Strengthening Emergency Care in Tanzania

What works?

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What Works?

A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health by Mayke Franssen, The Netherlands

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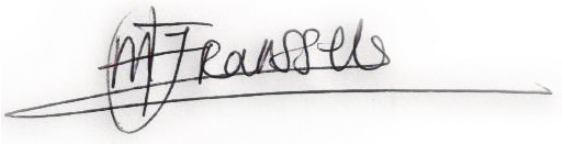
Signature: 

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"Universal emergency care is consistent with the right to health care; by definition, emergency care is a matter of life and death." (DCP3)

Abbreviations list

AFEM	African Federation for Emergency Medicine
ALSO	Advanced Life Support in Obstetrics
AMO	Assistant Medical officer
CD	Communicable disease
CHW	Community Health Worker
CO	Clinical Officer
DALY	Disability-Adjusted Life Year
DCP2	Disease Control Priorities version 2
DCP3	Disease Control Priorities version 3
EaCC	Emergency and Critical Care
EC	Emergency Care
ED	Emergency Department
EM	Emergency Medicine
EMAT	Emergency Medicine Association of Tanzania
EmONC	Emergency Obstetric and Newborn Care
EMS	Emergency Medical Systems
ETAT	Emergency Triage Assessment and Treatment
FDG	Focus Group Discussion
GECC	Global Emergency Care Collaborative
GECS	Global Emergency Care Skills
HICs	High-income countries
HLH	Haydom Lutheran Hospital
HRH	Human Resources for Health
HSSP	Health Sector Strategic Plan
IFEM	International Federation for Emergency Medicine
IHECS	In-hospital care systems
IMCI	Integrated Management of Childhood Illness
IMEESC	Integrated Management for Emergency and Essential
KIs	Key Informants
LGAs	Local Government Authorities
LIC	Low-income-country
MDG	Millennium Development Goal
MEWS	Modified Early Warning System
MLHW	mid-level health worker
MNH	Muhimbili National Hospital
MOHSW	Ministry of Health and Social Welfare
M&E	Monitoring and Evaluation
NBS	National Bureau of Statistics
NCD	Non-communicable disease
OHECS	Out-of-hospital care systems
PHC	Primary Health Care
PPH	Post-Partum Haemorrhage
RTI	Road Traffic Incident
SA	South Africa

SATS	South African Triage Scale
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
SSI	Semi-Structured Interview
TEWS	Triage Early Warning Score
UHC	Universal Health Coverage
UN	United Nations
UNICEF	United Nations International Children's Fund
VHW	Village Health Worker
WHO	World Health Organisation

Table of Contents

Abbreviations list **iv**

Table of Contents **vi**

List of Figures **viii**

Summary **ix**

Introduction **x**

Acknowledgments **xi**

1 Background **1**
1.1 Tanzania in short *1*
1.2 Overview of Tanzanian health system *1*

2 Problem statement and Justification **3**
2.1 The need for Emergency Care *3*
2.2 Emergency Care part of Primary Health Care *4*
2.3 Defining Emergency Care *5*
2.4 Tanzania and Emergency Care *6*
2.5 Justification *6*

3 Objectives **7**
3.1 General Objective *7*
3.2 Specific objectives *7*

4 Methodology **8**
4.1 Literature review *8*
4.2 Haydom Lutheran Hospital – a case study *9*
4.2.1 Introduction 9
4.2.2 Retrospective file study: Assessing the need for EC in Tanzania 10
4.2.3 Observational study: EC services at HLH 10
4.2.4 Qualitative study: Barriers and enablers to quality of EC 10
4.2.5 Approval & Ethics 10
4.2.6 Limitations of the case-study 11

5 Results **12**
5.1 Literature review *12*
5.1.1 To assess the need for EC in Tanzania 12
5.1.2 To describe the services currently delivered in EC in Tanzania 13
5.1.3 To analyse current EC policies and initiatives in Tanzania 19
5.1.4 To describe what is globally already done in relation to EC and what is applicable to Tanzania 23
5.1.5 To analyse what is known in Tanzania about barriers and enablers to quality of care in EC 29
5.2 Haydom Lutheran Hospital – a case study *30*
5.2.1 Introduction 30
5.2.2 Retrospective file study 31
5.2.3 Observational study 34
5.2.4 Qualitative study: barriers and enablers to quality of care in EC 40

6 Overall discussion **44**
6.1 The need for EC in Tanzania *44*
6.2 Current EC services delivered in Tanzania *44*
6.3 Current EC policies and initiatives in Tanzania *45*
6.4 Global initiatives *46*
6.5 Barriers and enablers to quality of EC in Tanzania *47*

7 Conclusion and Recommendations 49
8 References 52
Annex 1 – Analytical Framework 66
Annex 2 – Retrospective file study 69
Annex 3 – Observational Study 72
Annex 4 – Qualitative study 76
Annex 5 – Ethics 77
Annex 6 – Prevalence and surveillance studies 79
Annex 7 – Overview of Tanzanian health care system 81
Annex 8 – Government policies and strategies 83
Annex 9 – EC initiatives in SSA 89
Annex 10 – Layperson first-responder training 90
Annex 11 – Results observational study 91
Annex 12 – Results qualitative research 93

List of Figures

Figure 1 - Health sector pyramid Tanzania 2
Figure 2 - Comparison of leading causes of death in Tanzania, 2012 and 2000 3
Figure 3 - Comparison of leading causes of DALYs in Tanzania, 2012 and 2000 ... 4
Figure 4 - IFEM framework 9
Figure 5 - Conceptual framework for critical time points in Emergency Care 24
Figure 6 - The Emergency Care Continuum 27
Figure 7 - Tiered EC system 29
Figure 8 - Characteristics of analyzed cases admitted at the reception at HLH ... 32
Figure 9 - Retrospective TEWS for patients admitted in the reception 33
Figure 10 - Resource availability list of quality indicators for EC at HLH 36
Figure 11 - Resource availability score per section in different Tanzanian hospitals 39
Figure 12 - Hierarchy chart 41

Summary

The urgency of conditions presented at health facilities is high in Tanzania; people wait longer at home, have less access to care, chronic treatment of non-communicable diseases is lacking and injuries are worse. This was confirmed with a case study at Haydom Lutheran Hospital, where urgency of presenting cases was high. In practice, many people present on the primary care level with urgent conditions. Health workers at this level and even at higher levels are not trained nor equipped to deal with these patients. Unnecessary morbidity and mortality is the result. Also, pre-hospital care is almost non-existing, which literally leave people to die on the spot.

Barriers to quality of emergency care are rife, starting at the level of basic infrastructure. Together with poor career development options and lack of participation creates an environment of demotivated staff. Addressing these issues will be key for any intervention to be successful.

Some initiatives in Emergency Care have taken off; the Emergency Medicine Association of Tanzania has local expertise to take this subject forward. Together with local experts, the Ministry of Health and Social Welfare should start focusing on integrating the traditional vertical pillars in one integrated strategy for prevention, emergency care and routine (chronic) care. This national strategy is the basis for designing locally applicable and feasible strategies. The Global Emergency Care Collaborative proposes a pyramidal health care system with community responders in first-aid and non-physician emergency care providers at different levels. This system seems very suitable for the Tanzanian situation.

Keywords: Emergency Care, Quality of Care, Pre-Hospital, Triage, Tanzania

Word count: 13066

Introduction

After finishing the Tropical Medicine program in The Netherlands, I found a job in Tanzania at Haydom Lutheran Hospital (HLH). How Exciting! Exciting it was and overwhelming as well. From very early on there was one issue which bothered me: I noticed that patients arriving at the ward were not properly analyzed and treated at admission. I found out that patients were waiting for hours at 'the reception' before admitted to the ward. A period of delay without proper care. I started to realize that the concepts dealing with the approach and treatment of possible urgent problems were known by few, let alone triage. I felt overall disability and mortality could be reduced by introducing a structured approach at admission.

After working for some time at the maternity ward, I shifted to the reception after discussing my concerns with the director. Being a surgeon (just finished his training in Arusha) he completely agreed with my concerns. This was somehow revolutionary, a permanent real doctor at reception! Colleagues thought I was crazy, what was I going to do there in that complete chaos? They were sure I was not able to continue for a long time.

I tried to gradually introduce some new ideas to the nurses in reception. During that time, I saw some changes; vitals were taken faster, laboratory investigations were taken faster, very ill patients were seen first and treatment was initiated at reception. The director in the meantime asked me to analyze the problems at reception and write a plan for possible improvements. At that point I also started to think this should also be my thesis topic: How to improve Emergency Care (EC) at hospitals like HLH and Tanzania in general. I started reading about EC in Tanzania and surrounding countries and found out it was still a relatively new concept. However, some small initiatives in Tanzania were already started. I felt the time was there for Tanzania to take EC to the next level.

Acknowledgments

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It is a pleasure to thank those who made this thesis possible; the supervisors at KIT, the local supervisor Dr. E. Nuwass, Co-investigator Mr. D. Massay, Head of the Research Department at HLH Mr. E. Mduma and my family and friends for mental support.

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1 Background

1.1 Tanzania in short

The United Republic of Tanzania was formed in 1964 when the two states of Tanganyika and Zanzibar united. This thesis will focus on Tanzania mainland. The population of Tanzania has increased almost four times from 12.3 million in 1967 to 48.8 million in 2015. 71 percent of people live in a rural environment and life expectancy at birth is 62 years.(1) The total fertility rate is still high at 5.2 per woman, however under-five mortality rate almost halved in the last decade to 67 per 1000 live births. (2) Tanzania is still a low-income-country (LIC) with 28 percent of people below the basic needs poverty line. (3,4)

1.2 Overview of Tanzanian health system

The Tanzanian health system is built up in a pyramid starting from community-based health care up to national referral-level hospitals. (5) (see Figure 1 below) The private sector has a large role in providing health care in Tanzania. Especially at the higher levels of the health system, the private health sector is more prevalent (60% of all hospitals). 72% of Tanzania's population live within 5 km and 93% within 10 km of a health care facility. (6) Most of these facilities (87.1%) are dispensaries, 9.5% health centres and 3.4% hospitals. Tanzania has 0.39 nurses and 0.25 clinical staff (medical doctors, assistant medical officers and clinical officers) per 1000 population. This is low compared to the African average of 2.3 health workers (7,8) and the WHO recommended 4.45 skilled health professionals per 1000 population.(9)

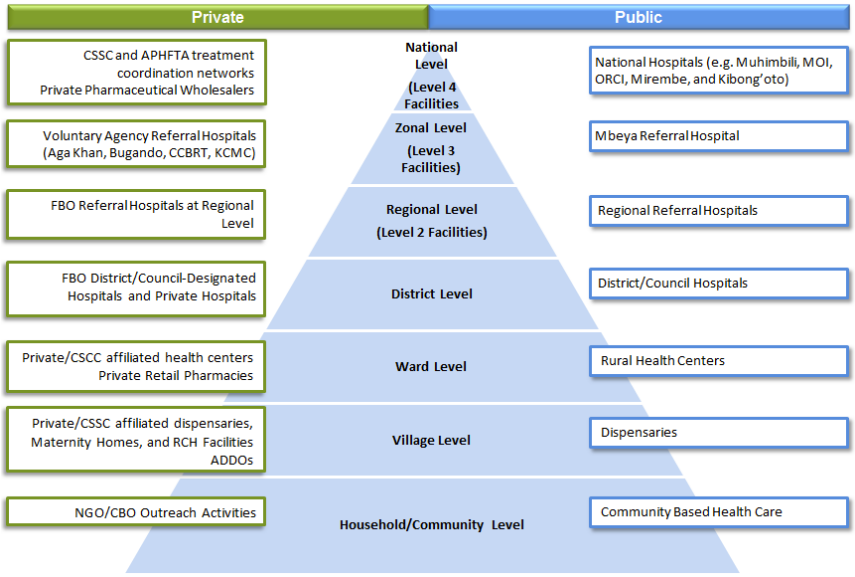

Figure 1 - Health sector pyramid Tanzania (11)

2 Problem statement and Justification

2.1 The need for Emergency Care

It is evident in Tanzania that Communicable Diseases (CDs) are still the main killers and causes of disability, although numbers are decreasing dramatically. Non-Communicable Diseases (NCDs) and road traffic injuries are coming up in Tanzania and will continue to rise in coming decades. (Figure 2 and Figure 3) (12) Tanzania at this moment is dealing with the triple burden of disease of CDs, NCDs and injuries. It is also very clearly shown in the figures below that obstetric emergencies are still not addressed well enough in Tanzania since birth asphyxia, birth trauma, and preterm birth complications are still in the top ten of mortality and leading causes of disability.

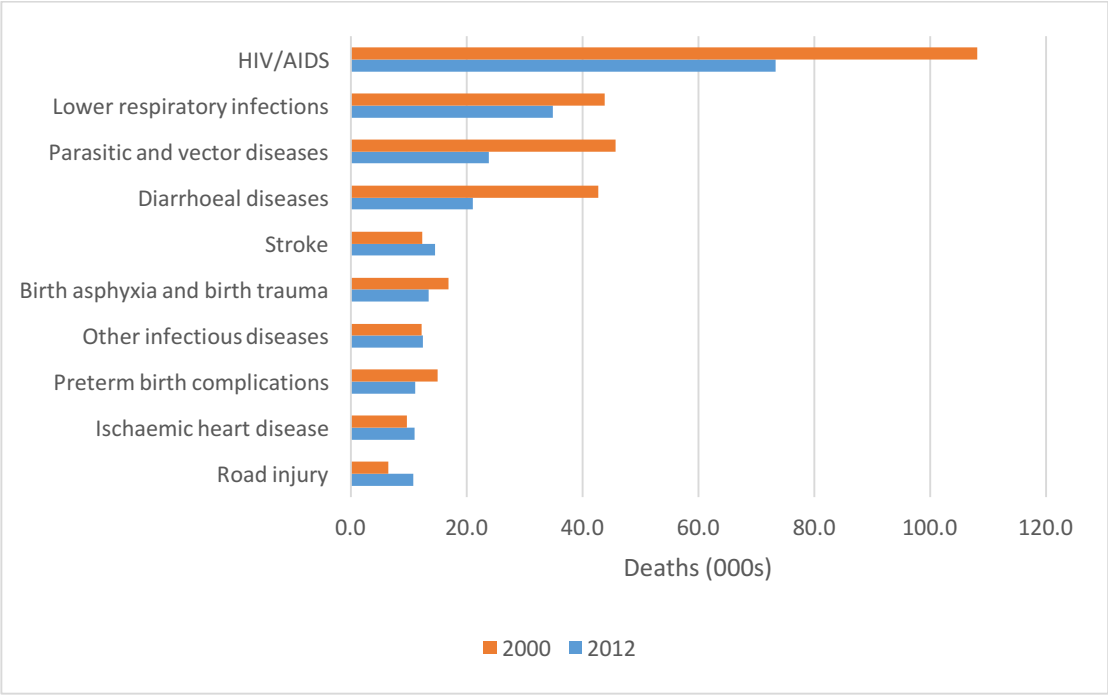

Figure 2 - Comparison of leading causes of death in Tanzania, 2012 and 2000 (12)

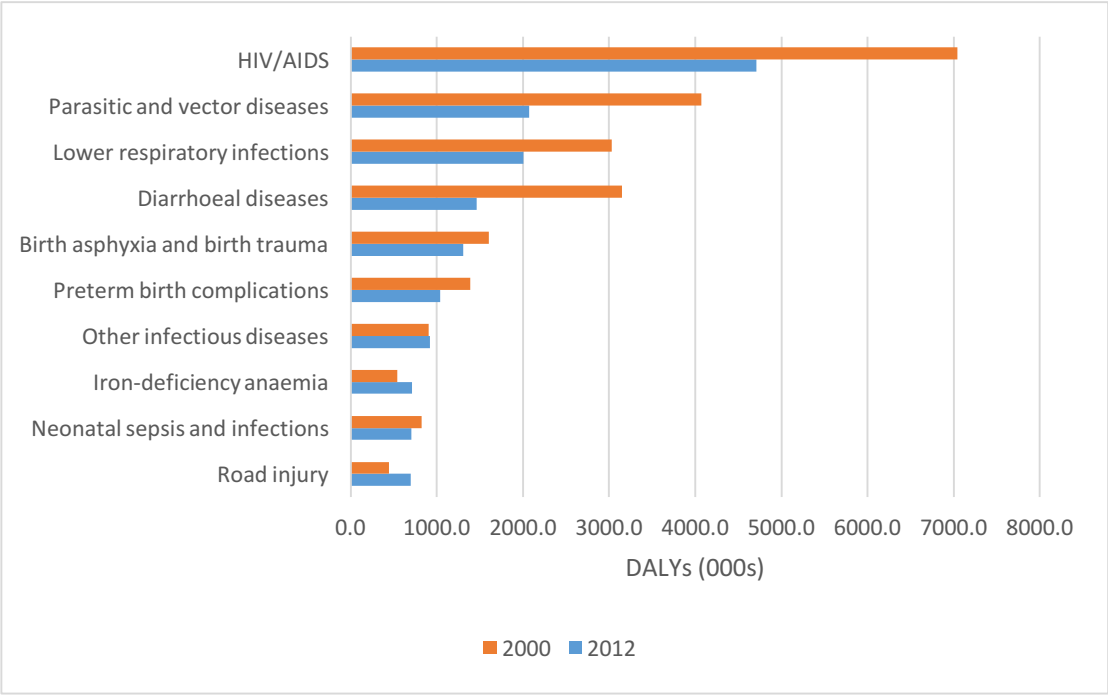

Figure 3 - Comparison of leading causes of DALYs in Tanzania, 2012 and 2000 (12)

There are limited data on the number of lives saved through Emergency Care (EC). Nevertheless, it is clear from the figures above that many conditions are urgent in their nature (e.g. stroke) or can present as urgent (e.g. lower respiratory tract infection) and thus EC can prevent morbidity and mortality. Another important issue is that many people in LICs often do not seek care or do not have access to care until a disease is in its later or acute stages. So despite all efforts of primary (preventive) care providers and public health planners, not all medical emergencies are preventable and thus EC is needed. (13)

2.2 Emergency Care part of Primary Health Care

Since the International Conference on Primary Health Care (PHC), held in Alma-Ata in 1978, the global health focus was on primary care. The declaration stated that PHC "addresses the main health problems in the community, providing promotive, preventive, curative and rehabilitative services". (14) Since then PHC is often equated with the delivery of preventive care and controlling important infectious diseases. PHC thus moved away from the original idea where the curative component was included. Health strategies and priorities in many LICs were strongly based on health promotion and prevention on primary care level. The problem is that most people with an urgent problem will present at the nearby primary care level. Since many Sub-Saharan African (SSA) countries such as Tanzania have a pyramidal health care system, where village-level primary care facilities and health centres serve as the location of initial presentation. At this moment the health

care workers at the primary care level are not capable to provide the first basic EC and are poorly trained in when and how to refer. (15) This is especially a problem in LICs, where people do not seek care until the disease is in an urgent phase. So even on primary care level in LICs, EC could reduce many deaths and DALYs. From a different perspective, EC is preventing further mortality and morbidity. Therefore, it can be argued that basic EC should be regarded as an essential service starting at primary care level.(16)

2.3 Defining Emergency Care

EC is not a well-defined term. Even the term by itself can take many forms; emergency medical care, acute care, critical care, urgent care and trauma care. Looking at the different definitions[1], it is clear that the time-sensitive component is an important part of defining EC. These definitions also emphasize that EC consist of different health system components and that these components should be well integrated into the (existing) health system.

For this thesis, the definition of AFEM will be used as basis, since it is defined with the African setting at its roots. An adjustment is made to explicitly point out the different health system components, pointed out by Anderson et al. (17,18)

[1] Hirshon et al. proposed a definition of acute care, which "includes the health system components, or care delivery platforms, used to treat sudden, often unexpected, urgent or emergent episodes of injury and illness that can lead to death or disability without rapid intervention." (140) Another definition by Razzak and Kellerman proposes, "The purpose of emergency medical care is to stabilize patients who have a life-threatening or limb-threatening injury or illness." (16) The African Federation of Emergency Medicine (AFEM) defines acute care as "The comprehensive, system-based approach to time-sensitive disease. It encompasses all health system components and care delivery platforms used to diagnose, manage, and treat injury and illness that may lead to death or disability without timely intervention. This includes acute care surgery, trauma care, emergency obstetrics, and primary urgent care." (18) A definition which is based more on the different health system components of emergency care is stated by Anderson et al.; "the core concepts and strategies of emergency medicine care focus on reducing preventable mortality, morbidity, and disability from time-sensitive disease processes through integrated systems for accessing emergency care, providing emergency care in the community, care during transportation, and care on arrival at receiving facilities."(17)

Textbox 1: Definition of Emergency Care used in this thesis

Emergency care will be defined as the comprehensive, system-based approach to time-sensitive disease. It encompasses all health system components and care delivery platforms used to diagnose, manage, and treat injury and illness that may lead to death or disability without timely intervention. This includes primary (basic) urgent care, acute care surgery, trauma care and emergency obstetrics. The EC chain should be an integrated system of accessing emergency care, providing emergency care in the community, care during transportation, and care on arrival at receiving facilities.

2.4 Tanzania and Emergency Care

EC is a relatively new concept in Tanzania. In the latest Health Sector Strategic Plan IV 2015 - 2020 (HSSP IV) there is little attention for EC as an integrated subject in the health system. (5) Basic EC on community level is hardly available. Although several hospitals are implementing EC concepts, nationally there is a lack of uniformity in the approach to EC and a lack of coordinated development of care systems, training programs and implementation planning. Now most hospitals that have a designated area for EC, most are not equipped for EC, lack staff with dedicated EC training and serve primarily as sorting out inpatient versus outpatient care. (19) Practically for most people, especially in rural areas, EC is non-existing. This lack of EC is creating unnecessary mortality and disability.

2.5 Justification

From the above paragraphs, it is obvious that EC is needed in Tanzania, but more detailed knowledge should confirm this. To be able to implement EC in Tanzania it should be clear what EC services are currently available and which policies are implemented linking to EC. Another concern is how the quality of EC services can be guaranteed. There is quite some literature and ideas about how to set up EMS in LICs, but the information is fragmented and not always practically implementable. This research addresses the above knowledge gaps, thereby contributing to the way forward for implementing EC in Tanzania.

3 Objectives

3.1 General Objective

To assess the need for EC in Tanzania and analyse current policies and initiatives in EC globally and in Tanzania specifically, in order to identify ways to strengthen the implementation of EC in the Tanzanian health care system.

3.2 Specific objectives

1. To assess the need for EC in Tanzania
2. To describe the services currently delivered in EC in Tanzania
3. To analyse current EC policies and initiatives in Tanzania
4. To describe what is globally already done in relation to EC and what is applicable to Tanzania
5. To analyse the barriers and enablers to quality of EC in Tanzania
6. To give recommendations relevant to the Ministry of Health and Social Welfare (MoHSW) of Tanzania and lower governmental levels on how EC can be implemented in the Tanzanian health care system

4 Methodology

To meet the specific objectives, a literature review and a case-study is carried out. These will be further described in the following paragraphs.

4.1 Literature review

To meet the specific objectives 1-5 a systematic literature search is done using different databases: PubMed and Web of Science. Search engine Google (scholar) is used to identify grey literature. Lastly websites from World Health Organisation (WHO), United Nations (UN), the Tanzanian government, The International Federation for Emergency Medicine (IFEM), The African Federation for Emergency Medicine (AFEM) and Global Emergency Care Collaborative are searched for additional information.

Results are limited to English and after 2000, landmark publications before 2000 are also included. Reference lists are scanned for any missed articles not found in the literature search. The literature search is performed using key search terms.[2]

To analyse the barriers and enablers of EC in Tanzania an IFEM framework is used. The IFEM framework is chosen because it covers all important aspects of quality of care in EC.[3] It is adjusted in two ways. The framework is written from an ED point of view, which is adjusted to fit a more holistic approach of the whole EC chain. Secondly, since this framework seems to be written for EDs in a high resource setting (not explicitly stated), it is adjusted to a

[2] Key search terms are: 'emergency care', 'emergency medicine', 'acute care', 'urgent care', 'emergency department', 'trauma care', 'emergency obstetric', 'emergency surgical care', 'emergency child care', 'emergency paediatrics' 'emergency new-born care', 'triage', 'strategies', 'guidelines', 'quality of care', 'Tanzania', 'global', 'international', 'Sub-Saharan Africa', 'low-income-country', 'middle-income-country', 'best practices', 'training' 'education' 'enablers', 'barriers', 'staff', 'processes', 'infrastructure', 'indicators', 'monitoring and evaluation', 'protocols', 'systems' and 'management' . The terms will be searched for in the following way: "emergency care" AND (triage OR strategies OR guidelines OR "quality of care" OR cost-effectiveness OR "health priorities" OR "burden of disease" OR trends OR "best practices" OR "training" OR "education") AND (Tanzania OR Global OR International OR "Sub-Saharan Africa" OR "low-income-country" OR "middle-income-country") The term "emergency care" will be replaced with 'emergency medicine', 'acute care', 'urgent care', 'emergency department', 'trauma care', 'emergency obstetric', 'emergency surgical care', 'emergency child care', 'emergency paediatrics' and 'emergency new-born care' and combined in the same way.

[3] The IFEM framework has been developed on a consensus meeting with many EC experts representing more than 70 countries, so many ideas and opinions were considered which gives the framework a strong foundation. (102)

low resource setting. The adjusted framework fits the definition of EC used in this thesis. (see Figure 4)[4]

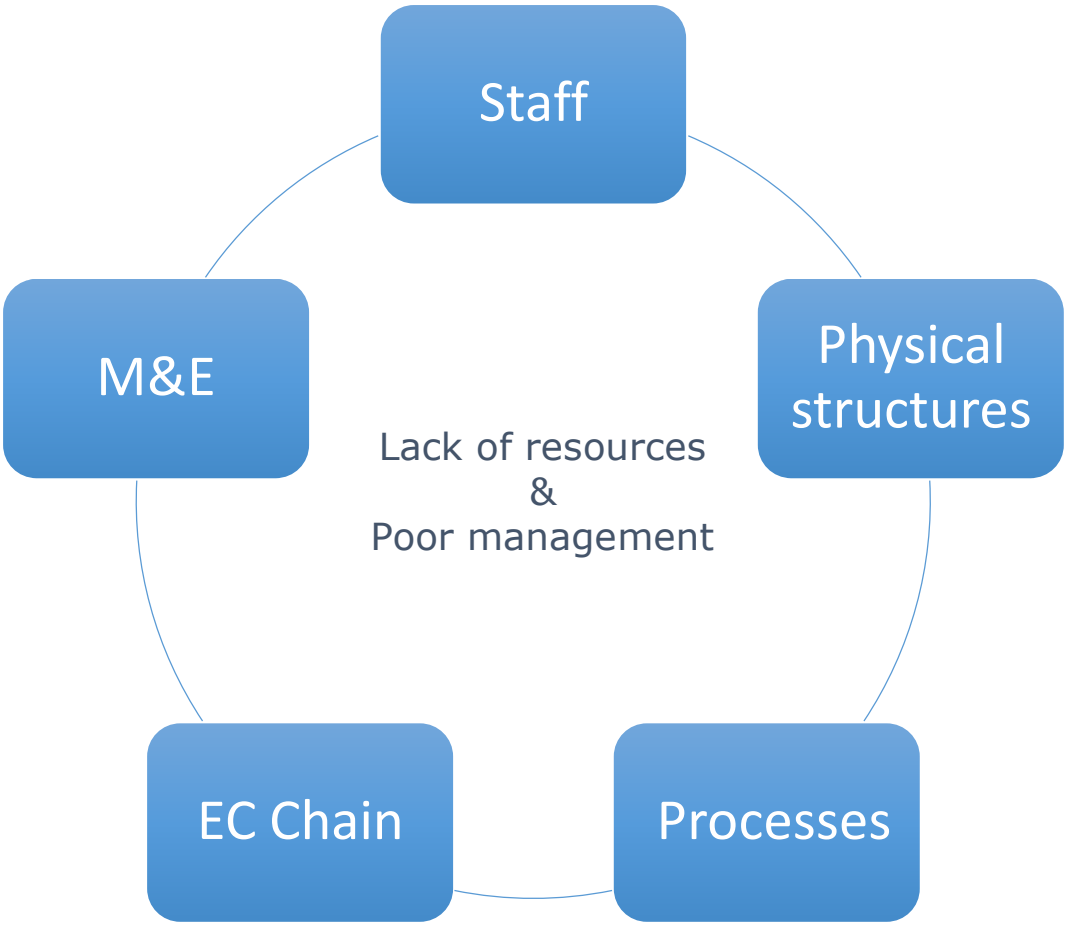

Figure 4 - IFEM framework

4.2 Haydom Lutheran Hospital – a case study

4.2.1 Introduction

To add more in-depth information to specific objectives 1,2 and 5, a case study is carried out at Haydom Lutheran Hospital (HLH). The case-study consists of 3 components; a retrospective file study (specific objective 1), an observational study (specific objective 2) and a qualitative study (specific objective 5).

HLH is a faith based regional referral hospital, located in the North of Tanzania, around 300 km South-West of Arusha. The hospital has 420 beds, serving around half a million people in its direct catchment area and a population of 3 million for its referral function. Since EC concepts are not yet fully implemented in HLH,

[4] The full framework can be found in Annex 1 – Analytical Framework.

whilst the management intends to improve this, HLH can serve as a case study in this thesis. HLH is in many ways a hospital with similar characteristics as many other large Tanzanian hospitals. (20) However, it is a faith-based hospital relying partly on Norwegian support, which probably has a positive influence on quality of care. (21) HLH is taken as a convenient sample, since the writer of this thesis was an employee at HLH for almost three years.

4.2.2 Retrospective file study: Assessing the need for EC in Tanzania

To further describe the need for EC in Tanzania (specific objective 1) a retrospective file study is undertaken at HLH. Diagnoses are categorized according to frequency. To analyse urgency of the patients admitted at the reception, a retrospective triage is done using the information from the files. This is done using part of the South-Africa Triage Scale (SATS), which has been thoroughly validated.[5]

4.2.3 Observational study: EC services at HLH

HLH can also be used to observe which EC services are currently available. (specific objective 2). Baker et al. conducted a survey of ten hospitals in Tanzania, assessing the structure and availability of resources for Emergency and Critical Care, in order to identify the priorities for improving care in this neglected specialty. (22) The tool used in this study is used as a checklist to observe and describe the current standards in EC that are delivered at HLH.[6]

4.2.4 Qualitative study: Barriers and enablers to quality of EC

To gain deeper insight in enablers and barriers of quality of care in EC (specific objective 5), information from health workers of HLH and other key informants is obtained. Focus Group Discussions (FGDs) are held with doctors and nurses from reception and labour ward. Semi-structured interviews (SSIs) are held with Key Informants (KIs) to gain additional information.
The discussion and interview guides are structured according to the adjusted IFEM framework used in this thesis (see description on p. 8). (23)[7]

4.2.5 Approval & Ethics

The Royal Tropical Institute, the National Institute for Medical Research (NIMR) in Tanzania, the Tanzanian Commission for Science and Technology (COSTECH) and HLH have approved this

[5] More information is found in Annex 2 – Retrospective file study.
[6] For more details see Annex 3 – Observational Study.
[7] Additional information and the topic guides (English and Kiswahili) can be found in Annex 4 – Qualitative study.

study. A Data Transfer Agreement (DTA) was also given out by NIMR.

Ethical considerations mainly concern FGDs. For the FGDs confidentiality is emphasized and informed consent forms are signed.[8]

4.2.6 Limitations of the case-study

The case study at HLH has some limitations. Since it is a small-scale study, the outcomes cannot be generalized. However, HLH is in many ways a hospital with similar characteristics to many other large Tanzanian hospitals (20), thus the recommendations can be used if aware of the differences. The case study is done to support findings of the literature review and should be interpreted as such.

[8] More details about the ethics of the case study can be found in Annex 5 – Ethics

5 Results

5.1 Literature review

5.1.1 To assess the need for EC in Tanzania

Why does Tanzania need Emergency Medical Systems?
The main reasons are mentioned in the introduction (p. x). Many prevalent conditions in Tanzania are urgent in their nature (e.g. stroke) or can present as urgent (e.g. lower respiratory tract infection) and thus EC can prevent morbidity and mortality (see Figure 2 and Figure 3).

Although the numbers of deaths by HIV/AIDS are decreasing (due to major funding of effective strategies), it is still a large killer. Part of these deaths could be averted by effective treatment of acute episodes of (opportunistic) infections in this group of people.

Many of the top ten deaths and DALYs in Tanzania affect children. Effective EC could avert these deaths and disabilities in this vulnerable group. PHC facilities are often, especially in rural areas and among the poor and non-educated families, used as the first option for (emergency) child care. These are groups with the highest child mortality, so EC needs to start at PHC level. (24)

Maternal deaths in Tanzania, although not in the top ten killers any more, still have a high prevalence (maternal mortality ratio 432/100.000 live births). (6) Although identifying risk factors for acute complications is easy, identifying which of the at-risk women will actually develop a life-threatening condition is not possible. (13) The only way to prevent these deaths is by ensuring access to emergency obstetric care for all pregnant women, since it is estimated that 15 percent of all pregnant women experience a potentially life-threatening condition and will need EC. (25)

NCDs are coming up strongly in Tanzania. (26–28) The lack of long-term everyday effective treatment and access to care means that acute episodes and flare-ups of NCDs may be life threatening and need EC.

Multiple studies done in Tanzania describe the burden of trauma and especially the lack of pre-hospital care for trauma patients. The ‘golden hour’ of trauma is hardly ever reached and many severely injured patients die before reaching care. Paradoxically many minor injured patients are being cared for in hospitals. (29–33)

More information about the need of EC in Tanzania can be obtained by knowing what kind of cases and their urgency are presenting to health facilities or through prevalence and surveillance studies. Most of these studies deal with trauma patients, which is category of patients ultimately needing EC.[9]

5.1.2 To describe the services currently delivered in EC in Tanzania

Overview Tanzanian healthcare system

As shortly described in the Background (p. 1), the Tanzanian healthcare system is built up in a pyramid. There is high density of PHC facilities in Tanzania with 72% of Tanzania's population living within 5 km and 93% within 10 km of a health care facility. (6). At dispensaries (the first level), the vast majority of health services are provided. However, dispensaries only receive around one-third of all resources on average (34). Also, the dispensaries are staffed with the least educated mid-level health workers (MLHW) which are not trained in dealing with urgent cases. (35) In theory, the referral system is designed for the dispensary to refer patients to health centres and for the health centres in turn to refer patients to hospitals. Unfortunately, this system is not functioning as intended, compounded by many factors.[10] (35)[11]

Existing services in EC

Currently, formal pre-hospital emergency medical services are non-existent in Tanzania and there is no (standardized) training for transport personnel. Most ambulance services are understaffed, poorly equipped and mostly stationed within health facilities, used for inter-facility patient transfers. Basic EC at community level is usually not available. Informal care received prior to arrival in a higher-level facility is most often given by bystanders, police officers, community leaders or relatives. In most larger facilities patients arrive at reception areas, which are used as a centralized point of entry to the hospital. The staff are tasked with channelling patients to the various departments and wards based on their presenting complaint or referral diagnosis. Most of these reception areas are not equipped or staffed to provide rapid evaluation, resuscitation, and management of acutely ill or injured patients. (19,36,37)

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[9] More details about the most important studies are described in Annex 6 – Prevalence and surveillance studies.

[10] Such as: underfunding, weak management arrangements, inadequate and poor quality of staff, lack of equipment and medicines and difficulties in transport and communication.

[11] A more detailed description can be found in Annex 7 – Overview of Tanzanian health care system.

Pre-Hospital Services

A qualitative study about Tanzanian trauma patients' prehospital experience highlighted the current gaps in health delivery within the referral system. There are large delays in care and transfer, diagnoses are missed and many patients have poor outcome due to very limited capabilities at pre-referral centres. Patients were also asked about potential barriers and facilitators to implementation of a EMS. Barriers included patient financial limitations and lack of insurance and limited public infrastructure and resources. Potential facilitators included communities' tendency to pool resources, individuals' trust of other community members to be first aid responders, and faith in community leaders to organise. Interestingly, participants expressed a strong desire to learn first aid. This study shows a very inadequate environment of pre-hospital care for injured patients, with long delays to definitive care. There might be a favourable climate for community-based-response models. (33)

Hospital EC Services

The Tanzania Service Provision Assessment Survey (TSPA) 2014-2015 provides information on the delivery of health care services in Tanzania.[12] EC is not mentioned or measured as such except for Emergency Obstetric Care. Chapters are grouped by vertical pillars (maternal health, child health, TB etc.). Emergency Care is not part of the basic amenities as basic client services are defined as follows: outpatient curative care for sick children, child growth monitoring, facility-based child vaccination services, provision of any modern method of family planning, antenatal care, and services for sexually transmitted infections (STIs). About 74 percent of all Tanzanian health facilities offer this basic client services package which does not include EC.

There are indicators comprising the basic amenities domain for assessing general services at all level health facilities such as regular electricity, an improved water source, visual and auditory privacy, a client latrine, communication equipment, a computer with Internet access, and emergency transport.[13] Logically for EC to

[12] The report seems to be partly based on the WHO SARA (Service Availability and Readiness Assessment) methodology. (41) (39). The SARA methodology can be used by countries as an annual monitoring system for service delivery in health care in general. (39)

[13] The most commonly available client amenity was visual and auditory privacy in the service area, available in over 90 percent of facilities. Availability of other amenities in Tanzanian health facilities ranges from 68 percent with improved water source, 67 percent with access to regular electricity, 58 percent with emergency transport, 51 percent with communication equipment, 44 percent with a client latrine and only 12 percent with a computer and Internet access. All these amenities are less available at lower levels comparing to higher levels.

function, most of these amenities are a prerequisite. These are also stated as essential by the WHO needs assessment and evaluation form for essential emergency equipment in the Emergency Department (ED)[14] (38).

The delivery of EC services requires availability of functioning basic equipment. The WHO has proposed a list of seven basic pieces of equipment that should be available at any health facility.[15] (39) In Tanzanian healthcare facilities, a stethoscope (91 percent) is the most commonly available piece of basic equipment. This is followed by a thermometer and blood pressure apparatus, each of which is found in about eight of ten facilities, and an adult scale found in 76 percent of facilities. In contrast, only 38 percent and 16 percent of facilities have an infant scale and light source, respectively.

According to the Disease Control Priorities version 3 (DCP3) "Essential Resources for the Delivery of Emergency Care in Hospitals" list, starting from district level hospitals, blood, basic laboratory tests and radiological services should be available 24 hours a day. (40) Basic laboratory tests are on average available at less than 40 percent of facilities.[16] Overall, hospitals and health centres are more likely to provide the range of basic diagnostic tests than other types of facilities. Advanced level diagnostic tests and diagnostic imaging should be available in hospitals. However, this is not the case for many hospitals.[17] (41)

Triage

A study of four emergency departments (EDs) in Dar es Salaam municipality looked at knowledge and skills in triage of nurses and availability of triage equipment. Only 22% of the nurses in the studied hospitals had formal training in either emergency, trauma, critical or intensive care nursing. Almost 50% had worked in the EDs of the selected hospitals for a period of one year or less, so it seems there is relatively many unexperienced nurses. Of all the nurses 67% had no knowledge about triage at all and, although not stated as such, real triage (with underlying guideline) seems to be only done in the national hospital. Of the nurses observed doing

[14] Part of the Integrated Management for Emergency and Essential Surgical Care (IMEESC) toolkit.

[15] These are: an adult scale, a child scale, an infant scale, a thermometer, a stethoscope, blood pressure apparatus, and a light source.

[16] Except for the malaria diagnostic test (83 percent), HIV test (81 percent), syphilis test (50 percent)

[17] For example, only 23 percent of hospitals provide blood typing and cross matching, while only 64 percent of hospitals offer serum electrolytes. Only 63 percent of hospitals have an X-ray machine and 73 percent have an ultrasound machine.

(some kind of) triage, respiratory rate was hardly ever measured, although this is seen as most discriminatory between stable and at risk patients. Availability of equipment was strikingly poor, there were no pulse oximeters and thermometers in all but the national hospital. (42)

Infrastructure

In a large multi-centre study in 2012, the WHO Tool for Situational Analysis to Assess Emergency and Essential Surgical Care was used to capture 48 health facilities in Tanzania. The capacity to perform basic surgical (including obstetrics and trauma) and anaesthesia interventions were analysed by investigating four categories of data: infrastructure, human resources, interventions available and equipment. The 48 facilities surveyed serve 46% of the population. The study found significant deficits in human resources, essential equipment and infrastructure.[18] (43)

A study done in 2011, evaluates the capabilities of the health care facilities in several sub-Saharan African countries, including Tanzania, in light of access to emergency and surgical care.[19] The study concludes that without building and rebuilding infrastructure and systems it is not possible to scale up emergency and surgical care in countries like Tanzania. (44)

Baker et al. evaluated ten hospitals in four regions of Tanzania using a structured data collection tool looking at the structure and availability of resources for Emergency and Critical Care (EaCC).

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[18] A striking example is that only six functioning pulse oximeters were available in all facilities surveyed and supplies for basic airway management were inconsistently available. Only 42% had consistent access to oxygen, and 37.5% of facilities reported both consistent running water and electricity. While very basic interventions (suturing, wound debridement, incision and drainage) were provided in nearly all facilities, more advanced life-saving procedures including chest tube thoracotomy (30/48), open fracture management (29/48) and caesarean section delivery (32/48) were not consistently available. Surgeons and Anaesthetists were almost exclusively available in the six largest hospitals.

[19] The study was based on DHS data looking at six key components required for a functioning district emergency and surgical service: basic infrastructure, equipment, medicine storage capability, infection control, quality systems, and education. Only 20% of the facilities had all basic infrastructure and 40% had adequate equipment to perform basic emergency and surgical care.
In all assessed hospitals in Tanzania there was little availability of infection control materials (soap, running water, sharps box, latex gloves and disinfectant) and only 40% had proper waste management in place. All these items were even less available in assessed health centres. Medicines were stored well in 70% of hospitals assessed, however, monitoring of medicines was only in place in 20% of facilities. Some form of in-service training and supervision was available at around 60% of all hospitals assessed. These numbers are almost the same in health centres. Surrounding countries in this study (Kenya, Uganda, Rwanda) are not doing much better or worse in most areas.

Their study has found that most hospitals lack an infrastructure designed for managing critically ill patients, lack routines for the prioritisation and management of the critically ill and a low level of EaCC training among staff.[20] (22)

Hanson et al. undertook an assessment in Southern Tanzania based on staff reports using a questionnaire assessing staffing, work load, equipment and supplies as well as interventions routinely implemented during childbirth. It turned out no first-line facility had provided all signal functions for emergency obstetric complications in the previous six months. Only 5% of dispensaries, 38% of health centres and 50% of hospitals were able to offer all care in the essential birth care package as described by WHO. (45)

Human resources

There are multiple problems in Human Resources for Health (HRH) in Tanzania, which is relevant in relation to providing EC in facilities. There is an absolute shortage of health workers, an unequal distribution of health workers (per capita and rural vs. urban) and there is evidence for suboptimal productivity and low motivation[21]. (8,10,46–49) In 2013 the total shortage of health workers was 57% and shortage of qualified staff in the health training colleges 35%. The shortage in health workers is most pronounced at district level. (10) Training institutions have produced many more health workers in the past 15 years. However, due to a weak HRH management system and the issues discussed above, the HRH situation in the district remained the same. The multiple ministries and other (private) stakeholders in health dealing with HRH management are not coordinated well.[22] (46,50) In the newest HRH strategic plan 2014-2019 the above named issues are all well described and planned for and will hopefully at least be partly addressed. (10)

A recent study by Manzi et al. highlight that besides inadequate staffing of health facilities, a high degree of absenteeism, low

[20] Interestingly enough, the study shows that the hospitals were well stocked with drugs and equipment necessary for basic EaCC. This suggests that a lack of the basic tools for EaCC cannot be blamed for deficiencies in the quality of care. Also shown in the study is that district and regional hospitals are less resourced than higher level facilities, suggesting that there is little capacity for EaCC in smaller centres.

[21] Reasons for poor motivation given are most importantly a poor working environment (infrastructure, equipment and housing), delays in payment of (low) salaries and allowances and poor career development options.

[22] Since the end of 2015 many finished MDs are not employed by the government, rumours are the new president will first 'clean-up' the system before employing new people. Meaning that apparently, many people who are on the government payroll as health worker are not actually working. (personal communication with various MDs, august 2016).

productivity of the staff who were present and inadequate supervision all add to HRH challenges .[23] (48)

In 2009, a qualitative study looking at motivation of non-physician clinicians (COs and AMOs) found that salary was a very important factor in the motivation of Clinical Officers (COs) and Assistant Medical Officers (AMOs).[24,25] (51) Another study looking at motivation of lower-cadre health workers in maternal and new-born health in rural settings found that key sources of encouragement include community appreciation, perceived government and development partner support, and on-the-job training. Discouragements are mostly financial in nature, but also include understaffing and the resulting workload, malfunction of the promotion system as well as health and safety issues. (52)

Perceived quality of care

There are multiple studies showing that care-seekers bypass dispensaries and health centres and enter the system through secondary level facilities. Two qualitative studies in Tanzania came up with similar findings why care-seekers bypass PHC facilities, all related to perceived quality of care.[26] (53,54) In a study among rural women bypassing the nearest facility for delivery, a major reason for this appeared to be a concern about the quality of care at government dispensaries and health centres. (55)

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[23] Absenteeism was due to meetings or short-term training seminars, official travel (collecting drugs/vaccines/wages in the district capital) and 'normal' leave. Low productivity seemed mainly due to lack of initiative undertaking other activities when patients were not present. The supervision was infrequent and in some cases poor of quality, however was still in general seen as helpful by staff. Reasons for poor supervision were the fact that the council health management team members, who are in charge of the district, had too many other obligations (seminars, unexpected visits from officials and health stakeholders, managing HMIS), disturbance by local factors (such as the breakdown of vehicles and unavailability of fuel) and poor guidance by the regional and national level.

[24] It is linked to feelings of respect and social status. The findings suggest that non-financial factors are also important but that satisfaction with salary level may be a prerequisite for any intervention to change motivation. Especially COs felt their work was not respected by higher cadres and most of the younger COs had the ambition to get higher education. The working environment, including the social, organisational, physical and broader political context of work, is of clear importance to clinicians.

[25] See Annex 7 – Overview of Tanzanian health care system for explanation about CO and AMO

[26] The studies cite the availability of basic diagnostic facilities, prescribing drugs by clinicians without any clinical exam or diagnostic test, frequent drug shortages and unsafe drug dispensing practices, unreliable availability of health workers, unclear opening hours, the fact that there is no staff around for emergency situations (because most staff do not live close to the facility), no electricity at night, long waiting times, poor and impolite communication by health workers, unofficial payments and poor referral services.

5.1.3 To analyse current EC policies and initiatives in Tanzania

Government policies related to EC

There are many government policies which have influence on EC. While Tanzania has some discipline-specific guidelines such as for Maternal and Child Health, Malaria and NCDs, there are no national guidelines specifically for EC. (11,56,57) In many strategies EC is mentioned, especially EmONC gets a lot of attention. In the HSSP IV, the importance of EmONC, Integrated Management of Childhood Illness (IMCI) and trauma care is highlighted, which are parts of EC. For primary health facilities, a star rating applies, which includes EC and Referral Mechanisms. Some characteristics of a five-star facility are:

- Fully trained staff and a strong functioning system to triage and refer if needed
- Successfully handle emergency cases as per the norms for the facility type

These norms cannot be clearly found in the HSSP IV or in any other government policy.[27]

Many strategies have a focus on strengthening the primary (district and below) health care system in terms of infrastructure, HRH, finance, equipment and supplies, which should help in strengthening EC as well. (5,10,58) In the strategy explaining the national essential health care package, one of the main strategic approaches is a client-centred service delivery model with 24/7 availability and accessibility of all services that are associated with that level. The details remain vague, however. [28,29]

[27] In a chapter called transport and ambulance service it is stated that; "The MOHSW will coordinate the setting up of a mechanism for emergency medical services at all levels, including guidelines and protocols" and "will also investigate options to establish a toll free telephone number 115, for emergency calls". (5) This seems very promising, although the practicalities are not addressed.

[28] Although Integrated Management for Emergency & Essential Care (IMEESC) is supposed to be included from dispensary level, it is not explained what it contains. (58) On paper EC seems to be on the agenda, although its content is not clear nor complete and has to be found in bits and pieces throughout the policies.

[29] More detailed information on EC in government policies can be found in Annex 8 – Government policies and strategies.

Initiatives in the field of EC in Tanzania

Pre-hospital EC

Pre-hospital EC systems are very limited in Tanzania as discussed earlier. In Mwanza, the Tanzania Rural Health Movement is trying to set up a community first responder system.[30] The first results are promising and the project will further expand into rural areas surrounding Mwanza. (59,60) In 2012 the government invested in 420 motor ambulances which can reach in rural areas.[31] (61) No data on its functioning are published so far.

There is an abundance of literature on pre-hospital maternal health initiatives, which can be useful for implementing EC. A large project, in collaboration with the MoHSW, in teaching village health workers and development of affordable transport systems turned out to be successful five years after implementation.[32] (62) Another large project in maternal health where Community Health Workers (CHWs) trained women in Home Based Life Saving Skills (HBLSS) on knowledge of danger signs, birth preparedness, complication readiness and facility delivery using story-telling, role-playing and skill acquisition with pictorial cards had significant success. (63) A qualitative study on functioning of CHWs (focusing on multiple issues within maternal and child health) showed their widespread acceptability and added value, although the district health care system in which they functioned was very weak, which is a general problem in Tanzania. (64).

EC in hospitals

In 2007, at a joint meeting of WHO and MoHSW, the WHO Integrated Management for Emergency and Essential Surgical Care (IMEESC) was introduced and plans were made for

[30] It uses an SMS-based emergency medical dispatching software together with training first aid to lay persons in the community who are already responding to medical emergencies, mostly motor and taxi drivers. Also fire and rescue staff and traffic police is involved in training.

[31] It is part of partnership with a UK based NGO developing these motor ambulances especially for hard to reach places in LICs.

[32] Village health workers (VHWs) were educating, giving advice, keeping record, referring women for care, helping dispensary staff and many of them reported on their activities during village assembly meetings. They were well respected in their communities. Transport systems included tricycles with platforms, canoes, oxcarts, and stretchers. Half of the systems were privately owned and the other half were community-financed. The community-financed systems seemed to work better due to having an Emergency Transport Committee to manage it and better collaboration with the VHWs.

implementation.[33] (43,65) However, it seems little action has so far been taken to take this project to the next level.

In 2010, the Muhimbili National Hospital (MNH) started a modern and fully equipped ED and collaborated with foreign academic institutes on training of personnel. A nursing, registrar and residency program in Emergency Medicine (EM) was started and the first residents graduated in 2013. (66) Since the opening of the new ED, a significant overall hospital mortality decrease was seen (13,6% to 8,2%). (36) Besides the national hospital, in the other three large (highest level) referral hospitals and even some smaller hospitals, EC projects in collaboration with different foreign institutes and universities are ongoing. So far there seems to be no collaboration between these projects. (19,67–69)

In an effort to advocate for the dissemination of high-quality EC in Tanzania, MNH providers in 2011 formed the Emergency Medicine Association of Tanzania (EMAT), the first EM professional organization in the region. It has been well received by the MoHSW. Their mission is to work in collaboration with other organizations, which deal with teaching, research and education of EC, regardless of location, to the benefit of EC in Tanzania.[34] (37,70,71)

Recently WHO in collaboration with the African Federation of Emergency Medicine (AFEM) and EMAT organised basic EC courses as part of larger pilot in multiple countries. (72) In 2016 EMAT hosted the first Tanzanian Conference on Emergency Medicine, which was visited by the Chief Medical Officer, reaffirming the full support of the government towards EMAT missions. In a conference consensus meeting the need for training on proper use of devices for general A to E management, teamwork, and training in basic and advanced life support was underlined. (73)

Foreign initiatives in training health workers on EC in Tanzania has mainly focused on maternal, child and trauma care. A Canadian group of surgeons implemented the Trauma Team Training program (which was validated in previous studies) in a hospital in Dar es

[33] This implementation was initiated with the formation of a formal 'Surgical Task force' in the Tanzanian MoHSW, training courses, the adoption of IMEESC toolkit by the Tanzania Surgical Association and later hosting the biennial WHO 'Global Initiative for Emergency and Essential Surgical Care' meeting.

[34] EMAT is a member of the African Federation of Emergency Medicine (AFEM) and has bonded with other East-African countries for collaboration on EC initiatives. They offer different short courses in EC (paediatric, trauma, life support, paramedic training for ambulance drivers) and have the ambition to do outreach programs to rural, district, and regional care facilities and clinics.

Salaam, training nurses and physicians.[35] (74) The same training program was implemented in Rwanda with a decrease in mortality of severely injured patients 6 months after initiation of the project. (75)

The Global Emergency Care Skills (GECS) is a non-profit voluntary organisation founded in 2008 with a core objective of providing emergency care and trauma skills training to doctors and nurses in countries where EM is a developing speciality. In 2011, they taught at MNH in Dar Es Salaam where the participants had a significant improvement in their knowledge of emergency care and trauma skills. The feedback from participants was very positive. (76)

A small-scale feasibility study in a district hospital in Tanzania demonstrated a successful introduction of a portable ultrasound unit by the health care staff. They were able to diagnose some basic acute pathology. It showed that ultrasound can be a sustainable addition to a district level ED. (77)

As discussed before, in most hospitals in Tanzania, triage is not used in a systematic way. A study in two large referral hospitals in Tanzania looked at the use of Modified Early Warning System (MEWS) as predictor of mortality in admitted patients. It was found that a MEWS <2 at admission is a good predictor of patients at low risk. Separately, patients that come in walking without help have a 97% chance of surviving their hospital stay. Early warning scores could be helpful in simple triage in district health care in Tanzania. (78)

In 2015, a before and after study looking at retention of emergency skills in obstetrics after a half-day obstetric simulation-based training course resulted in an immediate increase in knowledge, simulated skills, and confidence. However, knowledge and simulated basic delivery skills of medically trained staff decayed after nine months, which indicated a clear need for continuation of training.(79) Another study evaluated the impact of Advanced Life Support in Obstetrics (ALSO) training on staff performance and the incidences of post-partum haemorrhage at a regional hospital in Tanzania. Before and after a 2-day training course staff management and post-partum bleeding was observed. The training significantly improved staff performance and reduced the incidence

[35] It is a low-cost course designed to teach evaluation and management of the trauma patient in the initial resuscitative stage and it focuses on a team approach. Although being a small study, there was significant improved in both a theoretical pre-and post-test and a simulation assessment model. Even more important, participants were very supportive of this course and would recommend it to others.

of Post-Partum Haemorrhage (PPH) directly after training. Long-term effect was not measured in this study. (80)

5.1.4 To describe what is globally already done in relation to EC and what is applicable to Tanzania

> *"Because Emergency Care can successfully complement vertical programs and deliver public health interventions that are part of the larger health sector strategy, governments and funders should consider devoting some money designated for other programs (e.g. HIV care, malaria control and vaccination programs) toward developing Emergency Care. "* (81)

EC in global health strategies

There are large differences in Emergency Medical Systems (EMS) worldwide, hardly existing in LICs. EC in high-income countries (HICs) with advanced pre-hospital services with ambulance coverage, highly educated health personnel and advanced technology will not be affordable (nor cost-effective!) and will not address the need of acute illness and injury of the majority of people in Tanzania. The global health agenda for the past decade was dominated by reaching the MDGs. Strengthening emergency care systems was not part of the MDGs, although globally medical and surgical emergencies account for far more morbidity and mortality than for instance maternal mortality. In the MDG thinking, attempts to improve the management of emergencies in low- and middle-income countries have been focused on the vertical delivery of health services. In Tanzania, the main focus of emergencies was seen in maternal and child health, with mixed success. (82)

More recently there have been some efforts to a more horizontal approach. (83) Calvello et al. developed a conceptual framework for critical time points in EC (see *Figure 5*). This framework is based on the three phases of delay model, which has not only formed the basis for understanding the factors contributing to maternal mortality but also for the initiatives that may have had most impact on maternal health during the MDGs timeframe. (83,84) The critical time points are the moment of seeking care, reaching care and eventually receiving appropriate care. The first two time points fall into out-of-hospital EC and the final time point into facility-based EC and definitive care (after referral). It further classifies influencing

factors into patient factors and health system factors. It is a useful tool in understanding the factors contributing to mortality and morbidity in EC as it did for maternal health.

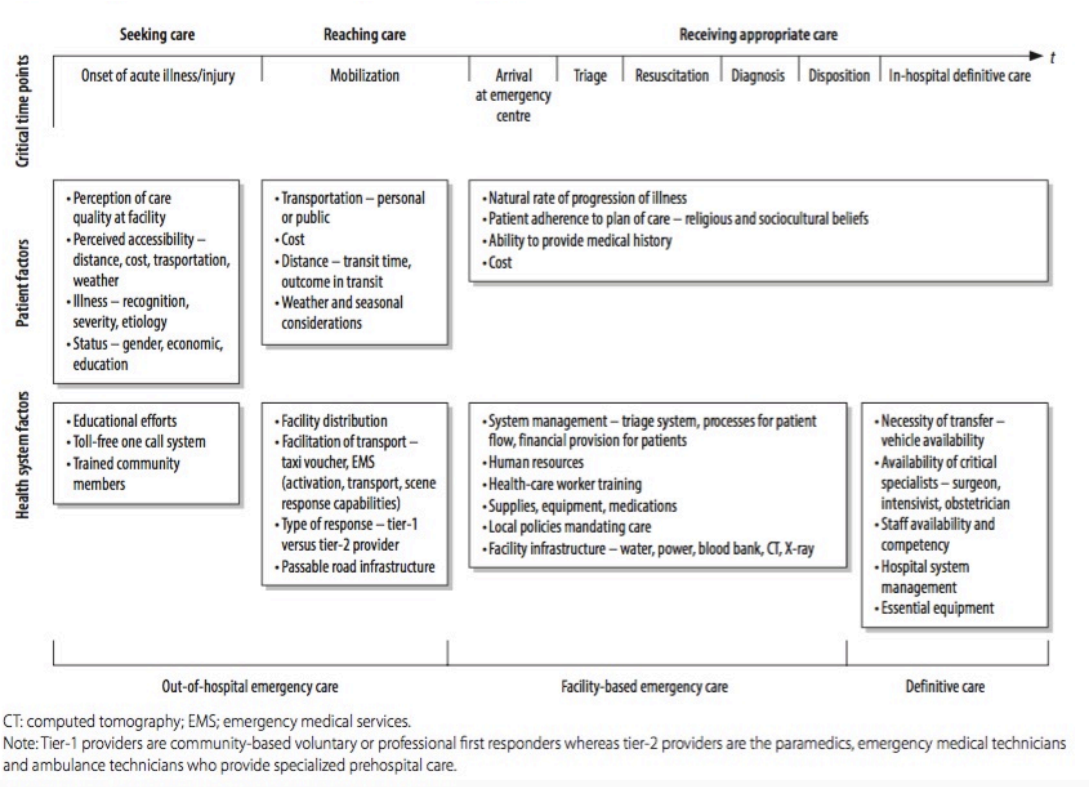

Figure 5 - Conceptual framework for critical time points in Emergency Care (83)

WHO

An important moment for EC in the last decade was when in 2007 the World Health Assembly Resolution 60.22, "Health Systems: Emergency Care Systems," drew attention for the idea that strengthened EC services can decrease the global burden of disease resulting from acute illness and injury and called on governments together with WHO to take concrete action to make this happen. (85) It can be an important advocacy tool to get attention for the importance of EC in Tanzania. (17) The WHO has created several guidelines and strategies supporting (parts of) EC which give guidance to implement and evaluate EC. (38,86–92) Especially important is the start of the WHO Global Initiative for Emergency and Essential Surgical Care (GIEESC) in 2005 and more recently in 2015 the first WHO meeting on development of Emergency Care Systems.

The Integrated Management of Childhood Illness (IMCI) is a strategy which was developed by the WHO and the United Nations

International Children's Fund (UNICEF) in 1992 as an integrated approach to improve child health. (86) Parts of it are related to EC and could be useful in approaching EC at community to district level. A recent review showed mixed results on the IMCI approach, but it probably helped in the reduction of child and infant mortality. (93) In 1996 IMCI was introduced in Tanzania (as one of the first countries). Large studies form the beginning period showed an improvement in quality of care, a reduction in under five mortality of 13% and the costs of care were similar or even lower. (94,95) The WHO Emergency Triage Assessment and Treatment (ETAT) is especially designed for triage in children, which was never officially implemented in Tanzania. Recent studies have been done showing mortality decrease in children under five using ETAT as part of system changes in EDs in LICs. (96–98).

Disease control priorities

In the third edition of the disease control priorities in developing countries (DCP3) EMS are emphasized. (99) In DCP3, new insights give a more concrete overview of how EMS could cost-effectively work in Tanzania. (see textbox 1 below) It is clear from these recommendations that urban areas need a different approach than rural areas. The DCP3 project estimates that nearly half of deaths and over a third of disability in low and middle income countries could be addressed by the implementation of effective EC.

Textbox 2: DCP3 interventions to build EMS in LICs

- Pre-hospital first-aid care in the community can be achieved by training laypersons, finding motivated citizens who often confront emergencies (costs are estimated to be US$0.06 per capita on voluntary basis) (large review coming-up (100))
- Paramedical personnel, with more advanced training, could be introduced in large urban areas with close attention to keeping costs low
- Where both exist, they should be integrated in one organizational unit
- Both lay and paramedical teams require ongoing refresher courses so that their skills do not deteriorate
- Exploring local transport options in rural settings is very important which can be (private) motorized or non-motorized vehicles, adjusted to what is locally available
- Ambulance services can be cost-effective in urban areas (average US$1.27 per capita)

- The WHO provides practical and comprehensive lists of equipment and supplies needed for prehospital and in-hospital providers in different settings
- Training of health personal in EC (trauma, obstetrics, life support, ETAT) seems beneficial
- Lack of basic infrastructure is a key barrier to EC success (running water, electricity etc.)
- Community finance options should be considered to help overcome barriers to accessing EC
- Careful considerations with locally collected data should be made to allocate funds to the right place ("Expensive technology and equipment and specialists should not be advocated for the urban privileged at the expense of the majority of the rural poor")

MDGs, SDGs and Universal Health Coverage

The MDGs did not focus on EC, however parts of MDG 4 and 5 for maternal and child health deal with parts of EC. In the light of the MDGs, it is good to analyse in strengthening EC what Tanzania can learn from disappointments and achievements made during the time chasing the MDG goals. Looking at MDG 4 and 5 for maternal and child health, Tanzania has made substantial advances in child survival but slower progress in maternal and new-born survival. A large case study, funded by large international donors, has explored reasons for these differences in progress. First of all, they found significant differences in funding and especially in implementation of strategies. Donor funding has been lower for maternal health than for child health, and much lower than that for HIV. (82) Child survival has focused on the implementation of high-impact interventions at lower levels of the health system. As discussed, Tanzania was one of the first countries to start implementing WHO's IMCI, showing a 13% reduction in child mortality between 1999 and 2002. In contrast, maternal health has had more focus in higher levels of the health system and at a smaller scale. The health facility births strategy needs a complete functioning of the health-care system. The low quality of especially obstetric care and disrespectful care might have discouraged attendance or cause women to bypass facilities that are closer to their homes. The HRH situation, discussed before, was also mentioned as key bottleneck for emergency services for maternal and child health. (82)

In the new Sustainable Development Goals (SDGs) there is more attention for health issues in general instead of focusing on specific groups or diseases. SDG 3, ensure healthy lives and promote well-

being for all at all ages, has some targets which can give attention to improvement of EC. Achieving universal health coverage (UHC) is the most important for EC. UHC is globally supported and emphasizes health as an essential element of international development as it was adopted in a resolution in the United Nations General Assembly in December 2012. (101) That EC fits very well in UHC was stressed by the 68th World Health Assembly where Strengthening Emergency and Essential Surgical Care and Anaesthesia was acknowledged as a component of UHC in May 2015. (91) This gives an important push for EC globally.

IFEM and AFEM

The International Federation of Emergency Medicine (IFEM) defines the scope of EM practice internationally. Quantitative tools and metrics for measurement of the quality of emergency care have been developed through the efforts of IFEM member organizations and individual members in many countries to guide quality improvement efforts, however for now these are mostly applicable to HICs. (102)

The AFEM is very active in promoting EC in Africa and tries to provide data to inform policy-making, generates training curricula for all levels of providers, and creates tools to facilitate documentation of the burden of acute disease.
AFEM defines EC as a continuum of care (see *Figure 6*), where out-of-hospital care systems (OHECS) are just as important as in-hospital EC systems (IHECS). When applied to Tanzania; lay-responders and community health workers (which could include police and other civil servants) should be the tier-one responders and health workers in dispensaries and health centres the tier two responders of the OHECS.

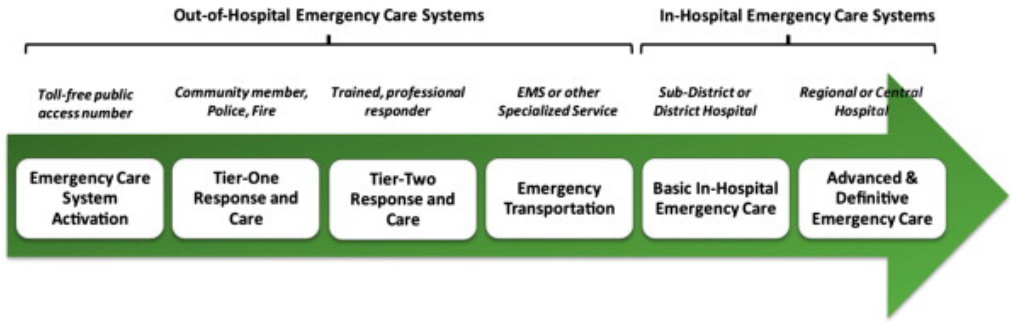

Figure 6 - The Emergency Care Continuum (106)

AFEM supported meetings among EC experts in Africa have served to provide recommendations on how to set up the whole continuum of EC in resource restrained settings. (103–106) In their latest consensus meeting the Emergency Care Assessment Tool (ECAT) was created which allows a pragmatic objective evaluation and designation of tiers of care based on the capacity for critical service

provision. The tool is divided into three levels of healthcare (basic, intermediate and advanced) which makes it very applicable to the Tanzanian pyramidal healthcare system. This tool can be very helpful planning interventions in EC. Another important issue AFEM is working on is trying to create standardised instruments to get data on the burden of acute disease and EC outcomes. These data are needed to measure the health impact of the lack of EC availability and to assess and target EC interventions to regionally-specific need. (106)

Status of EC in SSA

Interest in EC has significantly increased over the past decade on the African continent, however mostly in academia. Dedicated postgraduate EM residency training programmes now exist in nine countries: Ethiopia, South Africa, Republic of Tanzania, Sudan, Egypt, Botswana, Ghana and Uganda and Rwanda. Kenya and the Democratic Republic of Congo (DRC) are in process of developing a program. A large review looking at in-hospital EC in LMICs revealed that the median mortality within the investigated EDs was highest in SSA with 3,4% and care was mostly delivered by health personnel not trained in EC. (107)

The most interesting initiative in the region was started in Uganda. The Global Emergency Care Collaborative (GECC) was founded in 2007 to meet the need for quality EC. The GECC started several successful programs such as a two-year program teaching non-physician health providers EC skills and a pre-hospital education project teaching the community about EC. They also collaborated with a foreign university setting up a master's program in Emergency Medicine for Physicians. (81,108,109) The teaching program of non-physician health providers is very applicable to Tanzania, with also a high physician deficit in rural areas where COs and AMOs (MLHWs) are practicing. This concept of task-shifting is well known and has been shown to be effective in different countries and in different areas of healthcare. (110–112) The teaching program has a focus on being self-sustainable, since the program is set-up to teach the students to become the new instructors and therefor when progressing will need less and less foreign support. (81) Hammerstedt et al. propose a tiered EC system with these non-physician health providers (see *Figure 7*) which can be very useful for the Tanzanian setting.
Other countries in SSA have tried similar training curricula for physicians and non-physicians.[36]

[36] More details can be found in Annex 9 – EC initiatives in SSA.

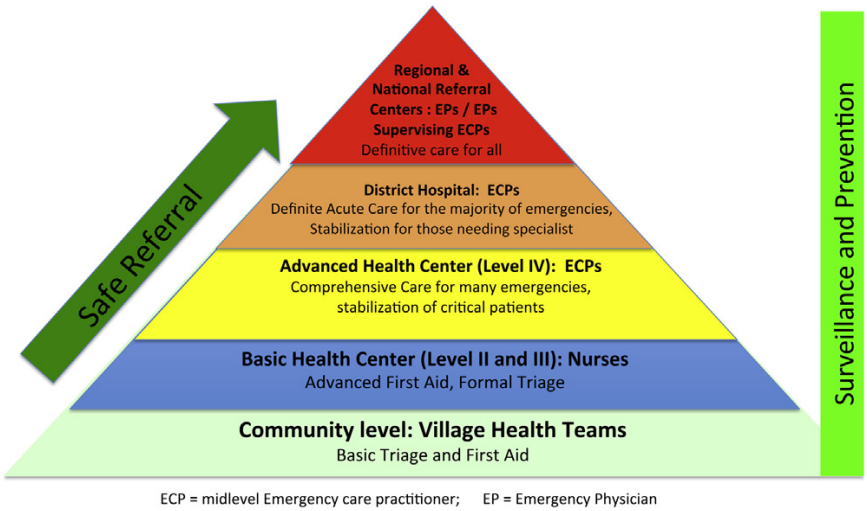

Figure 7 - Tiered EC system (81)

Pre-hospital training of lay persons in LICS got quite some attention. A Large review on pre-hospital trauma training showed positive results in training lay persons on knowledge and skills and even on morbidity and mortality in some studies. It revealed four themes central to layperson first-responder trauma education initiatives in LMICs. (113)[37]

Most triage systems are not suitable for LICs. The triage system used in this thesis for the case study could be (partly) applicable to the Tanzanian setting. (114,115) The triage system is mainly based on a 'triage early warning score' (TEWS), which is based on vital signs. It is also successfully used in other countries outside SA. (115–117) Very recently a new, very simple triage system was developed especially for use in LICs, which was piloted in Cambodia. It is called one-two-triage (OTT) and is based on a two-step method going through short flowchart of questions and measuring some basic vitals. It seems a valid, reliable and cost-effective alternative, however more studies in other LICs are needed.(118)

5.1.5 To analyse what is known in Tanzania about barriers and enablers to quality of care in EC

In 2013 the IFEM created a framework to promote quality and safety in Emergency Departments. (23,102) As explained in the

[37] More information about these themes can be found in Annex 10 – Layperson first-responder training.

methodology section, this framework was adjusted for use in this thesis. The original framework also gives a list of indicators. These could be used, in an adjusted form, as a Monitoring and Evaluation tool of EC in Tanzania, which should be an important part of trying to upgrade EC in Tanzania. Using the adjusted framework and the literature review above, it is clear that enablers are few and barriers are many. The main overall barriers are very much true for Tanzania; lack of resources and poor management stand at the basis of a poorly functioning health system in general. Also, EC processes, a whole-systems approach to EC and then obviously M&E of EC are mostly not present.

5.2 Haydom Lutheran Hospital – a case study

5.2.1 Introduction

At HLH on average around 40 adults and children are admitted daily through the reception and another 12 women are admitted in labour ward. (119) The two departments with most of the emergency cases are the reception and the labour ward. The reception (entrance) has the role of an Emergency Department. Recently it has got its own department head and staff. There is no formal triage system in place so there is limited prioritization and waiting times can be very long. Measuring of vital signs and initiation of diagnostics and treatment can be significantly delayed. The reception is staffed by an (intern) doctor and two nurses, a medical assistant and a secretary. The management of the hospital in the next 5 years wants the reception to grow into a well-functioning independent ED with improved infrastructure and trained personnel, including an effective triage system. (120)

The labour ward of the hospital has got an upgrade in infrastructure recently and has its own operating theatre now. EMONC training has been introduced but not fully integrated yet. In the 5-year plan for labour ward, upgrading and integrating EMONC is a priority. In general, this department is seen by many as the best functioning department of the hospital. This is not surprising since many researchers have done research in this department and therefor this department got additional funds and training. (79,121–124)

5.2.2 Retrospective file study

Results

320 files were analyzed aiming to describe the need for EC.[38] Of all the patients analyzed, 222 were admitted through reception. The other 98 patients were mothers admitted at the labor ward. It was found during collection that of these 98 women, not all vital signs needed to calculate the TEWS were taken at admission. For this group, the TEWS was not calculated. For the patients admitted at reception the TEWS was calculated. However, oxygen saturation was used instead of respiratory rate, since the respiratory rate was not measured for most of the patients. Also, the temperature was raised with 0,5 degree since it is measured in the armpit.[39]

A summary of the findings of the patients admitted through reception can be found in the table below (*Figure 8*). A quarter of the patients at reception were children under five. The median age of the patients is quite young even when children below 15 years are taken separately. The children that are coming are mostly under-fives. A blood sample is taken for most patients in reception. Diagnostic imaging is done in almost half of the patients. The reason for admission in 52% of the patients are CDs, in 34% NCDs and in 14% Injuries, which is line with the figures seen in the introduction for Tanzania in total. Ten percent of all admissions through reception died in reception or later in the wards.

[38] The plan was to collect data from a random selected 10% of the files of the year 2015. During collection, there was not sufficient time to collect data of 10% of the files. Only the files of the first quarter of 2015 were reviewed. Of the 338 files of the first quarter, 18 were not found.

[39] See legend in Annex 2 – Retrospective file study.

Characteristics of analyzed cases admitted at the reception at HLH (first quarter 2015)	
	Total N= 220 (100%)
Number of patients admitted at reception	220
Under fives	53 (24%)
Male	122 (55%)
Female	100 (45%)
Median age of all admissions, median [IQR]	26 [16,5 - 41,5]
Median age of all admissions > 15 years, median [IQR]	32 [23,5 - 47,5]
Median age of all admissions ≤ 15 years, median [IQR]	1,5 [0,25 - 4,5]
Laboratory test done	203 (93)
Diagnostic Imaging done	98 (45)
Total admissions days, median [IQR]	5 (3-11)
TEWS, median [IQR]	
< 3 years	5 [3-6]
3 – 12 years	5 [2-6]
> 12 years	3 [1-5]
overall	3,5 [1-6]
Reason of admission	
CDs	115 (52%)
NCDs	76 (34%)
Injuries	31 (14%)
Outcome	
Discharged home	196 (90%)
Death	23 (10%)

Figure 8 - Characteristics of analyzed cases admitted at the reception at HLH

Once triaged, the patients fall into four categories (Routine, Urgent, Very urgent and Emergency).[40] (114,115) The median TEWS for the total population is 3,5, which falls in the urgent category. The median TEWS for both young and older children fall in the very urgent category and the adults fall in the urgent group. This means that this population is quite ill when arriving at the reception and many of them must be seen fast. *Figure 9* shows clearly that only 37% of all patients can wait before they are seen (Routine category) and 63% needs urgent care. For most of the population studied, EC thus seems very important.

[40] See Annex 2 – Retrospective file study

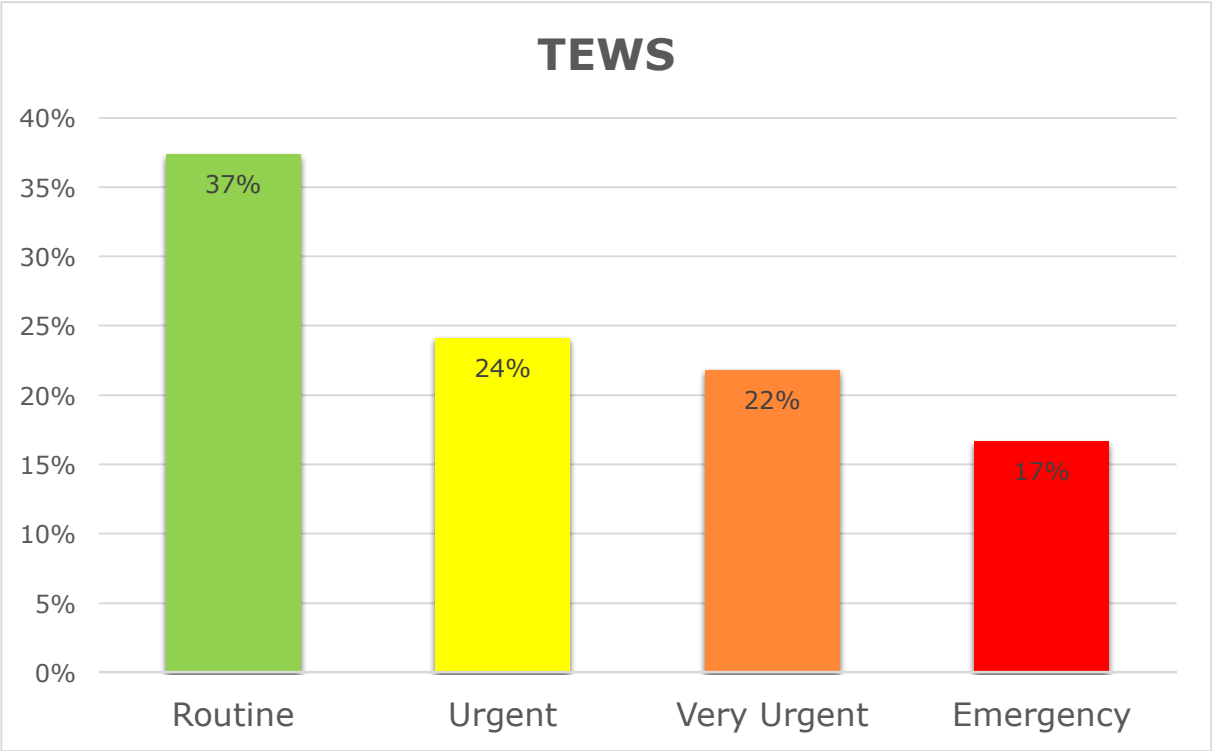

Figure 9 - Retrospective TEWS for patients admitted in the reception

Discussion

The small-scale study is by no means generalizable, but it gives an idea about the urgency of patients presenting at a large referral hospital in a rural area. No studies so far have been found in Tanzania to measure urgency in this way. The fact that many people are in such an urgent phase of disease can have many reasons, as seen in Calvello's framework. (83) It can, for instance, suggest that patients either wait too long at home (for different reasons) and/or care at lower levels of the system is poor. Another factor is care during transport, which is mostly non-existing in the Haydom area. This study gives an argument that EMS are needed in the Haydom area and Tanzania in general.

The case study has some limitations besides the fact that it is limited in number. The TEWS score had to be adjusted, which can influence the final results.[41] Another issue is the fact that there is seasonality in presenting diseases. Since only the first quarter of 2015 was reviewed, this could influence the results in terms of presenting diagnose and urgency. Although the most difficult time of the year in terms of food availability is later in the year, which probably correlates with a population more susceptible to disease.

[41] However, the adjusted version seems even more conservative, making the scores possibly even higher when used in the original form.

5.2.3 Observational study

Results

The goal of this part of the case study is to get an idea of services that could be delivered at HLH with the current resource availability. In

Section	Resource	Present at HLH
Infrastructure indicators	Designated triage area for adults	No
	Designated Emergency Room / Area for adults	Yes
	An ICU or a designated area of a ward for critically ill adults	Yes
	Designated triage area for children	No
	Designated Emergency Room / Area for children	Yes
	An ICU or a designated area of a ward for critically ill children	Yes
Human Resource Indicators	Nurse present in ER	Yes
	Clinician present in ER or being “on-call”	Yes
	Designated “Medical Head of ICU”	Yes
	Higher ratio of staff: patients on ICU than in other wards	Yes
Training Indicators	Staff involved with triage are trained in adult triage	No
	Staff trained in emergency care of adults	No
	Staff trained in critical care for adults	Yes
	Staff involved with triage are trained in paediatric triage	No
	Staff trained in emergency care of children	No
	Staff trained in critical care for children	Yes
Drug Indicators	IV glucose	Yes
	IV crystalloid (Normal Saline ± Ringers Lactate)	Yes
	Diazepam	Yes
	Paracetamol	Yes
	IV Penicillin (or equivalent)	Yes
	IV Gentamycin (or equivalent)	Yes
	IV Quinine (or other anti-malarial)	Yes
	Adrenaline	Yes
	Atropine	Yes
	Furosemide	Yes
	Aminophylline	Yes
	Salbutamol (for inhaler or nebuliser)	Yes
	Hydrocortisone	Yes
	Insulin	Yes
	IV/IM opioids	Yes
Equipment Indicators	Gloves – clean	Yes
	Running water & soap	Yes
	Oral airway (Guedel)	Yes
	Suction machine (foot powered or electric) & tubing	Yes
	Pulse oximeter	Yes
	Stethoscope	Yes
	Blood pressure cuff	Yes

	IV cannula	Yes
	Urine catheters & bags	Yes
	Electricity 24hours/day	Yes
	Bedside blood sugar testing device & strips	Yes
	Weighing scales	Yes
	Nasogastric Tubes	Yes
	Oxygen concentrator / cylinder with face masks or nasal prongs and tubing	Yes
Routine Indicators	System for categorising new adult patients according to clinical urgency (triage)	No
	System for prioritising the treatment of critically ill adults	No
	Admission registration and payment delayed until after triage and emergency treatment for adults	Yes
	Nurses have a routine of frequent observations of the critically ill adults	Yes
	Clinicians check critically ill adults (ward rounds) at least twice a day	No
	System for categorising new paediatric patients according to clinical urgency (triage)	No
	System for prioritising the treatment of critically ill children	No
	Admission registration and payment delayed until after triage and emergency treatment for children	Yes
	Nurses have a routine of frequent observations of the critically ill children	Yes
	Clinicians check critically ill children (ward rounds) at least twice a day	No
	ICU admission/discharge criteria	No
	There is a system for identifying critically ill patients on general wards and transferring to ICU	No
Guidelines indicators	Triage guidelines for adults	No
	Guidelines for Emergency Care of adults	No
	Guidelines for managing seriously ill adults	No
	Triage guidelines for children	No
	Guidelines for Emergency Care of children	No
	Guidelines for managing seriously ill children	No
	Guidelines for oxygen use	No
Support services indicators	Lab with facilities to measure haemoglobin	Yes
	Lab with facilities and trained personnel to measure blood glucose	Yes
	Lab with facilities and personnel to measure Serum Urea/Creatinine, Sodium and Potassium	Yes
	Lab with facilities and trained personnel to do bacterial culture and antibiotic sensitivities	Yes
	Lab with facilities and trained personnel to do direct microscopy & bacterial gram stain	Yes
	System for making cross matched blood available within 1 hour of blood sample arriving in lab	Yes
	System for emergency blood transfusion	Yes
	System for testing donor blood for the viruses HIV, Hepatitis B & C	Yes
	X-ray facilities and trained personnel for chest radiographs	Yes
Advanced emergency care indicators	Arterial blood gas monitoring	No
	Central venous pressure monitoring	No
	Piperacillin/Meropenem	No
	Colloid	No
	Fresh Frozen Plasma	No
	Propofol or Midazolam	Yes

	Noradrenaline or Dobutamine	No
	Invasive Blood Pressure Monitoring	No
	Syringe pump	No
	Mechanical ventilators	No

Figure 10 below, all indicators are scored based on communication with the staff in the hospital on one specific day.[42] A "Resource Availability Score" was calculated as the percentage of resources available at HLH (22). A comparison with other Tanzanian hospitals was done based on the data taken from Baker et al. (22)

Section	Resource	Present at HLH
Infrastructure indicators	Designated triage area for adults	No
	Designated Emergency Room / Area for adults	Yes
	An ICU or a designated area of a ward for critically ill adults	Yes
	Designated triage area for children	No
	Designated Emergency Room / Area for children	Yes
	An ICU or a designated area of a ward for critically ill children	Yes
Human Resource Indicators	Nurse present in ER	Yes
	Clinician present in ER or being "on-call"	Yes
	Designated "Medical Head of ICU"	Yes
	Higher ratio of staff: patients on ICU than in other wards	Yes
Training Indicators	Staff involved with triage are trained in adult triage	No
	Staff trained in emergency care of adults	No
	Staff trained in critical care for adults	Yes
	Staff involved with triage are trained in paediatric triage	No
	Staff trained in emergency care of children	No
	Staff trained in critical care for children	Yes
Drug Indicators	IV glucose	Yes
	IV crystalloid (Normal Saline ± Ringers Lactate)	Yes
	Diazepam	Yes
	Paracetamol	Yes
	IV Penicillin (or equivalent)	Yes
	IV Gentamycin (or equivalent)	Yes
	IV Quinine (or other anti-malarial)	Yes
	Adrenaline	Yes
	Atropine	Yes
	Furosemide	Yes
	Aminophylline	Yes
	Salbutamol (for inhaler or nebuliser)	Yes
	Hydrocortisone	Yes
	Insulin	Yes
	IV/IM opioids	Yes

[42] A short description of indicators is given in Annex 11 – Results observational study.

Equipment Indicators	Gloves – clean	Yes
	Running water & soap	Yes
	Oral airway (Guedel)	Yes
	Suction machine (foot powered or electric) & tubing	Yes
	Pulse oximeter	Yes
	Stethoscope	Yes
	Blood pressure cuff	Yes
	IV cannula	Yes
	Urine catheters & bags	Yes
	Electricity 24hours/day	Yes
	Bedside blood sugar testing device & strips	Yes
	Weighing scales	Yes
	Nasogastric Tubes	Yes
	Oxygen concentrator / cylinder with face masks or nasal prongs and tubing	Yes
Routine Indicators	System for categorising new adult patients according to clinical urgency (triage)	No
	System for prioritising the treatment of critically ill adults	No
	Admission registration and payment delayed until after triage and emergency treatment for adults	Yes
	Nurses have a routine of frequent observations of the critically ill adults	Yes
	Clinicians check critically ill adults (ward rounds) at least twice a day	No
	System for categorising new paediatric patients according to clinical urgency (triage)	No
	System for prioritising the treatment of critically ill children	No
	Admission registration and payment delayed until after triage and emergency treatment for children	Yes
	Nurses have a routine of frequent observations of the critically ill children	Yes
	Clinicians check critically ill children (ward rounds) at least twice a day	No
	ICU admission/discharge criteria	No
	There is a system for identifying critically ill patients on general wards and transferring to ICU	No
Guidelines indicators	Triage guidelines for adults	No
	Guidelines for Emergency Care of adults	No
	Guidelines for managing seriously ill adults	No
	Triage guidelines for children	No
	Guidelines for Emergency Care of children	No
	Guidelines for managing seriously ill children	No
	Guidelines for oxygen use	No
Support services indicators	Lab with facilities to measure haemoglobin	Yes
	Lab with facilities and trained personnel to measure blood glucose	Yes
	Lab with facilities and personnel to measure Serum Urea/Creatinine, Sodium and Potassium	Yes
	Lab with facilities and trained personnel to do bacterial culture and antibiotic sensitivities	Yes
	Lab with facilities and trained personnel to do direct microscopy & bacterial gram stain	Yes
	System for making cross matched blood available within 1 hour of blood sample arriving in lab	Yes
	System for emergency blood transfusion	Yes
	System for testing donor blood for the viruses HIV, Hepatitis B & C	Yes

	X-ray facilities and trained personnel for chest radiographs	Yes
Advanced emergency care indicators	Arterial blood gas monitoring	No
	Central venous pressure monitoring	No
	Piperacillin/Meropenem	No
	Colloid	No
	Fresh Frozen Plasma	No
	Propofol or Midazolam	Yes
	Noradrenaline or Dobutamine	No
	Invasive Blood Pressure Monitoring	No
	Syringe pump	No
	Mechanical ventilators	No

Figure 10 - Resource availability list of quality indicators for EC at HLH (27)

Summary of findings

Overall, HLH has a median Resource Availability Score of 83.3%. HLH scores maximal on the availability of Human Resource, Drugs, Equipment, and Support services. Training in EC and critical care is lacking as well as the use of guidelines. There is no availability of advanced EC.

Discussion

HLH scores quite well overall. However, a critical note should be made regarding the accessibility and management of drugs and equipment. Although most of the necessary equipment and drugs for emergency care are available at HLH, it is not always available in the right place or equipment might be scarce. For example, the reception is usually equipped with only one blood pressure cuff and pulse oximeter, hindering assessing multiple patients at the same time or performing triage. Similarly, all drugs on the indicator list are available, but would have to be collected from the main hospital pharmacy first. This causes delay in treatment. Human resources are available. However, nothing can be concluded about the amount of staff available at a specific time and training in Emergency and Critical Care is lacking.

Figure 11 below shows the score of indicators per section of HLH, compared to the median scores found by Baker et al. of 7 district/regional hospitals and 3 large referral/private hospitals in Tanzania. (22) HLH's overall score is almost as good as the large referral hospitals. As concluded, HLH has maximal resource availability scores in the sections Human Resources, Equipment, Drugs and Support services. HLH scores lower than both the district/regional and the referral/private hospitals in the sections Training, Guidelines, and Routines. Overall hospitals score lowest on the Training, Guidelines, and Routines indicators, which shows that it is probably a national problem.

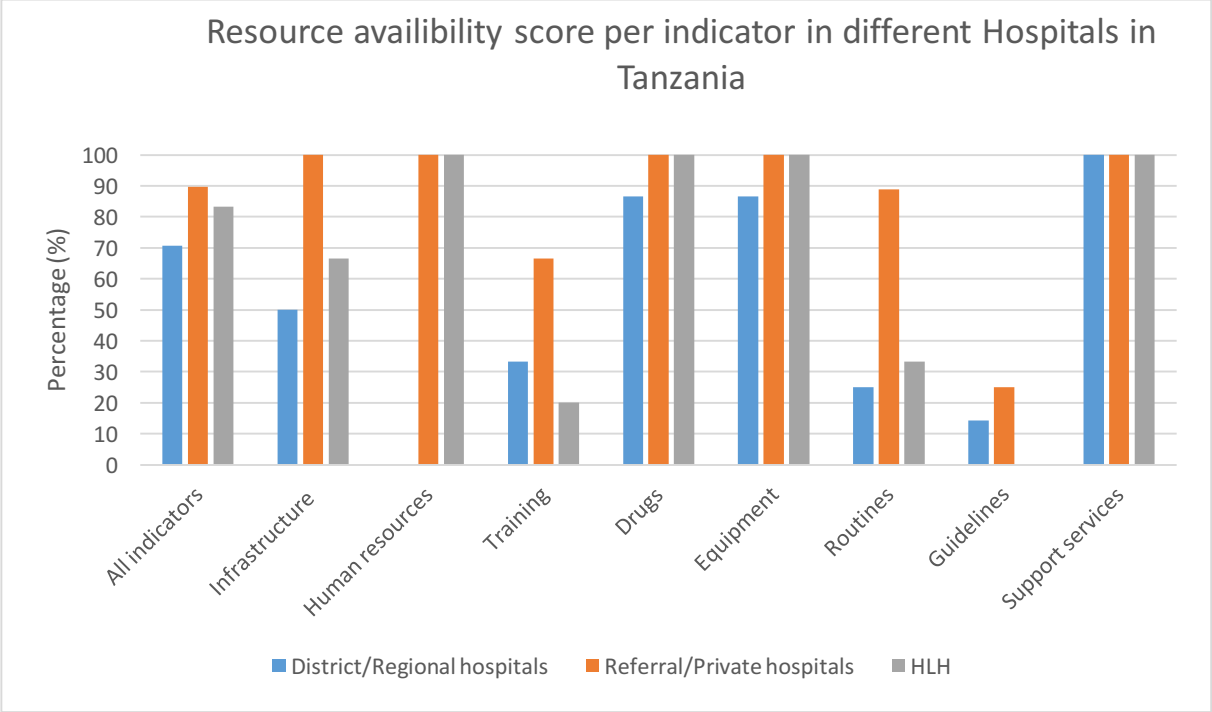

Figure 11 - Resource availability score per section in different Tanzanian hospitals

Resource availability scores calculated as a percentage of the resources available in each hospital. Data from district/regional and referral/private hospitals derived from Baker et al. District/regional hospitals n=7, referral/private hospitals n=3. HLH Haydom Lutheran Hospital.

In 2015 an initial quality assessment was done at HLH by PharmAccess as part of the national "SafeCare Quality Improvement Program".[43] (21) This assessment gives a comprehensive overview using 142 criteria divided into 4 areas; Management, Clinical, Clinical Support and Ancillary. The results show many similarities with the above discussed results, although described in much more detail. Looking at the relevant parts for comparison, also in this assessment, the scores for medication management and support services (laboratory and diagnostic imaging) are high. Throughout the assessment report, the lack of documented routines and guidelines is an important issue as well. A limitation of this part of the case study is that it shows which services are potentially available, it does not give any information about the quality of the services. For example, drugs might be available, but nothing can be said about its use. Another limitation is that it is a snapshot, availability might fluctuate in time.

[43] The program is a continual program and on 24 February 2017 HLH was awarded the Level 4 status, just one level below "International Standard Healthcare".

5.2.4 Qualitative study: barriers and enablers to quality of care in EC

Results

Before the FGDs were conducted, a lecture was given in the general morning meeting for all staff. In this lecture, the goals of the study were mentioned and a very short introduction on EC, as to not influence the answers given in the FGDs. Six FGDs were conducted, two with nurses from Reception, two with nurses form maternity ward and two with doctors. After the first round of three FGDs with the different groups it became clear that data saturation was probably already reached. However, the other FGDs were already planned and those people would have been disappointed if the FGDs would have been cancelled. It would have been difficult to explain that their opinions were not needed anymore, so all six FGDs were conducted. For the analysis in this thesis the data of the first three FGDs will be used.

In general, the FGDs were lively and filled with laughter. Most participants were eager to give their opinions, although commenting on each other's opinion was done with much caution. This is in line with cultural habits (personal knowledge of researcher). Every discussion started with the question to define what EC beholds. Participants came up with terms as "quick" "lifesaving" "a-b-c" "prioritizing" "treat first what kills first". One participant summarized: "Emergence care, the way I understand it is the service that is to be provided quickly to save the life of the victim. To an extent that if you delay the service to the one who needs it he/she will either die of it or have permanent disabilities." One participant came up with an example of what he thought was EC: "Suppose there is an accident and one is bleeding much, you should not go around but directly to the bleeding point and arrest it by applying pressure or any other possible means right there without wasting time." Looking at the definition set in this thesis, the understanding of EC seems to be a simplified version of that. It is mostly focused on the actual care given in the hospital.

After coding all the answers, it became clear that some subjects were discussed more than others, which is probably due to a mix of reasons (see *Figure 12*). First, the latter subjects did not get an equal amount of time in the discussions since time was not enough for all the subjects. It could be that these subjects deal with issues that are more pressing or important. Also, it could be due to fatigue, since the questions that were most discussed were in the beginning of the discussion. Another reason is that the latter questions were probably also more challenging and dealing with

issues that are right now not part of the daily routines of the participants. When comparing between groups, the distribution of answers was very similar.[44]

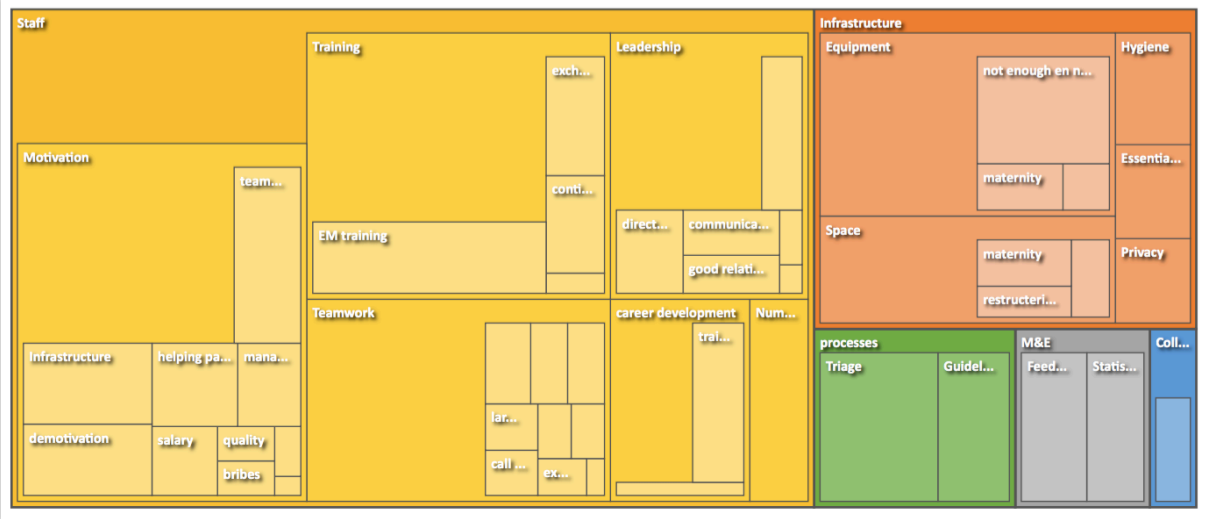

Figure 12 - Hierarchy chart

Summary of findings

The goal of the FGDs was to get a deeper insight in enablers and barriers of quality of EC in Haydom and similar hospitals using the adjusted IFEM framework. The issues dealing with staff and infrastructure got most attention (for reasons stated in the previous paragraph). As such, little can be concluded towards the EC chain and the M&E of EC at Haydom. An overall conclusion is, when looking at the enablers and barriers model, in general there are mostly barriers to giving good quality of care. The labour ward staff is generally more positive about their working environment. Useful suggestions were given to improve certain issues mostly within the staff and physical structures topics. Interestingly, in the closing question participants were very positive about the care at HLH in the light of where they would want to be treated themselves.

The most important enabling factor mentioned by many is the fact that there is good team spirit at Haydom.
Most important barriers mentioned are (mostly at the reception area):

- Amount of staff is not sufficient
- Skilled staff in EC is lacking
- Poor leadership and supervision
- Training and career development options are not sufficient
- Lack of (good quality) equipment to give EC

[44] A more detailed discussion of the results can be found in Annex 12 – Results qualitative research.

- Staff has little influence on working environment
- Space to see patients is not sufficient
- Privacy is not maintained for patients
- Hygiene is poor especially at reception
- Essential medicines are not readily available
- Guidelines or protocols are not used
- Official triage is not done
- Quality of care is not monitored at the reception

Discussion

It is clear from the FGDs the that there are many barriers to quality of EC at HLH. Many of these barriers are also discussed in the literature review and seem to be a national problem. Interestingly, participants were very positive about the care at HLH in the light of where they would want to be treated. There might be a few explanations for that besides the obvious reasons that were given (family close by, no bribes needed). They might know the quality of care in other hospitals is even worse. Which might be true for other district hospitals, looking at the discussion of the observational study. Another reason could be that, joining this research, they felt the (rare) opportunity to complain about certain issues to someone who might be able to change their situation. Certain issues might have been exaggerated. An issue that might need to be addressed by the management, since it was also given as a motivational factor to be able to have influence on their working place. Another interesting factor is that the working environment at the labor ward seems more favorable. This might be linked to the fact that there has been a lot of attention, through research, for maternal and newborn health. Leadership, funding and training of skills has been the result.

From the small-scale file study, it is seen that urgency of patients is high. Even without all the barriers mentioned, working at the reception is a challenge. Having few (EC skilled) staff and equipment can make this a very frustrating working place. Comparing the results of the FGDs with the observational study, there is a large difference in some topics and similarity in others. In the observational study, equipment, infrastructure, human resources and drugs seems to be in order at HLH. However, looking at the FGDs results, staff seems to think otherwise. First, it is probably easiest for staff to explain quality problems by blaming it on infrastructure, equipment and too little staff even if availability is quite good. It can also mean, as discussed before, that the tool used for the observations is not very good in showing the real situation on the floor. A drug might be available, however not in the

right place at the right time. It seems to be a problem in organization and management. This is, looking at the literature review, a general issue in Tanzania even on national level. Agreement between the observational results and the FGDs seems to be on the training, triage and use of guidelines topics.

Not all subjects of the topic list were well enough explored during the FGDs. There might have been different reasons to explain this issue. It appeared to be too many topics when performing the FGDs, so the topics at the end got less attention. Also, the topics that were discussed at the beginning of the discussion got many more responses which cannot only be explained by time restriction. The most obvious reason is that M&E and coordinated EC just does not exist which makes it hard to discuss. It also might have been due to fatigue and, as stated, the topics later on were also less straight forward and more challenging to discuss. It could have been more fruitful to have a better mix of straightforward and more challenging questions. Also, the challenging questions probably needed a bit more explanation about the concepts of EC which could have been done at the beginning of the FGDs. Although too much explanation can also influence the answers given. During analysis, it was seen that overall the discussion is lacking some depth. This probably again has the same reasons, there were too many subjects to discuss and the participants were too unfamiliar with the subjects.

Originally it was planned to have SSIs after the FGDs for even more insights of key informants and validation of the FGDs results. Due to time and financial constraints it was not possible to execute the SSIs. Thus, triangulation of results is not as solid as planned. Although the literature review and other parts of the case study (observations and file study) give options for validation as well. The main interviewer, a local researcher, performed all the FGDs. In two of the FGDs the language was switched to English after request of the participants. This might have reduced the quality of the results due to a cultural gap using a different language than their first language. Another language issue is the fact that the translation from Kiswahili to English was not perfect, details might have been lost in translation. In this study, there is not much emphasis on non-verbal communication, since these data were not collected in detail. This might influence the interpretation.

6 Overall discussion

6.1 The need for EC in Tanzania

Many arguments have been given to show that some form of EC is needed in Tanzania at all levels of the health pyramid. Calvello et al presented a framework which is helpful in defining bottlenecks in delay of care at local level. (83) Applying this framework to the literature review, there are many reasons for delay in Tanzania. Emergency cases will thus become even more urgent. The file study done within this thesis confirmed that urgency of presenting cases is also high at HLH.

6.2 Current EC services delivered in Tanzania

EC is hardly available in Tanzania, especially pre-hospital EC. Care prior to arrival at a health facility is most often given by bystanders, police officers, community leaders or relatives. Training these lay responders in first aid seems an obvious solution and research shows it might work. When people do make it to a health facility in time, they will often not meet the staff or equipment needed to give basic EC and the referral system is also not functioning as intended. For this reason, others are passing by the lower levels due to the perceived low quality of care and therefor deteriorate on their way to higher levels. Essential infrastructure and equipment for in-hospital EC, as defined by WHO and DCP3 are not available widely. (45,46) Any initiative in changing the situation of EC can only work if these essentials will be addressed. Motivation of staff is also strongly linked to available equipment and infrastructure, which was confirmed during the FGDs. A discrepancy in this, is Baker's study who concluded that equipment and drugs in the ten Tanzanian hospitals which were investigated are not the problem leading to poor quality of EC. However, infrastructure and lack of routines for the prioritisation and management of the critically ill did come up as problems. This is confirmed by the observations done at HLH.

Another important issue mentioned is the HRH situation. First, there is an absolute shortage of health care staff, let alone staff skilled in EC. This was also seen in the FGDs, skills in EC are hardly existing at HLH. It is thus important to start teaching available staff the basics of EC; triage and a structured approach to urgent cases. The AFEM and locally EMAT should be consulted in setting up a program of teaching staff. Secondly, the available staff is not equally distributed leaving the district (non-urban) level hanging with very few staff. This unequal distribution is partly due to educated people not wanting to live in a rural area for different reasons which are

not extensively addressed in this thesis. One obvious reason is that good quality schooling for their children is not available. This is a large structural problem going beyond the reach of this thesis. Another reason is the fact that too little funds arrive at lower levels and even less at hard to reach areas. Poor supervision and management, poor career development options and low salary add to the problems. In the FGDs, poor supervision and career development options were also mentioned. It creates a negative vicious circle where the staff that is available becomes demotivated. This demotivation and demoralisation also works bribery in hand, which is still a large problem delaying EC. This multifactorial problem should be addressed at district level other than just by strategies at national level which seem to be addressing these problems.

6.3 Current EC policies and initiatives in Tanzania

In all different Tanzanian national health strategies, there is quite some attention for EC. However, its content is not clear nor complete and has to be found in bits and pieces throughout the policies. Part of the problem is that most strategies address one pillar of the health system. EC needs a system-based approach which will also help all other pillars of care to be improved. Practically the pillars should all be combined to form one integrated strategy, addressing preventive care, emergency care and chronic care at all levels. Subsequently this guideline should be taken to the district and used as a tool to make locally applicable strategies to reach national goals.

EC is not completely new to Tanzania. All university hospitals have an ED and education in EM is available at the national hospital. However, many of them are private hospitals and a better collaboration between private and public systems is needed. The EMAT, a daughter organisation of the AFEM, is stimulating EC in all aspects and is collaborating with MOHSW to get attention for its importance. There are many NGOs who are dealing with projects linked to EC. The EMAT together with other experts in the field should be included in forming part of the integrated strategy dealing with EC.

Some small-scale initiatives in pre-hospital EC in Tanzania have shown positive results. Training CHWs in basic EC skills and arranging transport and training lay persons as first aid responders seems a good solution to the HRH situation in rural areas. Several studies dealing with in-hospital EC skills training of health workers shown positive results and can be used as example.

6.4 Global initiatives

Advocacy for EC as essential part of a health system has received quite some attention. Importantly, strengthening Emergency and Essential Surgical Care and Anaesthesia was acknowledged as a component of UHC in May 2015. Also, improving the quality of EC can greatly help achieving SDG 3. In the recent past the MDGs gave a push for child and maternal health in Tanzania, linking to EC. As stated, important lessons can be learned from this period.
Part of the funds designated for vertical programs (Maternal Health, HIV care, Malaria control etc.) should be devoted toward developing Emergency Care since part of all these vertical pillars are dealing with EC. Not only donors and the government should be convinced that EC is important. Health care workers should be educated in the advantages of EC, otherwise they will not see the point of getting trained in triage and EC skills. The same applies to the whole population, information campaigns should promote and educate the importance of EC. Understanding the importance and enthusiasm is needed to for later education in first aid skills.

Globally there have been many initiatives in EC, which can help Tanzania building up their own system. First of all, WHO has produced many documents, strategies and practical guidelines to give guidance on the different levels of EC, pre-hospital and in-hospital. Specifically interesting are the IMCI and ETAT guidelines for triage and treatment of children. Both are well studied methods and have been used on large scale with mostly positive results. IMCI specifically worked well in Tanzania during the MDG time reducing child mortality. It is striking that these methods were never taken to the next level for use in all age categories. However, the structured approach of triage and treatment should be used at all level health centres. Secondly, the DCP3 initiative shows practical cost-effective (and research based) interventions in EC which are very applicable to Tanzania. From these interventions it is clear that a different approach is needed in urban vs. rural areas.

More locally, the AFEM has been very active in promoting EC in Africa. Their meetings among experts have created very practical recommendations on how to set up the whole continuum of EC in resource constrained settings. The latest Emergency Care Assessment Tool (ECAT) tool can be very helpful planning interventions in Tanzania. The GECC have done tremendous work in a rural area of Uganda, teaching the community and health care staff addressing pre- and in-hospital care. The tiered EC-system proposed by Hammerstedt et al. which has emerged from that is very applicable to Tanzania. Discussion among experts in Tanzania would be needed to see which cadres in Tanzania would be most

suitable to become the midlevel EC practitioner and what care is possible and realistic at what level. Within the tiered EC system, the layperson as first responder should also be included, since this has shown to be quite successful in LICs.

Another important issue at hospital level is triage. The SATS might be too advanced for Tanzania at this moment. However, the simplified version (only using the TEWS) which was also used for the file study in this thesis might be applicable to the Tanzanian situation. More practical research is needed to confirm its value in Tanzania.

6.5 Barriers and enablers to quality of EC in Tanzania

The IFEM framework in adjusted form was used to look at barriers and enablers of EC in Tanzania. It is clear from both the literature and FGDs that enablers are few and barriers are many. In the FGDs mostly barriers in infrastructure, equipment and staff were discussed. Overcoming the barriers of infrastructure and equipment is mostly an issue of money. This could be partly solved if funding from vertical programs would be used to overcome these structural problems. Issues dealing with staff are very much multifactorial. There is an absolute shortage, however the staff that is available is often demotivated not only by the workload due to the shortage. As was also seen in the FGDs; infrastructure, equipment, leadership, supervision and training of skills are important motivators. At HLH, these issues are better addressed at the labour ward (due to external forces of research) with the result of better motivated staff.

The domains of the EC chain, processes and M&E were hardly touched upon in the FGDs. Probably mainly due to its non-existence. Evaluating something which is hardly available yet is obviously difficult. The IFEM framework, even in adjusted form, is in this point of time not very fitting yet for Tanzania. Nevertheless, the outcomes of the FDGs will be useful for HLH and other similar hospitals in improving care inside the hospital.

Solutions to the domains of the EC chain, processes and M&E might not be that difficult if people are willing to change. In a time where even in the most rural areas mobile internet becomes more and more available, the issues of communication should not be such a problem anymore. So, when a patient is referred, communication with the higher facility is possible. However, having the availability of communication does not automatically result in a change of attitude. For referral, transport is needed and in rural areas this is still a difficult issue. As stated in the DCP3 solutions, every district

needs to evaluate the best local options for transport, which will mostly be private vehicles. Using these private vehicles means that there is no care during transport. Training the community in first aid would therefore be important but challenging. Thus, stabilisation of urgent cases at dispensaries by MLHWs becomes even more important. This can even prevent referral in some cases.
Arriving at the facility, triage and a structural approach to urgent cases is a matter of (continuous!) training. This will need to happen at the facilities since taking people away from their work place for training is not desirable. Also, curricula at universities and colleges need to start including triage and EC as overarching subjects. Training non-physicians in acute care surgery needs to be part of that. Eventually to evaluate and adjust strategies a working HMIS system is needed. At this moment in time, AFEM is working on measurable indicators for quality of EC in LICs.

7 Conclusion and Recommendations

EC is needed in Tanzania to prevent disability and mortality in the acutely ill. Thus, Emergency Care should be and can be taken seriously as part of the healthcare system in Tanzania. Focusing on EC can have the potential to strengthen health care in general since it needs a systemic approach which also includes large parts of the traditional vertical pillars. Therefor funding going to large vertical pillars (e.g. HIV, Malaria, Maternal Health) should partly be spent on EC. There are many arguments available for the government of Tanzania to urge donors to bring this in practice.

The MoHSW of Tanzania should start focusing on integrating all vertical pillars in one integrated strategy for prevention, emergency care and routine (chronic) care. Local experts in EC, for instance coming from EMAT, should discuss how globally formed strategies can be applied to Tanzania. A different approach will be needed in rural vs. urban areas. Another important issue is the collaboration with the private sector, especially in the higher levels of the pyramid. The GECC, WHO, DCP3 and AFEM most importantly have developed many strategies and tools in EC. Within the strategy, plans should be made for M&E, including EC indicators in HMIS. Indicators are available for HICs made by IFEM, which could be adjusted for use in LICs. The AFEM is in the process of making locally applicable indicators.

The formation of this strategy is the first part, however most importantly this strategy should be taken to regional and district level to make it locally applicable. To find the gaps in EC at district level, Calvello's framework showing delays in care is a very useful tool. In a later phase, evaluating EC at district level, the adjusted IFEM framework can be used.

Together with forming a strategy, health care workers and the population as a whole should be educated about EC and its importance. Only then will people be enthusiastic to become first aid providers and start demanding quality EC in facilities.

Pre-hospital care is basically non-existing. Official transport is hardly available and only sparsely used for inter-facility transport. Private transport is probably the best solution, together with training the community with first aid skills. At this moment, only a few large urban hospitals have an ED. In the national hospital, EM physicians and nurses are trained to provide advanced EC. These people can also serve as source of information and need to be stimulated to teach others throughout the country. However, most people will never arrive at an ED and need to be helped in lower

(rural) levels. The pyramidal model proposed by the GECC seems a good solution for this. MLHWs need to be trained in triage and basic or advanced EC, depending on the level. To be able to keep this a sustainable model, students should become trainers. Communication between all levels (villages-district-regional-national) of care is very important in making the pyramidal referral system work.

The literature review and the qualitative study gave the same conclusions; infrastructure, equipment and HRH issues are large barriers in quality of EC. Introducing the GECC model will only be successful if basic infrastructure problems are addressed first. Buildings with electricity and running water are the very basic. Subsequently, the essential infrastructure and equipment needed for EC (and also non-urgent care), as listed by WHO and DCP3, should be installed. Using the strategies that are formed, training is the next level. Training in universities and colleges of new health workers is a good start, but ongoing training in facilities is even more important. The EMAT, together with AFEM, should be able to provide training models and structures for (basic) EC. Together with that, guidelines should be made available at facilities to be able to enforce a structured approach.

The case study at HLH showed that urgency of patients presenting at the reception is high. To get motivated staff in health facilities is important for EC to function. When an urgent patient arrives, staff should be available, skilled and motivated to save that patient's life and prevent further disability. From the analysis at HLH it can be concluded that staff gets demotivated by a poor working environment (infrastructure, equipment and housing), poor career development options, poor leadership and supervision and lack of skills (in EC).

Deriving from this conclusion the following recommendations to the MoHSW of Tanzania can be made:

- A task force Emergency Care needs to be composed within the ministry. The first task will be to find experts of EC in a low-income setting (inside and outside Tanzania) who are willing to collaborate in setting up (parts of) the EC strategy in Tanzania. The EMAT will be a good source to find experts.
- Development of a national strategy for EC (within an integrated strategy for prevention, EC and routine (chronic) care) using the GECC pyramidal model as a basis taking the difference between urban and rural settings into account. The WHO, AFEM, IFEM, DCP3 and the GECC have available tools, models and strategies to directly use and modify to form this

strategy. Lessons learned from previous strategies should be used to prevent similar mistakes.

- The taskforce EC needs to use the national strategy and other advocacy tools available (as described in this thesis) to convince donors to invest in EC.
- At district level, EC committees should be formed to analyse the gaps in EC locally. Calvello's framework can be the basis of a discussion to find the gaps.
- Before implementation of the national strategy, the ministry must start upgrading basic infrastructure and equipment. Input from the EC committees should be leading in this process. The outcomes of the most recent TSPA together with the WHO and DCP3 tools for essential equipment and infrastructure in EC should also be used in this process.
- Implementing the national strategy should be done in phases. A pilot study should start in one region. The EC committees from the districts in that region should come together and make a locally adjusted strategy for implementation. At the national level, the task force should form measurable indicators for evaluation. The IFEM indicators can serve as examples. Results from this pilot should inform the way forward in further adjustment and implementation.
- EM (physicians and nurses) training needs to be further developed throughout the country in the large referral hospitals. These EM physicians and nurses should be getting the responsibility to reach out to rural areas for supervision and training as part of their job.
- Hospitals can use the HLH case study as example how to evaluate their quality of EC

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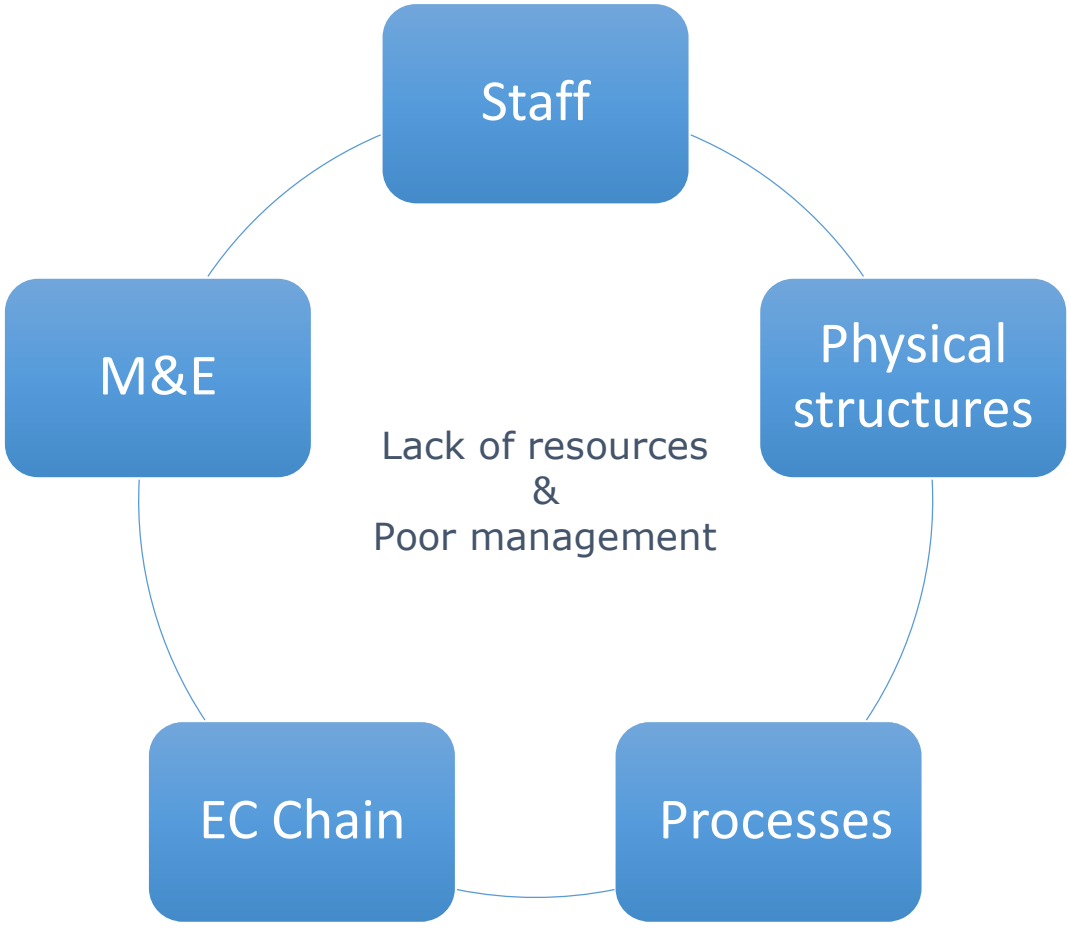
Annex 1 – Analytical Framework

Framework: barriers and enablers to quality of care in EC



Staff

- Enablers:
  - trained, qualified and motivated
  - the right skill/grade mix
- Barriers:
  - staff burn-out
  - low morale
  - poor remuneration
  - inadequate career development opportunities
  - high turnover
  - lack of co-ordinated teamwork

Physical structures

- Enablers:

        - appropriate size and numbers of rooms for resuscitation, major and minor cases, waiting area, reception, triage and diagnostics
        - availability of staff and patient's toilets
        - rooms should be clean, with appropriate lighting, ventilation and privacy
        - clean running water
        - availability and proper stock keeping of essential medicine and equipment
        - regular maintenance of equipment
    - Barriers:
        - lack of dedicated space
        - overspill into hallways and corridors
        - poor availability and stock keeping of essential medicine
        - lack of privacy and dignity
        - dirty/contaminated facilities

Emergency Care processes

- Enablers:
    - appropriate triage method
    - appropriate guidelines and protocols
    - standardisation of processes and equipment also including standard processes for safety and infection control (e.g. hand washing)
- Barriers:
    - lack of processes
    - lack of protocols and guidelines or poor adherence
    - lack of time to develop and implement processes
    - lack of local data to support the development of country-specific protocols

EC chain

- Enablers:
    - A systems approach that begins before the facility and runs through the healthcare system with shared ownership and a collaborative approach from community/dispensary level up to national referral hospital
    - Availability of transport to facilities with trained staff
- Barriers:
    - lack of whole-systems approach and co-ordination
    - weak integration of EC processes in the community and hospital services
    - duplication of processes and equipment (in an already low resource setting)

Monitoring and Evaluation of EC

- Enablers
    - A functioning HMIS to highlight both individual and system failure
    - Data collection through appropriate EC indicators encompassing the patient's entire pathway and experience
- Barriers
    - Lack of M&E systems
    - Failure to engage the whole EC chain with the facilities viewed in isolation

In addition to the barriers mentioned above, all aspects of EC quality and safety will be undermined by:

- A lack of resources, particularly inadequate finance leading to staff and equipment shortages, deterioration of premises and inadequate systems to ensure effective EC processes and oversight.
- Ignorance, apathy or disengagement by managers, commissioners or others with power over the EC chain, leading to disempowerment and demoralisation of staff

Annex 2 – Retrospective file study

The SATS is built up in different phases of which the Triage Early Warning Score (TEWS) is the core. Once triaged, the patients will fall into four categories (Routine, Urgent, Very urgent and Emergency). There are three different instruments for adults, children older than three years old and children younger than three years old (see below). (114,115) The TEWS is built on the first vital signs which are taken at admission. The additional information to fine-tune the triage score will usually not be done or noted down in the file at HLH. However, the TEWS on itself will give a good idea of the urgency of the patients. Early warning scores are used in many places now in the developed world to assess the urgency of the patients at any place in the hospital. (125) Additional information that will be collected are gender, age, duration of admission and outcome. A random selection and review will be done of 10% the admissions of the year 2015, to get a representative sample since there might be a seasonality factor in certain presentations throughout the year. HLH has a very well kept and administered patient records department, all basic information (age, gender and date of admission) is available in the electronic patient file system. Other information must be collected from the paper files, which are very well ordered so information loss will be minimal.

OLDER THAN 12 YEARS / TALLER THAN 150 cm tall)	ADULT TEWS						
	3	2	1	0	1	2	3
Mobility				Walking	With Help	Stretcher/ Immobile	
RR		less than 9		9 - 14	15 - 20	21 - 29	more than 29
HR		less than 41	41 - 50	51 - 100	101 - 110	111 - 129	more than 129
SBP	Less than 71	71 - 80	81-100	101 -199		more than 199	
Temp		Cold OR Under 35˚		35˚ - 38.4˚		Hot OR Over 38.4˚	
AVPU		Confused		**A**lert	Reacts to **V**oice	Reacts to **P**ain	**U**nres-ponsive
Trauma				No	Yes		

Figure 14: Adult TEWS (older than 12 years)

3 to 12 YEARS OLD / 95 to 150 cm tall	OLDER CHILD TEWS						
	3	2	1	0	1	2	3
Mobility				Normal for age		Unable to walk as normal	
RR	less than 15	15 -16		17 - 21	22 - 26	27 or more	
HR	less than 60	60 - 79		80 - 99	100 - 129	130 or more	
Temp		Feels Cold Under 35˚		35˚ - 38.4˚		Feels Hot Over 38.4˚	
AVPU		Confused		**A**lert	Reacts to **V**oice	Reacts to **P**ain	**U**nres-ponsive
Trauma				No	Yes		

Figure 13: Older Child TEWS (age 3 - 12 years)

YOUNGER THAN 3 YEARS / SMALLER THAN 95 cm	YOUNGER CHILD TEWS						
	3	2	1	0	1	2	3
Mobility				Normal for age		Unable to move as normal	
RR	less than 20	20 - 25		26 - 39		40 - 49	50 or more
HR	less than 70	70 - 79		80 - 130		131 - 159	160 or more
Temp		Feels Cold Under 35˚		35˚ - 38.4˚		Feels Hot Over 38.4˚	
AVPU				**A**lert	Reacts to **V**oice	Reacts to **P**ain	**U**nres-ponsive
Trauma				No	Yes		

Figure 12: Younger Child TEWS (younger than 3 years)

After scoring according to the above TEWS, patients can be divided into four categories.

- Emergency – score 7 or more
- Very Urgent – score 5 or 6
- Urgent – score 3 or 4
- Routine – score 0,1 or 2

Priority COLOUR	Target time	Management
RED	IMMEDIATE	Take to the resuscitation room for **emergency** management
ORANGE	**< 10 mins**	Refer to majors for **very urgent** management
YELLOW	**< 1 hour**	Refer to majors for **urgent** management
GREEN	**< 4 hours**	Refer to designated area for non-urgent cases
BLUE	**< 2 hours**	Refer to doctor for certification

Table 3: SATS priority levels and target times to be seen with-in

(114)

Legend for changes made in the TEWS:

- Saturation:
  - 95-100% =0
  - 90-95% =1
  - 80-90% =2
  - below 80% =3

- Temp: plus 0,5 °C

Annex 3 – Observational Study

The tool below was created by an expert group comprised of the six researchers plus ten anaesthesiologists and physicians currently working or with recent experience of working in low-income countries. The background literature consisted mostly of WHO standards and guidelines. The indicators are divided into eight sections: infrastructure; human resources; training; drugs; equipment; routines; guidelines; support services. (22) With approval and help from the medical director this checklist will be taken into the hospital and all items will be checked. This will create an overview of the EC standards of the hospital and shows the gaps in EC standards of the hospital. It is a limited study since it gives information at one point in time and it does not provide qualitative information (e.g. a certain drug is present, however it gives no information about its use).

Structure Standards for Emergency and Critical Care in Low Income Countries

The hospital should have

An infrastructure designed for managing emergency and critically ill adults and children		
Infrastructure Indicators	1 2	Designated Triage Area For adults For children
	3 4	Designated Emergency Room / Area For adults For children
	5 6	An ICU or a designated area of a ward for critically ill patients For adults For children
Sufficient human resources for managing emergency and critically ill adults and children		
Human Resource Indicators	7	Nurse/other health worker either working in the ER or having the task of immediately going to the ER if a critically ill patient arrives
	8	A clinician either working in the ER or being “on-call” for the ER if a critically ill patient arrives
	9	A designated “Medical Head of ICU”
	10	A higher ratio of staff: patients on ICU than on general wards
Sufficiently trained staff for managing emergency and critically ill adults and children		
Training Indicators	11	Nurses and clinicians involved in adult triage have been trained in adult triage
	12	Nurses and clinicians involved in emergency care of adults have undergone training in emergency care
	13	Nurses and clinicians involved in critical care for adults have undergone training in critical care
	14	Nurses and clinicians involved in paediatric triage have been trained in paediatric triage
	15	Nurses and clinicians involved in emergency care of children have undergone training in emergency care
	16	Nurses and clinicians involved in critical care for children have undergone training in paediatric critical care
Essential drugs for emergency and critical care		
Drug Indicators	17	Oral Rehydration Solution
	18	IV glucose
	19	IV crystalloid (Normal Saline ± Ringers Lactate)
	20	Diazepam
	21	Paracetamol

	22	Parenteral Penicillin (or equivalent)
	23	Parenteral Gentamycin (or equivalent)
	24	Parenteral Quinine (or other anti-malarial)
	25	Ketamine
	26	Lidocaine
	27	Adrenaline
	28	Atropine
	29	Frusemide
	30	Nifedipine or other anti-hypertensive
	31	Aminophylline
	32	Salbutamol (for inhaler or nebuliser)
	33	Hydrocortisone
	34	Insulin
	35	IV/IM opioids
	36	Naloxone
	37	Thiopentone
	38	Succinylcholine
	39	Non-depolarising muscle relaxant
	40	Oxytocin/Ergotamine
	41	Magnesium Sulphate
	42	Phenobarbital / Phenytoin

Essential equipment for emergency and critical care

Equipment Indicators	43	Clock with second hand
	44	Gloves - clean
	45	Gloves - sterile
	46	Sharps disposal
	47	Running water & soap
	48	Oral airway (Guedel) – adult & paediatric sizes
	49	Suction machine (foot powered or electric) & tubing
	50	Laryngoscope (working)
	51	Endotracheal Tubes – adult & paediatric sizes
	52	Rigid neck collar or Sandbags/Towel rolls and head restraints
	53	Chest tube & underwater seal (or equivalent)
	54	Pulse oximeter
	55	Bag valve mask (Ambu bag)
	56	Stethoscope
	57	Foetal stethoscope
	58	Blood pressure cuff
	59	IV cannulae – adult size (eg 18G)
	60	IV cannulae – paediatric size (eg 22G, 24G)
	61	IV giving sets
	62	Needles
	63	Syringes – 2ml & 5ml
	64	Urine catheters & bags
	65	Gauze & bandages
	66	Skin disinfectant
	67	Torch
	68	Electricity 24hours/day
	69	Light suitable for clinical examination

	70	Bedside blood sugar testing device & strips
	71	Weighing scales
	72	Thermometer
	73	Refrigerator
	74	Nasogastric Tubes
	75	Oxygen concentrator / cylinder with face masks or nasal prongs and tubing
	76	System for ensuring continuous availability of oxygen (eg reserve electricity generator / reserve cylinders with good transport and refilling system)

Routines for managing emergency and critically ill adults and children

Routines Indicators	77 78	System for categorising patients according to clinical urgency (triage) For adults For children
	79 80	System for prioritising the treatment of critically ill patients before stable patients For adults For children
	81 82	Admission registration and payment delayed until after triage and emergency treatment For adults For children
	83	ICU admission/discharge criteria
	84 85	Nurses have a routine of frequent observations of the patients (hourly or specified depending on clinical need) For adults For children
	86 87	Clinicians check patients (ward rounds) at least twice a day For adults For children
	88	There is a system for identifying critically ill patients on general wards and transferring to ICU (A “track and trigger” system)

Guidelines for managing emergency and critically ill adults and children

Guidelines Indicators	89 90	Guidelines for triage For adults For children
	91 92	Guidelines for Emergency Care For adults For children
	93 94	Guidelines for Critical Care For adults For children
	95	Guidelines for Oxygen use

Support Services for managing emergency and critically ill adults and children

Support Services Indicators	96	Lab with facilities and trained personnel to measure Haemoglobin
	97	Lab with facilities and trained personnel to measure blood glucose
	98	Lab with facilities and personnel to measure Serum Urea/Creatinine, Sodium and Potassium
	99	X-ray facilities and trained personnel for chest radiographs
	100	System for emergency blood transfusion
	101	System for making cross matched blood available within 1 hour of blood sample arriving in lab
	102	System for testing donor blood for the viruses HIV, Hepatitis B & C
	103	Lab with facilities and trained personnel to do direct microscopy & bacterial gram stain
	104	Lab with facilities and trained personnel to do bacterial culture and antibiotic sensitivities

IV intravenous; IM intramuscular;

Advanced Emergency & Critical Care Indicators

The hospital has:

1	Ventilator
2	Piperacillin/Meropenem

3	Colloid
4	Fresh Frozen Plasma
5	Propofol or Midazolam
6	Noradrenaline or Dobutamine
7	Invasive Blood Pressure Monitoring
8	Central Venous Pressure Monitoring
9	Aterial Blood Gas analysis
10	Syringe pump

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(22)

Annex 4 – Qualitative study

The research starts with FGDs with nurses from the reception and labour wards and with doctors, who have worked for more than three months at HLH. Separate discussions are held with doctors and nurses which gives everyone the opportunity to speak freely. Maximum variation sampling is done to form six groups, two groups of nurses of each ward and two groups of doctors. If saturation of information is not reached, more FGDs are planned.
The maximum number of people in a group are eight. A local researcher is engaged in these discussions which are held in Kiswahili and not last longer than 90 minutes. The local researcher is thoroughly instructed before the FGDs. All the FGDs are recorded for later analysis. After the FGDs, semi-structured interviews (SSIs) with Key Informants (KIs) are held to gain additional information. KIs are the director of HLH, the district and regional medical officers and a spokesman from the emergency medicine association of Tanzania. The interviews are recorded. One interview lasts for 60-90 minutes.

The results of the FGDs are analysed using Nvivo (Nvivo for mac version 11.4.0). The goal of the FGDs is to get a deeper insight in enablers and barriers of quality of care in EC using the adjusted IFEM analytical framework as basis. Therefore, the descriptive analysis is structured according to the topics of the discussion guide which is based on the analytical framework.

The relevant statements in the transcripts are extracted and coded for each topic of the framework. Subsequently, for every topic the key ideas of the participants and some key quotes are summarized. This gives a good overview to be able to see how topics are linked and what the possible relationship is between topics. Also, to reveal general patterns in the data, the extensiveness and the frequency of topics are analyzed. The results are also compared between focus groups to see if differences arise. The last step is the interpretation of all the findings whereby a narrative is made structured by topic. Some quotes are used to illustrate findings. For validation of the results a comparison with the literature and the other parts of the case study (observational study and retrospective file study) is done.

Annex 5 – Ethics

Retrospective file study

During the retrospective file study, the main researcher has access to information which can show malfunctioning or poor performance of the Emergency Department or Maternity ward. This information will be ignored and not used in this research. The main researcher will not report any of this information to the management.
The confidential information collected from files will only be accessible with a password known by the main researcher. In the results, patient names or ID numbers will not be used.

Observational study

The results of the observational study will be discussed with the director before they will be used in the thesis.

Qualitative study: FGDs and interviews

The potential risk for participants in the FGDs and interviews is that their opinions will be traceable back to a participant. In the case the information shared in FGDs/interviews is obviously traceable back to a participant or can have an adverse effect on the participant, it will not be used in the research. Another issue is that participants can share confidential information heard in the FGDs with other people not participating which can have potential adverse effects. Before every FGD it will be emphasized that the information shared is confidential and should not be shared with other people. However, the risk of sharing confidential information cannot be completely prevented. Health workers will be asked to devote some time to this research. The main researcher will make sure that the patient care will not be interrupted or disturbed by this research by choosing appropriate times in conducting the FGDs and interviews. Before the FGDs and interviews will take place, written informed consent will be obtained from the participants after providing them with the study details and the assurance that the data will be dealt with anonymously and confidentially. Before the moment of signing, all participants have already joined in a meeting explaining the goal and output of the research. This information was also given to them on paper in Kiswahili. The main researcher was a colleague of the participants joining the FGDs. For that reason, they might feel obliged to join the FGDs. The main researcher will underline, in the recruitment phase, that it is an absolute voluntary process where not joining will not have any influence on their career within the hospital. The participants will also be informed that they are free to withdraw from the study without having to give any explanation. Even after the discussion they can request that the information provided will not be used in the study. The entire discussion/interview will be phone-recorded with permission from the

participants. The recordings will be saved on a hard drive password protected.

Annex 6 – Prevalence and surveillance studies

A study done in KCMC, a large consultant and referral hospital in northern Tanzania, evaluates the magnitude and scope of injury-related disorders in the population. (31) All patients in a single year presenting to the department with a chief complaint of injury, as defined by the International Classification of Disease 9th revision (ICD-9): External Causes of Injury E800-E999, were subject to retrospective chart review. The injury patients represented 11.5% of all visits. Road traffic injuries (RTI) represent the largest proportion of traumatic events with 44%. Injuries related to a fall and secondary to an assault were the second and third most common mechanisms reported at 30% and 15%. Mostly male patients aged 15 to 44 years represented the highest proportion of injuries for all mechanisms (except falls and burns). The most common types of injury were fractures and traumatic brain injury (TBI) and head injury was associated with increased mortality (OR 5.8). During hospitalization, 38% of patients required surgical intervention. Death, either prior to arrival in the emergency department, while in the emergency department or during hospitalization, occurred in 5% of patients suffering from injuries. (31)

Another study done at Bugando Medical Centre in Mwanza, also a large consultant and referral hospital, shows that trauma is the single most common reason for admission and associated with high morbidity and mortality. A two-year descriptive prospective study of trauma patients was conducted. The modal age group was 21–30 years accounting for 53% of cases. Road traffic accident was the most common cause of trauma accounting for 61% of cases. The majority of patients were found to have moderate to severe injuries. In this study the case mortality rate for trauma patients was 17%, which was much higher in night hours (with little staff available) compared to daytime. (32)

In a qualitative study done in two wards of Dar es Salaam interviewing 6000 participants (randomly selected) about the prevalence of RTIs and the circumstances of the incidents, health consequences, long-term functional status, economic impact and length of disability. Information was also collected on any household members that had died in a RTI. This study shows that about 33 out of every 1000 individuals reported to be involved in a RTI within the past 12 months and four household members had a fatal RTI. Two-thirds of the surveyed population went to a hospital, and three fourths of those involved in an RTI received some form of roadside assistance. The average disability was 49 days and fractures represented 16.3% of injuries. (126)

In a large study looking at the prevalence of hypertension in rural population of individuals aged 70 years and over, of the 2223 subjects,

1553 (69.9%, 95% CI 68.0-71.8) had hypertension (BP ≥140/90). Only 586 (37.7%) hypertensives had been previously diagnosed, 94 (6.1%) were currently treated and 14 (0.9%) were adequately controlled. These figures show that a large amount of older people are at risk of complications of hypertension such as stroke and acute ischaemic heart disease, which need EC. (28)

Little et al. looked at acute presentations at a small community hospital near Arusha and found as the top five diagnoses; respiratory infection (22.1%); malaria (21.4%); skin or soft tissue infection (7.9%); genitourinary infection or gynaecological problem (6.3%); and ear, nose, or throat pain or infection (5.9%). Very little trauma and paediatric cases were seen at this hospital, probably due to a bypass effect. The hospital only referred 2,2% of the patients and only 0,8% was admitted. The authors conclude that small medical centres may have the capacity to handle many of the emergency cases seen in this type of setting. In that way it might decrease the burden of patient load at higher-level district and regional hospitals by shifting EC to these smaller facilities. However, nothing was said about the quality of the care given. (127)

In Southern Tanzania the Ifakara Health Institute has a Demographic Surveillance System since 1996, visiting registered households once every 4 months. The study focuses on males and females aged 15–59 years, a socially and economically active group in which death is considered premature. The causes of deaths were determined by the verbal autopsy technique. Of all death, 41% died of CDs, 15% NCDs and 9% of accidents/injuries (others were undetermined). For the accidents and injuries group it is clear that EC will decrease mortality. In the group of CDs, Malaria was most prevalent with 31%, followed by HIV/AIDS 24% and Pulmonary Tuberculosis 13%. Especially for Malaria and partly for the other two, functioning EC can make a large difference in mortality. In the NCDs group, Cerebrovascular (11%), Epilepsy (10%), Carcinoma Cervix / Uterus (9%) and Unspecified Cardiovascular disorders (9%) were most prevalent. EC could make a difference in almost all of these groups.

Annex 7 – Overview of Tanzanian health care system

The Tanzanian health system is built up in pyramid. At the bottom, community-based health activities, which promote good health practices and preventive measures, reach families in villages (rural) and neighbourhoods (urban). Dispensaries should provide preventive and curative outpatient services, while health centres can also admit patients and sometimes provide surgical services. District/Council hospitals are the first level referral hospitals which provide health care including surgical services to referred patients. Regional hospitals have a referral function to provide specialist medical care. Zonal and national hospitals offer advanced medical care and are training centres for other hospitals in medical, paramedical, and nursing care. (5) The part of the health system which delivers PHC services encompasses the network of dispensaries, health centres and district hospitals. The management of government activities within districts are through Local Government Authorities (LGAs) and is thus decentralized. (35). The decentralized system does not function as it should. Too little funds are flowing from central to the LGAs, there are too little incentives for staff to work at district level and there is too little capacity and supervision in the district for good governance. (128,129) Zooming in at district level there is limited involved of dispensaries and health centres in district planning and priority setting, which has a negative impact on professional motivation. Decisions are mostly made at district/council level. Another problem is finance at district level. There are large geographical differences between LGAs in terms of financial resources (coastal districts are relatively 'richer'). Dispensaries receive around one-third of all resources on average, although the vast majority of health services are provided there. Financial resources seem to get stuck at district level. Also easier-to-reach facilities appear to attract a larger share of available district resources than harder-to-reach facilities which forms part of the incentive to work at a certain location and thus amplifies already existing staff inequities. (34)

There are different cadres of healthcare workers in Tanzania. Most are mid-level health workers (MLHW), only a small percentage are professionals (doctors, dentists, pharmacists, or specialized nurses). Within these MLHW there are different levels; (community) nurses, midwives, clinical assistants, technicians (radiological, pharmacological and laboratory) and two cadres of 'doctors'. These two cadres of doctors are clinical officers (CO, 3 years of training) and Assistant Medical Officers (AMO, 5 years of training). At district level these doctors mostly manage the care, with the AMO supervising the CO and other MLHWs. (8,49) Practically in dispensaries, where most people go for care, the CO and MLHWs are managing everything.

The organization and management relationship between public and private sector is not well enough developed yet, leading to inefficiency and duplication of efforts (130) EC could benefit from better partnership in several ways. Most importantly in creating a properly functioning referral system, which should include all facilities. As well in teaching and creating guidelines, since large hospitals (which are 60 percent private) are usually involved as teaching institutes.

Tanzania's health financing largely relies on taxes. Taxation is complemented by user fees. MoHSW has introduced three insurance schemes: Community Health Fund (CHF), TIKA (for urban, peri-urban areas), and the National Health Insurance Fund (NHIF). CHF and TIKA aim to reduce health care costs in primary care by allowing households to prepay their health care costs for the coming year, and NHIF is for formal sector employees. The latest Health Financing Strategy (HFS), focuses on universal and equitable access to essential health services in line with the achievement of universal health coverage. A key barrier to improved quality and access is the lack of effectiveness and efficiency in health financing. The Health Basket Funds play a crucial role in health care financing on district level, however contributions from development partners are dwindling. (5,131)

Annex 8 – Government policies and strategies

Tanzania Development Vison 2025

The Tanzania Development Vision 2025 (Vision 2025) is a document providing direction and a philosophy for long-term development written by the president's office. By 2025, Tanzania wants to achieve "a high quality of livelihood for its citizens, peace, stability and unity, good governance, a well-educated society, and a competitive economy capable of producing sustainable growth and shared benefits by 2025." (Mkapa 1999) The Vision 2025 document identifies health as one of the priority sectors contributing to the above philosophy. Some specific health service goals in the Vision 2025 are important as general principles underlining the importance of EC;

- Access to quality primary health care for all.
- Access to quality reproductive health services for all individuals of appropriate ages.
- Reduction in infant and maternal mortality rates by three-quarters of current levels. (Mkapa 1999)

As stated earlier, primary health care (as stated in the Alma Ata Declaration (Fendall 1978)) includes EC, so the first goal alone is an important argument for strengthening EC in Tanzania. EmOC and EC for children is emphasized by the second and third goal.

National Five Year Development Plan 2016/17 – 2020/21

In this plan, written by the Ministry of Finance and Planning, the theme is "Nurturing Industrialization for Economic Transformation and Human Development". Within that context, the focus on health is mainly included in the aspiration to "improve quality of life and human wellbeing".
The key interventions should be aimed towards:

- Strengthening health systems (primary and referral);
- Equipping district, regional and referral hospitals with modern equipment;
- Training health staff (short and long courses);
- Management of Non-communicable diseases (NCDs);
- Improving working environment for health personnel (commensurate remuneration, housing in close proximity to work premise);
- Speed up comprehensive health care, focusing on proactive preventive medicines and timely and effective control of epidemic diseases. (Ministery of Finance and Planning 2016)

In the annex all interventions are set up in practical outcome tables. Looking at the health interventions table, most of the interventions are dealing with constructing and equipping buildings. This does not seem to match with the above list of outcomes.

Financial Strategies

Tanzania's total health expenditure (THE) was 7.3 percent of nominal gross domestic product (GDP) in 2011-2012. (Ministry of Health and Social Welfare 2012) There is a high dependency on external funding, a decline in donor support, and a fragmented health financing structure. Out-of-pocket payments are still very high at 32% of THE. (Health Policy Project 2016) In general, government health budgets since 2006 have remained consistently below the Abuja target of 15%. (131) In the latest HSSP the plan is to have a Single National Health Insurance (SNHI) in place in 2020, which should cover the essential care package (see below). (MoHSW 2015) This will be very challenging since only 2% of the THE is now funded by the existing National Health Insurance Fund. (Health Policy Project 2016) Having a closer look at the budget; two disease control programmes (HIV/AIDS and NCDs including mental health) account for nearly half of total health service costs. Maternal and Neonatal Health receive much less and trauma less than 10% of the HIV budget. It is very difficult to analyse which part of the budget is or will go to EC since it is (partly) included in the different disease control programmes or heath systems pillars.

Big Results Now (BRN) 2015-2018

The BRN is an 8-Step Delivery Methodology designed to focus on delivering implementation of specific goals within a certain timeline. The BRN Delivery Methodology was adopted by the Government of Tanzania in 2013 to transform Tanzania's public service delivery, enabling Tanzania to achieve its Vision 2025 aspirations. For the health care sector this process was started in 2014. The MOHSW, local governments and Medical Stores Department (MSD) are collaborating to implement strategies. The four key results areas that were formulated in the Health and Social Welfare sector include:

- Human Resources for Health (HRH) interventions aim to attain 100% balanced distribution of skilled health workers at the primary level in thirteen underserved regions by 2017/18.
- Health Commodities targets focus on ensuring 100% stock availability of essential medicines in all primary health facilities in the country.
- Health facility performance management improvement goals include achieving 80% of primary health facilities at the 3-stars and above rating by 2017/18 in twelve identified priority regions.
- Reproductive Maternal Neonatal Adolescent and Child Health (RMNCAH) services target the achievement of 20% reduction in maternal and neonatal mortality rates in five identified priority regions by 2017/18. (The United Republic of Tanzania n.d.)(MoHSW 2015)

All of these areas are potentially important for EC, if it were applied to deliver EC. This is only explicitly stated in the last area, mentioning

expansion of BEmONC/CEmONC and construction of satellite blood bank facilities.

Tanzanian National Health Policy 2007

This MoHSW policy gives general health sector guidance over long period of time. Its goals are very general and still hold today; training, HRH, good governance, accessibility of services, construct and maintain infrastructure, build partnership between public and private sector and health education. It is an older policy and in that time EC was not so much on the global agenda yet, however the basic goals this policy pursues are definitely important for EC to function.

Primary Health Care Services Development Programme 2007-2017

This policy written by the MoHSW in collaboration with local government authorities (LGAs) has the main objective "to accelerate provision of quality primary health care services to all by 2017" and should be executed by the LGAs under supervision of the MoHSW. It is meant to improve the health care system at district level (community-based health care, dispensaries, health centres and district hospitals). The main areas are rehabilitation, upgrading and establishing facilities at primary care level, human resource development, improving the referral system, increasing health sector financing and improving the provision of medicines, health care waste management, sanitation, equipment and supplies. The objectives are put into action by many vertical programs, mainly disease and governance focused. For EC to function well, an integrated approach is needed. EC on itself is only mentioned in terms of BEmONC/CEmONC and a small section on improving emergency transport between facilities. (Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] 2007)

National Essential Health Care Interventions Package – Tanzania (NEHCIP–Tz)

This policy was written in 2013 to achieve "the provision of equitable, quality and affordable basic services that are gender sensitive and sustainable and that are aimed at achieving improved health status". One of the main strategic approaches is a client centred service delivery model with 24-hour-seven-days-a-week availability and accessibility of all services that are associated with that level. Hereby the government thrives to strengthen the referral system with close collaboration of different service units within the same facility and across facilities. (Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] 2013) This underlying approach fits very well with a functioning EC system.

Looking deeper into what is in the essential package, surprisingly Integrated Management for Emergency & Essential Care (IMEESC) is included form dispensary level. However, it is not mentioned in the whole

rest of the document and there is no further explanation about what it contains at what level. BEmONC and CEmONC is included form health centre level, although a normal delivery should be available from dispensary level. (Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] 2013) This does not seem to go together, since according to Tanzanian standards (The United Republic of Tanzania Ministry of Health and Social Welfare 2008) every delivery should be attended by staff trained in BEmONC. (The United Republic of Tanzania Ministry of Health and Social Welfare 2008) IMCI should be available from health centre level as well. In the description of what should be available at what level of the pyramid, EC is not mentioned at all. Strikingly, in a short table about what is the expected outcome of work in a specific department of a facility, the emergency/casualty room/department is not mentioned. In general, this whole document is still very much divided into vertical pillars which do not seem very integrated.

Health Sector Strategic Plan July 2015 – June 2020 (HSSP IV)

The overall objective of HSSP IV is "to reach all households with essential health and social welfare services, meeting, as much as possible, the expectations of the population, adhering to objective quality standards, and applying evidence-informed interventions through efficient channels of service delivery." This document was written with all the above documents and the SDGs and Universal Health Coverage as background. There are five specific objects;

- measurable quality improvement of primary health care services, delivering a package of essential services
- improve equitable access to services in the country by focusing on geographic areas with higher disease burdens and by focusing on vulnerable groups in the population with higher risks
- active community partnership through intensified interactions with the population for improvement of health and social wellbeing
- a higher rate of return on investment by applying modern management methods and innovative partnerships
- close collaboration with other sectors, and advocate for inclusion of health promoting and health protecting measures in other sectors' policies and strategies.

For the first objective, a star rating applies for primary health facilities, which includes Emergency Care and Referral Mechanism. Some characteristics of a five-star facility are:

- Fully trained staff and a strong functioning system to triage, refer if needed
- Successfully handle emergency cases as per the norms for the facility type

In separate chapters, the importance of EmOC, IMCI and trauma care is highlighted. In a chapter called transport and ambulance service is stated that; "The MOHSW will coordinate the setting up of a mechanism for emergency medical services at all levels, including guidelines and protocols" and "will also investigate options to establish a toll free telephone number 115, for emergency calls". On paper EC seems to be on the agenda, although it has to be found in bits and pieces throughout the policy.

Standard treatment guidelines and essential medicine list - 2013

This guideline gives on overview of how to treat the most common diseases including acute presentations. It is very practical and easy to use by health care professionals. Although it seems that health care professionals are not really aware that these guidelines exist or they have reasons for not using them. (Amuli 2015) (Chandler et al. 2008)

The National Road Map Strategic Plan To Accelerate Reduction of Maternal, Newborn and Child Deaths in Tanzania 2008 – 2015

This policy is a very elaborate document based on meeting the MDGs 4 and 5. (The United Republic of Tanzania Ministry of Health and Social Welfare 2008) The plan was 'sharpened' in 2014 to try and accelerate progress. (Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] 2014) In 2016 a new strategy is yet to come. There are clear objectives and strategies based on international agreed evidence-based interventions. For EC important targets are;

- "Increased coverage of CEmOC from 64% of hospitals to 100% and of BEmOC from 5% of health centres and dispensaries to 70%.
- Increased proportion of health facilities offering Essential Newborn Care to 75%
- 90% of sick children seeking care at health facilities appropriately managed."

Strategies are based on; "advocacy and resource mobilization, health system strengthening and capacity development, community mobilization and participation, fostering partnership information, education and communication." Within EC, the 'sharpened' plan focused on "care during labour and delivery, immediate care after delivery and postnatal period, especially close the urban/rural gap". With these strategies, Tanzania has achieved MDG 4 for child survival, which is remarkable in the region. However, MDG 5 for maternal and newborn survival, was not reached by far. (Afnan-Holmes et al. 2015)

National Malaria Strategic Plan 2014-2020

The main goal of this strategy is "to reduce the average country malaria prevalence from 10% in 2012 to 5% in 2016 and further down to less than 1% in 2020". The most important part of the objectives for EC is "universal access to appropriate early diagnosis and prompt treatment".

One of the strategic interventions is to "provide high-quality case management of fever services from skilled providers", whereby training in treating severe cases and supervision is stated as important. (11) Since the trend in malaria prevalence is downwards (in the latest survey it went slightly up again) (MoHSW, MoH, NBS 2016), availability and knowledge of treatment of severe cases becomes more important since immunity is going down.

National Non-Communicable Disease Strategy 2008-2018

This policy seems to use a model of continuous care of NCDs in terms of primary, secondary and tertiary prevention. Tertiary prevention beholds improving (acute) treatment in order to prevent complications and deaths, however in the whole document this cannot not be found back. EC or acute care for NCDs is not mentioned, it is seen as part of general treatment. (57)

Annex 9 – EC initiatives in SSA

An interesting initiative in EC on Zanzibar showed that with little financial resources change and improvement in EC is possible. In a tertiary hospital serving a population of 1.2 million, the emergency department was overcrowded and understaffed and the hospital management initiated a quality improvement project. In meetings with staff, possible areas for improvement were identified using a consensus-based approach. During six months, regular staff meetings were implemented, a registration system was developed and implemented, the numbers of patients with simple problems were reduced, a simple triage tool was developed and implemented and a resuscitation room was established. It was agreed beforehand there would be no extra funds, no additional staff and low-tech equipment. Key factors for success mentioned were; involvement of all stakeholders from the start, identification and use of 'local champignons', regular feedback and a focus on human resources rather than equipment. (Thomassen et al. 2015)

In Kenya, the situation of EC resembles that of Tanzania, with some few private hospitals offering good acute care which are only affordable for a very small proportion of the society mostly situated in Nairobi. Training of EM physicians has just taken off. (132–135) A very large qualitative study looking at perceptions of EC in Kenyan communities asked for solutions to improve care. Most importantly mentioned were; community first aid education, training health providers in basic EC and simple process changes such as triage protocols at health facilities. Creation of a unified pre-hospital system was also an important issue which would require a substantial financial investment much more than the other solutions. (136)

Rwanda has established an HRH program to rapidly build capacity in multiple sectors of its healthcare delivery system which involves multiple foreign medical and surgical residencies, nursing programs, allied health professional trainings and hospital administration support. Within this HRH program EC training is strongly represented. In 2013, a two-tiered program consisting firstly of a 2-year part-time postgraduate diploma (PGD) course in emergency and critical care medicine to create capacity for establishing EC at the country's 44 district hospitals. The second tier will recruit graduates from the PGD course to continue training for another 3 years to become EM physicians. (137) Although there is no formal data yet, many PGD participants feel that some of the morbidity and mortality at the district hospital level have decreased as a direct result of their training. (138) This program seems very applicable to the Tanzanian situation.

Annex 10 – Layperson first-responder training

A Large review on pre-hospital trauma training showed positive results in training lay persons on knowledge and skills and even on morbidity and mortality in some studies. (113) It revealed four themes central to layperson first-responder trauma education initiatives in LMICs. To start with an effective needs assessment is important to determine the national/regional burden of injury, current prehospital capabilities, and baseline first aid knowledge of the target trainee population. It also includes involvement of key stakeholders which may include police and fire departments, local government, national government, taxi operators, commercial truck drivers, and physicians and nurses who care for injured patients. (113) In Tanzania several studies (from urban areas) show that RTIs probably form the large bulk of trauma patients and that pre-hospital systems are almost not existing. (29–32) Important stakeholders in the rural communities in Tanzania, as seen in a study about community responses in maternal health, are village government, religious leaders, teachers, community health workers and traditional healers. (139) The second theme was the development of training curricula that acknowledge existing local infrastructure, available resources, and needs. Most of the training programs were oriented toward practical real-world scenarios and emphasized hands-on training. (113) Theme three is that the training should be applicable to low levels of literacy and health knowledge of laypersons, which is extremely important in Tanzania. Many programs used visual aids mainly and hands-on training. The final theme is dealing with post implementation evaluations, which is the hardest part and where different styles are used according to local standards.

Annex 11 – Results observational study

Infrastructure

HLH scores quiet well on the infrastructure indicators with 66%. There is no dedicated triage area at the reception. Patients enter the reception area and await their turn to be seen by a clinician, mostly on a first-come-first-serve basis. The reception has one consultation room, a bathroom and a registration room. Besides the separate rooms there is one large area where all patients are waiting for diagnostics and treatment before transfer to the wards. Privacy is a major problem in the reception. HLH has two designated Intensive Care Units (ICU) for adults and children separately. The main differences in the ICUs compared to other wards is the use of electronic monitors, availability of suction machine and a higher number of nurses.

Human resources

At HLH human resources does not seem a large problem with a score of 100% on this indicator (see table above). During day and evening time there is always a clinician in the ED, in the night a clinician is "on-call". Nurses are always present.

Training

With a score of 20% there is little knowledge available for EC. If focusing on staff working at the ED and ICUs; they did not receive any formal training in triage, EC or critical care. Probably all staff had some education on emergency care in their primary degree, however this was not counted as training in this field. There are nurses trained in anaesthesia/critical care available in the operating theatre who are "on-call" for other wards. Emergency Obstetric Care training has been done on a regular basis at the maternity ward.

Drugs

There is a 100% score in availability of drugs at HLH. HLH has a fully operational pharmacy that supplies the hospital with all required medicines. The only problem is that drugs are not readily available in the ED, staff must go to the main pharmacy to get the drugs when needed. Occasionally, there is a delay in supply of medicines mostly due to delay at the supplier side.

Equipment

Also in terms of equipment there is a 100% score. HLH has reliable electricity and a backup generator, also clean running water is never a problem. A suction machine is not available at the ED, only in the ICU. Otherwise all equipment is readily available in the ED, although the amount of equipment is not always sufficient.

Routines
A score of 33% mainly due to not having a formal triage system in place or a system for prioritising and identifying critically ill adults. Also, there are no formal ICU admission/discharge criteria. Talking to staff, there are some informal 'rules' about which patients are supposed to be in ICU or not.

Guidelines
There is currently no official use of any written guidelines, although some doctors are using WHO guidelines especially for emergency child care. Written guidelines were once developed for HLH, however they are currently out-dated and not distributed anymore.

Support services
Again a 100% score on support services. HLH has well-functioning lab and x-ray facilities. Sometimes reagents are missing in the lab due to delay at the supplier side.

Advanced emergency care
With a score of 10% due to availability of midazolam, advanced EC is not available. Although three mechanical ventilators are available, they are only used in the operating theatre.

Annex 12 – Results qualitative research

Staff

Amount of staff and skills

Many participants were complaining about the lack of human resources available, especially the number of nurses and medical attendants. “But the major challenge we have at the department is human resources.” They feel it affects the quality of service, in some cases the outcome can be very poor due to this issue. Also, hygiene can be poor since there is too little staff around. Another issue is that lack of human resources is strongly linked to motivation. It is not only the amount of staff that was commented on, also the emergency care skills of the available staff need to be optimized by different ways of training.

Motivation

This topic was discussed extensively and the importance of teamwork and a good infrastructure were mentioned many times as motivators. Another issue which was mentioned many times as motivator was the fact of being able to help a patient getting better and deliver good service. One nurse summarized these motivators; "What I like in my work is that when emergency occurs, we collaborate well to attend that patient, also when all the equipment we need are available at that particular moment and we save that patient". Not having the right equipment available was also mentioned as demotivating by some. To be able to be involved in decision-making processes was also seen as motivating. The dynamics of working at the reception with many emergencies was mentioned as motivator by two nurses. Salary as motivator was mentioned by few.

Leadership

According to the participants a good leader is very knowledgeable and skillful, must communicate well, give direct supervision, has a good relationship with all workers and is self-motivated. A nurse stated; “Primarily the leadership must be active, the one leading the emergency management must be skillful and with ability to make quick decisions and be creative."

Some participants were commenting on what could be improved in terms of leadership at HLH. They mentioned that good supervision especially at the reception is lacking and that the management is not listening enough to the suggestions from staff about possible improvements. Some also mentioned that some nurses/doctors should go for further education in EM to be able to lead an emergency/resuscitation team; "But as a profession there are those who were taught all about it, those who took it as a specialty. Those could be good leaders of the emergency team with better ability to manage it."

Training

Most participants agreed on the fact that training in EC is very important and that at this moment at HLH there is little knowledge and training in EC. An exception might be the labor ward where some (skill)training on acute cases was given, although this was only mentioned by the doctors and not by the nurses.

There were different suggestions on how to get knowledge on EC at HLH. Many participants mentioned that nurses/doctors should be send for specialist training as to be able to lead an emergency department/team and to pass on their knowledge to others in their department. On job-training which should be continuous/sustainable was also mentioned by many. "The sustainability in terms of time to time orientation refresher course, for the staff, especially dealing with emergency services." This could be given by experts in EC from outside but even by doctors within HLH who have at least basic knowledge on EC. "I mean those one can be trained by anyone who is senior, somebody who is experienced. For example, any doctor can conduct a training, for example for intern doctors, but also, in long run we need a specialist, an emergency care specialist." Others were also suggesting that nurses and doctors should be able to work in a university hospital for a short period to get exposure to EC. Some doctors were suggesting having an exchange program with foreign hospitals for the same reason.

Teamwork

Teamwork as topic was discussed in many forms. Willingness to collaborate among workers is seen as something that is going well at HLH. Many participants were talking about a certain team-spirit that is less found in other hospitals. This collaboration and team-spirit is a strong motivator for many participants; "in Haydom we have a team spirit which I noticed since I was a student nurse."

Although collaboration is good, some participants feel that the functioning of the team at reception, especially in comparison with the labour ward, is not very good. They feel the team at reception lacks supervision of a skilled and knowledgeable team-leader, which many confirmed as being very important. "One is supervision I can say, because the team should have a good leader, without a leader of the team who is really ambitious and good at supervising his team, then the team will not function" The doctors also felt that there was lack of motivation among workers at the reception. "There is an arena of demotivation, I cannot say that much why and how, but it seems there is some sort of demotivation, which makes then the team to not function properly [at reception]"

To call for help when an emergency arises was mentioned by many labor ward nurses as very important step in teamwork. Some doctors were

mentioning that this mechanism was lacking in the reception. Some junior nurses thought that learning from your seniors is also part of teamwork and that a team should comprehend at least some senior workers for it to function well.

Career development

Participants were not very talkative about this topic. Salary increase and further education opportunities were issues discussed. Especially the doctors all felt that specializing is an important step in their career, even sub-specialization; "So having a career and, developing our career, is not just voluntary, it's something that is really needed. As the hospital continues to grow"

Nurses felt that chances to get a sponsorship at HLH to go for further education are slim. People sometimes must wait 'in-line' for 10-20 years to be able to get the chance, when they are already too old. This issue needs to be addressed by the management according to some nurses. "To get additional training in a higher institution is often a problem. Don't be surprised for someone to spend twenty years at work and he/she did not get a chance for training"

Infrastructure

Equipment

In general, all participants agreed that the equipment which is available is not sufficient for giving optimal care at the reception, also the quality of the equipment available is not good. Specific items which are missing or not sufficient were mentioned; oxygen concentrators, patient monitors, a suction machine, an ECG machine, glucometers, trolleys and a defibrillator. "Another thing is the oxygen machine at reception is a real problem. You may have a patient who have an airway or breathing problem, you cannot be able to assist him/her because the machine is not available there"

Paradoxically, some participants mentioned that when in need of care they would want to be treated in Haydom because of the available equipment. This might be since they know that other hospitals have even less resources available. "I would like to be treated in Haydom because they have enough equipment"

In maternity, most agreed that equipment was sufficient and of good quality. "Yes, equipment is available [at labour ward], the equipment we need really is."

Motivation is also strongly linked to available and functioning equipment.

"What disappoints me most is when I have a knowledge (skill) to save the patient but I cannot be able to provide that service because of lack of equipment"

Space

The general opinion about the space at reception at HLH is that it is too small and that it either needs restructuring or rebuilding; "I think building is one thing but also restructuring the existing one for the short-term plan"

Specific needs in terms of space for the reception that were mentioned; more consultations rooms, a minor theatre, screens/curtains to create privacy, observation rooms and new bathrooms. "Sometimes we only have one screen. We need to have more rooms, when a doctor is attending one patient, then you [nurse] can attend another patient in another room"

In labour ward the only complaint from the nurses is that the operating theatre is too small (which was recently built), otherwise the space seems to be sufficient. "For example, if there are two caesarean emergencies at one time, you have no chance to do the second, because you have one operation bed. You must bring one to the main theatre"

Hygiene

The opinions on hygiene issues are divided. Some think that enough cleaning is done, others feel it is lacking. The overall argument why it is lacking is due to shortage of staff. Sterility was another issue that was mentioned in this topic. Due to shortage of space nurses from reception feel that it is difficult to maintain sterility at certain procedures. "Maintenance of sterility is a major problem because you will find congestion and one is clean and other is not and then they can easily come into contact" Also, infection prevention is difficult due to overcrowding. "That number is much for that room, they [patients] are overcrowded, even the circulating air is not enough"

Privacy

A lack of privacy is huge issue in the reception, everyone agreed on that. Screens are not available enough, there are no curtains to separate patients. "You see, there is only one room where the patients can be seen privately, [outside that room] you cannot examine patients fully, because of lack of privacy" In maternity ward the privacy is maintained according to all participants, all women have their own room in labour ward.

Essential medicines

Some participants were mentioning that emergency drugs are not readily available at reception and in labour ward. They are available at the main pharmacy of the hospital, however the process to get them in the ward

takes too long. "It is not good somebody needs go to pharmacy for medicines that can be put in a first aid box, emergency drugs must be available at the reception"

Some were saying that in general there is good variety of drugs available at the hospital and that this could be a main reason for people to come to Haydom for treatment.

Processes

Guidelines and protocols

There is again a real difference between the reception and labour ward. The overall opinion is that there are few official guidelines or protocols which are used in reception. One participant mentioned there is no time to pay attention to protocols due to staff shortage; "Do you think I will follow any emergency protocol as is required? Oh no, I will assist one patient and will not even finish and rash to the other quickly." Also, equipment shortage was mentioned as a reason not be able to follow a protocol. Some were commenting that sometimes there are protocols being put on the wall, however no education is given about its use.

In labour ward participants say that there are guidelines and protocols for emergency situations and that they are also being used. "Guidelines are there, when you get a PPH [post-partum haemorrhage] you know what to do first or foetal distress, or if the child is not breathing. In fact, there are guidelines for each emergency at the department."

Triage

Participants agree that both in reception and labour ward there is no official triaging done and it is mostly on 'first come, first serve' basis. "Identification of acute cases and prioritisation is not there. Most of the time." However, it seems that some nurses do some kind of prioritizing and understand that is important. "But really, we consider children, they should be given the priority." "If you have several patients then you do quick assessment as who gets first and quick attention, and which patients can wait few minutes." They all feel triage is important and some mention an official triaging protocol should be installed. "So that is an area which really needs a protocol maybe, for really triaging. And then followed. Yeah. Established and followed" Although one nurse comments it will only work if additional staff will be there to do this triaging. "The problem I think is [staff] shortage and, probably, maybe, supervision." Nepotism was another issue that was brought up, relatives or friends of staff are usually helped first which will not be done if official triage will be followed. "We can fail to come in to compromise since he/she [colleague] feels this is my relative and needs immediate attention and she will feel that I have not cared or given enough attention."

Monitoring and Evaluation

When asked about the topic of monitoring quality of EC, the answers were very different from group to group. The nurses in labour ward were very much aware of statistics and how the right statistics can help in improving care. "Possibly it (statistics) should be improved, because if you remove it how can you evaluate your work? Probably let's think on how to improve record keeping." They also tried to come up with some indicators mostly related to maternal deaths. "Where you have succeeded and where you have failed that could be an indicator."

The doctors agreed that at this moment there is no good monitoring of quality of EC. On discussing how to do this they agreed that timing is an important issue. "So, time, the time, there must be a nurse, who is recording the time, when the patient arrives, and then the time the patient is seen by the doctor, and what was the nature of the emergency."

Learning from mistakes and evaluating cases were issues that came up in all groups. Especially evaluating cases in a structured manner is something which is done in labour ward.
"When emergency occurs, and unfortunately it ends up negatively, we are asking ourselves what happened, what went wrong"

EC-chain

This final topic was only touched upon very briefly. In this topic only the referral system was discussed. Two doctors commented on the fact that referrals coming to Haydom were not treated well in the first hospital and that information transfer was poor. "Because one thing is that some hospitals refer some patients, but they have not done the basic things. So, it is as if that person did not pass the first hospital from the beginning."

Some mentioned that patients who were referred from Haydom to another hospital most of the time had a good outcome. It was felt that this good outcome was mainly due to good initial treatment at Haydom and communication with the referral hospital. "I think one of the best things that I have loved with the referral system of our hospital is that patients who are referred, we really take good care of them first here."

Ending question

All discussions ended with the question where they would want to be treated when ill themselves. Almost all participants said they would want to be treated at HLH if possible. Reasons given are; enough equipment, the good quality of care, family close by, no need of bribes and care 'in god's name'. This is interesting in the light of the answers to the other questions, which are mostly not very positive.