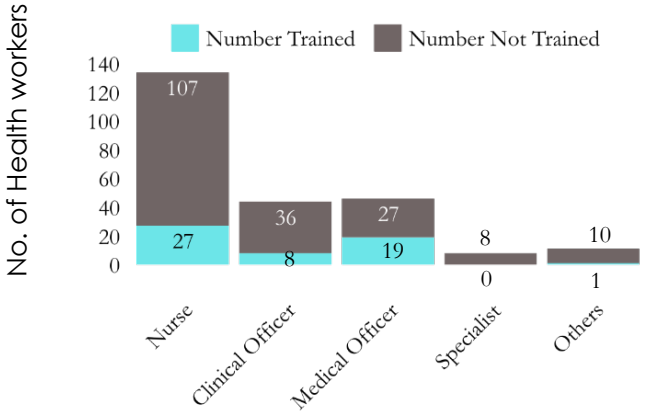
Basic Life Support Training



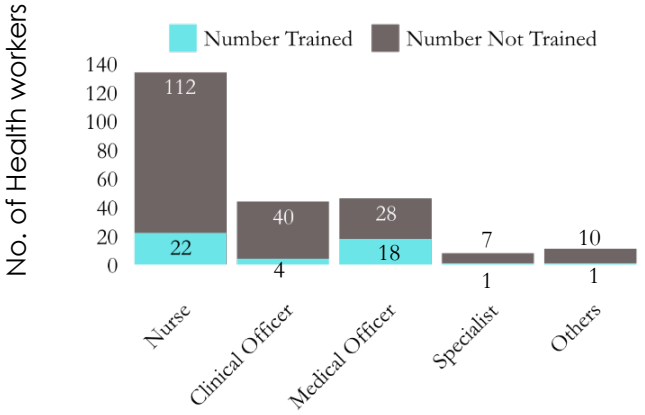
Essential Surgical Skills Trainings



Emergency Triage Assessment and Treatment (ETAT) Training



Basic Life Support Training



Advanced Cardiac Life Support Training (ACLS)

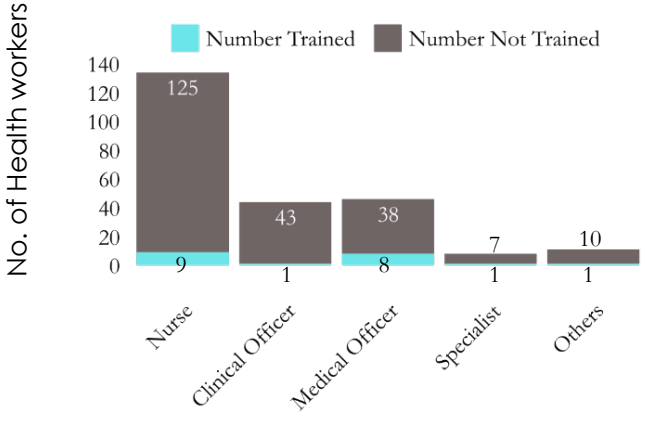


Figure 6: Emergency care training by Cadre. **Figure 6 indicates that the level of emergency care training varied by cadre and type of training. However, specialists generally had the lowest levels of training.**

Figure 7: Emergency care training by region.

Among the five regions surveyed, the Albertine region had the lowest percentage of health workers trained in most of the training programs, as shown in **Figure 7** above. However, all regions exhibited very low training levels, with none exceeding 45% in any training program.

b) other emergency training by region.

Notably, ACLS training varied from 17.7% in Eastern to 7.9% in North & West Nile, while the majority remained untrained, with percentages ranging from 82.4% to 95.1%. Similarly, ATLS training ranged from 11.8% in Central to 11.1% in North & West Nile, with a predominant lack of training in all regions, ranging from 86.1% to 93.8%. ETAT training followed a similar pattern, with trained personnel ranging from 35.3% in Eastern to 25.4% in North & West Nile, while the untrained majority varied from 64.7% to 87.7% (Table 39).

3.4.1 Self-assessment in performing emergency procedures among adults.

Based on self-assessment scores using a scale of 1 to 10 to gauge confidence in executing emergency procedures among adults, nurses attained an average rating of 7.1, clinical officers 7.5, medical doctors 7.9, consultants 7.6, and other cadres 6.7. Notably, pelvic binding received the lowest average score of 5 across all cadres within the emergency unit. The consultants are more confident in their areas of specialisation. (refer to **Table 23**).

In summary, applying the grading system of A-E, where A corresponds to 90-100, B to 80-89, C to 70-79, D to 60-69, and E to 0-59, nurses, clinical officers, medical doctors, and specialist consultants achieved a grade C in performing the procedures outlined in **Table 23**.

3.4.2 Self-assessment in performing emergency procedures among children.

According to the self-assessment, which employed a scale of 1 to 10 to evaluate confidence levels in executing procedures during pediatric emergencies, nurses averaged a score of 6.9, clinical officers 7.5, medical doctors 7.9, consultants 6.9, and other cadres 6.2. Notably, pelvic binding garnered the lowest average score of 4.9 across various cadres within the emergency unit (refer to **Table 24**). In summary, employing the grading system of A-E, where A corresponds to 90-100, B to 80-89, C to 70-79, D to 60-69, and E to 0-59, nurses, specialist consultants, and other personnel like theater assistants received a grade D, while clinical officers and medical doctors achieved a grade C in executing the procedures outlined in **Table 24**.

3.4.3 Objective assessment of basic emergency knowledge

In the first scenario involving a car crash with power lines, only 19% correctly identified the initial action required. Regarding managing the airway of a collapsed 60-year-old, 42.1% correctly determined the next step after encountering gagging with an oropharyngeal airway. In the case of a staff member experiencing severe allergic reactions, 56.1% knew the appropriate course of action. And when asked about identifying a sign of shock, a high percentage (93.2%) correctly recognized it (Table 25).

In another scenario, involving a woman with difficulty breathing and wheezing, only 0.9% correctly identified the appropriate medication. Similarly, in the case of a diabetic man with signs of poor perfusion, only 1.3% correctly determined the likely cause. When presented with a collapsed woman with possible ectopic pregnancy, only 0.8% knew the initial action to take. And when asked about identifying a high-pitched sound during inhalation, only 3.8% provided the correct response (Table 25).

In the case of a 40-year-old man with tuberculosis and difficulty breathing, only 5% correctly identified the likely cause. Regarding a 70-year-old woman with severe chest pain and other symptoms, only 2.5% correctly determined the possible cause. When presented with an

unconscious man with pinpoint pupils and slow respiratory rate, 52.1% correctly identified the appropriate medication. In the scenario of a confused man with low blood glucose, only 2.9% knew the recommended treatment (Table 25).

In the case of a 70-year-old stroke patient with a severe headache and signs of potential brain bleeding, 59.9% correctly identified the treatment to provide while awaiting transfer. Regarding naloxone administration for opioid overdose, 34.6% knew what to worry about afterward. When presented with a confused 19-year-old with a head laceration following a fall, 37.8% correctly determined the initial action to take (Table 25).

3.4.4 Objective assessment categorized

For Airway-related questions, the average correctness rate was 42.1%. Breathing-related questions had an average correctness rate of 25%. Shock/Circulation questions averaged a correctness rate of 24.5% and disability-related questions showed a relatively low average correctness rate of 37.4%. In terms of Exposure/Environment, the average percentage of correct answers across the two questions was 28.4%. (Table 26).

Objective 5: To evaluate data systems for emergency services, including data collection, reporting and utilization at all levels of the health system.

3.5 Data

3.5.1 Data systems and data collection

More than half of the emergency departments primarily used the manual emergency register within the Health Management Information System (HMIS) to capture daily data on emergency cases. This data was aggregated and submitted monthly in HMIS 105 reports.

Fifty-two percent of Health Centre IVs primarily used manual medical records at the emergency department, while other facility levels employed both manual and electronic medical records, as indicated in **Table 27**. The survey also revealed that only 45.6% of facilities had a data system (26 out of 57) and reported being able to access the internet. Additionally, the majority, 87.5% of the regional referral hospitals had emergency registers while 30.4% of HC IVs, 43.5% of general hospitals, and 0% of National referral facilities had emergency registers at the emergency department. The reason for 0% at NRH is that they are transitioning to electronic systems.

The majority, 73.7% of facilities did not have the ambulance form HMIS EMS 002, 80.7% did not have the emergency unit form HMIS EMS 003, or a referral register. Nevertheless, the few facilities that possessed these forms actively utilized them. (**Table 27**)

3.5.2 Emergency data collection challenges

One major challenge was the use of outdated Emergency Management Information System (EMIS) report forms limiting effective data capture.

> *"The EMIS has some outdated report forms whose eHMIS 105 lacks the area for emergency reporting."* ***Arua RRH.*** *"The EMIS has some outdated report forms whose eHMIS 105 lacks the area for emergency reporting."* ***Bwera hospital***

At Bwera Hospital, the eHMIS 105 form lacked a dedicated section for emergency reporting, making it difficult to capture comprehensive and specific data on emergency cases, leading to data gaps. Facilities also struggled with delayed responses from the teams responsible for updating the eHMIS system, affecting the ability to incorporate necessary changes and improvements, thus impacting the overall effectiveness of emergency data collection. Additionally, inadequate training on using the eHMIS system led to unreliable data outputs, as staff often lacked sufficient training to ensure data accuracy, undermining the reliability of collected data and leading to errors in reporting and analysis.

> *Delayed response from the team that developed the eHMIS system on updating the system." "Inadequate training on using eHMIS and data outputs are not checked for accuracy."* ***Bwera Hospital (Respondent: Facility Staff)*** *"There is delayed response from the team that developed the eHMIS system on updating the system."* ***Jinja RRH***

3.5.3 Emergency data quality

The majority of health facilities at HC IV (87%), General Hospitals (73.9%), Regional Referral Hospitals (50%), and National RH (100%) received regular supportive supervisory visits from the Division of Health Information (DHI) team. Regarding the timing of data quality assurance, a large percentage had done quality assurance within the last 3 months was reported across all facility levels, although slightly lower in Regional Referral Hospitals (37.5%).

Feedback provision was notably high across most facilities, with Regional Referral Hospitals achieving 100%. However, procedures to correct data errors in registers were less uniform, with the highest percentage reported in Regional Referral Hospitals (87.5%) and the lowest in National RH (33.3%). Overall, the data highlights variations in data quality assurance practices across different facility levels, indicating areas for potential improvement and standardization. (**Table 28**)

3.5.4 Emergency data capacity-building

Approximately 49.1% of facilities reported having dedicated emergency data staff, with higher percentages at General Hospitals (52.2%) and National Referral Hospitals (66.7%). Training on data collection or reporting tools was provided to all staff in only 28.1% of facilities and to some staff in 35.1%, with Regional Referral Hospitals (50%) and National RH (66.7%) having the highest training rates.

Training involving emergency data handling occurred in 47.2% of facilities, with the highest percentage at Regional Referral Hospitals (71.4%). Continuous medical education (CME) or training sessions on emergency data documentation were conducted by the data team in 38.6% of facilities. Recent training on documenting emergency data within the last 3 months was reported by 45.5% of the facilities that provided such data. Lastly, a significant majority (96.5%) of respondents indicated a need for further training on data entry or system usage, highlighting an area for improvement across all facility levels. (**Table 29**)

Several health facilities benefited from training programs supported by the Ministry of Health and other organizations. For instance, Virika Hospital participated in significant training sessions conducted by the Ministry of Health and supported by Baylor, equipping staff with essential skills. Ongoing communication with District Health Offices (DHOs) aimed to secure additional training opportunities. Bwera Hospital emphasized the importance of Continuous Medical Education (CME) for emergency staff, which kept them updated on best practices and protocols. Short courses, such as those conducted during the Annabel project in 2018/2019, also contributed to capacity building but highlighted the challenge of sustaining these programs post-project. Despite these efforts, training gaps remained. Bwera Hospital noted inadequate training on the electronic Health Management Information System (eHMIS), potentially leading to inaccuracies in data outputs, underscoring the need for well-trained data personnel to maintain high data quality.

> *"We have had two trainings, one by the Ministry of Health and another through the support of Baylor. We attended both but we are in touch with the DHOs to get more trainings."* ***Virika Hospital (Respondent: Facility Staff)****".*

"CMEs for emergency staff." "Short courses were done in 2018/2019 when there was an Annabel project. When the projects end then it's difficult to continue with trainings." "There is inadequate training on using eHMIS and data outputs are not checked for accuracy." ***Bwera Hospital (Respondent: Facility Staff).***

3.5.5 Compliance, data utilizations and reporting

Overall, 68.4% of facilities reported having a protocol or schedule for data review, with General Hospitals (73.9%) and HC IV (69.6%) having the highest percentages. However, only 33.3% of National Referral Hospitals reported having such protocols. Among facilities with a data review schedule, 50% included emergency unit data in their reviews, with the highest inclusion rate at Regional Referral Hospitals (71.4%) and 100% inclusion at National Referral Hospitals.

Only 54.4% of facilities analyzed and presented collected emergency unit data to staff and stakeholders for quality improvement, with National Referral Hospitals leading at 100%. (**Table 30**)

Almost all facilities (98.2%) make monthly summary reports, with General Hospitals slightly lower at 95.7%. All facilities (100%) submit these reports. Regular feedback on the quality of their reports with EMS data is received by 76.8% of facilities, with National Referral Hospitals at 100%, while Regional Referral Hospitals lag at 50%. Feedback is most commonly provided monthly (62.8%), followed by quarterly (32.6%). This indicates a high level of compliance in report submission but varying levels of feedback frequency and quality. (**Table 30**)

3.5.6 Documentation and record keeping

Proper documentation of medical procedures and interventions was highly practiced, with 94.7% overall compliance. All Regional and National Referral Hospitals (100%) adhered to this, while HC IVs and General Hospitals showed slightly lower compliance at 95.2% and 91.7%, respectively. Compliance with data protection and patient privacy regulations is at 69.6% overall, with the highest adherence in National Referral Hospitals (100%) and the lowest in HC IVs and General Hospitals (66.7%). (
Table *31*)

Objective 6: To assess the availability and functionality of infrastructure, diagnostic equipment, emergency services and management protocols for operational effectiveness and efficiency in emergency departments and critical care units in Uganda.

3.6 Infrastructure

3.6.1 Availability and functionality of infrastructure

Clean running water was predominantly available and functional in 80% of the facilities, with national referral hospitals reporting full functionality. Electricity was similarly widely available and functional in 86.4% of the facilities. However, significant gaps were noted in communication tools, with nearly half of the facilities lacking a designated telephone or radio for inter-facility communication, and only 40.7% having functional systems. Paper-based emergency charts were generally unavailable in 51.7% of the facilities, and functional electronic emergency charts were present in only 16.7%. Isolation rooms for infectious diseases were also limited, with only 31.7% of the facilities having them functional, highlighting critical areas needing improvement in lower-level healthcare settings. (**Table 32**)

Physical access to emergency units was generally available and functional in 78.3% of facilities, though this was less common at HC IVs, where functionality was at 60%. Designated ambulance spaces were functional in 65% of facilities, with full availability at national referral hospitals. Rapid access to transport ambulances was functional in 63.3% of cases, with complete availability at regional referral hospitals but limited to 44% at HC IVs.)

Provider care during patient transport was widely functional (78.3%) across facilities, peaking at regional referral hospitals (100%). Call and dispatch centers were generally unavailable in 78.3% of facilities, with a mere 10% reporting functional centers, predominantly in general hospitals (17.4%). Staff responsible for these centers were largely absent (70%), particularly in HC IVs (80%), with only 23.3% of facilities having a functional team, notably at general and regional referral hospitals. (**Table 32**)

Patient toilet facilities were functional in 75% of facilities, with the highest functionality at regional and national referrals (88.9% and 100%, respectively). Hand washing facilities in patient care areas were functional in 68.3% of the facilities, with the best availability at general hospitals (78.3%). Systems for stocking, managing, and dispensing were widely functional, reported by 90% of facilities, especially at regional and national referral hospitals (100%). (**Table 32**)

The data indicates that key emergency facility components vary in availability and functionality across different healthcare settings. A dedicated theatre for emergencies is generally functional in 60% of facilities, particularly at national referral hospitals (66.7%). Waiting areas before the emergency department (ED) are functional in 70% of cases, with full availability at regional referrals (100%) and high functionality at general hospitals (73.9%). Triage waiting areas are functional in 65% of facilities, particularly at regional referrals (88.9%). Designated triage areas are functional in 70% of settings, with national referrals showing the highest functionality (100%). Functional resuscitation areas accessible by ambulance are

available in 46.7% of facilities, with regional referrals having the highest functional availability (88.9%). (**Table 32**)

Decontamination areas for poison or toxicology, which are crucial for handling toxic emergencies, are functional in 30% of facilities, with the highest functionality observed at national referrals (66.7%). Overall, national and regional referral hospitals show better infrastructure for emergency services compared to lower-level facilities. (**Table 32**)

3.6.2 Appropriate PPE (personal protective equipment)

More than 54% of the sampled facilities had available and functional Personal Protective Equipment (PPE), including hair covers, eye protection, N95 face masks, impermeable gowns, gloves, and gumboots as necessary. However, it was observed that shoe covers were generally unavailable in 70% (42/60) of the facilities, as indicated in **Table 33**.

3.6.3 Electronic cardiac monitoring equipment

Defibrillators were generally unavailable in 63.3% of facilities, with the lowest availability at HC IVs (80%). Functional defibrillators were mostly found in regional referral hospitals (44.4%) and national referral hospitals (66.7%). Patient monitors were generally lacking in 55.9% of facilities, especially HC IVs (84%), but were fully available and functional at national referral hospitals (100%). (**Table 34**)

Pulse oximeters were available and functional in 81.7% of facilities, with full functionality at regional and national referral hospitals. Blood pressure monitors were available and functional in 86.7% of facilities, with 100% availability at regional and national referral hospitals. Stethoscopes were functional in 85% of facilities, with the highest functionality at general hospitals (87%). Glucometers were functional in 71.7% of facilities, with the highest availability at HC IVs (72%) and regional referral hospitals (77.8%). EKG machines, specifically for national and regional hospitals, were generally unavailable in 61.5% of facilities, with only 23.1% being functional, predominantly at regional referral hospitals (22.2%) and national referral hospitals (33.3%). Overall, higher-level facilities tended to have better access to functional medical equipment compared to lower-level facilities. (**Table 34**)

3.6.4 Airway management equipment

The availability of airway management and emergency equipment varied significantly across different levels of healthcare facilities. Oropharyngeal airways were generally unavailable in 33.3% of facilities, with 40.9% in general hospitals and 50% in national referral hospitals, whereas they were fully functional in only 48.5% of facilities. Nasopharyngeal airways were even less available, with 51.5% of facilities generally lacking them and national referral hospitals having non-available, while only 33.3% of facilities had functional ones. Laryngoscopes were generally unavailable in 39.4% of facilities, particularly in national referral hospitals (66.7%), with 48.5% being functional. Endotracheal tubes were generally unavailable in 38.2% of facilities, with national referral hospitals being the best equipped at 66.7% functionality. (**Table 35**)

Bag-valve-masks were relatively more available, with 64.7% of facilities having functional ones, and all national referral hospitals equipped with them. Suction units were available and functional in 58.8% of facilities, with 77.8% at regional referral hospitals. Oxygen masks were the most available, with 76.5% functional across all facilities, and 100% availability in both regional and national referral hospitals. However, stylets and cricothyrotomy kits were scarce, with

55.9% and 79.4% of facilities generally lacking them, respectively, and only 26.5% of facilities having functional stylets. National referral hospitals had no functional stylets, and only 14.7% of facilities had functional cricothyrotomy kits. (**Table 34**)

Cardiopulmonary resuscitation boards, crucial for providing a hard surface during CPR, were largely unavailable (75.8%), particularly in general hospitals (81.8%). Flashlights for visibility and pupil examination were generally unavailable in 63.6% of facilities, but 30.3% reported them as available and functional. Thermal blankets to prevent hypothermia were largely unavailable (81.8%), particularly in general hospitals and regional hospitals, while sharps containers for safe needle disposal were available in 75.8% of facilities, with the highest availability in general hospitals (77.3%) and national referral hospitals (100%). (**Table 35**)

3.6.5 Crash trolley: advanced equipment

Intraosseous infusion devices for emergency vascular access were generally unavailable in 78.8% of facilities, with slight variations across hospital types, but were available and functional in only 18.2%. Emergency ultrasound devices, vital for diagnostics, were generally available (39.4%), but were often non-functional (21.2%). (**Table 36**).

Spinal needles, crucial for certain procedures, were generally available (42.4%) but were notably lacking in some facilities. Ventilators, essential for respiratory support, were generally unavailable in nearly half of the facilities (48.5%), with regional hospitals showing the highest availability. Pacing equipment for emergency cardiac pacing was largely unavailable (75.8%), with available and functional units at 15.2% of facilities, particularly in general hospitals and regional referral hospitals. These findings underscored the need for improved access and functionality of critical medical equipment across all healthcare tiers. (**Table 36**)


INISTRY OF HEALTH
MASAKA REGIONAL REFERRAL HOSPITAL
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4. Conclusions and Recommendations

4.1 Distribution of Emergency Cases

The assessment of emergency medical cases in Uganda from January to December 2023 reveals that trauma and injuries accounted for 17% of all cases, while infectious diseases made up 14.3%. In comparison, Olive K et al. reported a combined total of 31.1% for both unintentional and intentional injuries(Kobusingye et al., 2006), and the World Bank report attributed 57% of emergency cases to road traffic injuries (RTIs)(Ministry of Health, 2023). The differences can be explained by variations in data sources. Our study included data from facilities with and without proper emergency registers, including some HCIVs, capturing a broader range of cases. On the other hand, the other studies relied on DHIS2 data, which primarily reflects reporting from facilities with established emergency data. systems.

Infectious diseases showed a higher percentage at 34.6% in the previous study compared to the current assessment. Cardiac emergencies in this assessment are lower at 8.1% compared to 16.3% in the Kobusingye et al. (2006) study. The same trend is seen with neurological emergencies, which account for 4.3% of the current data versus 12.5% in the earlier study. These discrepancies might reflect changes in the prevalence of these conditions, improvements in prevention and treatment, or variations in reporting practices. Respiratory emergencies were reported at 6.7% in the current assessment, while the Kobusingye et al. (2006) study reported a lower percentage of 2.3%. This increase could indicate a growing prevalence of respiratory conditions or improved detection and reporting mechanisms.

Regarding emergency outcomes, this assessment revealed a death rate of 2.1%, compared to 4% in the Kobusingye et al. (2006) study and 1.1% in the MOH National Emergency Medical Services Annual Indicator Performance Report 2023 (MOH, 2023). While this indicates a decline in deaths due to emergencies over the past two decades, there appears to be a slight variation of 1% in this assessment. This could be due to reporting discrepancies. These discrepancies may signal a shift in the patterns and types of emergencies or highlight serious issues with the reporting of specific categories of emergencies. Addressing these reporting inconsistencies is crucial for improving emergency medical services in Uganda, ensuring accurate data collection, and better resource allocation.

The Ministry of Health should prioritise the enhancement of EMS data collection systems to improve the availability, access, and accuracy of data in order to accurately estimate the distribution of emergency cases. Most importantly they should devise a means of identifying the emergency cases seen at HCIVs that use OPD registers to record emergency cases.

Ministry of Health and its partners should identify EMS data collection centers of excellence at all facility levels preferably high-volume facilities distributed across major administrative regions and act as sentinel surveillance sites to provide highly accurate data that can be used to model the distribution of emergency services across the entire country.

4.2 Medicines and Supplies

The findings highlight varied strategies for ordering EMS supplies across Ugandan health facilities, with some using structured approaches and others relying on integrated methods needing enhancement. Key challenges identified include frequent stock-outs, unreliable supply schedules, inadequate storage conditions, and financial constraints, all of which impact the readiness and efficiency of emergency medical services. Addressing these issues requires improved supply chain management, adherence to delivery schedules, and better alignment of supply with demand. Additionally, there is a need for enhanced storage facilities, increased funding, staff recruitment and training, and the provision of essential equipment. A multifaceted approach, including standardized guidelines and support systems involving district health offices and partnerships, is essential to enhance the preparedness and efficiency of emergency medical services in Uganda specifically(Muyingo et al., 2022).

The Ministry of Health should prioritize addressing the inconsistent availability of emergency medicines across healthcare facilities. Enhanced coordination with the National Medical Stores (NMS) is essential to ensure reliable delivery schedules and implement a rigorous inventory management system for real-time tracking of stock levels. Leveraging technology can improve monitoring and distribution patterns, reducing the frequency of stock-outs.

Healthcare facilities need dedicated emergency departments with proper storage facilities and trained staff on advanced stock management techniques. This will improve response times and patient outcomes. Targeted procurement strategies should be adopted for medicines like tranexamic acid IV and haloperidol IV, creating a reserve supply of critical medications with volatile availability. Long-term contracts with pharmaceutical suppliers should be secured to guarantee the availability of essential drugs.

Pain management and maternal health medicines, which are generally well-stocked, should serve as models for managing other emergency supplies. Successful strategies ensuring the availability of magnesium sulfate, misoprostol, and oxytocin should be reviewed and potentially replicated for other essential medicines. Public health facilities can learn from private facilities, which have fewer stock-outs due to better ordering systems and electronic monitoring. Implementing electronic health records (EHR) and automated ordering systems can streamline the supply chain and make it more responsive to actual demand. Training healthcare workers in these systems is essential for their success.

Regular audits and feedback loops at the facility level are crucial for proactive stock management. The Ministry of Health should establish a task force to oversee the distribution of emergency medicines, ensuring protocol adherence and accountability for stock management practices.

For ICU medicines and supplies, the Ministry should ensure a consistent supply of critical drugs like nalbuphine, methadone, hydromorphone, and oxycodone by establishing long-term contracts with NMS and other suppliers. A targeted procurement strategy is needed for medications like Morphine PO and Meperidine, and a dedicated supply chain should be developed for essential anesthesia and sedation drugs. Better inventory management and regular audits are necessary to ensure consistent stocking of vital drugs like thiopental, suxamethonium, and rocuronium. Cardiovascular support medications, such as Milrinone and

metaraminol, should be included in essential drug lists and have streamlined procurement processes.

A centralized task force should be established to monitor ICU medicines and supplies, conduct regular assessments, and address any gaps promptly. Training programs should educate healthcare workers on efficient inventory management and the use of new diagnostic equipment.

For Theatres and HDUs, the Ministry should prioritize improving the availability of essential medicines. Establishing long-term contracts with suppliers will ensure a steady supply of critical medications like Enoxaparin and Heparin. Targeted procurement strategies and a centralized procurement system are necessary to address the inconsistent availability of medicines such as protamine sulfate, digoxin, and verapamil. Improving logistics and delivery systems will make medications like Amiodarone, Sodium nitroprusside, and Ranitidine consistently available across all facilities.

4.2.1 Oxygen, Laboratory Services and Equipment

The Ministry of Health should prioritize the expansion and maintenance of oxygen supply systems across all healthcare facilities. While two-thirds of facilities had oxygen concentrators, the availability of central piped oxygen was limited to only 26.7% of facilities. This disparity highlights the need for a targeted initiative to install central piped oxygen systems, particularly in general hospitals and Health Centre IVs, where functional oxygen plants were notably absent.

Additionally, the Ministry should address the gaps in laboratory services, especially in Health Centre IVs where renal and liver function tests were often unavailable. This can be achieved by equipping these centers with the necessary laboratory equipment and reagents, and by providing ongoing training for laboratory technicians to handle and interpret these tests accurately.

The issue of blood storage and transfusion services requires immediate attention. Despite 80% of facilities having functional blood storage equipment, many facilities lacked blood storage units. The Ministry should implement a nationwide program to install and maintain blood storage units in all facilities, with a particular focus on national hospitals. This includes establishing robust supply chains and emergency protocols to reduce the turnaround time for urgent blood transfusions, which currently average 10-19 minutes in over half of the theaters. Enhancing technical support for equipment maintenance will further ensure the reliability of these life-saving services.

To address the limitations of advanced medical equipment, the Ministry of Health should prioritize the procurement and distribution of essential diagnostic tools. Functional stationary X-rays were present in only 35% of facilities, portable X-rays in 11.9%, and ultrasound machines in 79.7%. CT scans, available in just 21.7% of facilities, were primarily located in regional and national hospitals. Expanding access to these diagnostic tools is essential for accurate and timely medical assessments. The Ministry should develop a phased plan to equip all general hospitals and Health Centre IVs with stationary and portable X-ray machines, ultrasound devices, and CT scanners, ensuring comprehensive diagnostic capabilities across all levels of healthcare.

4.3 Human resource for EMS

Human resource for emergency medical services (EMS) across Uganda has critical challenges, including insufficient staffing levels, inadequate training, and a lack of specific personnel dedicated to emergency care. Many healthcare facilities are understaffed, with trained emergency care professionals often rotated to other units, leading to gaps in emergency coverage. Additionally, a significant portion of healthcare workers lack formal training in essential emergency procedures, contributing to suboptimal patient care.

The Ministry of Health should urgently address the human resource challenges in Uganda's emergency medical services (EMS). In Health Centre IVs, while more than 50% of facilities had appointed key personnel such as senior medical officers, clinical officers, and nursing officers, the full-time presence of these cadres in emergency departments was notably low, ranging from 9.1% to 43.5%. To remedy this, the Ministry should implement policies to ensure that these essential staff members are stationed full-time in emergency departments, with senior nursing officers already at 66% needing to be further increased.

Training in Basic Emergency Care (BEC) is also limited, with only 33.3% of health workers in Health Centre IVs, 47% in general hospitals, and 52.4% in regional referral hospitals trained. The Ministry should roll out comprehensive BEC training programs across all healthcare levels, prioritizing Health Centre IVs and general hospitals where the need is greatest. The Ministry should also ensure that these modules are made part of the pre-service training and provide refresher training for the same.

In general hospitals, although 96% of facilities had medical officers, only 58.3% worked full-time in emergency departments, and 60.9% were trained in BEC. Moreover, roles such as emergency medical technicians and emergency care assistants were significantly underrepresented, appointed in only 12% and 8% of facilities, respectively. The Ministry should focus on increasing the appointment and full-time presence of these critical roles by establishing dedicated emergency care units with specialized staff.

Regional referral hospitals showed a similar trend, with general medical officers prevalent at 88.9%, but only 14.3% working full-time in emergency departments. Nursing officers were appointed in only 22.2% of facilities, with half working full-time in emergencies. The Ministry should ensure that all regional referral hospitals have a sufficient number of full-time emergency medical officers and nursing officers. The appointment rates for consultants in emergency medicine, surgery, and specialized fields like intensivists, which are currently very low, should also be increased.

At the national referral level, while the distribution was more robust for some roles, such as medical officers' special grade (SG) in surgery, consultants in emergency medicine, surgery, and specialized fields like intensivists had low appointment rates. The Ministry should focus on recruiting and retaining specialists to ensure that national referral hospitals have the expertise needed for advanced emergency care.

Human resource challenges are compounded by severe understaffing, with some hospitals operating at only 35% of required staffing levels. This shortage extends to emergency departments, often relying on clinicians not specialized in emergency care. Personnel trained in emergency medicine are frequently rotated to other units, leading to a lack of continuity and expertise. The Ministry should implement strategies to retain specialized emergency staff in their designated roles, reducing rotation and ensuring continuity of care.

Inadequate salaries and lack of job promotions, even for those with additional training, further exacerbate staffing issues. The Ministry should review and improve compensation packages and career advancement opportunities for EMS staff, making these positions more attractive and retaining skilled workers.

Capacity-building efforts should be consistent across all facilities. The Ministry should develop and implement ongoing training programs, ensuring that all health workers receive regular updates and skill enhancements. Facilities like Virika Hospital, which have benefited from recent training, should serve as models for implementing successful training programs nationwide.

4.4 EMS Knowledge and Skills

While some healthcare workers have received formal training in essential areas such as Basic Life Support (BLS) and Advanced Life Support (ALS), the overall level of knowledge and training is insufficient. Critical gaps were identified in recognizing and responding to various emergency medical scenarios, indicating a need for enhanced training and education. Only a small percentage of ICU staff had formal training in Pediatric Advanced Life Support (PALS), highlighting a specific area of concern.

The Ministry of Health should urgently enhance the training programs for healthcare workers to address the deficiencies revealed by the knowledge assessment. With only 36.3% of healthcare workers trained in Basic Emergency Care (BEC) and 22.6% in Emergency Triage Assessment and Treatment (ETAT), there is a clear need for a comprehensive and mandatory training initiative. This initiative should aim to provide BEC and ETAT training to all emergency department staff within a specified timeframe. Additionally, partnerships with private training providers should be strengthened to increase access to Basic Life Support (BLS), Advanced Life Support (ALS), and Pediatric Advanced Life Support (PALS) training, which currently reach 34%, 24.5%, and 11.8% of healthcare workers, respectively.

To improve confidence and proficiency across various emergency procedures, the Ministry should implement regular, hands-on training workshops focused on areas where self-assessment scores were lower, such as cervical spine immobilization, pelvic binding, and lumbar puncture. These workshops should be designed to address the specific needs of different cadres, with targeted sessions for medical officers, specialists, clinical officers, and nurses. By focusing on practical skills and offering repeated practice opportunities, healthcare workers can build the necessary confidence and competence.

The alarming deficiencies identified in objective knowledge assessments should be addressed through rigorous, scenario-based training programs. These programs should simulate real-life emergency situations, allowing healthcare workers to practice and refine their skills in a controlled environment. Scenarios should include identifying medication for a woman with

breathing difficulties, determining the cause of poor perfusion in a diabetic man, and knowing the initial action for a collapsed woman with a possible ectopic pregnancy. Additionally, training should cover recognizing high-pitched sounds during inhalation, managing tuberculosis-related breathing difficulties, and diagnosing severe chest pain in elderly patients.

To support these initiatives, the Ministry of Health should establish a continuous professional development (CPD) framework that mandates regular refresher courses and assessments for all emergency department staff. This framework should include periodic evaluations to measure knowledge retention and identify areas requiring further training. By incorporating both theoretical knowledge and practical skills, the CPD framework will ensure that healthcare workers remain proficient and up-to-date with the latest emergency care protocols.

Furthermore, the Ministry should invest in advanced training tools and technologies, such as simulation labs and virtual reality (VR) training modules, to provide immersive and interactive learning experiences. These tools can help bridge the gap between theoretical knowledge and practical application, making training more effective and engaging.

Collaboration with international health organizations and academic institutions can also enhance training programs by incorporating global best practices and innovations in emergency medical care. By leveraging these partnerships, the Ministry can ensure that training programs are comprehensive, evidence-based, and aligned with international standards.

4.5 EMS data

The assessment of emergency data quality, storage, sharing, and utilization at various healthcare levels in Uganda reveals several challenges. While most facilities utilize the daily emergency register within the HMIS and prioritize accurate data collection, issues persist due to outdated EMIS report forms and the eHMIS 105's lack of a dedicated section for emergency reporting. Delayed system updates and inadequate training on the eHMIS system further hinder data accuracy and efficiency. Although some facilities benefit from supportive supervisory visits and capacity-building programs, inconsistencies in data management practices remain.

To address the challenges in Emergency Medical Services (EMS) data management, the Ministry of Health should take a multifaceted approach. Firstly, it is essential to develop a dedicated section for emergency reporting within the electronic Health Management Information System (eHMIS). This enhancement will enable more effective data capture and timely updates, thus improving the overall quality and usability of EMS data.

Implementing robust electronic health records (EHR) and mobile data collection apps that can replace paper-based records and ensure real-time, comprehensive data capture, especially in remote areas. Standardizing data collection processes through unified electronic reporting forms and comprehensive training programs for healthcare workers will ensure consistent and accurate data entry. There is also a need for a template or a well-designed system with customized registers and emergency data collection tools to accurately capture such data as required.

Integration of these tools with the national Health Management Information System (HMIS) is crucial for centralized data aggregation and analysis. Real-time synchronization of data from healthcare facilities to the HMIS will ensure up-to-date information is available for decision-making. Regular audits and quality checks, along with a feedback loop for correcting data entry errors, will maintain data integrity.

Training programs supported by the Ministry and other organizations should be expanded and standardized to address the gaps identified, particularly in facilities like Bwera Hospital, where inadequate training on the eHMIS system leads to inaccuracies in data outputs. A comprehensive training program should be implemented across all healthcare facilities to ensure that staff are proficient in using the eHMIS. This training should include practical sessions on data entry, error correction, and data utilization to enhance the accuracy and reliability of the information captured.

The Ministry of Health should also transition from manual reporting to electronic systems, especially in Health Centre IVs, where 52.2% of facilities still rely on manual reports. Providing these facilities with the necessary technology and training to adopt electronic reporting will significantly reduce errors and improve data accuracy. Additionally, ensuring the availability of critical forms like the ambulance form HMIS EMS 002 and the emergency unit form HMIS EMS 003 is essential for comprehensive data capture.

To address data quality issues, the Ministry should implement regular supervisory visits and standardized feedback mechanisms. The Division of Health Information (DHI) should conduct these visits more frequently and provide consistent, high-quality feedback to facilities. Establishing a structured protocol for feedback provision and error correction will help facilities identify and rectify data collection and reporting issues promptly.

Given that 96.5% of respondents indicated a need for further training on data entry and system usage, the Ministry should establish ongoing education programs. These programs should be designed to provide continuous professional development and keep healthcare workers updated on best practices in data management. Regular refresher courses and workshops will help maintain high standards of data quality and ensure that staff remain competent in using the eHMIS.

Data utilization and sharing practices should also be improved. While 68.4% of facilities have protocols for data review, only 54.4% present analyzed data to staff and stakeholders for quality improvement. The Ministry should mandate regular data review meetings and ensure that the findings are communicated to all relevant parties. This practice will promote a culture of continuous improvement and encourage the use of data-driven decision-making.

Finally, the Ministry should ensure that monthly summary report submissions are consistent across all facilities. Although 98.2% of facilities submit these reports, the regularity and quality of feedback received vary, with only 50% of regional referral hospitals receiving consistent feedback. Establishing a centralized monitoring system to track report submissions and feedback will help ensure that all facilities adhere to reporting protocols and receive the necessary support to improve data quality.

Incentivizing accurate data reporting with performance-based rewards and implementing accountability measures for non-compliance will further enhance data quality. Utilizing the

collected data for policy development, resource allocation, and emergency response planning will ensure that the insights gained lead to tangible improvements in emergency medical services.

4.6 Emergency Department

Regarding the availability and functionality of essential infrastructure, diagnostic equipment, and management protocols across Emergency Departments (EDs), several issues were identified. Many facilities lacked consistent access to critical medical equipment, reliable oxygen supply, and adequate storage and processing facilities. Additionally, there were substantial disparities in the availability of personal protective equipment (PPE), with many facilities reporting frequent shortages. The absence of dedicated and functional emergency spaces, such as isolation rooms and resuscitation areas, further exacerbated the challenges faced by healthcare providers in delivering effective emergency care.

To address the issues in emergency department infrastructure, the Ministry of Health should prioritize improving the availability of clean running water, electricity, and essential communication tools. There is a need to establish dedicated isolation rooms for infectious diseases in all healthcare facilities to prevent the spread of infections and manage patients effectively.

The Ministry should also focus on ensuring that both paper-based and electronic emergency charts are available and functional across all levels of healthcare facilities. This can be achieved by providing the necessary equipment and training for healthcare workers to use these systems efficiently. Lower-level facilities, which struggle with inadequate storage spaces, staff work areas, and toilet facilities, should receive targeted investments to upgrade their infrastructure.

Critical medical equipment, such as defibrillators, patient monitors, and airway management tools, should be made universally available. The Ministry should implement a centralized procurement system to ensure that these essential items are supplied to all facilities, particularly lower-level ones. Additionally, while PPE like N95 masks and gloves are mostly available, the Ministry should ensure the availability of shoe covers and other essential PPE to protect healthcare workers and patients.

For crash trolleys, the Ministry should establish a standard list of required items and ensure that all facilities have fully functional crash trolleys equipped with essential airway management equipment, including oropharyngeal and nasopharyngeal airways, laryngoscopes, and endotracheal tubes. Essential drugs such as Ketamine, midazolam, and propofol should be stocked consistently, with a particular focus on making these medications available in all facilities, not just national referral hospitals. The availability of other critical drugs like epinephrine, amiodarone, and calcium gluconate should also be ensured through improved inventory management and supply chain systems.

5. Appendices

Table 1: General Hospitals and Health Centre IV Assessed per Region.

Region	Hospital Name	Facility Ownership	Health Centre IV	Facility Ownership
Albertine	Bwera hospital	Public	Bukuku HC IV	Public
	Mityana hospital	Public	Ntwetwe HC IV	Public
	Kiboga hospital	Public	Kataraka HC IV	Public
	Kida hospital	PNFP	Kigorobya HC IV	Public
	Virika hospital	PNFP	Midas Torch HC IV	PFP
			St. Paul (Kasese) HC IV	PNFP
Eastern	Bugiri hospital	Public	Bugono HC IV	Public
	Masafu hospital	Public	Busese HC IV	Public
	Iganga hospital	Public	Buvuma HC IV	Public
	Kawolo hospital	Public	Namwendwa HC IV	Public
	Kamuli Mission hospital	PNFP	Kaproron HC IV	Public
	New hope hospital	PNFP	Kibuku HC IV	Public
			Nabilatuk HC IV	Public
North & West Nile	Kiryandongo hospital	Public	Aboke HC IV	Public
	Koboko hospital	Public	Adumi HC IV	Public
	Luwero hospital	Public	River Oli HC IV	Public
	Lacor hospital	PNFP	Atiak HC IV	Public
	Rhema hospital	PNFP	Goli HC IV	PNFP
	Angal hospital	PNFP		
Southwestern	Itojo hospital	Public	Lwengo HC IV	Public
	Kalisizo hospital	Public	Butenga HC IV	Public
	Lyantonde hospital	Public	Kiyumba HC IV	public
	Kitovu hospital	PNFP	Bwizibwera HC IV	Public
	Bamu hospital	PFP	Double cure IV	PNFP
	Nkozi hospital	PNFP		
Central	IHK	PFP	Kasangati HC IV	Public
	Mengo	PNFP	Victoria Medical service	PFP
	Nakesero hospital	PFP		
	Nsambya hospital	PNFP		
Total facilities	**27**		**25**	

**PFP-Private for profit, PNFP-Private not for profit, HC-Health center*

Table 2: National and Regional Referral Hospitals Assessed per Region.

Region	Facility Name	Facility Ownership	Affiliated to university
Albertine	Fort Portal RRH	Public	Yes
	Hoima RRH	Public	Yes
	Mubende RRH	Public	Yes
Eastern	Jinja RRH	Public	Yes
	Mbale RRH	Public	Yes
North & West Nile	Arua RRH	Public	Yes
Southwestern	Masaka RRH	Public	Yes
	Mbarara RRH	Public	Yes
Central	Entebbe RRH	Public	Yes
Total	**09**		
National Referral Hospital			

Central	Kawempe NRH	Public	Yes
	Kiruddu NRH	Public	Yes
	Mulago NRH	Public	Yes
Total	**03**		

*NRH-National referral Hospital, RRH-Regional referral hospital

Table 3: Overall Emergency Cases for the Period of January to December 2023

Month	Central Region	Eastern Region	Albertine Region	North & West Nile Region	Southwestern Region	Total
January	2570	1970	3111	1057	2285	10993
February	2315	2086	2783	870	2357	10411
March	2504	2661	3118	1565	2095	11943
April	2396	1882	3076	1097	2080	10531
May	2648	2893	3360	871	2408	12180
June	2311	1948	3098	978	2236	10571
July	2265	2596	3279	1182	2719	12041
August	2344	2491	2963	1026	2539	11363
September	2092	2377	2851	1340	2665	11325
October	2264	1927	3209	1219	2507	11126
November	2192	1567	3020	1630	2359	10768
December	2259	1667	3372	1035	2350	10683
Total	**28160 (21%)**	**26065 (19.5%)**	**37240 (27.8%)**	**13870 (10.4%)**	**28600 (21.4%)**	**133,935**

**Source: Emergency registers, OPD registers and HMIS 105*

Table 4: Common Emergencies

Type of medical and surgical Emergency	Frequency	Percentage (%)
Trauma and injuries	14300	17
Infectious	12024	14.3
Other Emergency	11083	13.2
Cardiac Emergency	6780	8.1
Gastrointestinal Emergency	6014	7.2
Pediatric emergency	5992	7.1
Respiratory emergency	5604	6.7
Obstetric / Gynecological emergency	5287	6.3
Hematological emergency	3995	4.8
Neurological Emergency	3618	4.3
Intoxication Poisoning emergency	2591	3.1
Endocrine Emergency	2359	2.8
Dental emergency	1605	1.9
Genitourinary emergency	1140	1.4
Psychiatric Emergency	604	0.7
Environmental	505	0.6
Allergic Emergency	332	0.4
Ophthalmic	54	0.06
Total	**83887**	**100**

Table 5: Associated Outcomes for the Period of January to December 2023

Outcomes	Central	Eastern	Albertine	North & west Nile	Southwestern	Total	Percent (%) /133,935
Deaths	590	815	417	99	951	2872	2.1
ICU admissions	22	563	108	0	1	694	0.5
Admitted to the ward	8845	18275	649	342	19785	47896	35.8
Transferred to theatre	53	644	165	301	141	1304	0.97
Discharged	3731	8109	13658	161	16562	42221	31.5
Transferred out	864	326	876	1380	1209	4655	3.5

Source: Emergency registers, OPD registers, and HMIS 105

Table 6: Medicine Stocked and Expected only in Regional Referral and National referral Hospitals

	Medicines Available	Frequency (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Shock Medicine					
Norepinephrine Injection	No	4 (36.4)			
	Yes	7 (63.6)	6 (85.7)	96 (35.6)	1 (16.7); less than 30 days 0 (0); 30-60 days 0 (0); 61-90 days 5 (83.3); 91 days or more
Dobutamine IV	No	2 (100)	N/A	N/A	N/A
Mental Medicine					
Midazolam	No	3 (27.3)			
	Yes	8 (72.7)	5 (62.5)	72.4 (53.6)	1 (20); less than 30 days 1 (20); 30-60 days 1 (20); 61-90 days 2 (40); 91 days or more
Phenytoin injection	No	2 (18.2)			
	Yes	9 (81.2)	7 (77.8)	51.1 (44.6)	2 (28.6); less than 30 days 3 (42.9); 30-60 days 0 (0); 61-90 days 2 (28.6); 91 days or more
Antidotes & Vaccinations					
Anti-rabies immunoglobulin*	No	8 (22.9)			
	Yes	27 (77.1)	18 (66.7)	71.8 (42.9)	4 (22.2); less than 30 days 4 (22.2); 30-60 days 3 (16.7); 61-90 days 7 (38.9); 91 days or more
Anti-venom immunoglobulin*	No	17 (48.6)			
	Yes	18 (51.4)	10 (55.6)	85.9 (44.1)	2 (20); less than 30 days 0 (0); 30-60 days 2 (20); 61-90 days 6 (60); 91 days or more
Antimicrobials					
Amphotericin B *	No	20 (57.1)			
	Yes	15 (42.9)	5 (33.3)	113.4 (15.9)	1 (20); less than 30 days

	0 (0); 30-60 days 0 (0); 61-90 days 4 (80); 91 days or more

***commodity stocked in a National, regional, and General Hospital., SD- Standard deviation**

Table 7: Emergency Medicines for Respiratory Failure Management Available.

Respiratory failure medicine	Medicines Available (at the time of visit)	Frequency (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Adrenaline, n=59	No	6 (10.2)			
	Yes	53 (89.8)	12 (22.6)	67.3 (50.5)	1 (8.3); less than 30 days 6 (50); 30-60 days 0 (0); 61-90 days 5 (41.7); 91 days or more
Hydrocortisone injection, n=60	No	10 (16.7)			
	Yes	50 (83.3)	23 (46)	60.3 (44.0)	6 (26.1); less than 30 days 8 (34.8); 30-60 days 2 (8.7); 61-90 days 7 (30.4); 91 days or more
Salbutamol Aerosol inhalation 100 µg/, n=59	No	18 (30.5)			
	Yes	41 (69.5)	27 (65.9)	77.1 (44.6)	4 (14.8); less than 30 days 8 (29.6); 30-60 days 2 (7.4); 61-90 days 13 (48.2); 91 days or more

SD-Standard deviation

Table 8: Emergency Medicines for Shock Management Available.

Shock medicine	Commodities Available (At time of visit)	Frequency (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Phyto menadione (vitamin K)	No	10 (16.7)			
	Yes	50 (83.3)	0 (0)	0 (0)	
Sodium lactate (Ringer's lactate)	No	6 (10.2)			
	Yes	53 (89.8)	21 (39.6)	55.8 (29.9)	3 (14.3); Less than 30 days 11 (52.4); 30-60 days 4 (19.1); 61-90 days 3 (14.3); 91 days or more
Tranexamic acid IV	No	25 (42.4)			
	Yes	34 (57.6)	31 (91.2)	80.2 (46.9)	4 (12.9); less than 30 days 9 (29); 30-60 days 2 (6.5); 61-90 days

	16 (51.6); 91 days or more

SD-Standard deviation

Table 9: Emergency Medicines Available at the Time of the Visit for Altered Mental Status Management

Mental Medicine	Commodities Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Diazepam rectal	No	8 (13.6)			
	Yes	51 (86.4)	12 (23.5)	61.4 (34.6)	2 (16.7); less than 30 days 3 (25); 30-60 days 5 (41.7); 61-90 days 2 (16.7); 91 days or more
Haloperidol IV	No	30 (51.7)			
	Yes	28 (48.3)	23 (39.7)	79.7 (45.3)	5 (21.7); less than 30 days 4 (17.4); 30-60 days 1 (4.4); 61-90 days 13 (56.5); 91 days or more
Insulin injection	No	10 (16.9)			
	Yes	49 (83.1)	23 (46.9)	65.3 (36.2)	5 (21.7); less than 30 days 6 (26.1); 30-60 days 5 (21.7); 61-90 days 7 (30.4); 91 days or more

SD-Standard deviation

Table 10: Emergency Medicines Available at the Time of the Visit for Pain Management

Pain Medicines	Commodities Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days.	No. of facility (%); Days stocked out
Diclofenac injection	No	8 (13.3)			
	Yes	52 (86.7)	7 (13.5)	161.9 (226.5)	1 (14.3); less than 30 days 3 (42.9); 61-90 days 3 (42.9); 91 days or more
Ketamine	No	12 (20)			
	Yes	48 (80)	10 (20.8)	51.6 (41.6)	4 (40); less than 30 days 2 (20); 30-60 days 1 (10); 61-90 days 3 (30); 91 days or more
Lidocaine injection	No	12 (20)			
	Yes	48 (80)	24 (50)	57.1 (35.6)	6 (25); less than 30 days 7 (29.2) 30-60 days 7 (29.2) 61-90 days 4 (16.7) 91 days or more
Morphine iv	No	34 (58.6)			
	Yes	24 (41.4)	16 (66.7)	91.1 (43.3)	2 (12.5); less than 30 days 2 (12.5); 30-60 days 2 (12.5); 61-90 days 91 days or more
Paracetamol iv	No	35 (60.3)			
	Yes	23 (39.7)	22 (95.7)	87.1 (45.7)	5 (22.7); less than 30 days 5 (22.7); 61-90 days 12 (54.6); 91 days or more
Paracetamol rectal	No	10 (16.9)			
	Yes	49 (83.1)	13 (26.5)	36.6 (23.0)	4 (30.8); less than 30 days 8 (61.5); 30-60 days 1 (7.7); 91 days or more
Pethidine injection	No	18 (30.5)			
	Yes	41 (69.5)	17 (41.5)	78.8 (34.9)	1 (5.9); less than 30 days 4 (23.5); 30-60 days 5 (29.4); 61-90 days

	7 (41.2); 91 days or more

SD-Standard deviation

Table 11: Emergency Medicines Available at the Time of the Visit for Maternal Health Medicine

Maternal Medicine	Commodities Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in the last 4 months (SD) in days	No. of facility (%); Days stocked out
Magnesium sulfate	No	9 (15.3)			
	Yes	50 (84.7)	14 (28)	43.8 (33.2)	6 (42.9); less than 30 days 4 (28.6); 30-60 days 3 (21.4); 61-90 days 1 (7.1); 91 days or more
Misoprostol tab	No	11 (18.6)			
	Yes	48 (81.4)	16 (33.3)	45.5 (38.2)	7 (43.8); less than 30 days 5 (31.3); 30-60 days 2 (12.5); 61-70 days 2 (12.5); 91 days or more
Oxytocin	No	11 (18.3)			
	Yes	49 (81.7)	8 (16.3)	73.3 (49.9)	2 (25); less than 30 days 2 (25); 30-60 days 4 (50); 91 days or more

SD-Standard deviation

Table 12: Emergency Medicines Available at the Time of The Visit for antidotes & vaccinations medicine

Antidotes & Vaccinations	Commodity Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Atropine	No	10 (16.9)			
	Yes	49 (83.1)	14 (28.6)	81.6 (45.8)	5 (29.4); less than 30 days 4 (23.5); 30-60 days 2 (11. 8); 61- 90 days 6 (35.3); 91 days or more
Calcium gluconate	No	18 (30)			
	Yes	42 (70)	17 (40.5)	63.2 (49.4)	5 (29.4); less than 30 days 4 (23.5); 30-60 days 2 (11.8); 61-90 days 6 (35.3); 91 days or more
Naloxone	No	29 (49.2)			

	Yes	30 (50.8)	13 (40.5)	83.3 (43.8)	3 (23.1); less than 30 days 4 (30.8); 61-90 days 6 (46.2); 91 days or more

SD: standard deviation

Table 13: Antimicrobials Emergency Medicines Available at the Time of the Visit

Antimicrobials	Commodity Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Ampicillin injection	No	19 (31.7)			
	Yes	41 (68.3)	29 (70.7)	77.3 (35.6)	3 (10.3); less than 30 days 8 (27.6); 30-60 days 5 (17.2); 61-90 days 13 (44.8); 91 days or more
Artesunate	No	7 (11.7)			
	Yes	53 (88.3)	19 (35.8)	48.9 (37)	7 (36.8); less than 30 days 7 (36.8); 30-60 days 2 (10.5); 61-90 days 3 (15.8); 91 days or more
Ceftriaxone	No	12 (20.3)			
	Yes	47 (79.7)	25 (53.2)	57.2 (32.2)	6 (24); less than 30 days 9 (36); 30-60 days 5 (20); 61-90 days 5 (20); 91 days or more
Gentamicin injection	No	18 (30.5)			
	Yes	41 (69.5)	32 (78.0)	70.2 (36.1)	5 (15.6); less than 30 days 8 (25); 30-60 days 9 (28.1); 61-90 days 10 (31.3); 91 days or more

SD-Standard deviation

Table 14: Emergency Cardiac Medicines Available at the Time of the Visit.

Cardiac	Commodity Available	Frequency, (%)	Facilities with stockouts (%)	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
Furosemide injection	No	6 (10)			
	Yes	54 (90)	11 (20.4)	62.1 (46)	2 (18.2); less than 30 days 5 (45.5); 30-60 days 4 (36.4); 91 days or more
Furosemide	No	12 (50)			
	Yes	12 (50)	11 (91.7)	117.5 (9.7)	
Hydralazine injection	No	14 (23.3)			
	Yes	46 (76.7)	13 (28.3)	68.3 (48.9)	4 (30.8); less than 30 days 3 (23.1); 30- 60 days 1 (7.7); 61-90 days 5 (38.5); 91 days or more
Labetalol injection	No	3 (25)			
	Yes	9 (75)	7 (77.8)	55 (47.9)	3 (42.9); less than 30 days 1 (14.3); 30-60 days 2 (28.6); 61-90 days 1 (14.3); 91 days or more

SD-Standard deviation

Table 15: Other Emergency Medicines and Commodities Available at the Time of The Visit

	Commodity Available	Frequency, (%)	Facilities with stockouts	Average stock out days in last 4 months (SD) in days	No. of facility (%); Days stocked out
0.9% normal saline	No	4 (6.7)			
	Yes	56 (93.3)	18 (32.1)	37.1 (28.1)	9 (50); less than 30 days 7 (38.9); 30-60 days 1 (5.6); 61-90 days 1 (5.6); 91 days or more
Ranitidine iv	No	29 (49.2)			
	Yes	30 (50.9)	20 (66.7)	117.5 (17.0)	2 (10); 61-90 days 18 (90); 91 days or more
Dextrose IV Infusion 50%	No	10 (16.7)			
	Yes	50 (83.3)	21 (42)	50.3 (32.1)	7 (33.3); less than 30 days 7 (33.3); 30-60 days 4 (19.1); 61-90 days 3 (14.3); 91 days or more
Whole blood	No	9 (15.5)			
	Yes	49 (84.5)	12 (24.5)	25.5 (21.8)	8 (66.7); less than 30 days 3 (25); 30-60 days 1 (8.33); 61-90 days
Anti-tetanus immunoglobulin	No	13 (22)			
	Yes	46 (78)	8 (17.4)	74 (43.7)	2 (25); less than 30 days 2 (25); 30-60 days 4 (50); 91 days or more

SD-Standard deviation

Table 16: Oxygen Assessment at the Facility

	Facility Level				
	Total (%), n=60	**HC IV (%), n=25**	**General Hospital (%), n=23**	**Regional Referral (%), n=9**	**National Referral (%), n=3**
Oxygen supplied through a central piped system					
Yes	16 (26.7)	2 (8)	5 (21.7)	**6 (66.7)**	**3 (100)**
No	44 (73.3)	23 (92)	18 (78.3)	3 (33.3)	0 (0)
Oxygen supplied by oxygen concentrator stored on this unit					
Yes	**40 (66.7)**	**16 (64)**	**14 (60.9)**	**8 (88.9)**	**2 (66.7)**
No	20 (33.3)	9 (36)	9 (39.1)	1 (11.1)	1 (33.3)
Oxygen supplied in cylinders that are stored on this unit					
Yes	**46 (76.7)**	**19 (76)**	**18 (78.3)**	**7 (77.8)**	**2 (66.7)**
No	14 (23.3)	6 (24)	5 (21.7)	2 (22.2)	1 (33.3)
Emergency unit calls for oxygen cylinders from a central location if needed					
Yes	**39 (65)**	**15 (60)**	**15 (65.2)**	**7 (77.8)**	**2 (66.7)**
No	21 (35)	10 (40)	8 (34.8)	2 (22.2)	1 (33.3)
Emergency unit calls for oxygen concentrator from central location if needed					
Yes	20 (33.3)	6 (24)	7 (30.4)	4 (44.4)	**3 (100)**
No	40 (66.7)	19 (76)	16 (69.6)	5 (55.6)	0 (0)
Existence of an oxygen plant at the facility					
Yes	15 (25)	0 (0)	3 (13)	**9 (100)**	**3 (100)**
No	45 (75)	25 (100)	20 (87)	0 (0)	0 (0)
Existing oxygen plant functional, n=14					
Yes	**14 (23.3)**	**Na**	**3 (100)**	**8 (88.9)**	**3 (100)**
No	46 (76.7)	Na	0 (0)	1 (11.1)	0 (0)

Table 17: Laboratory Services

	Facility Level				
	Total, n=60 (%)	**HC IV, n=25 (%)**	**General Hospital, n=23 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
24 Hour In-Hospital Access to Laboratory					
Generally unavailable	2 (3.3)	2 (8)	0 (0)	0 (0)	0 (0)
Available and not functional	11 (18.3)	6 (24)	4 (17.4)	1 (11.1)	0 (0)
Available and functional	**47 (78.3)**	**17 (68)**	**19 (82.6)**	**8 (88.9)**	**3 (100)**
Full hemogram CBC machines and reagents					
Generally unavailable	2 (3.3)	2 (8)	0 (0)	0 (0)	0 (0)
Available and not functional	7 (11.7)	4 (16)	2 (8.7)	1 (11.1)	0 (0)
Available and functional	**51 (85)**	**19 (76)**	**21 (91.3)**	**8 (88.9)**	**3 (100)**
Renal function tests and Liver function					
Generally unavailable	18 (30)	17 (68)	1 (4.3)	0 (0)	0 (0)
Available and functional	**42 (70)**	**8 (32)**	**22 (95.7)**	**9 (100)**	**3 (100)**
Cross-matching for blood and blood products					
Generally unavailable	1 (1.7)	1 (4)	0 (0)	0 (0)	0 (0)
Available and functional	**59 (98.3)**	**24 (96)**	**23 (100)**	**9 (100)**	**3 (100)**
Urinalysis					
Generally unavailable	1 (1.7)	1 (4)	0 (0)	0 (0)	0 (0)
Available and not functional	2 (3.3)	2 (8)	0 (0)	0 (0)	0 (0)
Available and functional	**57 (95)**	**22 (88)**	**23 (100)**	**9 (100)**	**3 (100)**
CSF analysis					
Generally unavailable	22 (36.7)	16 (64)	5 (21.7)	0 (0)	1 (33.3)
Available and not functional	6 (10)	4 (16)	2 (8.7)	0 (0)	0 (0)
Available and functional	**32 (53.3)**	**5 (20)**	**16 (69.6)**	**9 (100)**	**2 (66.7)**
Capacity to obtain sterile blood sample					
Generally unavailable	1 (1.7)	0 (0)	1 (4.3)	0 (0)	0 (0)
Available and not functional	3 (5)	2 (8)	0 (0)	1 (11.1)	0 (0)
Available and functional	**56 (93.3)**	**23 (92)**	**22 (95.7)**	**8 (88.9)**	**3 (100)**
System for reporting lab results					
Unavailable	1 (1.7)	0 (0)	1 (4.3)	0 (0)	0 (0)
Hand-delivered	**43 (71.7)**	**20 (80)**	**12 (52.2)**	**9 (100)**	**2 (66.7)**
Electronic	16 (26.7)	5 (20)	10 (43.5)	0 (0)	1 (33.3)
Urine dipstick					
Generally unavailable	11 (18.3)	5 (20)	3 (13)	3 (33.3)	0 (0)
Available and not functional	3 (5)	2 (8)	0 (0)	1 (11.1)	0 (0)
Available and functional	**46 (76.7)**	**18 (72)**	**20 (87)**	**5 (55.6)**	**3 (100)**
Urine pregnancy					
Generally unavailable	5 (8.3)	1 (4)	2 (8.7)	2 (22.2)	0 (0)
Available and not functional	1 (1.7)	1 (4)	0 (0)	0 (0)	0 (0)
Available and functional	**54 (90)**	**23 (92)**	**21 (91.3)**	**7 (77.8)**	**3 (100)**
Glucose					
Generally unavailable	2 (3.3)	1 (4)	0 (0)	1 (11.1)	0 (0)
Available and functional	**58 (96.7)**	**24 (96)**	**23 (100)**	**8 (88.9)**	**3 (100)**
Malaria Rapid Diagnostic Test (RDT)					
Generally unavailable	3 (5.1)	1 (4.2)	1 (4.3)	1 (11.1)	0 (0)
Available and not functional	1 (1.7)	0 (0)	0 (0)	1 (11.1)	0 (0)
Available and functional	**55 (93.2)**	**23 (95.8)**	**22 (95.7)**	**7 (77.8)**	**3 (100)**
Blood Slide for Malaria					
Generally unavailable	5 (8.3)	1 (4)	3 (13)	1 (11.1)	0 (0)

Available and not functional	3 (5)	2 (8)	1 (4.3)	0 (0)	0 (0)
Available and functional	**52 (86.7)**	**22 (88)**	**19 (82.6)**	**8 (88.9)**	**3 (100)**
Rapid HIV testing					
Generally unavailable	1 (1.7)	0 (0)	1 (4.3)	0 (0)	0 (0)
Available and not functional	1 (1.7)	0 (0)	0 (0)	0 (0)	1 (33.3)
Available and functional	**58 (96.7)**	**25 (100)**	**22 (95.7)**	**9 (100)**	**2 (66.7)**

Table 18: Advanced Equipment

Facility Level					
	Total, n=60 (%)	**HC IV, n=25 (%)**	**General Hospital, n=23 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
Stationary X-ray					
Generally unavailable	27 (45)	18 (72)	8 (34.8)	1 (11.1)	0 (0)
Available and not functional	12 (20)	2 (8)	6 (26.1)	3 (33.3)	1 (33.3)
Available and functional	21 (35)	5 (20)	9 (39.1)	**5 (55.6)**	**2 (66.7)**
Portable X-ray for use in emergency unit, n=59					
Generally unavailable	**48 (81.4)**	**21 (87.5)**	**17 (73.9)**	**8 (88.9)**	**2 (66.7)**
Available and not functional	4 (6.8)	1 (4.2)	3 (13)	0 (0)	0 (0)
Available and functional	7 (11.9)	2 (8.3)	3 (13)	1 (11.1)	1 (33.3)
Ultrasound in the hospital, n=59					
Generally unavailable	8 (13.6)	8 (33.3)	0 (0)	0 (0)	0 (0)
Available and not functional	4 (6.8)	3 (12.5)	1 (4.3)	0 (0)	0 (0)
Available and functional	**47 (79.7)**	**13 (54.2)**	**22 (95.7)**	**9 (100)**	**3 (100)**
Point of care Ultrasound					
Generally unavailable	**40 (66.7)**	**20 (80)**	**14 (60.9)**	**5 (55.6)**	**1 (33.3)**
Available and not functional	3 (5)	1 (4)	0 (0)	1 (11.1)	1 (33.3)
Available and functional	17 (28.3)	4 (16)	9 (39.1)	3 (33.3)	1 (33.3)
CT scan					
Generally unavailable	47 (78.3)	25 (100)	20 (87)	2 (22.2)	0 (0)
Available and functional	13 (21.7)	0 (0)	3 (13)	**7 (77.8)**	**3 (100)**
System for reporting radiology result					
Unavailable	14 (23.3)	**14 (56)**	0 (0)	0 (0)	0 (0)
Hand delivered	**33 (55)**	**6 (24)**	**17 (73.9)**	**7 (77.8)**	**3 (100)**
Electronic system	13 (21.7)	5 (20)	6 (26.1)	2 (22.2)	0 (0)

Table 19: Human Resource at National Referral Hospitals (NRHs)

Cadre	Frequency, n=3 (%)	Full-time at Emergency department (%)	Average cadre per facility
Senior Consultant Emergency Medicine (By appointment, not qualification)			
Yes	0 (0)	0 (0)	0
No	3 (100)		
Consultant Emergency Medicine			
No	3 (100)	-	-
Consultant -Surgery			
Yes	1 (33.3)	1 (33.3)	2
No	2(66.7)		
Medical Officer Special Grade -Surgery			
Yes	2 (66.7)	2 (100)	10
No	1 (33.3)		
Medical Officer SG - Emergency Physician			
Yes	1 (33.3)	1 (100)	1
No	2 (66.7)		
Medical Officer			
Yes	2 (66.7)	2 (100)	9
No	1 (33.3)		
Senior Nursing Officer			
Yes	1 (33.3)	1 (100)	1
No	2 (66.7)		
Nursing Officers			
Yes	2 (66.7)	2 (100)	2.5
No	1 (33.3)		
Assistant Nursing Officers			
Yes	3 (100)	3 (100)	8
Emergency Medical Technicians			
No	3 (100)	Na	Na
Call and Dispatch Officers			
Yes	1 (33.3)	Na	
No	2 (66.7)		
Theatre Assistants			
Yes	2 (66.7)	Na	
No	1 (33.3)		
Theatre Attendants			
Yes	1 (33.3)	Na	
No	2 (66.7)		
Porters/Cleaners			
Yes	3 (100)	Na	
Senior Consultant			
No	3 (100)	-	
Consultant			
No	3 (100)	-	
Medical Officer SG			
Yes	1 (33.3)	1 (100)	2
No	2 (66.7)		
Nutritionist			
Yes	2 (66.7)	1 (50)	1
No	1 (33.3)		

Senior Nursing Officer			
Yes	2 (66.7)	2 (100)	1
No	1 (33.3)		
Nursing Officer			
Yes	2 (66.7)	2 (100)	5
No	1 (33.3)		
Assistant Nursing Officers			
Yes	3 (100)	3 (100)	8.7
Principal Nursing Officer			
Yes	1 (33.3)	1 (100)	2
No	2 (66.7)		
Senior Nursing Officers			
No	3 (100)	-	-
Nursing Officers			
Yes	1 (33.3)	1 (100)	1
No	2 (66.7)		
Assistant Nursing Officers			
Yes	3 (100)	3 (100)	8.7
Senior Theatre Assistant			
Yes	1 (33.3)	Na	2
No	2 (66.7)		
Theatre Assistants			
Yes	2 (66.7)	Na	1
No	1 (33.3)		
Senior Consultant (Intensivist)			
No	1 (100)	-	Na
Consultant (Intensivist)			
No	1 (100)	-	Na
Medical Officer Special Grade -Intensivist			
Yes	1 (100)	1 (100)	8
Medical Officer Special Grade -Emergency Medicine			
No	1 (100)	-	Na
Medical Officer Special Grade -Anaesthesia			
Yes	1 (100)	1 (100)	2
Senior Nursing Officers			
No	1 (100)	1 (100)	-
Nursing Officers			
Yes	1 (100)	1 (100)	5
Respiratory Technicians			
No	1 (100)	Na	-

Table 20: Human Resource quantities and distribution and competencies of emergency care workers in Regional Referral hospital by appointment, not qualification.

Cadre	Appointed At facility	Frequency, n=9 (%)	Full-time at Emergency department (%)	Average cadre per facility	Trained in BEC
Consultant Emergency Medicine	Yes	1 (11.1)	1 (100)	3	N/a
	No	8 (88.9)			
Medical Officer SG - Emergency Medicine	Yes	1 (11.1)	1 (100)	2	
	No	8 (88.9)			
Medical Officer	Yes	8 (88.9)	1 (14.3)	9	6 (75)
	No	1 (11.1)			
Principal Nursing Officer	Yes	1 (12.5)	0 (0)	1	0 (0)
	No	7 (87.5)			
Senior Nursing Officer	Yes	2 (22.2)	1 (50)	6	1 (50)
	No	7 (77.8)			
Nursing Officers	Yes	2 (22.2)	1 (50)	2	0(0)
	No	7 (77.8)			
Assistant Nursing Officer	Yes	8 (88.9)	4 (50)	26	4 (50)
	No	1 (11.1)			
Regional EMS Officer	Yes	3 (33.3)	3 (42.9)		N/a
	No	6 (66.7)			
Senior Medical Officer	Yes	3 (33.3)	2 (66.7)	2	2 (66.7)
	No	6 (66.7)			
Medical Officer	Yes	7 (77.8)	5 (71.4)	8	3 (42.9)
	No	2 (22.2)			
IT Officer	Yes	1 (11.1)	1 (100)	1	N/a
	No	8 (88.9)			
Technician (ICT)	No	9 (100)	N/a		N/a
Supervisor Call Centre	No	9 (100)	N/a		N/a
Medical dispatcher	Yes	1 (11.1)	0 (0)	2	N/a
	No	8 (88.9)			
Call Agent	No	9 (100)	N/a		N/a
Assistant Secretary Logistics	Yes	1 (11.1)	0 (0)		N/a
	No	8 (88.9)			
Drivers	Yes	9 (100)	7 (77.8)		N/a
Children's' emergency Department, Frequency, n=3 (%)					
Consultant (Intensivist)	No	3 (100)	0 (0)	Na	N/a

Medical officer Special Grade - Intensivist	No	3 (100)	0 (0)	Na	N/a
Medical officer Special Grade - Emergency Medicine	No	3 (100)	0 (0)	Na	N/a
Medical officer Special Grade - Anesthesia	Yes	1 (33.3)	0 (0)		N/a
	No	2 (66.7)			
Senior Nursing Officers	Yes	2 (66.7)	1 (50)	2	N/a
	No	1 (33.3)			
Nursing Officers	Yes	3 (100)	0 (0)	2	N/a
Respiratory Technicians	No	3 (100)	0 (0)		N/a

Table 21: Human Resource quantities and distribution and competencies of emergency care workers in General hospitals by appointment, not qualification.

Cadre	Appointed at facility	Frequency, n=25 (%)	Full-time at Emergency department (%)	Average cadre per facility	Trained in BEC (%)
Medical Officer SG - Surgery	Yes	11 (44)	3 (18.2)	1	N/a
	No	14 (56)			
Medical Officer SG-Medicine	Yes	7 (28)	4 (57.2)	1	N/a
	No	18 (72)			
Senior Medical Officer	Yes	16 (64)	4 (25.1)	1	8 (50%)
	No	9 (36)			
Medical Officer	Yes	24 (96)	14 (58.3)	3	14 (60.9)
	No	1 (4)			
Senior Clinical Officer	Yes	14 (60.9)	4 (28.6)	1	6 (42.9)
	No	9 (39.1)			
Clinical Officer	Yes	23 (92)	10 (43.5)	3	7 (30.4)
	No	2 (8)			
Emergency Medical Technician	Yes	3 (12)	1 (33.3)	2	N/a
	No	22 (88)			
Emergency Care Assistant	Yes	2 (8)	1 (50)	1	1 (50)
	No	23 (92)			
Drivers	Yes	23 (92)	18 (78.3)	Na	N/a
	No	2 (8)			
Senior Nursing Officer	Yes	8 (32)	3 (37.5)	4	2 (25)
	No	17 (68)			
Senior Anaesthetic Officer	Yes	8 (32)	2 (25)	Na	6 (75)
	No	17 (68)			
Anaesthetic Officer	Yes	20 (80)	6 (30)	Na	11 (55)
	No	5 (20)			
Nursing Officer	Yes	14 (56)	7 (50)	5	6 (42.3)
	No	11 (44)			
Assistant Anaesthetic Officer	Yes	6 (24)	3 (50)	1	2 (40)
	No	19 (76)			
Assistant Nursing Officer	Yes	21 (84)	13 (61.9)	4	9 (45)
	No	4 (16)			
Children's' emergency Department, Frequency (%), n=2					
Medical Officer Special Grade -Emergency Medicine	Yes	1 (50)	0 (0)	1	N/a
	No	1 (50)			
Medical officer Special Grade -Anesthesia	No	2 (100)	N/a	Na	N/a
Senior Nursing Officers	No	2 (100)			N/a
Nursing Officers	Yes	2 (100)	2 (100)	5	

Respiratory Technicians	No	2 (100)	N/a		N/a

Table 22: Human Resource quantities and distribution and competencies of emergency care workers in HC IVs by appointment, not qualification.

Cadre	Appointed at facility	Frequency (%), n=24	Full-time at Emergency department (%)	Average cadre per facility	Trained in BEC
Senior Medical Officer	Yes	16 (66.7)	3 (18.8)	1	5 (33.3)
	No	8 (33.3)			
Medical officer	Yes	21 (87.5)	5 (23.8)	1	7 (36.8)
	No	3 (12.5)			
Senior clinical officer	Yes	16 (66.7)	4 (15)	1	6 (40%)
	No	8 (33.3)			
Clinical officer	Yes	19 (79.2)	7 (36.9)	2	7 (36.9)
	No	5 (20.8)			
Senior nursing officer	Yes	11 (45.8)	1 (9.1)	1	3 (27.3)
	No	13 (54.2)			
Nursing officers	Yes	13 (54.2)	4 (30.8)	2	3 (23.1)
	No	11 (45.8)			
Assistant nursing officers	Yes	14 (58.3)	2 (14.3)	1	4 (28.6)
	No	10 (41.7)			
Senior enrolled nurse	Yes	3 (12.5)	2 (66.6)	2	0 (0)
	No	21 (87.5)			
Enrolled nurses	Yes	23 (95.8)	10 (43.5)	4	4 (18.2)
	No	1 (4.2)			
Anesthetic Officer	Yes	14 (58.3)	Na	1	7 (50)
	No	10 (41.7)			
Assistant Anesthetic Officer	Yes	7 (29.2)	Na	1	3 (42.9)
	No	17 (70.8)			
Senior Theatre Assistant	Yes	2 (8.3)	Na	1	0 (0)
	No	22 (91.7)			
Theatre Assistant	Yes	18 (75)	Na	1	5 (29.4)
	No	6 (25)			

Table 23: Self-assessment average rate of confidence in performing the following procedures during emergencies in adults.

Cadre	Nurses	Clinical officer	Medical officer	Specialist/ Consultant	Others	Avg.
Procedures	**Average self-assessment of (a score of 1-10)**					
Assessing ABCDE	7.5	8.3	8.9	8.6	6.8	**8.0**
Cervical spine immobilization	5.1	5.7	6.9	4.8	6.2	**5.7**
Head-tilt and chin-lift/jaw thrust	6.4	7.4	8.3	9.6	6.8	**7.7**
Management of choking	6.4	7.5	7.1	7.4	6.8	**7.0**
Recovery position	8.6	8.3	9.1	10	8.8	**9**
Nasopharyngeal and oropharyngeal airway placement			6.6	10		**8.3**
Bag-valve-mask ventilation	6.9	6.4	7.7	9.5	6.9	**7.5**
Indication for oxygen and equipment for appropriate Oxygen administration	8.2	7.9	8.8	9.1	8.5	**8.5**
AVPU/GCS (alert, voice, pain, unresponsive) Assessment	7.2	8	9	8.4	6.9	**7.9**
Indications for and dosing of Glucose	7.6	7.8	9	8.2	5.7	**7.7**
Needle decompression for tension pneumothorax			7.5	5		**6.3**
Three-sided dressing for chest wound	5.2	5.5	6.4	5.6	5.9	**5.7**
Intravenous (IV) line placement	9	7.9	9.1	9.9	8.8	**8.9**
Choice of IV fluid and dosing	8.3	8.5	9.3	8.9	7.5	**8.5**
Direct pressure for haemorrhage control, including deep wound packing	8.2	8.3	8.7	7.6	8.3	**8.2**
Achieving haemorrhage control with Tourniquet	7.9	8.3	8.4	7.5	8	**8.0**
Pelvic binding	4.7	4.9	5.2	5	5	**5**
Wound management	8.3	8.2	8.8	8	8.6	**8.4**
Fracture immobilization	6.9	7.6	8.2	6.4	8.4	**7.5**
Lumbar Puncture			7.6	9.5		**8.6**
Conducting CPR			7.9	9.5		**8.7**
PPH Management	6	6.6	8.2	7	4.3	**6.4**
Management of the third stage of labor	6.5	6.9	8.4	4.5	3.4	**5.9**
MVA/D&C			8.3	8		**8.2**
Poisoning/ toxicology	6.6	7.6	7.7	5	4.9	**6.4**
Management of snake bite	6.6	8.2	7.9	4.9	5.5	**6.6**
Management of dog bite	7.2	8.2	8.3	6.3	6.2	**7.2**

Endotracheal intubation			4.9	9.5		**7.2**
FB removal			6.5	8.5		**7.5**
Burns assessment			8.3	5.5		**6.9**
Overall Average	**7.1**	**7.5**	**7.9**	**7.6**	**6.7**	**7.4**

Table 24: Self-assessment average rate of confidence in performing the following procedures during emergencies in Children.

Cadre	Nurses	Clinical officer	Medical officer	Specialist/ Consultant	Others	Average
Procedures	**Average self-assessment of (a score of 1-10)**					
Assessing ABCDE	7.4	8.4	8.9	8.4	6.7	**8**
Cervical spine immobilization	5	5.5	7.2	5.5	5.5	**5.7**
Head-tilt and chin-lift/jaw thrust	6.3	7.2	8.2	9.8	6.9	**7.7**
Management of choking	6.4	7.1	7.3	7	6.5	**6.9**
Recovery position	8.5	8.3	8.9	10	8.1	**8.8**
Nasopharyngeal and oropharyngeal airway placement			6.9	7.5		**7.2**
Bag-valve-mask ventilation	6.6	6.2	8	8.6	6.4	**7.2**
Indication for oxygen and equipment for appropriate Oxygen administration	8	8.2	8.9	9.3	7.5	**8.4**
AVPU/GCS (alert, voice, pain, unresponsive) Assessment	6.6	7.7	9	7.8	6	**7.4**
Indications for and dosing of Glucose	7.1	8.4	8.6	6.9	4.7	**7.1**
Needle decompression for tension pneumothorax			7	5.5		**6.3**
Three-sided dressing for chest wound	4.9	5.2	6.8	5	3.7	**5.1**
Intravenous (IV) line placement	8.3	8	8.6	7.5	5.5	**7.6**
Choice of IV fluid and dosing	7.9	8.5	9.1	8	5.8	**7.9**
Direct pressure for hemorrhage control, including deep wound packing	7.7	8.1	8.7	7	7	**7.7**
Achieving hemorrhage control with Tourniquet	7.4	7.8	8.7	7.1	7.3	**7.7**
Pelvic binding	4.5	4.4	5.4	5	5.2	**4.9**
Wound management	8.1	8.4	8.9	7.3	8.5	**8.2**
Fracture immobilization	6.7	8.1	8.5	7.1	8.4	**7.8**
Lumbar Puncture			7.3	5		**6.2**
Conducting CPR	6.2		7.8	5		**6.3**
Poisoning/ toxicology	6.6	7.4	7.6	6	4.6	**6.4**
Management of snake bite	6.8	8.1	8.1	5.1	5.7	**6.8**
Management of dog bite		8.1	8.1	6.5	4.9	**6.9**
Endotracheal intubation			5.6	9.5		**7.6**
FB removal			6.7	5		**5.9**
Burns assessment			8.5	4.5		**6.5**
Overall Average	**6.9**	**7.5**	**7.9**	**6.9**	**6.2**	**7**

Table 25: Objective Assessment of Basic emergency care Knowledge.

Objective assessment	Answered correctly	Frequency	Percentage (%)
A 26-year-old man crashed his car into an electrical power pole and appears to be unconscious in the driver seat. The car is badly damaged and power lines have fallen onto the car which are still sparking. What is your first action? (n=242)	Yes	46	19
	No	196	81
You are managing the airway of a 60-year-old man that has collapsed after having chest pain. You are worried about his airway and place an oropharyngeal airway (OPA) and he gags. What is your next step? (n=235)	Yes	99	42.1
	No	136	57.9
One of your staff members accidentally ate peanuts with her lunch and she has a history of allergies. She is now having severe difficulty in breathing, swelling of the mouth and lips, and developing a rash on her face, chest, and arms. What is your next step? (n=237)	Yes	133	56.1
	No	104	43.9
Which of the following is a sign of shock? (n=236)	Yes	220	93.2
	No	16	6.8
A 24-year-old woman is complaining of difficulty in breathing for the past 3 days getting gradually worse. She has wheezing on exam and her vital signs are blood pressure 140/80 mmHg, heart rate 110 beats per minute, respiratory rate 24 breaths per minute. What medication would you give her? (n=235)	Yes	2	0.9
	No	233	99.1
You are taking care of a 22-year-old man who has been sick for the past we sick for the past week. He is confused and has rapid, deep breathing and a sweet smell on his breath. His vital signs are blood pressure is 90/50 mmHg and his heart rate is 120 beats per minute. His family states that he is a diabetic but has not been taking his insulin for the past few days because he was vomiting and could not eat. He has been urinating a lot. What is the most likely because of his poor perfusion? (n=237)	Yes	3	1.3
	No	234	98.7
A 32-year-old female collapsed and is brought to you for evaluation. She is awake now but feels dizzy. Her vital signs are: blood pressure is 84/48 mmHg, heart rate is 125 beats per minute, and respiratory rate is 18 breaths per minute. She is complaining of abdominal pain and a small amount of vaginal bleeding. What is the first action that you should take to manage her possible ectopic pregnancy? (n=240)	Yes	2	0.8
	No	238	99.2
You are listening to the lungs of a person with difficulty in breathing and you hear a high-pitched sound when breathing IN. What is this called? (n=236)	Yes	9	3.8
	No	227	96.2
You are taking care of a 40-year-old man with tuberculosis who has difficulty in breathing. On exam he has distended neck veins and muffled heart sounds. His vital signs are: blood pressure 80/40 mmHg, heart rate 130 beats per minute, respiratory rate 30 breaths per minute. What is the most likely because of his difficulty in breathing? (n=238)	Yes	12	5
	No	226	95
A 70-year-old woman comes in with severe chest pain. She has crackles in her lungs on both sides and distended neck veins. Her vital signs are blood pressure is 80/50 mmHg, and her capillary refill is 5 seconds. What is the most likely possible cause? (n=239)	Yes	6	2.5
	No	233	97.5
An ambulance brings you a 28-year-old man that was found unconscious at home. You do not see any trauma, but his both pupils are very small, and he has a slow respiratory rate. What medication would you give? (n=240)	Yes	123	52.1
	No	113	47.9

A 30-year-old male is found confused at the bus stop. He is brought to you for evaluation and is found to be responsive to verbal stimuli. His vital signs are: blood pressure 134/78 mmHg, heart rate 96 beats per minute, respiratory rate 16 breaths per minute. His pupils are equal and reactive, and his blood glucose is 1.5 mmol/L. What is the recommended treatment? (n=240)	Yes	7	2.9
	No	233	97.1
Objective assessment	**Answered correctly**	**Frequency**	**Percentage (%)**
You are taking care of a 70-year-old man who suffered a stroke and is now complaining of a severe headache. He is very sleepy and confused. You are concerned for possible bleeding in the brain and are arranging transfer to a referral facility. What treatment can you provide while awaiting transfer? (n=240)	Yes	142	59.9
	No	95	40.1
What do you need to worry about after you have given naloxone for an opioid overdose? (n=228)	Yes	79	34.6
	No	149	65.4
You are called outside to evaluate a 19-year-old male who fell and is now laying on the ground. He is confused but awake. He has a laceration on his head from the fall. Which of the following should you do first? (n=238)	Yes	90	37.8
	No	148	62.2

Table 26: Objective Assessment of basic emergency care categorised

Category	Number of questions	Percentage who answered correctly	Average percentage per category
Exposure/Environment	2; Qn.1	19	28.4
	Qn.15	37.8	
Airway	1; Qn.2	42.1	42.1
Breathing	4; Qn.3	56.1	25
	Qn.5	0.9	
	Qn.8	38	
	Qn.9	5	
Shock/ Circulation	4; Qn.4	93.2	24.5
	Qn.6	1.3	
	Qn.7	0.8	
	Qn.10	2.5	
Disability	4; Qn.11	52.1	37.4
	Qn.12	2.9	
	Qn.13	59.9	
	Qn.14	34.6	

Table 27: Availability of data management system and data storage

	Facility Level				
	HC IV (%)	General Hospital (%	Regional Referral	National RH (%)	Total, n=57 (%
Type of medical records you have at the emergency department					
Manual	12 (52.2)	11 (47.8)	3 (37.5)	0 (0)	26 (45.6)
Electronic	1 (4.3)	1 (4.3)	1 (12.5)	0 (0)	3 (5.3)
Both	10 (43.5)	11 (47.8)	4 (50)	3 (100)	28 (49.1)
Does the data system have access to the Internet?					
Yes	9 (39.1)	10 (43.5)	4 (50)	3 (100)	26 (45.6)
No	14 (60.9)	13 (56.5)	4 (50)	0 (0)	31 (54.4)
Does the facility have a register at the emergency unit					
Yes	7 (30.4)	10 (43.5)	7 (87.5)	0 (0)	24 (42.1)
No	16 (69.6)	13 (56.5)	1 (12.5)	3 (100)	33 (57.9)
Is the register actively used, n=43					
Yes	15 (93.8)	13 (81.3)	8 (100)	3 (100)	39 (90.7)
No	1 (6.3)	3 (18.8)	0 (0)	0 (0)	4 (9.3)
Does the facility have an ambulance form HMIS EMS 002					
Yes	6 (26.1)	4 (17.4)	4 (50)	1 (33.3)	15 (26.3)
No	17 (73.9)	19 (82.6)	4 (50)	2 (66.7)	42 (73.7)
Is the ambulance form actively used, n=15					
Yes	4 (66.7)	1 (25)	4 (100)	0 (0)	9 (60)
No	2 (33.3)	3 (75)	0 (0)	1 (100)	6 (40)
Does the facility have an emergency unit form HMIS EMS 003					
Yes	4 (17.4)	4 (17.4)	2 (25)	1 (33.3)	11 (19.3)
No	19 (82.6)	19 (82.6)	6 (75)	2 (66.7)	46 (80.7)
Is the emergency unit form actively used, n=11					
Yes	2 (50)	1 (25)	2 (100)	1 (100)	6 (54.5)
Sometimes	2 (50)	1 (25)	0 (0)	0 (0)	3 (27.3)
No	0 (0)	2 (50)	0 (0)	0 (0)	2 (18.2)
Does the unit have emergency referral forms					
Yes	8 (34.8)	13 (56.5)	6 (75)	0 (0)	27 (47.4)
No	15 (65.2)	10 (43.5)	2 (25)	3 (100)	30 (52.6)
Does the unit have a referral register?					
Yes	6 (26.1)	9 (39.1)	3 (37.5)	0 (0)	18 (31.6)
No	17 (73.9)	14 (60.9)	5 (62.5)	3 (100)	39 (68.4)

Table 28: Emergency data quality and Quality Assurance

	Facility Level				
	HC IV (%)	General Hospital (%)	Regional referral (%)	National RH (%)	Total, n=57
Health facility receive regular supportive supervisory visits from the DHI team (Division of Health Information)					
Yes	20 (87)	17 (73.9)	4 (50)	3 (100)	44 (77.2)
No	3 (13)	6 (26.1)	4 (50)	0 (0)	13 (22.8)
When the last data quality assurance done					
Within the last 3 months	15 (65.2)	12 (52.2)	3 (37.5)	2 (66.7)	32 (56.1)
More than 6 months	2 (8.7)	2 (8.7)	2 (25)	0 (0)	6 (10.5)
More than 12 months	2 (8.7)	2 (8.7)	1 (12.5)	0 (0)	5 (8.8)
Never	4 (17.4)	7 (30.4)	2 (25)	1 (33.3)	14 (24.6)
Was feedback given					

Yes	14 (60.9)	15 (65.2)	5 (71.4)	2 (100)	36 (65.5)
No	8 (34.8)	8 (34.8)	2 (28.6)	0 (0)	18 (32.7)
I don't know	1 (4.3)	0 (0)	0 (0)	0 (0)	1 (1.8)
Are there any procedures in place to correct data errors in the registers					
Yes	18 (78.3)	16 (69.6)	7 (87.5)	1 (33.3)	42 (73.7)
No	4 (17.4)	6 (26.1)	1 (12.5)	2 (66.7)	13 (22.8)
I don't know	1 (4.3)	1 (4.3)	0 (0)	0 (0)	2 (3.5)

Table 29: Staff Training on emergency data systems

Facility Level					
	HC IV (%), n=23	**General Hospital (%), n=23**	**Regional RH (%), n=4**	**National RH (%), n=3**	**Total, n=57 (%)**
Is there a dedicated emergency data staff					
Yes	10 (43.5)	12 (52.2)	4 (50)	2 (66.7)	28 (49.1)
No	13 (56.5)	11 (47.8)	4 (50)	1 (33.3)	29 (50.9)
Are staff members trained on how to use data collection or reporting tools					
Yes, all	9 (39.1)	5 (21.7)	2 (25)	0 (0)	16 (28.1)
Yes, some	6 (26.1)	8 (34.8)	4 (50)	2 (66.7)	20 (35.1)
No	7 (30.4)	9 (39.1)	2 (25)	1 (33.3)	19 (33.3)
I don't know	1 (4.3)	1 (4.3)	0 (0)	0 (0)	2 (3.5)
Did the training involve any issues regarding Emergency data handling					
Yes	10 (45.5)	9 (40.9)	5 (71.4)	1 (50)	25 (47.2)
No	12 (54.5)	13 (59.1)	2 (28.6)	1 (50)	28 (52.8)
Does the data team conduct CMEs or training with health workers on emergency data documentation					
Yes	9 (39.1)	9 (39.1)	3 (37.5)	1 (33.3)	22 (38.6)
No	14 (60.9)	14 (60.9)	5 (62.5)	2 (66.7)	35 (61.4)
When was the last time the data team trained health workers on documenting emergency data, n=22					
Within the last 3 months	5 (55.6)	5 (55.6)	0 (0)	0 (0)	10 (45.5)
More than 6 months	2 (22.2)	2 (22.2)	3 (100)	1 (100)	8 (36.4)
More than 12 months	2 (22.2)	2 (22.2)	0 (0)	0 (0)	4 (18.2)
Do you think staff members require further training on data entry or system usage					
Yes	21 (91.3)	23 (100)	8 (100)	3 (100)	55 (96.5)
No	2 (8.7)	0 (0)	0 (0)	0 (0)	2 (3.5)

Table 30: Compliance, Data Utilizations and Reporting

Facility Level					
	HC IV (%)	**General Hospital (%)**	**Regional Referral (%)**	**National RH (%)**	**Total n=57 (%)**
Is there a protocol/schedule for data review and decision-making based on the data reviewed					
Yes	16 (69.6)	17 (73.9)	5 (62.5)	1 (33.3)	39 (68.4)
No	7 (30.4)	6 (26.1)	3 (37.5)	2 (66.7)	18 (31.6)
If there is a schedule for data review, is emergency unit data included in these reviews, n=52					
Yes	9 (40.9)	11 (50)	5 (71.4)	1 (100)	26 (50)
No	13 (59.1)	10 (45.5)	2 (28.6)	0 (0)	25 (48.1)
I don't know	0 (0)	1 (4.5)	0 (0)	0 (0)	1 (1.9)
Is the collected emergency unit data analyzed and presented to staff and stakeholders for quality improvement and evidence-based services					
Yes	11 (47.8)	12 (52.2)	5 (62.5)	3 (100)	31 (54.4)
No	12 (52.2)	11 (47.8)	3 (37.5)	0 (0)	26 (45.6)

Does the health facility make monthly HMIS 105 summary reports					
Yes	23 (100)	22 (95.7)	8 (100)	3 (100)	56 (98.2)
No	0 (0)	1 (4.3)	0 (0)	0 (0)	1 (1.8)
Does the health facility submit monthly HMIS 105 summary reports, n=56					
Yes	23 (100)	22 (100)	8 (100)	3 (100)	56 (100)
Receive regular feedback on the quality of their reports with EMS data submitted to the district or IP, n=56					
Yes	19 (82.6)	17 (77.3)	4 (50)	3 (100)	43 (76.8)
No	4 (17.4)	5 (22.7)	4 (50)	0 (0)	13 (23.2)
How often does the health facility regular feedback on the quality of their reports, n=43					
Monthly	11 (57.9)	11 (64.7)	2 (50)	3 (100)	27 (62.8)
Quarterly	7 (36.8)	5 (29.4)	2 (50)	0 (0)	14 (32.6)
Semi-annually	1 (5.3)	0 (0)	0 (0)	0 (0)	1 (2.3)
Other	0 (0)	1 (5.9)	0 (0)	0 (0)	1 (2.3)

Table 31: Documentation and Record Keeping

	Facility Level				
	Total, n=57 (%)	**HC IV, n=21 (%)**	**General Hospital, n=24 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
A Proper documentation of medical procedures and interventions					
No	3 (5.3)	1 (4.8)	2 (8.3)	0 (0)	0 (0)
Yes	54 (94.7)	20 (95.2)	22 (91.7)	9 (100)	3 (100)
Compliance with data protection and patient privacy regulations, n=56					
No	17 (30.4)	7 (33.3)	8 (33.3)	2 (25)	0 (0)
Yes	39 (69.6)	14 (66.7)	16 (66.7)	6 (75)	3 (100)

Table 32: Availability and Functionality of infrastructure in the EDs, n=60

	Total, n=60 (%)	**HC IV, n=25 (%)**	**General Hospital, n=23 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
Clean running water					
Generally unavailable	5 (8.3)	3 (12)	2 (8.7)	0 (0)	0 (0)
Available and not functional	7 (11.7)	5 (20)	2 (8.7)	0 (0)	0 (0)
Available and functional	48 (80)	17 (68)	19 (82.6)	9 (100)	3 (100)
Electricity source e.g., wired, generator, Solar					
Available and not functional	8 (13.6)	3 (12)	3 (13.6)	2 (22.2)	0 (0)
Available and functional	51 (86.4)	22 (88)	19 (86.4)	7 (77.8)	3 (100)
Designated telephone or radio for communicating with other facilities and/ or pre-hospital providers					
Generally unavailable	29 (49.2)	15 (62.5)	11 (47.8)	2 (22.2)	1 (33.3)
Available and not functional	6 (10.2)	2 (8.3)	3 (13)	1 (11.1)	0 (0)
Available and functional	24 (40.7)	7 (29.2)	9 (39.1)	6 (66.7)	2 (66.7)
Paper-based emergency unit chart					
Generally unavailable	31 (51.7)	16 (64)	12 (52.2)	3 (33.3)	0 (0)
Available and not functional	9 (15)	4 (16)	2 (8.7)	0 (0)	3 (100)

Available and functional	20 (33.3)	5 (20)	9 (39.1)	6 (66.7)	0 (0)
Electronic emergency unit chart					
Generally unavailable	44 (73.3)	22 (88)	14 (60.9)	5 (55.6)	3 (100)
Available and not functional	6 (10)	2 (8)	3 (13)	1 (11.1)	0 (0)
Available and functional	10 (16.7)	1 (4)	6 (26.1)	3 (33.3)	0 (0)
Isolation room for infectious diseases (e.g., TB, sepsis, hemorrhagic fever)					
Generally unavailable	33 (55)	14 (56)	13 (56.5)	5 (55.6)	1 (33.3)
Available and not functional	8 (13.3)	6 (24)	1 (4.3)	1 (11.1)	0 (0)
Available and functional	19 (31.7)	5 (20)	9 (39.1)	3 (33.3)	2 (66.7)
Easy physical access to emergency unit for those requiring a wheelchair or stretcher					
Generally unavailable	9 (15)	6 (24)	3 (13)	0 (0)	0 (0)
Available and not functional	4 (6.7)	4 (16)	0 (0)	0 (0)	0 (0)
Available and functional	47 (78.3)	15 (60)	20 (87)	9 (100)	3 (100)
Designated ambulance space near with easy access in and out of the emergency department					
Generally unavailable	16 (26.7)	10 (40)	6 (26.1)	0 (0)	0 (0)
Available and not functional	5 (8.3)	1 (4)	3 (13)	1 (11.1)	0 (0)
Available and functional	39 (65)	14 (56)	14 (60.9)	8 (88.9)	3 (100)
Rapid access to a transport ambulance for patients who need to be transferred to another facility					
Generally unavailable	4 (6.7)	3 (12)	1 (4.3)	0 (0)	0 (0)
Available and not functional	18 (30)	11 (44)	6 (26.1)	0 (0)	1 (33.3)
Available and functional	38 (63.3)	11 (44)	16 (69.6)	9 (100)	2 (66.7)
Provider to administer care during transportation of patients who need to be transferred to another facility					
Generally unavailable	7 (11.7)	4 (16)	3 (13)	0 (0)	0 (0)
Available and not functional	6 (10)	3 (12)	2 (8.7)	0 (0)	1 (33.3)
Available and functional	47 (78.3)	18 (72)	18 (78.3)	9 (100)	2 (66.7)
A call and dispatch center					
Generally unavailable	47 (78.3)	22 (88)	18 (78.3)	5 (55.6)	2 (66.7)
Available and not functional	7 (11.7)	2 (8)	1 (4.3)	3 (33.3)	1 (33.3)
Available and functional	1 (1)	0 (0)	(0)	1 (11.1)	0 (0)
A team/staff responsible for the call and dispatch center					
Generally unavailable	42 (70)	20 (80)	16 (69.6)	4 (44.4)	2 (66.7)
Available and not functional	4 (6.7)	2 (8)	0 (0)	2 (22.2)	0 (0)
Available and functional	14 (23.3)	3 (12)	7 (30.4)	3 (33.3)	1 (33.3)
Access to storage space within (or with immediate proximity to) the emergency unit, including secure storage for controlled substances					

Generally unavailable	13 (21.7)	5 (20)	8 (34.8)	0 (0)	0 (0)
Available and not functional	10 (16.7)	7 (28)	2 (8.7)	1 (11.1)	0 (0)
Available and functional	37 (61.7)	13 (52)	13 (56.5)	8 (88.9)	3 (100)
A dedicated staff work area					
Generally unavailable	14 (23.3)	8 (32)	5 (21.7)	1 (11.1)	0 (0)
Available and not functional	5 (8.3)	2 (8)	2 (8.7)	0 (0)	1 (33.3)
Available and functional	41 (68.3)	15 (60)	16 (69.6)	8 (88.9)	2 (66.7)
A toilet facility for Staff					
Generally unavailable	8 (13.3)	5 (20)	1 (4.3)	2 (22.2)	0 (0)
Available and not functional	10 (16.7)	5 (20)	4 (17.4)	1 (11.1)	0 (0)
Available and functional	42 (70)	15 (60)	18 (78.3)	6 (66.7)	3 (100)
A toilet facility for patients					
Generally unavailable	7 (11.7)	3 (12)	3 (13)	1 (11.1)	0 (0)
Available and not functional	8 (13.3)	4 (16)	4 (17.4)	0 (0)	0 (0)
Available and functional	45 (75)	18 (72)	16 (69.6)	8 (88.9)	3 (100)
A hand washing facility in each patient care area					
Generally unavailable	6 (10)	5 (20)	1 (4.3)	0 (0)	0 (0)
Available and not functional	13 (21.7)	6 (24)	4 (17.4)	2 (22.2)	1 (33.3)
Available and functional	41 (68.3)	14 (56)	18 (78.3)	7 (77.8)	2 (66.7)
System for stocking, managing, and dispensing					
Generally unavailable	4 (6.7)	3 (12)	1 (4.3)	0 (0)	0 (0)
Available and not functional	2 (3.3)	1 (4)	1 (4.3)	0 (0)	0 (0)
Available and functional	54 (90)	21 (84)	21 (91.3)	9 (100)	3 (100)
Dedicated theatre for emergency					
Generally unavailable	9 (15)	6 (24)	3 (13)	0 (0)	0 (0)
Available and not functional	15 (25)	4 (16)	6 (26.1)	4 (44.4)	1 (33.3)
Available and functional	36 (60)	15 (60)	14 (60.9)	5 (55.6)	2 (66.7)
Designated waiting area before the ED					
Generally unavailable	10 (16.7)	6 (24)	4 (17.4)	0 (0)	0 (0)
Available and not functional	8 (13.3)	5 (20)	2 (8.7)	0 (0)	1 (33.3)
Available and functional	42 (70)	14 (56)	17 (73.9)	9 (100)	2 (66.7)
Designated waiting area at triage					
Generally unavailable	14 (23.3)	8 (32)	5 (21.7)	1 (11.1)	0 (0)
Available and not functional	7 (11.7)	3 (12)	3 (13)	0 (0)	1 (33.3)
Available and functional	39 (65)	14 (56)	15 (65.2)	8 (88.9)	2 (66.7)
Designated triage area					
Generally unavailable	13 (21.7)	6 (24)	6 (26.1)	1 (11.1)	0 (0)
Available and not functional	5 (8.3)	3 (12)	2 (8.7)	0 (0)	0 (0)
Available and functional	42 (70)	16 (64)	15 (65.2)	8 (88.9)	3 (100)
Designated resuscitation area accessible by ambulance					
Generally unavailable	20 (33.3)	12 (48)	7 (30.4)	1 (11.1)	0 (0)

Available and not functional	12 (20)	7 (28)	3 (13)	0 (0)	2 (66.7)
Available and functional	28 (46.7)	6 (24)	13 (56.5)	8 (88.9)	1 (33.3)
Decontamination area for poison or toxicology with its own drainage					
Generally unavailable	32 (53.3)	17 (68)	11 (47.8)	3 (33.3)	1 (33.3)
Available and not functional	10 (16.7)	4 (16)	4 (17.4)	2 (22.2)	0 (0)
Available and functional	18 (30)	4 (16)	8 (34.8)	4 (44.4)	2 (66.7)

Table 33: Does the facility have appropriate PPE (Personal protective equipment) when needed.

Facility Level					
	Total n=59 (%)	**HC IV, n=24 (%)**	**General Hospital n=23 (%)**	**Regional Referral n=9 (%)**	**National Referral n=3 (%)**
Hairs covers					
Generally unavailable	15 (25.4)	7 (29.2)	5 (21.7)	3 (33.3)	0 (0)
Available and not functional	12 (20.3)	5 (20.8)	4 (17.4)	1 (11.1)	2 (66.7)
Available and functional	32 (54.2)	12 (50)	14 (60.9)	5 (55.6)	1 (33.3)
Eye protection					
Generally unavailable	13 (22)	6 (25)	6 (26.1)	1 (11.1)	0 (0)
Available and not functional	11 (18.6)	6 (25)	3 (13)	2 (22.2)	0 (0)
Available and functional	35 (59.3)	12 (50)	14 (60.9)	6 (66.7)	3 (100)
N95 face masks					
Generally unavailable	6 (10.2)	3 (12.5)	1 (4.3)	2 (22.2)	0 (0)
Available and not functional	5 (8.5)	5 (20.8)	0 (0)	0 (0)	0 (0)
Available and functional	48 (81.4)	16 (66.7)	22 (95.7)	7 (77.8)	3 (100)
Impermeable gowns					
Generally unavailable	19 (32.2)	8 (33.3)	9 (39.1)	2 (22.2)	0 (0)
Available and not functional	5 (8.5)	2 (8.3)	2 (8.7)	1 (11.1)	0 (0)
Available and functional	34 (57.6)	13 (54.2)	12 (52.2)	6 (66.7)	3 (100)
Not applicable	1 (1.7)	1 (4.2)	0 (0)	0 (0)	0 (0)
Shoe covers					
Generally unavailable	42 (70)	17 (68)	17 (73.9)	7 (77.8)	1 (33.3)
Available and not functional	2 (3.3)	0 (0)	1 (4.3)	0 (0)	1 (33.3)
Available and functional	15 (25)	7 (28)	5 (21.7)	2 (22.2)	1 (33.3)
Not applicable	1 (1.7)	1 (4)	0 (0)	0 (0)	0 (0)
Gloves					
Generally unavailable	1 (2.9)		0 (0)	1 (11.1)	0 (0)
Available and not functional	1 (2.9)		1 (4.3)	0 (0)	0 (0)
Available and functional	33 (94.3)		22 (95.7)	8 (88.9)	3 (100)
Gumboots					
Generally unavailable	16 (27.1)	5 (20.8)	8 (34.8)	2 (22.2)	1 (33.3)
Available and not functional	10 (16.9)	8 (33.3)	2 (8.7)	0 (0)	0 (0)
Available and functional	32 (54.2)	10 (41.7)	13 (56.5)	7 (77.8)	2 (66.7)
Not applicable	1 (1.7)	1 (4.2)	0 (0)	0 (0)	0 (0)

Table 34: Electronic cardiac monitoring equipment

Facility Level					
	Total, n=60 (%)	**HC IV, n=25 (%)**	**General Hospital, n=23 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
Defibrillator - Manual and/or automated external defibrillator (AED)					
Generally unavailable	38 (63.3)	20 (80)	15 (65.2)	2 (22.2)	1 (33.3)
Available and not functional	10 (16.7)	3 (12)	4 (17.4)	3 (33.3)	0 (0)
Available and functional	12 (20)	2 (8)	4 (17.4)	4 (44.4)	2 (66.7)
Patient Monitor - To monitor the patient's heart rate and rhythm.					
Generally unavailable	33 (55.9)	21 (84)	8 (36.4)	4 (44.4)	0 (0)
Available and not functional	7 (11.9)	0 (0)	6 (27.3)	1 (11.1)	0 (0)
Available and functional	19 (32.2)	4 (16)	8 (36.4)	4 (44.4)	3 (100)
Pulse Oximeter - For measuring blood oxygen saturation.					
Generally unavailable	5 (8.3)	3 (12)	2 (8.7)	0 (0)	0 (0)
Available and not functional	6 (10)	3 (12)	3 (13)	0 (0)	0 (0)
Available and functional	49 (81.7)	19 (76)	18 (78.3)	9 (100)	3 (100)
Blood Pressure Monitor - Both manual (sphygmomanometer) and automatic.					
Generally unavailable	5 (8.3)	3 (12)	2 (8.7)	0 (0)	0 (0)
Available and not functional	3 (5)	1 (4)	2 (8.7)	0 (0)	0 (0)
Available and functional	52 (86.7)	21 (84)	19 (82.6)	9 (100)	3 (100)
Stethoscope - To listen to heart and lung sounds.					
Generally unavailable	7 (11.7)	3 (12)	2 (8.7)	1 (11.1)	1 (33.3)
Available and not functional	2 (3.3)	1 (4)	1 (4.3)	0 (0)	0 (0)
Available and functional	51 (85)	21 (84)	20 (87)	8 (88.9)	2 (66.7)
Glucometer - For measuring blood glucose levels.					
Generally unavailable	8 (13.3)	4 (16)	2 (8.7)	1 (11.1)	1 (33.3)
Available and not functional	9 (15)	3 (12)	5 (21.7)	1 (11.1)	0 (0)
Available and functional	43 (71.7)	18 (72)	16 (69.6)	7 (77.8)	2 (66.7)
EKG Machine for National and Regional Hospitals					
Generally unavailable	8 (61.5)	Na	1 (0)	6 (66.7)	1 (33.3)
Available and not functional	2 (15.4)	Na	0 (0)	1 (11.1)	1 (33.3)
Available and functional	3 (23.1)	Na	0 (0)	2 (22.2)	1 (33.3)

Table 35: Crash trolley: Airway management equipment

	Facility Level			
	Overall Total	**General hospital**	**Regional RH**	**National RN**
	Freq (%), n=34	**Freq (%), n=22**	**Freq (%), n=9**	**Freq (%), n=3**
Oropharyngeal Airways (of different sizes)				
Generally unavailable	11 (33.3)	9 (40.9)	1 (11.1)	1 (50)
Available and not functional	6 (18.2)	2 (9.1)	3 (33.3)	1 (50)
Available and functional	16 (48.5)	11 (50)	5 (55.6)	0 (0)
Nasopharyngeal Airways				
Generally unavailable	17 (51.5)	13 (59.1)	2 (22.2)	2 (100)
Available and not functional	5 (15.2)	3 (13.6)	2 (22.2)	0 (0)
Available and functional	11 (33.3)	6 (27.3)	5 (55.6)	0 (0)
Laryngoscope - With blades of different sizes.				
Generally unavailable	13 (39.4)	9 (40.9)	2 (25)	2 (66.7)
Available and not functional	4 (12.1)	3 (13.6)	1 (12.5)	0 (0)
Available and functional	16 (48.5)	10 (45.5)	5 (62.5)	1 (33.3)
Endotracheal Tubes - Various sizes, for intubation.				
Generally unavailable	13 (38.2)	11 (50)	1 (11.1)	1 (33.3)
Available and not functional	4 (11.8)	2 (9.1)	2 (22.2)	0 (0)
Available and functional	17 (50)	9 (40.9)	6 (66.7)	2 (66.7)
Bag-Valve-Mask (BVM) - For manual ventilation.				
Generally unavailable	9 (26.5)	8 (36.4)	1 (11.1)	0 (0)
Available and not functional	3 (8.8)	3 (13.6)	0 (0)	0 (0)
Available and functional	22 (64.7)	11 (50)	8 (88.9)	3 (100)
Suction Unit - Portable, for clearing airway				
Generally unavailable	9 (26.5)	7 (31.8)	1 (11.1)	1 (33.3)
Available and not functional	5 (14.7)	4 (18.2)	1 (11.1)	0 (0)
Available and functional	20 (58.8)	11 (50)	7 (77.8)	2 (66.7)
Oxygen Masks - Non-rebreather masks, nasal cannulas.				
Generally unavailable	5 (14.7)	5 (22.7)	0 (0)	0 (0)
Available and not functional	3 (8.8)	3 (13.6)	0 (0)	0 (0)
Available and functional	26 (76.5)	14 (63.6)	9 (100)	3 (100)
Stylets - For guiding endotracheal tubes during intubation				
Generally unavailable	19 (55.9)	14 (63.6)	3 (33.3)	2 (66.7)
Available and not functional	6 (17.6)	3 (13.6)	2 (22.2)	1 (33.3)
Available and functional	9 (26.5)	5 (22.7)	4 (44.4)	0 (0)
Cricothyrotomy Kit - For emergency tracheostomy				
Generally unavailable	27 (79.4)	18 (81.8)	7 (77.8)	2 (66.7)
Available and not functional	1 (2.9)	0 (0)	0 (0)	1 (33.3)
Available and functional	5 (14.7)	3 (13.6)	2 (22.2)	0 (0)
Not applicable	1 (2.9)	1 (4.5)	0 (0)	0 (0)
Ketamine				
Generally unavailable	12 (35.3)	11 (50)	1 (11.1)	0 (0)
Available and not functional	6 (17.6)	3 (13.6)	2 (22.2)	1 (33.3)
Available and functional	16 (47.1)	8 (36.4)	6 (66.7)	2 (66.7)
Propofol				
Generally unavailable	22 (64.7)	16 (72.7)	6 (66.7)	0 (0)
Available and not functional	3 (8.8)	2 (9.1)	1 (11.1)	0 (0)
Available and functional	9 (26.5)	4 (18.2)	2 (22.2)	3 (100)
Midazolam				
Generally unavailable	23 (67.6)	17 (77.3)	6 (66.7)	0 (0)
Available and not functional	2 (5.9)	1 (4.5)	0 (0)	1 (33.3)

Available and functional	9 (26.5)	4 (18.2)	3 (33.3)	2 (66.7)
Cannulas - Different sizes for venous access.				
Generally unavailable	2 (5.9)	2 (9.1)	0 (0)	0 (0)
Available and not functional	2 (5.9)	0 (0)	1 (11.1)	1 (33.3)
Available and functional	30 (88.2)	20 (90.9)	8 (88.9)	2 (66.7)
Fluids - Saline, Ringer's Lactate, etc.				
Generally unavailable	3 (8.8)	3 (13.6)	0 (0)	0 (0)
Available and functional	31 (91.2)	19 (86.4)	9 (100)	3 (100)
Start Kit - Including tourniquet, alcohol swabs, and dressing				
Generally unavailable	10 (29.4)	6 (27.3)	2 (22.2)	2 (66.7)
Available and not functional	4 (11.8)	3 (13.6)	1 (11.1)	0 (0)
Available and functional	20 (58.8)	13 (59.1)	6 (66.7)	1 (33.3)
Syringes and Needles - Various sizes.				
Generally unavailable	3 (8.8)	2 (9.1)	1 (11.1)	0 (0)
Available and not functional	1 (2.9)	1 (4.5)	0 (0)	0 (0)
Available and functional	30 (88.2)	19 (86.4)	8 (88.9)	3 (100)
Extension Sets - For IV lines.				
Generally unavailable	3 (9.1)	3 (13.6)	0 (0)	0 (0)
Available and not functional	2 (6.1)	0 (0)	1 (12.5)	1 (33.3)
Available and functional	28 (84.8)	19 (86.4)	7 (87.5)	2 (66.7)
Pumps/Infusion Devices - For controlled fluid administration.				
Generally unavailable	12 (36.4)	9 (40.9)	3 (37.5)	0 (0)
Available and not functional	6 (18.2)	2 (9.1)	3 (37.5)	1 (33.3)
Available and functional	15 (45.5)	11 (50)	2 (25)	2 (66.7)
Epinephrine/Norepinephrine - For cardiac arrest and severe allergic reactions.				
Generally unavailable	12 (36.4)	10 (45.5)	1 (12.5)	1 (33.3)
Available and functional	21 (63.6)	12 (54.5)	7 (87.5)	2 (66.7)
Amiodarone - Antiarrhythmic.				
Generally unavailable	26 (78.8)	19 (86.4)	6 (75)	1 (33.3)
Available and functional	7 (21.2)	3 (13.6)	2 (25)	2 (66.7)
Calcium Gluconate for magnesium sulphate toxicity				
Generally unavailable	17 (51.5)	13 (59.1)	3 (37.5)	1 (33.3)
Available and not functional	3 (9.1)	2 (9.1)	1 (12.5)	0 (0)
Available and functional	13 (39.4)	7 (31.8)	4 (50)	2 (66.7)
Atropine - For bradycardia.				
Generally unavailable	6 (18.2)	4 (18.2)	1 (12.5)	1 (33.3)
Available and functional	27 (81.8)	18 (81.8)	7 (87.5)	2 (66.7)
Lidocaine - Local anesthetic and antiarrhythmic.				
Generally unavailable	6 (18.2)	3 (13.6)	3 (37.5)	0 (0)
Available and not functional	1 (3)	0 (0)	1 (12.5)	0 (0)
Available and functional	26 (78.8)	19 (86.4)	4 (50)	3 (100)
Nitroglycerin - For chest pain.				
Generally unavailable	29 (87.9)	20 (90.9)	7 (87.5)	2 (66.7)
Available and functional	4 (12.1)	2 (9.1)	1 (12.5)	1 (33.3)
Dopamine - For shock.				
Generally unavailable	24 (72.7)	16 (72.7)	6 (75)	2 (66.7)
Available and not functional	1 (3)	0 (0)	1 (12.5)	0 (0)
Available and functional	8 (24.2)	6 (27.3)	1 (12.5)	1 (33.3)
Aspirin - For suspected myocardial infarction.				
Generally unavailable	17 (51.5)	12 (54.5)	4 (50)	1 (33.3)
Available and not functional	3 (9.1)	2 (9.1)	0 (0)	1 (33.3)
Available and functional	13 (39.4)	8 (36.4)	4 (50)	1 (33.3)

Dextrose Solutions - For hypoglycemia.				
Generally unavailable	4 (12.1)	3 (13.6)	1 (12.5)	0 (0)
Available and functional	29 (87.9)	19 (86.4)	7 (87.5)	3 (100)
Salbutamol (Albuterol) or Short-acting beta-agonists (Saba)- For asthma or COPD.				
Generally unavailable	12 (36.4)	8 (36.4)	3 (37.5)	1 (33.3)
Available and not functional	2 (6.1)	0 (0)	1 (12.5)	1 (33.3)
Available and functional	19 (57.6)	14 (63.6)	4 (50)	1 (33.3)
Naloxone - For opioid overdose.				
Generally unavailable	24 (72.7)	19 (86.4)	5 (62.5)	0 (0)
Available and functional	9 (27.3)	3 (13.6)	3 (37.5)	3 (100)
Benzodiazepines - For seizures or sedation.				
Generally unavailable	6 (18.2)	3 (13.6)	2 (25)	1 (33.3)
Available and functional	27 (81.8)	19 (86.4)	6 (75)	2 (66.7)
Magnesium Sulfate - For eclampsia or torsades de pointes.				
Generally unavailable	15 (45.5)	11 (50)	4 (50)	0 (0)
Available and not functional	3 (9.1)	2 (9.1)	1 (12.5)	0 (0)
Available and functional	15 (45.5)	9 (40.9)	3 (37.5)	3 (100)
Sodium Bicarbonate - For acidosis or certain overdoses.				
Generally unavailable	22 (66.7)	16 (72.7)	5 (62.5)	1 (33.3)
Available and not functional	2 (6.1)	1 (4.5)	0 (0)	1 (33.3)
Available and functional	9 (27.3)	5 (22.7)	3 (37.5)	1 (33.3)
Shears - For cutting clothing or bandages.				
Generally unavailable	11 (33.3)	9 (40.9)	2 (25)	0 (0)
Available and not functional	1 (3)	0 (0)	0 (0)	1 (33.3)
Available and functional	21 (63.6)	13 (59.1)	6 (75)	2 (66.7)
Tape and Dressings - Various types for securing IVs and dressing wounds.				
Generally unavailable	5 (15.2)	4 (18.2)	1 (12.5)	0 (0)
Available and not functional	1 (3)	0 (0)	1 (12.5)	0 (0)
Available and functional	27 (81.8)	18 (81.8)	6 (75)	3 (100)
Gloves - Sterile and non-sterile.				
Generally unavailable	3 (9.1)	2 (9.1)	1 (12.5)	0 (0)
Available and functional	30 (90.9)	20 (90.9)	7 (87.5)	3 (100)
CPR Board - To provide a hard surface under the patient during CPR.				
Generally unavailable	25 (75.8)	18 (81.8)	6 (75)	1 (33.3)
Available and not functional	2 (6.1)	0 (0)	0 (0)	2 (66.7)
Available and functional	6 (18.2)	4 (18.2)	2 (25)	0 (0)
Flashlight - For visibility and pupil examination				
Generally unavailable	21 (63.6)	16 (72.7)	5 (62.5)	0 (0)
Available and not functional	2 (6.1)	1 (4.5)	0 (0)	1 (33.3)
Available and functional	10 (30.3)	5 (22.7)	3 (37.5)	2 (66.7)
Thermal Blanket - To prevent hypothermia.				
Generally unavailable	27 (81.8)	18 (81.8)	6 (75)	3 (100)
Available and not functional	1 (3)	1 (4.5)	0 (0)	0 (0)
Available and functional	5 (15.2)	3 (13.6)	2 (25)	0 (0)
Sharps Container - For safe disposal of needles.				
Generally unavailable	5 (15.2)	4 (18.2)	1 (12.5)	0 (0)
Available and not functional	3 (9.1)	1 (4.5)	2 (25)	0 (0)
Available and functional	25 (75.8)	17 (77.3)	5 (62.5)	3 (100)

Table 36: Crash Trolley: Advanced Equipment

	Facility Level			
	Overall Total Freq (%) n=33	**General hospital Freq (%), n=22**	**Regional RH Freq (%), n=8**	**National RN Freq (%), n=3**
Intraosseous (IO) Infusion Device - For emergency vascular access.				
Generally unavailable	26 (78.8)	19 (86.4)	5 (62.5)	2 (66.7)
Available and not functional	1 (3)	0 (0)	1 (12.5)	0 (0)
Available and functional	6 (18.2)	3 (13.6)	2 (25)	1 (33.3)
Emergency Ultrasound Device - For diagnostic purposes.				
Generally unavailable	13 (39.4)	10 (45.5)	2 (25)	1 (33.3)
Available and not functional	7 (21.2)	4 (18.2)	2 (25)	1 (33.3)
Available and functional	13 (39.4)	8 (36.4)	4 (50)	1 (33.3)
Spinal Needles				
Generally unavailable	12 (36.4)	10 (45.5)	1 (12.5)	1 (33.3)
Available and not functional	7 (21.2)	4 (18.2)	3 (37.5)	0 (0)
Available and functional	14 (42.4)	8 (36.4)	4 (50)	2 (66.7)
Ventilator				
Generally unavailable	16 (48.5)	13 (59.1)	3 (37.5)	0 (0)
Available and not functional	7 (21.2)	3 (13.6)	3 (37.5)	1 (33.3)
Available and functional	10 (30.3)	6 (27.3)	2 (25)	2 (66.7)
Pacing Equipment - For emergency cardiac pacing				
Generally unavailable	25 (75.8)	18 (81.8)	6 (75)	1 (33.3)
Available and not functional	3 (9.1)	2 (9.1)	0 (0)	1 (33.3)
Available and functional	5 (15.2)	2 (9.1)	2 (25)	1 (33.3)

Table 37: Emergency Preparedness

	Facility Level				
	Total, n=57 (%)	**HC IV, n=21 (%)**	**General Hospital, n=24 (%)**	**Regional Referral, n=9 (%)**	**National Referral, n=3 (%)**
Number of surgical cases the facility theatre can manage daily					
1-5 Cases	25 (43.9)	15 (71.4)	10 (41.7)	0 (0)	0 (0)
6-15 Cases	28 (49.1)	6 (28.6)	12 (50)	8 (88.8)	2 (66.6)
16 cases and more	4 (7)	0 (0)	2 (8.3)	1 (11.1)	1 (33.3)
Number of additional surgical cases theatre can manage daily during a mass casualty or public health emergency without compromising standard care quality					
0-3 Cases	15 (26.8)	9 (42.9)	3 (12.5)	1 (12.5)	2 (66.7)
4-6 Cases	24 (42.9)	9 (42.9)	11 (45.8)	4 (50)	0 (0)
7 cases and more	17 (30.4)	3 (14.3)	10 (41.7)	3 (37.5)	1 (33.3)
A stockpile of surgical supplies reserved for mass casualty or public health emergency at the facility, n=56					
No	33 (58.9)	17 (81)	10 (41.7)	6 (75)	0 (0)
Yes	23 (41.1)	4 (19)	14 (58.3)	2 (25)	3 (100)
Emergency response plan in place, including evacuation procedures					
No	37 (64.9)	17 (81)	11 (45.8)	7 (77.8)	2 (66.7)

Yes	20 (35.1)	4 (19)	13 (54.2)	2 (22.2)	1 (33.3)
Regular drills and training for staff on emergency response					
No	39 (68.4)	15 (71.4)	16 (66.7)	8 (88.9)	0 (0)
Yes	18 (31.6)	6 (28.6)	8 (33.3)	1 (11.1)	3 (100)
Training schedule available, n=14					
No	11 (78.6)	3 (75)	5 (83.3)	1 (100)	2 (66.7)
Yes	3 (21.4)	1 (25)	1 (16.7)	0 (0)	1 (33.3)

Table 38: Communication, compliance, and Coordination with emergency departments

	Facility Level				
	Total, n=57 (%)	HC IV, n=21 (%)	General Hospital, n=24 (%)	Regional Referral, n=9 (%)	National Referral, n=3 (%)
Regular audits and reviews to ensure ongoing compliance (audit books/register), n=56					
No	14 (25)	4 (19)	8 (33.3)	2 (22.2)	0 (0)
Yes	42 (75)	17 (81)	16 (66.7)	7 (77.8)	2 (100)
Clear communication with patients and their families regarding procedures and post-operative care					
No	1 (1.8)	0 (0)	1 (4.2)	0 (0)	0 (0)
Yes	56 (98.2)	21 (100)	23 (95.8)	9 (100)	3 (100)
Regular (monthly) team meetings for updates and feedback (meeting minutes)					
No	13 (22.8)	7 (33.3)	5 (20.8)	1 (11.1)	0 (0)
Yes	44 (77.2)	14 (66.7)	19 (79.2)	8 (88.9)	3 (100)
Does the theatre anesthetist/anesthetic officer review patients before the operation					
No	8 (14)	4 (19)	3 (12.5)	0 (0)	1 (33.3)
Yes	49 (86)	17 (81)	21 (87.5)	9 (100)	2 (66.7)
Is there a standardized and structured process for handovers and interdisciplinary information transfer, n=56					
No	11 (19.6)	5 (25)	4 (16.7)	1 (11.1)	1 (33.3)
Yes	45 (80.4)	15 (75)	20 (83.3)	8 (88.9)	2 (66.7)
Clinical information system (patient data management system) in use for efficient data handling, n=56					
No	12 (21.4)	4 (20)	4 (16.7)	3 (33.3)	1 (33.3)
Yes	44 (78.6)	16 (80)	20 (83.3)	6 (66.7)	2 (66.7)
Are communication lines available 24/7 within the theatre for continuous information exchange, n=56					
No	33 (58.9)	16 (80)	11 (45.8)	3 (33.3)	3 (100)
Yes	23 (41.1)	4 (20)	13 (54.2)	6 (66.7)	0 (0)
How accessible is the theatre from the emergency department in case of critical patient transfers, n=56					
Good	26 (46.4)	12 (60)	9 (37.5)	2 (22.2)	3 (100)
Poor	18 (32.1)	6 (30)	8 (33.3)	4 (44.4)	0 (0)
Very good	8 (14.3)	1 (5)	4 (16.7)	3 (33.3)	0 (0)
Very poor	4 (7.1)	1 (5)	3 (12.5)	0 (0)	0 (0)
Is there a rapid and direct connection between the theatre and the emergency department, n=56					
No	36 (64.3)	16 (80) *	16 (66.7)	4 (44.4)	0 (0)
Yes	20 (35.7)	4 (20)	8 (33.3)	5 (55.6)	3 (100)

**NB: Health center IVs did not have well-designated emergency departments*

Table 39: Other Basic Emergency training

	Albertine	Central	Eastern	North & west Nile	southwestern
Advanced Cardiac life support (ACLs)					
Trained	4 (4.9)	3 (17.7)	4 (9.3)	5 (7.9)	4 (10.3)
Not trained	77 (95.1)	14 (82.4)	39 (90.7)	58 (92.1)	35 (89.7)
Advanced Trauma life support (ATLs)					
Trained	5 (6.2)	2 (11.8)	6 (13.9)	7 (11.1)	3 (7.7)
Not trained	76 (93.8)	15 (88.2)	37 (86.1)	56 (88.9)	36 (92.3)
Emergency triage Assessment and treatment (ETAT)					
Trained	10 (12.4)	6 (35.3)	15 (34.9)	16 (25.4)	8 (20.5)
Not trained	71 (87.7)	11 (64.7)	28 (65.1)	47 (74.6)	31 (79.5)

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