CONTENT ANALYSIS OF AFRICAN EMERGENCY CARE PUBLICATIONS PUBLISHED BETWEEN 2013 AND 2017

A dissertation submitted in fulfilment of the requirements for the degree of Master of Health Sciences in Emergency Medical Care in the Faculty of Health Sciences at the Durban University of Technology

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DECLARATION OF ORIGINALITY

This is to certify that this work is entirely my own and not that of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

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ABSTRACT

Introduction: Despite global advances in clinical academic research, published research output emanating from the countries within the African continent remains disproportionately low when compared to that of western and other developed countries. While academic research is always encouraged, no matter the origin, the implications of the continued low rate of publication in Africa has the potential to increase dependency on research originating from settings and populations that are characteristically different to those in Africa. This may be done in order to support the evidence base that informs both the introduction of and support for prehospital patient care practice and the development of high-quality, emergency medical service systems.

Therefore, although existing research may very well be robust clinically relevant research, it may not necessarily be contextually appropriate and applicable to African countries. In an effort to initiate and promote the development of an emergency care research agenda for Africa, this study focused on establishing the type of articles that have already been published in this space, and also whether the aim of these published articles has been to address the research gap as indicated in the continent's burden of disease (BOD). Using the process of content analysis all research articles published on emergency care in Africa between 2013 and 2017 were analysed to establish themes and trends in the research. These trends were then compared the local BOD.

Methodology: Published articles with a focus on emergency care, as identified by their medical subject headings (MeSH) and originating from the continent of Africa between 01 January 2013 and 31 December 2017 found within Scopus, Elsevier's abstract and citation database, were extracted and reviewed using content analysis. Systematically coded and categorised themes, topics and patterns, as well as trends in the research, were identified and then compared to conditions, topics, illness and injuries that represented the continent's prevailing BOD. Descriptive and inferential tests were then conducted to examine the relationship between the trends that emerged and the conditions representative of the BOD.

Results: A total of 886 emergency care articles were initially identified as originating in the selected review period. However, 211 (24%) were then removed as a result of their not being relevant and not meeting the stipulated inclusion criteria. Accordingly,

a total of 675 emergency care articles were analysed. Eleven core themes emerged as being representative of trends found in the research articles published between 2013 and 2017 and which were specfic to emergency care in Africa. The majority of emergency care articles were related to trauma emergencies (37.48%), ethics and professional practice (31.26%) and medical emergencies (15.85%). These core themes consistently emerged as the themes identified in the greatest number of publications within the 2013 to 2017 timeframe. Underpinning the 11 core themes, 24 subthemes were identified with articles related to, firstly, burns 135 (20%) which were classified into core Theme 1: Trauma emergencies – greatest number of articles. The number of articles on burns was followed by articles related to professional development, namely, 117 (17.3%) and to ethics and patients' rights, namely, 91 (13.48%), with the last two both being classified into core Theme 2: Ethics and professional practice. In relation to the journal type and origin, the majority of the articles were published in the *African Journal of Emergency Medicine* (21.1%), followed by the *Injury Journal* 74 (10.9%) and the *Burns Journal* (10.5%) while, in terms of the citation numbers, it was found that the greatest number of articles reported on were ethics and professional practice (1223), with the most articles being published in 2013 (415). A total of 235 (34.8%) out of 675 published articles matched conditions representing the African BOD, specifically BOD Type III: Injuries, with the largest subcategory comprising unintentional injuries (29.33%), followed by intentional injuries (5.33%).

Conclusion: The study found that the number of research articles on emergency care published in Africa was increasing year on year, with the majority of articles published being on trauma emergencies, specifically injuries related to burns. While there were a notable number of articles that matched with conditions representing the African BOD, specifically BOD Type III: Injuries, it was found that fewer articles addressed conditions classified as BOD Type I and Type II, which include conditions such as cardiovascular disease, respiratory disease, infectious and parasitic disease and HIV/AIDS.

DEDICATION

This thesis is dedicated to my husband, Thierry, and my son, Luca. Without your help, encouragement and belief in me, this would not have been possible. Thank you for your patience, love and understanding during this journey.

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GLOSSARY OF TERMS

Academic journal article: A collection of articles collated into a journal which represents the most recent research written by experts within a specific field of interest and which have been peer-viewed.

Burden of disease (BOD) study: Defined by Pillay-van Wyk *et al.* (2014) with this definition being adopted for the purposes of this study, a BOD study is a comprehensive demographic and epidemiological framework used to estimate health gaps in a country as related to an extensive set of disease and injury causes, and for major risk factors, using all available mortality and health data and methods designed to ensure the internal consistency and comparability of estimates.

Communicable diseases: A broad cause-group which makes up the burden of disease groups, particularly communicable diseases, maternal causes, perinatal conditions, nutritional deficiencies, HIV/ AIDS and tuberculosis (Pillay-van Wyk *et al.* 2014).

Content analysis: As defined by Stemler (2000), content analysis is a systematic, replicable technique for compressing several words of text into fewer content categories based on explicit rules of coding.

Disability-adjusted life expectancy (DALY): One DALY signifies the loss of the equivalent of one year of full health. The DALYs for a disease or health condition comprise the sum of the years of life lost as a result of premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health conditions in a population (World Health Organization 2002b).

Emergency care: Van Hoving, Barnetson and Wallis (2015) define emergency care as prehospital and medical care as well as nursing as a procedure-orientated field that requires adequate knowledge and skills to diagnose and manage acute aspects of illnesses and injuries. Razzak *et al.* (2019) define emergency care as the first 6 hours with patients presenting with potentially life-threatening symptoms or diagnosis at any stage in the healthcare system.

Emergency care research: Emergency care (EC) is a broad field which includes several disciplines and themes. EC is uniquely defined by the urgency and location of treatment rather than by the organ system or type of condition in question. The

emergency care research field has, therefore, branched into multiple sections, generally defined by speciality or research discipline. The fact that emergency care lacks an easy definition has been proven to be one of the challenges facing the field as it seeks to find its niche in the medical research and funding establishment. The scope of emergency care research is defined by the Institute of Medicine (2007) as including emergency medicine, contributions from other specialities and trauma and injury control.

Intentional injuries: Intentional injuries include self-inflicted injuries, war-related injuries as well as those injuries arising from interpersonal violence and legal intervention (Pillay-van Wyk *et al.* 2014). Intentional Injuries are fall under the Burden of Disease: Injuries category and, as stated above, include injuries arising from interpersonal violence, and self-inflicted injuries.

Non-communicable diseases (NCDs): This type of burden of disease includes malignant neoplasms, cardiovascular diseases, chronic respiratory diseases, digestive, musculoskeletal and genitourinary conditions, as well as mental disorders and neurological conditions (Pillay-van Wyk *et al.* 2014).

Unintentional injuries: These injuries fall under the Burden of Disease: Injuries category and are caused by fate, accidents, or other unpredictable and uncontrollable events such as road traffic injuries, poisoning, falls, fires, drowning, surgical and medical misadventure, suffocation, foreign bodies obstructions, and other unintentional injuries (Pillay-van Wyk *et al.* 2014).

CHAPTER ONE: OVERVIEW OF STUDY

1.1 Introduction

There is a clear and notable disparity in the number of academic medical journal articles that originate from countries deemed to be developing countries compared to those classified as developed countries (Bruijns 2017). While it would appear that a clear resolution of an exact definition of these terms is still lacking, a developing country (or a low and middle income country (LMIC), or less developed country, or less economically developed country, or medium-industrialised country or underdeveloped country) is typically a country with a less developed industrial base and a low Human Development Index relative to other countries (World Bank 2016).

Countries identified as developing are generally from South-East Asia, South America and Africa, with some African countries being deemed to belong to the least developing category (World Bank 2016). Countries that are considered developed typically include those from Europe, America and the Oceanic continents (World Bank 2016). The disparity in the genesis of academic medical journal articles emanating from the former compared to the latter is often attributed to resource constraints and the redistribution of funds to meet front line healthcare needs at the expense of research and academic scholarship (Van Hoving, Barnetson and Wallis 2015). There may, however, be other reasons which remain unknown due to the notable paucity of research in this area. This paucity extends not only to fully understanding where and what type of research is done and the areas of focus, but also whether the research that has been conducted actually addresses the burden of disease (BOD) plaguing the countries from which they originate. This was the purpose of this study, namely, to describe the research undertaken specifically in emergency care in Africa and to investigate its association with the continent's BOD. This introductory chapter presents the aim and objectives of the study. However, the chapter commences by discussing the background to the research problem on which the aim and objectives of the study were based.

1.2 Background of the study

There appears to be a multitude of factors that impact on the influence of emergency care research in different regions throughout the world. Bruijns (2017) contends that most of the effect is apportioned to (a) the development stage of emergency

medicine, (b) resources available for research, and (c) access to funding. Bruijns (2017) suggests that it would appear that while these stages are affected worldwide, the effect in Africa is primarily negative as demonstrated by the low number of publications when compared to the number of publications in North America, Bruijns *et al.* (2017) emphasise that research publication outputs on emergency care in LMIC regions are far fewer than those in high-income regions due to population size and BOD.

Bruijns *et al.* (2017) found that publications from the African region made up 1.8% of the global emergency medicine outputs between 2011 and 2015, with the most publications emanating from South Africa and Tanzania. In the context of South Africa, the cause of this since 2009 could be due to the South African government's decision to no longer fund clinical research in provincial health departments; the National Health Laboratory no longer granting discounts on laboratory tests; and the lack of funds available to the Medical Research Council despite its key mandate at the time in 2009 to strive for the development and maintenance of the country's research capacity (Gevers 2009). A further reason for the paucity of research publications in these regions is emphasised by the World Health Organization (2014) which states that the lack of emergency care systems in Africa is the reason for the increased mortality in the region. Mould-Millman, Sasser and Wallis (2013b) highlight the importance of the expansion of emergency care in the countries of sub-Saharan Africa.

In order to advance the emergency care systems, it is essential that further research is conducted to assess and quantify the local and regional need for both prehospital care and test solutions. Emergency care leaders have pointed out that the burden of acute disease is poorly documented and that the critical advancement of the field would emphasise the collection of the epidemiological data required to identify where the existing gaps exist (Mould-Millman, Sasser and Wallis 2013b). Luchetti (2014) suggests that a 10/90 gap exists in research into prehospital care in low- and middle-income countries as it is in these countries that 10% of research investments are for problems affecting 90% of the world's population. If research is readily accessible to the population, it enables improved knowledge interpretation for the health practitioners, thus impacting on the health outcomes of patients (Bruijns *et al.* 2017).

In the 1990s, the Harvard School of Public Health (1992), the World Bank and the World Health Organization (WHO) developed the concept of the BOD worldwide

commissioned in 1992, which is used to describe death and loss of health as a result of diseases, injuries and risk factors. The burden of a particular disease or condition is estimated by adding together (a) the number of years of life a person loses as a result of dying early because of the disease in question (Years of life lost (YLL)) and (b) the number of years of life a person lives with a disability caused by the disease (Years of life lived with disability (YLD)). The sum of these two equals a single figure estimate of disease burden known as the disability adjusted life year (DALY). A single DALY refers to the loss of one year of life lived in full health. Establishing the BOD in a country may divulge revelations about the status of the population's health. In addition, burden of disease study may help to improve global public health, as national and international health policies should be based on accurate and meaningful information (World Health Organization 2009a).

A total of 56.9 million deaths occurred worldwide in 2016. The biggest global killers in the 15 years after 2001 were stroke and ischemic heart disease – categorised as non-communicable diseases (NCDs) – with 15.2 million deaths arising from stroke and ischemic heart disease in 2016 (World Health Organization 2018). Although NCDs are a difficult BOD group to define, they are associated with four disease groups that account for 80% of NCDs, namely, cardiovascular disease, cancers, chronic pulmonary diseases and diabetes (Hunter and Reddy 2013). This global epidemic of NCDs creates challenges for all healthcare systems worldwide. Nevertheless, it is incumbent on each country to confront its own problems by intervening early to mitigate these high numbers (Hunter and Reddy 2013). The developed/high-income countries face a unique challenge in this regard with the costs of technology-intensive healthcare ever increasing. On the other hand, the healthcare systems in LMICs face multiple challenges simultaneously, for example malnutrition, multiple infectious diseases and poor maternal and child healthcare, whilst competing with NCD for scarce financial and human resources (Hunter and Reddy 2013). Globally, 78% of all NCD deaths occur in LMICS (World Health Organization 2018).

At the time of this study just a few BOD studies had been conducted in South Africa, while only 35 countries worldwide had either started or concluded a BOD study, with the initial BOD study being conducted in 2000 (Bradshaw *et al.* 2003a). The most recent South African burden of disease study, which investigated mortality trends and differentials from 1997 to 2012, was only the second burden of disease study to

be conducted in South Africa (Pillay-van Wyk *et al.* 2016a). The majority of the top 10 global deaths experienced in South Africa in 2016 were the result of NCDs. On the other hand, in 2016, more than half of the deaths in LMICs were caused by disease conditions such as communicable diseases, maternal causes, conditions relating to pregnancy and childbirth and nutritional diseases (World Health Organization 2018) compared to less than 7% of the deaths from these causes in the high-income countries. In the low- and middle-income countries the burden of maternal and child mortality is caused predominantly by the low quality of health services in these regions (Mayosi *et al.* 2012).

Regarding the BOD globally, injuries claimed over 4.9 million lives in 2016 with more than a quarter of these deaths being attributed to road traffic accidents – the highest mortality rate in the LMICs at a rate of 24.9 deaths per population of 100 000 compared to the global rate of 18.8. Road traffic injuries were also among the leading causes of death in the low, lower middle and upper middle income countries (World Health Organization 2013) .

1.3 Problem statement

A paucity of peer-reviewed published articles on emergency medicine emanate from Africa. In 2017 reports indicated that, compared to the 18 122 articles emanating from North America, 820 only had originated in Africa (Bruijns 2017). The implications of these low publication rates translate primarily into the continued utilisation of and dependency on evidence-based treatment strategies, new procedures, and medications that are based on populations that are characteristically different and may, therefore, very well be clinically relevant but not necessarily contextually appropriate to Africa. The focus of this study was on obtaining an understanding of the contextual relevance of published articles, the areas of research, specifically those undertaken in Africa, and whether the research meets the existing gaps found. This study investigated the trends/themes of articles published between 2013 and 2017 on the field of emergency care in Africa and whether the themes/trends could be assigned to the burden of disease, in an attempt to apportion and quantify its distribution over the selected time frame. This was done in an attempt to identify an association between the themes which had been identified and the BOD plaguing Africa at the time of the study.

1.4 Research purpose and objectives

The purpose of the research study was to describe the themes and trends found in all of the research articles on emergency care published anywhere in Africa between 2013 and 2017 using content analysis, and then to compare these articles to the local African BOD. This was achieved through the following objectives:

1. Describe the themes and trends in research articles published in Africa in the selected timeframe and specific to emergency care.
2. Describe the publication type and number of citations over the selected time frame.
3. Describe the association between publication themes established and those representative of the African BOD.

1.5 Structure of dissertation

This section provides a brief outline of the layout of the dissertation and the content of each chapter.

Chapter 1 contextualised the study by presenting the background of the study and discussing the problem statement, research questions and research objectives.

Chapter 2 contains an in-depth review of the existing literature which discusses the publication of academic medical journal articles pertaining to emergency care research and published both locally and globally. The chapter further focuses on literature on the African BOD, specifically highlighting the unique findings in Africa and the possible reasons why these findings occur and how they differ to the global BOD, as well as exploring the themes/trends in the emergency care field in Africa.

Chapter 3 discusses the methodology used in the study, including the research design as well as an explanation of content analysis and the techniques used to collect and analyse the requisite data.

Chapter 4 provides a detailed description of the study's findings which addresses the three study objectives.

Chapter 5, the penultimate chapter, presents a discussion based on the study's findings and relate these findings to the literature review.

Chapter 6, the final chapter, contains a summary of the recommendations and conclusions based on the data analysis. It also discusses and the limitations of the study.

1.6 Summary

Africa does not have a specific emergency care research agenda. Although it would appear that the continent does possess research capacity, which seems to be both strong and robust when compared to the discipline internationally, in general the research output produced does not appear to be of the type, quality standard and scale to inform evidence-based policy for the continent as a whole. If research output is to be valued and accepted at a level at which it may actually inform, drive and ensure that clinically effective, culturally appropriate and responsive emergency care practice is adopted in Africa, it must stem from a committed platform with an African-centric emergency care research agenda that will result in the production of collaborative, high quality, clinical, epidemiological and health services research that is translatable into practice. In an effort to promote the development of an emergency care research agenda for Africa, this study examined a number of articles specific to emergency care in Africa that were published over a selected time period, it investigated the areas of emergency care have been researched and it attempted to ascertain whether the aim of addressing the research need, as represented by the continent's BOD, had been addressed. This chapter provided an introduction to the study. This introduction included the background to the study, the problem statement, the research aim, as well as the research objectives of the study. The chapter concluded with an outline of the chapters contained in the thesis.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of existing literature on the publication of academic (also known as peer-reviewed) medical journal articles, specifically articles and literature related to emergency care research (ECR) in Africa. As indicated by Hart (2018), the main purpose of a literature review is to analyse, critically evaluate and create a synthesis of the existing body of knowledge of research related to a specific topic or research question, in an attempt to establish a theoretical foundation for an intended study. Accordingly, the literature review discusses what has already been written about the topic of a study prior to the study, as well as what has not been written or what is not locatable in an attempt to create a theoretical framework or basis for the intended study. The literature review in this study also examined the relationship between the available literature and the themes that reflect the prevailing BOD in Africa.

2.2 Search strategy

A search strategy is principally defined as an organised process that utilises key terms and concepts in order to examine a selection of databases. In this study the search terms and concepts were informed by the study's three research objectives in an attempt to ensure accurate results. An initial search of Scopus and other search engines such as Google Scholar, Science Direct and the Durban University of Technology's Summon were used to find literature relevant to creating a theoretical basis for the study.

A further search was performed to gather specific articles for the content analysis and to address the study objectives. This was done by examining the reference list of the articles identified for the purposes of the literature review, while a further investigation was conducted using the following key terms to search for specific additional studies.

Keywords
Advanced life support paramedics Africa

African burden of disease
Communicable diseases
Emergency care
Emergency care research
Emergency care themes
Emergency care outputs
Emergency care professionals
Emergency department
Emergency medicine
Emergency medical care research
Emergency medical services
Global burden of disease
Global emergency care
Healthcare goals
Health professions
Healthcare policies and procedures
Healthcare systems
Prehospital care
Prehospital emergency care
Publications in Africa
Prehospital management
Prehospital medicine
Medicine
Non-communicable diseases
Unintentional accidents
Unintentional injuries

Only publications for the review written in the English language were included and a database timeline from 2009 to 2020 was selected. This produced thousands of results which were then filtered based on their relevance to the research topic.

2.3 Defining emergency care

Emergency care (prehospital, medical and nursing) is defined as a procedure-orientated field that entails adequate knowledge and skills to prevent, diagnose and manage acute aspects of illness and injuries affecting patients of all age groups (Wallis 2010; Van Hoving and Brysiewicz 2017). Hsia *et al.* (2010) suggest that a healthcare system delivers emergency care by providing access to acute healthcare such as stabilisation and the provision of initial treatment for acute illnesses, which may be unpreventable. Calvello *et al.* (2013b) defines acute medical care services as incorporating a range of healthcare functions beyond but inclusive of traditional emergency care, including areas such as prehospital emergency care, trauma care, acute care surgery, urgent care and short-term inpatient stabilisation. On the other hand, Marsh *et al.* (2015) explain that EC is a section of healthcare that is focused on the delivery of critical curative interventions, primarily for surgical and medical

conditions that relate to a threat to either life or limb. Emergency services, more encompassing than EC as they represent the total sum of all efforts to deliver effect health action in response to extreme risk under intense time pressure, which includes the population and individual-level interventions which include the components of pre-hospital and hospital-based services. Thus, both these divisions treat a wide range of illnesses and injuries which may include traumatic injuries and acute chronic illness (such as stroke, myocardial infarction and complications arising from other medical conditions) that require acute care and immediate intervention which may be lifesaving. It is essential that there is an emphasis on documenting the role of EC in health systems and the effects of EC on morbidity and mortality in a specific region. Ideally, the end goal is that emergency care is able to meet a population's healthcare needs and standards specific to the region, rather than merely at the point of individual care delivery (Hsia *et al.* 2010).

2.3.1 Defining emergency care research

According to Van Hoving and Brysiewicz (2017), health research plays an extremely valuable role in society and resulted in significant improvements in healthcare. McRae *et al.* (2018) assert that a solid foundation of clinical research in emergency medicine is required if emergency care is to progress. Recent studies reviewed by Talan (2019) suggest that the reason for the limitations of emergency medicine research is due to the overall perception of such research which resulted from frustrations in relation to gaining the respect of pioneers in the field regarding emerging areas of research in emergency medicine. This has led to a lack in success in expanding innovative investigations into a new discipline such as emergency medicine. The goal of EC research is to build an evidence base that informs both prehospital patient care practice and the development of high-quality emergency medical service systems.

2.4 Emergency care research: a global perspective

Although there have been significant advances in global health, emergency care has been underrepresented, as it has been perceived to be a field which derives only from regions with advanced and expensive health systems (Marsh *et al.* 2015). In the developing countries there has been resistance from health authorities to including comprehensive emergency care in their essential packages of services

(Marsh *et al.* 2015). Accordingly, as a result of the oversight of emergency care as a concept in developing countries, according to the Commission on Health Research for Development (2011), research in these settings existed only in “vertical programs which are not fully integrated in the national health research picture and, therefore, do not contribute optimally to the development of a strong and self-reliant national health research system” . In developing countries there have been significant advances in funding for debilitating disease burdens such as HIV/AIDS, tuberculosis and malaria, with these advances resulting in basic scientific research, clinical trials and implementation strategies. However, Marsh *et al.* (2015) point out that these vertical programmes serve only to broaden the knowledge of and be of benefit to some diseases, hence there remains a gap in service delivery in resource-stricken areas.

Due to the distraction of the developing countries’ BOD, the global health research agenda has neglected the emergency care field. Historically, there has been some effort from those in the emergency care field to bring about an awareness of the need for emergency care research. However, outside this community there has been little recognition of the emergency care field (Hsia *et al.* 2010). In developing countries where resources are limited, it is imperative that the importance of emergency care and its cost-effectiveness are researched in order to ensure an appreciation for its presence and the role it plays.

2.4.1 Challenges to emergency care research

An earlier study conducted by Pouris (2006) addressed the significant lack of research in the scientific local journals in relation to African publications. However, studies by Benatar and Vaughan (2008) suggest that the majority of research ethics committees in Africa at this time were facing two challenges, namely, a lack of resources and a shortage of specialists in research ethics which, together with poor governmental funding, was resulting in a low priority being given to both ethics and research committees. Further challenges arose from the poorly funded public health-care structures in the Southern African regions which caused research to be accorded a lower priority compared to the provision of care and the training of healthcare personnel (Benatar and Vaughan 2008).

In 2009, the health departments of provincial governments in South Africa no longer contributed to funding clinical research, the National Health Laboratory no longer gave discounts on laboratory tests and, despite having to comply with the key mandate to strive for development and maintenance of the country's research capacity, the Medical Research Council was grossly underfunded (Gevers 2009). This in turn resulted in a lack of publications on emergency care in Africa, however Paraje, Sadana and Karam (2005) report that since the 1960s the sub-Saharan African region has dominated the number of publications despite only producing a small percentage of world's health research literature. In addition, specific research areas in emergency care in Africa were unknown. Benatar and Vaughan (2008) found that both international and local research agendas and areas were moulded by economic and political forces which focused on creating both economic and other power by a concentration of scientists pursuing curious intellectual questions. Maturing the capacity on both the national and international levels of essential health research and conducting it successfully are fundamental aspects of health systems. In order to grow and allow research communities to deliver research that contributes to the health of the public, Lansang and Dennis (2004) suggest that developing countries should secure experienced scientists and provide a supportive environment which would entrench research in the health systems.

Lansang and Dennis (2004) reiterate the importance of investment in health research in developing countries, as this leads to improved health outcomes for populations. However, in the past, sub-Saharan African health research comprised less than 0.5% of national budgets. Nchinda (2002) claims that the "research capacity in the [Global] South remains one of the world's unmet challenges". Nevertheless, there has been a vast improvement in the two decades subsequent to 2002. However, government focus in South Africa and other African regions is required to guide research in instances where relevant local problem areas arise.

2.4.2 Drivers of emergency care research agendas

The World Health Organization (2014) asserts that the lack of emergency care systems in Africa has been the reason for the increased mortality in the region, while Mould-Millman, Sasser and Wallis (2013a) highlight the importance of the expansion of emergency care in the countries of sub-Saharan Africa. In order to advance the emergency care systems, it is essential that further research is conducted to assess and quantify the local and regional need for both prehospital care and test solutions.

Emergency care leaders worldwide have expressed the view that the burden of acute disease is poorly documented and that a critical advancement of the field would be to emphasise the need to gather epidemiological data (Mould-Millman, Sasser and Wallis 2013b) The World Health Organization (2002a) and Mould-Millman, Sasser and Wallis (2013a) contend that a 10/90 gap exists in research into prehospital care in low- and middle-income countries, while 10% only of research investments are aimed at the problems affecting 90% of the world's population. If research were readily accessible to a population, it would allow for the improved provision of knowledge to health practitioners, thus impacting on the health outcomes of patients (Bruijns *et al.* 2017).

Owing to the disparities in emergency care between the developed and developing countries such as South Africa, Bruijns and Wallis (2011) launched the first *African Journal of Emergency Medicine* in 2011. The main aim of this journal was to provide practical solutions for the unique problems faced in Africa's resource-scarce environment. They explained the purpose for this journal as follows: Africa faces its own set of challenges and thus there is a need for an African academic journal which may communicate Africa's innovations, successes, advances and ideas that could live up to international scrutiny. Thus, the *African Journal of Emergency Medicine* was established to provide an evidence-base that could be used to inform policy and practice of emergency care throughout Africa and also highlight the continents unique approaches of problem solving to the rest of the world (Bruijns and Wallis 2011). It was hoped that this journal would create opportunities for health practitioners to engage with or to focus on emergency care research questions within their regions and thus to address the most pressing uncertainties.

Health research plays a key role in the development of LMICs (Whitworth *et al.* 2008; Van Hoving and Brysiewicz 2017). A disparity in health research contributes to inequalities in health as the capacity for health research differs dramatically between LMICs, especially in Africa (Van Hoving and Brysiewicz 2017). In African countries, the environment in which research must be conducted is challenging, with prevailing research capacity gaps that include inadequate training in research skills, unreliable internet access, lack of knowledgeable and experienced local supervisors and a shortage of research funds. These all result in barriers to research, thus also impacting negatively on the publication rate (Van Hoving and Brysiewicz 2017). The

impact of research depends on the development stage of emergency medicine in the particular region, as well as the availability of resources and funding (Bruijns (2017). Bruijns *et al.* (2017) and Van Hoving and Brysiewicz (2017) highlight that the African region lags far behind the rest of the world in terms of not only the volume of publications but also the quality of research and the impact thereof, with the latter requiring improvement. Although these inequalities in health research in Africa have been discussed at length, to date the focus has never been on emergency care. Both mortality and morbidity are improved by evidence-based emergency care, and thus ongoing research is required to ensure best practices. An example, is demonstrated by the Sevene *et al.* (2005) study that highlights the importance of pre-eclampsia and eclampsia management in preventing maternal and infant mortality and morbidity. Annually over 63 000 woman die after eclampsia convulsions, with the majority of these occurring in LMICs (Sevene *et al.* 2005) . Magnesium sulphate has been found to be highly effective in preventing eclampsia, thus demonstrating the low cost and effective drug which due to evidence-based care has demonstrated a decline in mortality surrounding the illness as access to these essential medicines were lacking in Africa previously (Sevene *et al.* 2005).

In an effort to enhance emergency care research productivity in Africa, strategies were implemented to encourage health practitioners to become more involved in research. These strategies resulted in a positive change in the attitude towards research and the ability to acquire research skills, thus resulting in an increase in the number of publications. These factors should drive the optimisation of emergency care curricula (Van Hoving and Brysiewicz 2017).

According to Van Hoving and Brysiewicz (2017), research is an extremely important tool in education in improving the clinical skills of emergency practitioners. The hope is that, in time, the knowledge acquired will be implemented, thus strengthening the health systems, developing future interventions and improving general healthcare overall. It is for this reason that enhancing research capacity in Africa is imperative (Whitworth *et al.* 2008; Van Hoving and Brysiewicz 2017). Hodkinson and Wallis (2010) explain that in order to promote emergency medicine in the developing world, it is vital that key strategies are determined. These guidelines must be practical and relevant to existing healthcare systems, thus allowing direct integration into these systems. Although the World Health Organization has drawn up such guidelines for

the vital components of prehospital service and trauma care, in the low- and middle-income countries there are no general guidelines for emergency medicine services, nor is there a roadmap for establishing emergency services (Hodkinson and Wallis 2010). Alibhai, Hendrikse and Bruijns (2019) explain that, in general, it is difficult to implement the evidence-based guidelines and policies generated in high income countries meaningfully in low- and middle-income settings, thus depriving citizens in the latter countries of the developing evidence base. This in turn causes a gap in research, specifically in the LMICs.

Lowe (2000) describes evidence-based medicine as a movement in modern medicine that is based on decisions about care for individual patients which involves the conscientious, explicit and judicious use of existing best evidence. As explained by Van Hoving, Barnetson and Wallis (2015), these evidence-based decisions on daily patient care should be made by the healthcare workers in LMICs. However, implementing this remains a challenge. The majority of emergency medicine publications originate in high-income countries and reflect the health conditions that are important in such countries (Bruijns 2017). When these findings are applied to LMIC countries, including South Africa, a knowledge vacuum occurs and this results in limited applicability and transferability (Van Hoving, Barnetson and Wallis 2015).

2.5 Research output: international versus local numbers

Numerous factors exist that affect the impact of research in various regions across the world. These factors include the development stage of emergency medicine, resources available for research and access to funding (Bruijns 2017). There is a disparity between the number of publications emanating from first-world countries and the number emanating from the rest of the world. Over a five-year period from 2010 to 2015, Bruijns (2017) found that highest number of emergency medicine publications worldwide emanated from North America with 18122, compared to 820 from the African region. Bruijns *et al.* (2017) further state that, between 2010 and 2015, publications from the African region made up 1.8% of global emergency medicine outputs, with most of the publications emanating from South Africa and Tanzania.

Bruijns *et al.* (2017) argue that the number of emergency care research publication outputs in low- and middle-income regions is lower than that in high-income regions

due to both population size and the BOD. It has become clear from all regions worldwide that it is not possible to implement the research outcomes, such as emergency care guidelines, derived from studies universally. It is for this reason that Baelani *et al.* (2011) and Bruijns *et al.* (2017) state that emergency care research, which is the basis for evidence-based care, often does not directly apply to the African context due to the lack of resources available in the region. The evidence-based emergency care standards used in emergency care in South Africa at the time of the study were based primarily on international findings and not on local studies (Baelani *et al.* 2011). It would therefore be more beneficial for the developing countries to establish their own emergency care guidelines and protocols that are relevant to their regions.

If knowledge on African emergency care is to improve, thus boosting new innovation, it is essential that research outputs in the region increase. Bruijns (2015) analysed sources of emergency care publications from Africa between 2010 and 2015. He found an 89% increase in annual African emergency medicine publications over the five-year period. The journal with the highest number of publications was the *African Journal of Emergency Medicine* with a total of 168 publications, followed by the *Burns Journal* with 87 publications. It is therefore clear that there must be an increase in emergency medicine publications originating from Africa. This increase in the number of African publications was probably due to the formation of a dedicated regional emergency care journal (founded in 2011), increased uptake of dedicated emergency care training and the expansion of local specialist training centres (Bruijns 2015).

2.6 Emergency care topics

Van Hoving, Barnetson and Wallis (2015) explain that it is vital that the research gaps be addressed and key areas for research topics prioritised in the field of emergency care in South Africa. Van Hoving, Barnetson and Wallis (2015) ranked clinical emergency care, general systems and safety management as priority research areas that warranted investigation in South African emergency care. In view of the fact that no further studies have originated highlighting the areas or themes in emergency care in Africa, this gap in the literature is a cause for concern as good quality healthcare implies that practice is in line with the prevailing best evidence. This

becomes extremely important in regions where there is a mismatch between the BOD and the available resources.

2.7 Burden of disease

When treating patients it is hard to deliver effective and high-quality care without knowing the patient diagnosis. Similarly, for effective health systems, it is essential to appreciate the key challenges in order both to improve population health and to understand how these challenges are constantly changing (Murray and Lopez 2013). Before the 1990s, reliable, inclusive information on the global BOD, injuries and risk factors simply did not exist. However, in 1991, the World Bank and the World Health Organization decided to close this gap and launched the Global Burden of Disease Study (Murray *et al.* 2015).

A BOD study is a direct measure of a country's health status which is attained by measuring each cause of death and illness, fatal or non-fatal (Bradshaw *et al.* 2003a). Estimating the value of the BOD is key to improving global public health, as both national and international health policies should be aligned with and based on accurate health data (World Health Organization 2009a). In 2016, there were 56.9 million deaths worldwide. The biggest global killers since 1999 have been strokes and ischemic heart disease which are known as NCDs. Strokes and ischemic heart disease combined accounted for 15.2 million deaths in 2016 (World Health Organization 2018).

Roser and Ritchie (2016) highlight that epidemiologists categorise diseases into the following three key categories of health condition/disability or disease, namely, NCDs, communicable, maternal, perinatal and nutritional diseases, and injuries. The calculation of disability adjusted life years (DALYs) is used to measure the total disease burden which is defined by Murray *et al.* (2015) as a standardised metric which is used to directly compare and sum up the burdens of different diseases. One DALY is equal to one year in good health lost due to premature mortality or disability.

In South Africa, NCDs are the leading cause of death, with the adult population manifesting high levels of common risk factors such as tobacco use, physical inactivity and unhealthy diet, while a large proportion of the burden of disease may be linked to potentially modifiable risk factors (Mayosi *et al.* 2009). A possible reason

for the increase in this BOD in a high to middle income country such as South Africa may be chronic diseases. In addition, risk factors are infrequently diagnosed and inadequately treated in both the public and private sectors in the country (Steyn and Levittb (2006); Mayosi *et al.* (2009). This may result in an increase in the number of cases of hyperlipidaemia, uncontrolled hypertension, diabetes and chronic respiratory diseases yearly, which if not treated correctly may be fatal. Healthcare workers in community clinics often do not have the skills required to comprehensively deal with NCDs (Steyn 2018). In South Africa, the worsening of these untreated risk factors and high volumes in the community clinics may be detrimental to the population, as over time, they may lead to death. It is therefore essential that the focus on healthcare should be specific to the regional BOD.

The majority of the top 10 global deaths in 2016 were caused by NCDs, which are also the main causes of death in high-income countries (Hunter and Reddy 2013). In comparison, according to the Global Health Observatory data (World Health Organization 2018), in 2016 more than half of the deaths in low-income countries were caused by disease conditions such as communicable diseases, maternal causes, pregnancy and childbirth and nutritional diseases. In the LMICs maternal and child mortality is predominantly caused by the low quality of the health services (Mayosi *et al.* 2009).

2.7.1 Burden of disease in developing countries

According to Pillay-van Wyk *et al.* (2014), a national burden of disease study (NBD) is a “comprehensive measure of the health status of the nation by accessing ill-health and causes of death. A BOD study attempts to derive consistent and coherent estimates of all causes of ill-health and death for a specific country”.

At the time of this study a few BOD studies had been conducted nationally in South Africa only, with the latest study revealing mortality trends for the period 1997 to 2012 (Msemburi *et al.* (2016). In addition, just a few countries worldwide had either started or concluded a BOD study (Bradshaw *et al.* 2003a; Bradshaw *et al.* 2003b). Previous mortality data analysis for South Africa revealed numerous insufficiencies in the capture and classification of data, thus making it inappropriate to use the cause of death data for the purposes of analysis (Joubert *et al.* 2013). A recent improvement in death registration allowed for the first NBD study to be conducted in 2000 by

researchers from the South African Medical Research Council. It emerged from these results that South Africa has progressed from a triple BOD to a quadruple BOD, namely, communicable diseases (HIV/AIDS and tuberculosis), NCDs, perinatal and maternal conditions and injury-related disorders (Mayosi *et al.* 2009).

Pillay-van Wyk *et al.* (2014) pointed out that the South African government is under pressure to meet the care demands of ill-health that lead to these deaths. The revised list of South African Burden of disease was drawn up by the Medical Research Council has been designed to reflect local causes of death patterns and thus contrasts with the Global Burden of Disease studies (Pillay-van Wyk *et al.* 2014). This should enable government, on both a national and a provincial level to address and reduce the disease burden and also allocate resources more appropriately in resource-constrained areas. The trends in mortality provide a comprehensive understanding of the BOD (Pillay-van Wyk *et al.* 2014). Pillay-van Wyk *et al.* (2016a) state that the quadruple BOD faced by South Africans has been said to be related to poor health, although at the time of this study there had been a decline in mortality resulting from NCDs, tuberculosis and injuries.

Since 2009, certain changes have occurred in South Africa, leading to specific challenges and transformation. The most severe medical challenge faced by South Africa since the first democratic election in 1994 was “four colliding epidemics”, namely, HIV and tuberculosis; chronic illness and mental health disorders; deaths from injury and violence; and a silent epidemic of maternal, neonatal and child mortality. The statistics revealed that South Africa had the highest BOD of any middle-income country in the world (Department of Health 2010/2011); Mayosi *et al.* (2012); Pillay-van Wyk *et al.* (2016a).

2.7.2.1 Non-communicable diseases

The majority of the top 10 global deaths in 2016 were caused by non-communicable diseases, which also resulted in the same causes of death in high-income countries. In LMICs the burden of maternal and child mortality is caused predominantly by the poor quality of the health services (Mayosi *et al.* 2009). Lower respiratory infections is the communicable disease that claims the most lives globally, with over 3 million lives annually (Mayosi *et al.* 2009). In sub-Saharan Africa the main contributors to the disease burden for an extended period of time have been malaria, tuberculosis

and HIV/AIDS (Mayosi *et al.* 2009). Gouda *et al.* (2019) explain that, recently, in LMICs worldwide there has been an epidemiological transition which has resulted in a shift in the disease profile from communicable diseases to an increase in chronic, NCDs. In sub-Saharan Africa, there has been an increase in diseases such as diabetes, chronic respiratory disease, chronic kidney disease, cardiovascular disease, cancers as well as mental and substance use disorders (Gouda *et al.* 2019).

Together with these is the increased exposure of risk factors relating to tobacco use, harmful alcohol abuse, unhealthy diet, physical inactivity, obesity and high blood pressure which are likely to pose and increase the challenges facing the healthcare system in sub-Saharan Africa (Gouda *et al.* 2019). These conditions are often presented to medical practitioners as acute cases in the emergency care setting and are either treated out-of-hospital or in a hospital emergency department. Nielsen *et al.* (2012) point out that all injuries and some NCDs present acutely and require emergency care and immediate treatment. Thus, the capabilities of emergency care at both hospital and prehospital level are being addressed and improved in order to deal with the increased burden of NCDs (Calvello *et al.* 2013a).

It has been found that 37% of the deaths in LMICs in 2004 were caused by NCDs (diseases such as ischemic heart disease, stroke, chronic obstructive pulmonary disease) as compared to 88% in high-income countries (Mayosi *et al.* (2009). The World Health Organization (2013) ranks NCDs in South Africa at two to three times higher than in the developed countries. Particularly in the rural areas of South Africa, these diseases are on the increase and also disproportionately affect poor people living in urban settings (Murray and Lopez 2013). NCDs are characterised by certain risk factors such as tobacco use, inactivity and unhealthy diet which often eventually translate into cardiovascular disease, diabetes and cancer as an acute BOD.

2.7.2.2 Communicable diseases

This category of health diseases is dominated by diarrheal and other infectious diseases as well as neonatal disorders which account for more than 60% of communicable disease DALY losses globally (Pillay-van Wyk *et al.* 2014). There has been a considerable decrease in the occurrence of these diseases, namely, approximately 40% reduction in the current decade, with numbers dropping from over 1.1 billion in 1990 to below 670 000 in 2016 (Roser and Ritchie 2016). However,

in South Africa, the disease profile is different with a large majority of the DALY losses being caused by HIV/AIDS and tuberculosis (TB). In fact, South Africa has the highest incidence rates of TB and HIV/AIDS worldwide. However, Pillay-van Wyk *et al.* (2014) found that there was a marked decline in mortality from HIV/AIDS and TB since 2006. This originally accounted for the majority of the deaths from communicable diseases, highlighting the major challenge facing South Africa. The reason for the decline noted above may have been due to the intensified antiretroviral therapy treatment rollout for adults since 2005 (Pillay-van Wyk *et al.* 2014). Nevertheless, the burden of HIV/AIDS remains an issue of major concern because it accounts for more than half of all premature mortality. In the second NBD study conducted in South Africa, Pillay-van Wyk *et al.* (2014) reported that, in 2002, the prevention of mother-to-child transmission programme was initiated. This reduced mother-to-child transmission and, hence, the number of infant deaths caused by HIV/AIDS. Their study also highlighted the fact that mortality rates caused by communicable diseases (excluding HIV/AIDS and TB), infectious diseases and nutritional deficiencies had remained unchanged, thus demonstrating poor progress in dealing with infectious diseases such as lower respiratory diseases, diarrheal conditions and septicaemia, despite the fact that these deaths are largely preventable and treatable.

2.7.2.3 Injuries

2.7.2.3.1 Road injuries

In countries worldwide, injuries are a major health concern, causing over five million deaths per year (The World Health Organization 2008). According to the World Health Organization's Global Burden of Disease study (2010), of these unintentional injuries accounted for more than 3.9 million deaths in 2004. However, in the study the burden of injuries was disproportionally focused on LMICs (World Health Organization 2014). The highest cause of death in the injury BOD were road traffic injuries, with the highest mortality rate resulting from road traffic injuries being seen in low-income countries, with more than 29.4 deaths per 100–000 population (which is more than the average global figure of 18.9 deaths per 100 000). Road traffic injuries were found to be among the 10 leading causes of deaths in low, lower-middle and upper-middle income countries (World Health Organization 2018). Murray *et al.* (2012) explain that publications on road safety report that the majority of road injuries

are preventable. Australia, a high-income country, has managed to reduce its road injuries death rate by 43.7% since 1990. Global road safety initiatives were launched in 2005 in an attempt to decrease the number of deaths on the road. However, these were poorly funded and, at the time of this study, had not had a significant impact on the increasing BOD.

Injuries were found to be the fourth highest cause of death in South Africa, accounting for 9.6% (50 737) of all deaths in 2012. Intentional injuries, including interpersonal violence, resulted in 49.0% (24 874) of all deaths, while unintentional injuries resulted in 51.0% (25 864) of the total deaths due to injuries. However, there was a decline in deaths due to injury between 1997 and 2012, which was due mainly to a decrease in the deaths from interpersonal violence (Pillay-van Wyk *et al.* (2016b). This may be attributed to the introduction of the Fire Arms Control Act of 2000 which may have contributed to the general decrease in interpersonal violence (Abrahams, Jewkes and Mathews 2010).

Trauma is defined as an illness that is directly related to an individual's interaction with other people and the environment. Common mechanisms of trauma injury described by Brysiewicz (2001) include penetrating or blunt injuries which are due primarily to interpersonal violence which is frequently seen in trauma centres in South Africa. Nevertheless, the most common and often the most severe trauma seen every day is due to road traffic accidents (Hardcastle and Oteng 2011). Although these trauma cases are detrimental to the wellbeing of the population, they have produced expert surgeons, orthopaedists and emergency physicians. In addition, they have also resulted in major advancements in both the operative and non-operative management of penetrating trauma initiated by South Africa; the adoption of the Advanced Trauma Life Support (ATLS) course and the Definitive Surgical Trauma Care course pioneered in South Africa and which has become a training initiative which is respected worldwide (Hardcastle and Oteng 2011). These advancements have enabled South Africa to provide an accreditation system for trauma-capable hospitals. However, the challenge remains to expand this system to other countries. There is a marked contrast on the African continent in terms of regions which are part of both the developing world and the developed world and comparable to well-resourced international cities, and other regions which are

comparable to extremely poorly resourced low-middle income countries (Brysiewicz 2001; Hardcastle *et al.* 2013).

Trauma is the second most frequent cause of mortality in KwaZulu-Natal (KZN) in South Africa with HIV/AIDS being the leading killer (The Epidemiology Unit 2004). In KZN, violence and motor vehicle incidents make up the majority of trauma cases, with one study showing that 15 to 20% of emergency medical services cases are major trauma (Hardcastle *et al.* 2013). In South Africa the most common non-natural death is caused by accidental/unintentional injuries with 39.8% fatal injuries and 39.3% violence and homicide injuries. However, in KZN the pattern of fatal injuries differed with violence and homicide accounting for 45.9% of non-natural deaths and accidental injuries comprising 33% of such deaths. The majority of the accidental injuries were transport related. Of these injuries, blunt trauma accounted for 66.3% of trauma injuries and penetrating injury comprising 33.7% of trauma injuries. The commonest cause of blunt injury was found to be motor vehicle collisions (Cheddie *et al.* 2011).

2.7.2.3.2 Interpersonal violence

Interpersonal violence refers to everyday violence on a micro-interactional level, for example sexual abuse, physical abuse or assault that may occur between family members, intimates, acquaintances and/or strangers (Montesanti and Thurston (2015). As a type of injury, reported that the Global Burden of Disease study ranked interpersonal violence 27th in the list of causes of deaths with 81% of the DALYs being due to interpersonal violence on the part of males. Globally, there is vast inter-regional variation in the extent of interpersonal violence. The regions which are characterised by violence as one of the top five causes of the BOD are Central and tropical Latin America and southern sub-Saharan Africa (Murray et al. 2012).

The high levels of gender-based violence are also a cause of concern, in particular, intimate femicide. In 2012, the South African Medical Research Council revealed that South Africa's intimate femicide rate in 2009 was more than double that in the United States, despite the fact that the intimate femicide rate is likely to be underestimated because, in over 20% of such murders, no perpetrator was identified (Abrahams *et al.* 2012). Homicide is also linked to trauma emergencies. As reported by Bradshaw *et al.* (2003b), the South African Burden of Disease study showed that homicide is

the second leading cause of mortality in the country and that, although the overall number of homicides had decreased significantly since 1994, violent deaths from gun-related murders remained the leading cause of mortality (Abrahams, Jewkes and Mathews 2010). South Africa has the highest number of female murders by shooting in a country which is not at war, with guns being used by men to intimidate and assault woman (Sithomola 2020). Studies show that, compared to legally owned firearms, illegal firearms are more likely to be fired in violent crime whereas legally owned firearms are the main risk factor in the murder of intimate partners (Abrahams, Jewkes and Mathews 2010). These trauma emergencies are seen on a daily basis in South African emergency departments, especially over weekends and holidays (Matzopoulos *et al.* 2020b). This is possibly the reason why trauma emergencies are a major BOD in Africa, and the reason why so many researchers choose to investigate these themes and trends.

2.7.2.3.3 Alcohol abuse leading to intentional injuries

Another significant health burden in South Africa which is related to trauma emergencies is that of alcohol abuse which results in the high alcohol-related injury burden in South Africa (Schneider *et al.* 2007). The World Health Organization global comparative risk assessment study (World Health Organization 2009b), carried out in 2000, suggests that 28% of unintentional injuries and 12% of intentional injuries were attributable to alcohol compared to the South African figures of 20.2% unintentional injuries and 40.9% intentional injuries (Ezzati *et al.* 2004). Brysiewicz (2001) explains that the majority of injuries, especially those arising from interpersonal violence and traffic collisions, are caused by alcohol and other substance abuse. Since 2001, more than 60% of violent confrontations and one-third of traffic collisions in Durban, a city in the province of KZN in South Africa, were alcohol related (Matzopoulos *et al.* 2020a). It is therefore clear that alcohol abuse results in a considerable BOD in South Africa, as intoxication tends to result primarily in acute outcomes such as both intentional and unintentional injuries. Alcohol affects the central nervous system, causing a slow reaction time as well as impaired coordination and alertness, even in minimal quantities (Brysiewicz 2001). Extreme volumes of alcohol often cause disruptions in family life, domestic violence and child neglect and may also be associated with unsafe sexual practices, thus exacerbating the risk of spreading HIV (Bonner *et al.* 2019).

Bonner *et al.* (2019) explain that strategies to reduce HIV risk may benefit from addressing alcohol misuse, especially as alcohol misuse/abuse often relates to past trauma such as physical assault. The Health Department of the Western Cape Province in South Africa reported an average number of 89 daily trauma cases across five district hospitals. During the COVID-19 epidemic, the South African president announced the suspension of the sale, dispensing and distribution of alcohol with immediate effect during the national lockdown which came into effect at the beginning of April 2020. These measures were noticeably stricter than those in other countries (Matzopoulos *et al.* 2020a). The rationale for the alcohol ban was to decrease the influx of trauma cases due to alcohol misuse and abuse in local hospitals. This measure saw a marked decrease in the number of murders in the province, particularly as a result of stabbings, as well as a general decrease in the number of admissions for alcohol- related trauma events. Matzopoulos *et al.* (2020a) explains that, in South Africa, violence-related trauma admissions and homicides are strongly associated with alcohol.

The alcohol ban was lifted on 1 June 2020 during lockdown level 3. There was an almost immediate and notable increase in the number of murders and a spike in trauma admissions. This in turn placed strain on the trauma units, hospitals and the healthcare system in general, specifically units such as the intensive care units (ICU) and high-care units which were trying to save the lives of those infected with COVID-19. The lifting of the alcohol ban effectively resulted in a 62% increase in daily trauma cases presenting to emergency centres (Matzopoulos *et al.* 2020a). In addition, the trauma admissions increased by 54%, trauma ICU admissions increased by 350% and trauma deaths in the emergency centres increased by 308% (Navsaria *et al.* 2020). The link between alcohol and violence is well established and, as shown above, a ban on alcohol sales usually results in a reduction in incidents of murder, gender-based violence and trauma events, such as road accidents and assaults and, for this reason, may have an immediate impact on hospital capacity (Murray William 2020). Thus, the impact of alcohol abuse was immediately demonstrated by the ban on alcohol during the lockdown in South Africa and is an issue of major concern in relation to its adverse effect on the BOD in South Africa.

2.8 Conclusion

This chapter presented an overview of the literature that discusses the publication of academic medical journals, specifically on emergency care research in Africa. This overview, which resulted from an in-depth literature review which was conducted over several months, resulted in a greater understanding of the emergency care field specific to the African context. According to scholarly articles the emergency care field in Africa is still in its infancy. It emerged that the number of publications emanating from Africa was low compared to the number originating in the developed countries. A possible reason for the low number of articles on emergency care in Africa may be the many challenges experienced, not only in this context, but also internationally. Such challenges include a lack of resources, research specialists and supervisors, an absence of ethics committees, as well as inadequate funding and internet access, to name a few. It is imperative that both the number of publications from Africa increase and that the quality of research conducted improves. This will, in turn, create contextually relevant emergency care research that will strengthen the health systems, assist in the development of future interventions and improve general healthcare overall. However, while an increase in the production of emergency care publications in Africa is required to generate new, local evidence-based guidelines and protocols, it is also important to establish the areas of emergency care research that have already been explored and which areas lack focus and attention.

At the time of this study no study of this nature had been conducted. The research into emergency care in Africa should also be aligned to the BOD. This is important as the overall problem for public healthcare and medicine is to effectively allocate the available resources in order to decrease the major causes of disease burden globally, as well as to decrease health disparities between poor and wealthy populations. The next chapter discusses the methodology used in the study and explains both content analysis and the techniques which were used to collect and analyse the requisite data.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design and research methodology which were used to collect and analyse the data required for the study. The chapter presents an overview of both the study setting and the data collection process, with specific mention of the inclusion and exclusion criteria and also discusses the ethical considerations which were taken into account during the study. The aim of the chapter was to provide a clear understanding of the research process which was undertaken during the study by describing the way in which the requisite data was collected, validated and analysed as part of the process to realise the three interconnected research objectives.

3.2 Research paradigm

A research paradigm refers to four basic assumptions underpinning a belief system and/or a theoretical framework. The four dimensions of a research paradigm include the assumptions about ontology, epistemology, methodology and methods. Ontology is described as the researcher's beliefs about reality and how these beliefs exist. It is demonstrated in the way the researcher collects the requisite knowledge and then disseminates the knowledge which has been acquired, which is epistemology. The epistemology of a study will guides the methodological approach to the study, for example, the data collection and data analysis methods. There are three main paradigms used in research, namely, interpretivism, positivism and critical theory (Kivunja and Kuyini 2017). Although positivism and interpretivism paradigms use different ontological approaches, positivists believe in one reality and one truth compared to interpretivists who believe in many realities. Thus, interpretivists use qualitative research as they require several perspectives in order to understand a phenomenon, while positivism is linked with quantitative research approaches (Rehman and Alharthi 2016).

In order to choose the most suitable approach to use in a research study, the researcher must to determine the research question(s) and also formulate the objectives of the study. The three main approaches which may be used are the qualitative, quantitative and mixed methods research designs. These designs are each suited to a particular type of data, for example, numerical and text data in

quantitative and qualitative designs, while mixed methods designs incorporates both text and numerical data (Christensen *et al.* 2011). In this study the following three research objectives were formulated by the researcher, namely, 1) to describe the themes and trends in research articles published in Africa in the selected timeframe and specific to emergency care on the continent, 2) to describe the publication type and number of citations in the selected time frame and 3) to describe the association between publication themes established and those representative of the African BOD. Once these objectives had been formulated it became evident that the type of research design required would enable the researcher to interpret meaning from text and, hence, content analysis approach was chosen.

According to Hsieh and Shannon (2005), content analysis is used as a qualitative research technique. As opposed to it being a single approach, existing applications of content analysis show the following three distinct approaches, namely, the conventional, directed and summative approaches. In this study all these methods were used to interpret meaning from the content of the text data and, thus, to adhere is to the naturalistic paradigm. Hsia *et al.* (2010) explain that the conventional approach is used when the existing theory or research literature on the phenomenon under investigation is limited. This process of content analysis allows the categories and names of categories to flow from the data rather than using preconceived categories and is known as inductive category development (Hsieh and Shannon 2005). In this study qualitative content analysis was used as a research method to enable the subjective interpretation of the content of the text data through a systematic classification process of coding and identifying themes or patterns (Hsia *et al.* 2010). In other words, in this study the quantitative reporting of frequency expands on the qualitative descriptions (themes) of the data.

Observational study designs are often used in healthcare research, A key issue noted with observational studies over time has been the poor reporting, thus making the critical appraisal and reproducibility of the studies difficult (Adams *et al.* 2018). The reporting of observational research is often not detailed and clear enough to make it possible to assess the strengths and weaknesses of the investigation. Accordingly, Von Elm *et al.* (2007) explain the use and aim of the strengthening the reporting of observational studies in epidemiology (STROBE) initiative. This initiative was developed to provide recommendations on what should be included in an accurate and complete report of the observational study which had been conducted.

The aim of these recommendations are both to provide direction and to improve the quality of the reporting of observational studies. The STROBE initiative comprises up of a checklist made up of 18 items with detailed recommended description of each item. STROBE was used in this study in an effort to improve the quality of this study with the STROBE checklist being adhered to when applicable.

3.3 Study design

This study utilised a retrospective, cross-sectional content analysis of all the emergency care articles relevant to the African context included in Scopus for the period 01 January 2013 to 31 December 2017.

3.4 Content analysis

Vaismoradi, Turunen and Bondas (2013) define content analysis as a systematic coding and categorising approach which is used for exploring large amounts of textual information discreetly in order to determine trends and patterns of words used, their frequency, their relationships, and the structures and discourses used in the communication. While content analysis is the preferred approach for describing themes that emerge from a range of newly gathered, written or oral communications related to a specific topic, it also offers the capacity to methodically assign existing and established content into pre-determined categories or themes, thus allowing for the quantification and interpretation of content (Drukman 2005).

In their studies Steyn (2018) and Moretti *et al.* (2011) both used a content analysis approach, demonstrating how qualitative data may be converted into quantitative data and bridging the gap between quantitative and qualitative research. Not only is content analysis now deemed to be a scientific tool which comprises a series of specialised procedures with the aim of providing new understandings of a particular phenomenon, but it is also used as the unpinning to inform practical actions for drawing replicable and valid inferences from texts and other meaningful matter to the contexts of their use (Krippendorff 2018). The trustworthiness of content analysis hinges on both the reliability of the techniques used and also their capacity to yield findings that are replicable (Krippendorff 2018).

Content analysis was used in this study to systematically code and categorise a selection of textual information from articles on emergency care relevant to the African context and that were included in Scopus between 01 January 2013 and 31 December 2017 in order to determine the trends and patterns of the words used,

their frequency and relationships. The series of specialised procedures that were used included those previously utilised by Gaur and Kumar (2018) and included the following:

1) Careful selection of specific database(s) according to the objective/s of the review;
2) Selection of the literature according to the criteria contained in the objective/s of the research;
3) Development of a valid coding scheme;
4) Coding of the entire sample;
5) Summarising and interpreting the coded text.

3.5 Identification and collection of data

A search strategy is a process that involves the continual assessment and refinement of key words and terms in the search for evidence related to the research question (Aromataris and Riitano 2014). The data required for the purposes of this study was obtained from both Scopus and online databases using SciVal (Elsevier Research Intelligence, New York, NY). SciVal is an online data analytics programme that allows access to the research performance of authors, groups, journals, research fields, research institutions and countries. It allows benchmarking in various amalgamations of the variables in question for the purpose of detailed analysis. The researcher in this study created an account on SciVal in order to access and extract the required data.

The search strategy entailed a simple search of keywords (Africa; medicine/emergency medicine; health professions/emergency medical services), the study's date set and year range to obtain the research titles and specific related abstracts from SciVal. The variables analysed in this study included title, abstract, full-text for inclusion, publication counts, citations per publication, specific year range and where the journals where published. The date range analysed was from 01 January 2013 to 31 December 2017 (five years). The data was extracted and each of the articles collected were analysed to determine their relevance using the inclusion criteria as per the themes and categories which had been identified in line with the approach that had been selected, namely, content analysis. This, in turn, led

to the creation of sampling units which Krippendorff (2018) describes as units that have been noted for their selective inclusion in a analysis.

The data/sampling units were inserted in an Excel spreadsheet with the following headings, namely, title, journal, year published, included/excluded, citation frequency, core themes and categorisation into BOD. Figure 1 (PRISMA flow diagram) depicts the initial sorting process that each article underwent after having been sourced up to the inclusion criteria used for the purposes of the analysis. According to Gaur and Kumar (2018), selection criteria may include the time period, domain definition for the literature review and/or type of manuscript;

3.5.1. Inclusion criteria

- This study included all articles that were applicable to the emergency care field specific to the African continent from 01 January 2013 to 31 December 2017.
- The study included articles that were available in English and those without the restriction of a payable fee, meaning those articles that were published open access.

3.5.2. Exclusion criteria

Characteristics that may possibly disqualify potential subjects from a study are classified as exclusion criteria (Meline 2006).

- The study excluded articles with duplicated posts within the time frame of 01 January 2013 to 31 December 2017;
- The study excluded articles predating 2013;
- The study excluded emergency care articles not originating from the African continent.

Content analysis was deemed suitable for the purpose of this study as it allowed the researcher to convert the qualitative data (themes) into quantitative data (counting the frequency of the themes).

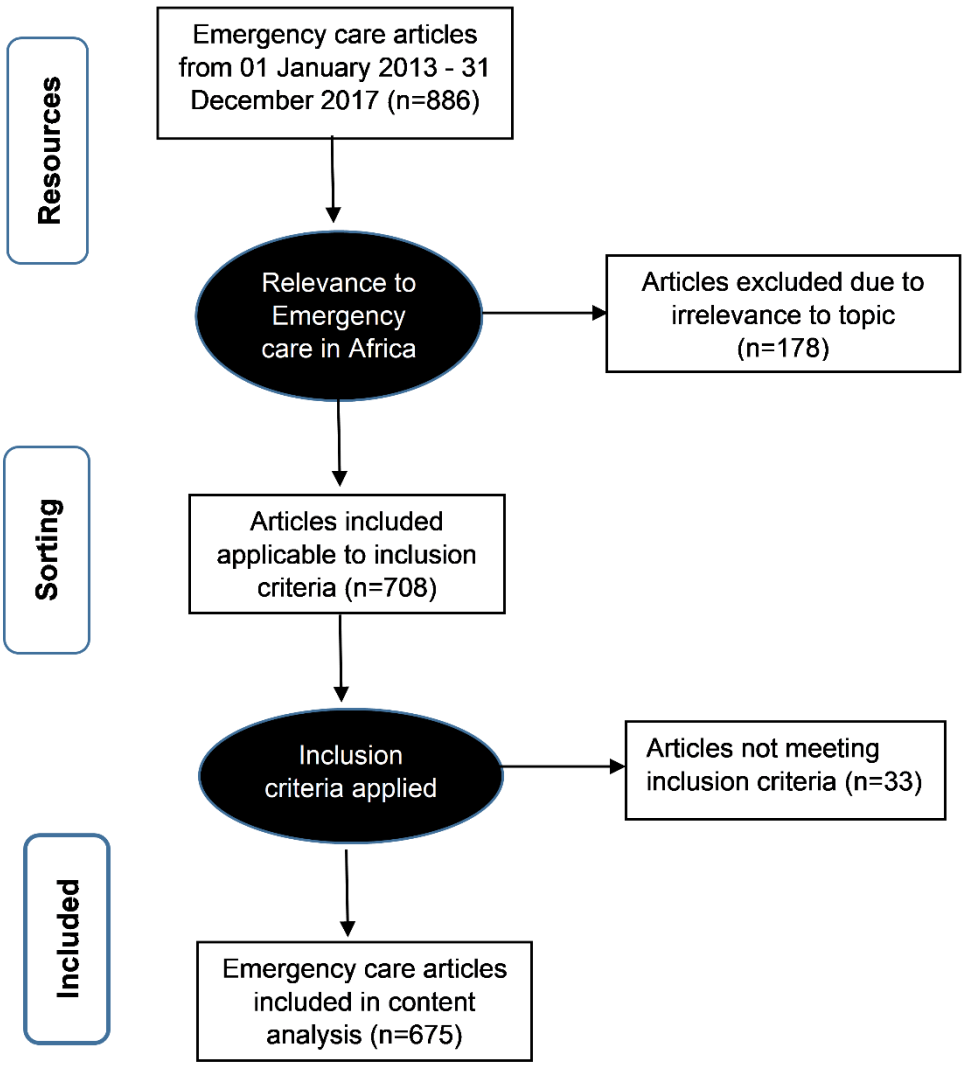


Figure 1: Flow diagram of initial search and review of sampling units of emergency care articles published in Africa during 01 January 2013 - 31 December 2017

3.6 Coding of categories

The codes that emerged from the identification and collection of the data were representative of the content that had been collected and analysed. Each article collected was recorded in an Excel spreadsheet. Emerging themes and topics were identified and noted. These themes were then coded similar themes for coding were also clustered. The coded themes were then re-read and clustered under main headings. The themes which had been identified then became subheadings of the main themes. In short, topics were clustered into categories from which the main themes emerged.

This resulted in the creation of Addendum A. Addendum A is made up of 11 main headings which comprised the core themes of this study, categorising the data which spoke to the first research objective. A further categorisation was performed with the data which had been collected being categorised according to the National Burden of Disease List compiled for the South African National Burden of Disease study 2 (Pillay-van Wyk *et al.* 2014). The data collected was categorised using Addendum B which derived from Pillay-van Wyk *et al.* (2014) second South African NBD study in which a list of the country's disease burden was categorised into three main cause groups. The three main BOD cause groups, according to the South African national burden list, are Type I: Communicable, maternal, perinatal and nutritional conditions; Type II: NCDs and Type III: Injuries. The South African Burden of Disease list was utilised in this study as Addendum B due to latest Burden of Disease study being performed in South Africa to date.

3.7 Coding content

Based on the initial categorisation of the data into core themes from Annexure A and Annexure B, a further coding process was initiated. In Addendum A, each 11 core themes included further subthemes numbered 1–25, which represented the themes and trends in emergency care as found in Addendum A.

The three categories in Addendum B are further broken down into category types from 1–23 which are representative of the African BOD list. These codes were then quantified by exploring the frequency of the codes.

3.8 Data analysis

A process of content analysis was used to analyse each of the relevant emergency care articles published in Africa. After the initial search and review of articles found as seen in the flow diagram in Figure 1 (886 initial) 675 were then subjected to the following three-step process of analysis as depicted in Figure 2:

(1) The article title was viewed and either included or excluded based on emergency care in Africa, the inclusion criteria and appropriateness,
(2) The included article abstracts were read and matched to the coded themes and subthemes 1–25 (Addendum A). Research objective two was realised in

the data collection search on Scival from which emerged the time frame of the study, the number of citations and the origin of the type of publication.

(3) Finally, the research articles were grouped in terms of the burden of disease category if applicable *(Addendum B)*.

This process enabled the qualitative data (themes) to be converted into quantitative data (counting the frequency of the themes), thus making content analysis an appropriate choice for the study.

The study findings were collected, sorted, analysed and recorded in a Microsoft Excel spreadsheet by the researcher. Basic statistical functions were used to convert the themes into basic descriptive data while inferential statistics were performed to realise research objectives one and two. This was done to

1) describe the themes and trends in research articles (as per core theme and category contained in Addendum A and Addendum B) published on emergency care in Africa during the period 2013 to 2017 and compare these trends and themes between years

2) describe the type of publication and number of citations and compare them between years, as well as describe the classified themes, categories and objectives

3) describe the extent to which existing publication themes are aligned to the local African BOD.

Due to the study search using a single database the results yielded were single distribution. The results were then described in terms of frequencies within each coded category as sub-categories and then a comparison was done between these subcategories and within each year of the timeline.

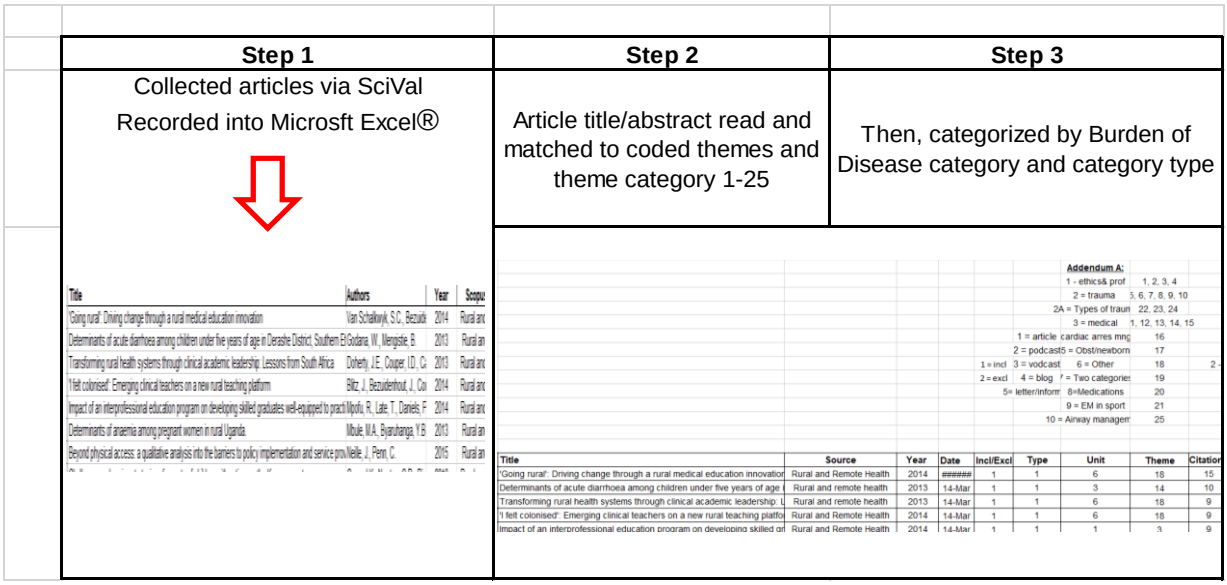
3.9 Statistical analysis

A single chi-square statistic was performed to determine whether a difference existed between the multiple variables. The Kruskal-Wallis test is a non-parametric test which is used when three or more independently sampled groups are used to assess the differences on a single, non-normally distributed continuous variable. The Kruskal-Wallis test may be used for both continuous and ordinal-level dependent variables (McKight and Najab 2010). This test was performed to investigate the association (if any) between the number of citations and themes and the number of citations and categories contained in the BOD list. The value of these two tests

provided an indication of how often the number of articles were cited within each category or theme, thus demonstrating the themes or categories which were mentioned the most often in the cited articles.

A Fisher's exact test was performed to test for an association between the themes and categories for the BOD. This test a statistical dependency analysis which is used to discover dependency between attributes (Hamalainen 2010). A Fisher's exact test was conducted because a chi-square test would not have been valid in this instance (i.e. if at least one expected frequency is 0 or if more than 20% of the expected frequencies is less than 5). The reason for carrying out this test was to ascertain whether there was a correlation between the BOD in Africa and whether researchers were in fact researching topics/areas in relation to this BOD on the African context.

Figure 2: Depiction of three-step data analysis process



3.10 Quality assurance

Worthwhile research in medical education is characterised by the following attributes, namely, trustworthiness (credibility), applicability and consistency (Frambach, van der Vleuten and Durning 2013). The most common and frequently used criterion to assess qualitative research is a model developed by Guba and Lincoln in 1994 which ensures the trustworthiness of the research. As explained by Thomas and Magilvy (2011), Guba and Lincoln's model adresses the following four components of trustworthiness in qualitative research, namely, (a) truth-value (credibility); (b) applicability (transferability); (c) consistency (dependability); and (d) neutrality

(confirmability). Guba and Lincoln (1994) explain that the aim of trustworthiness in a qualitative inquiry is to support the argument that the inquiry's findings are worth paying attention to. This is important when undertaking inductive content analysis, as themes or categories are created from raw data, for example when analysing documents or printed material without a theory-based categorisation matrix (Elo *et al.* 2014). Elo *et al.* (2014) conclude that the trustworthiness of content analysis results relies on the availability of rich, appropriate, well-saturated data, while improving trustworthiness starts with systematic preparation prior to the study.

3.10.1 Credibility

The researcher in this study ensured credibility by collecting data from reliable online sources. Credibility was also enhanced by collecting data for longer than a period of a single month. Instead, data were collected over a period of five years – prolonged engagement which increases the credibility. The data were sourced to allow the research performance of authors, groups, journals, research fields, research institutions and countries to be assessed, and were accessed from credible sources.

3.10.2 Transferability

Transferability in research is referred to as the likelihood of extrapolation and relies on the reasoning that the results may be generalised or transferred to different settings or groups (Elo *et al.* 2014). This study contains narratives about the context in which the research occurred, thus enabling others who may wish to apply findings elsewhere to make a decision about the degree of fit or similarity of their research to this study. Transferability in qualitative content analysis is, however, difficult to attain due to researcher subjectivity. In this study, transferability was achieved by providing a detailed description of the research methodology used as well as a comprehensive explanation of the coding content. It was anticipated that these would provide adequate information to make it possible to assess the applicability of both the research methodology and the coding content to other settings.

3.10.3 Dependability and confirmability

Frambach, van der Vleuten and Durning (2013) describe dependability as the extent to which research results are reliable in relation to the contexts in which they were generated. Thus, if a study were to be replicated within a similar framework, the findings should be the same. Dependability in this study was ensured by providing a detailed description in the study design of all the steps taken/the progression of events, the way in which the data was extracted, analysed and interpreted, and how the results and conclusions were reached.

According to Nowell *et al.* (2017), confirmability involves ensuring both that the interpretation and findings of the researcher are derived from the data which were collected and also that an explanation is provided on the way in which the conclusion and interpretation were drawn. The criterion for confirmability includes the neutrality of the researcher, which was ensured by creating an audit trail of the researcher's documentation data, research methods, frequency of the codes, the decisions taken during the study and the conclusion of the final results. According to Wolf *et al.* (2004), audit trails enhance the credibility of a study and also demonstrate the study's rigour. The raw data, categorised data, interpretations and conclusions were reviewed by the researcher's supervisors to ensure the confirmability and dependability of the study and its results.

3.11 Delimitations

According to Simon (2011), delimitations in research refers to the features that restrict the scope and define the boundaries of a study. In this study, the scope of the content analysis extended to publications on emergency care in Africa for the period 2013 to 2017 only, as well as such publications included in Scopus, which is a powerful publishing data analyser that feeds into SciVal, no other data base has this capability, thus the reason for choosing Scopus as the database. The specific and selected time confined the study findings to the period between 2013 and 2017 due to the researcher's timeline required to complete the dissertation. In addition, the study was confined only to an analysis of articles on emergency care that originated from the African region and those written in English. Thus, emergency care articles predating 2013 were not included within the limited five-year time period stipulated in the study. In addition, the researcher acknowledged that the analysis of the data

was based on her understanding and/or interpretation of the themes and topics of emergency care that evolved and how they related to the African BOD.

3.12 Ethical considerations

If a researcher is to conduct research in an ethical way, the research must be rigorous, methodologically sound and carried out competently. It is imperative that the resources used are treated with respect and integrity and also that the contributors are acknowledged for their assistance or guidance. The researcher must present the research results accurately and also take into account the implications of the research findings for the field of study in question (Brink, van der Walt and van Rensburg 2012). The data collection was performed using retrospective content analysis and, therefore, there was no direct contact between the researcher and any study participants. In addition, the results did not contain any identifiable information on the authors consulted. Consequently, the researcher did not require ethical approval to conduct the study, as no primary participants were utilised and all the data analysed was available on an online electronic database. The data captured were stored in the researcher's password protected laptop and accessible only to the researcher and the supervisors of the study. It was decided that the data would be kept for a minimum of five years and then disposed of in an appropriate manner, with electronic data being deleted and hard copies shredded.

3.13 Conclusion

The study used content analysis, systematically coding and categorising the data emerging from the large volumes of text. This provided the study with the investigative capacity required to analyse emergency care articles relevant to the African context. This chapter presented and described how a selection of published articles was extracted using a retrospective, cross-sectional design and analysed using content analysis. A foundational understanding emerged from this analysis which in turn gave rise to knowledge on emergency care themes and trends in Africa. The methodology used in the study enhanced the validity of the findings. The chapter also outlined the research design and the methodology used in the study, as well as the data analysis process and the reasoning behind the use of content analysis. Issues regarding quality assurance were also addressed in the chapter. The following chapter presents the findings of the study.

CHAPTER FOUR: RESULTS

4.1 Introduction

The results of the study are presented and interpreted in this chapter. For the purposes of clarity, the results are presented in relation to both the study's primary aim and also the three corresponding and interconnected research objectives, namely, to describe the themes and trends which emerged from research articles published in the selected time frame and specific to emergency care in Africa; to describe the publication type and number of citations pertaining to the selected time frame and, finally, to describe the association between the publication themes determined and the themes established which were representative of the African burden of disease (BOD).

4.2 Objective one

Describe the themes and trends which emerged from research articles published within the selected timeframe and specific to emergency care in Africa.

4.2.1 Selection of articles specifically on emergency care in Africa

As indicated in Figure 1, a total of 886 emergency care articles were initially identified as belonging to the selected review period, i.e. 2013 to 2017. Of the articles reviewed, 24% (211) were omitted either due to a lack of relevance (i.e. neither specific nor contained elements related specifically to emergency care in Africa) or as a result of their being published in a language other than English. Thus, a total of 675 articles, which met the inclusion criteria, were analysed.

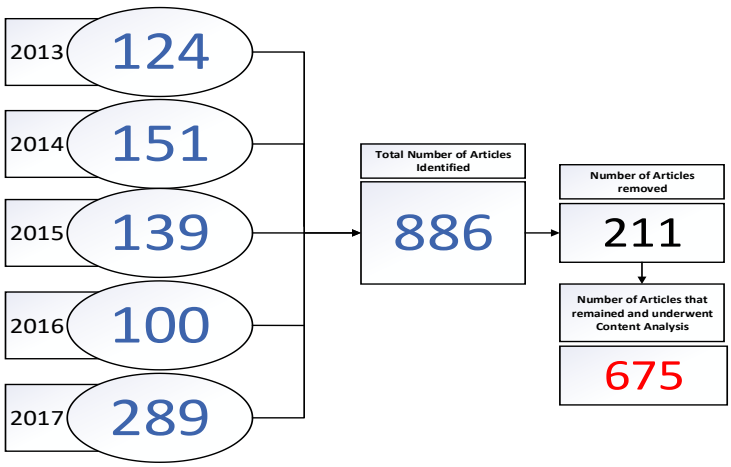


Figure 3: Selection of articles used for the content analysis

4.2.2 Publication themes specifically on emergency care in Africa

A total of 24 subthemes emerged as representing those found in research articles published between 2013 and 2017 and which were specific to emergency care in Africa. These subthemes were categorised into 11 core themes. As seen in Table 1, the majority of the articles, namely, 253 (37.48%) were related to trauma emergencies in the selected time frame. The lowest number of publications, namely, five (0.74%) were on aspects specifically related to medication.

Table 1. Frequency of emergency care themes

	Themes	Frequency	Percentage
1	Trauma emergencies	253	37.48
2	Ethics and professional practice	211	31.26
3	Medical emergencies	107	15.85
4	Training and curriculum development	23	3.41
5	Types of trauma	22	3.26
6	Cardiac arrest management	14	2.07
7	Two focus areas	12	1.78
8	Obstetrics/neonate care	11	1.63
9	Airway management	11	1.63
10	Sports Injuries	6	0.89
11	Medications	5	0.74
	Total	**675**	**100.00**

4.2.3 Yearly comparison of published articles with emergency care themes

When the 11 themes which had been identified were examined over the five-year period (2013–2017), publications relating to trauma emergencies, ethics and professional practice and medical emergencies were consistently identified as the main themes in the majority of publications. As depicted in Table 2, the total annual publication numbers remained relatively consistent between 2013 and 2016. Although a notable increase was seen between 2016 (136) and 2017 (166), this difference was, nevertheless, not significant.

Table 2. Yearly comparison of African emergency care themes (2013–2017)

Theme	Theme Code	2013	2014	2015	2016	2017	Total
Trauma emergencies	**1**	48	46	50	45	64	**253**
Ethics and professional practice	**2**	42	32	33	48	56	**211**
Medical emergencies	**3**	20	23	22	21	21	**107**
Training and curriculum development	**4**	4	3	6	5	5	**23**
Specific types of traumatic injuries	**5**	3	4	4	5	6	**22**
Cardiac arrest management	**6**	1	2	4	2	5	**14**
Trauma and medical emergencies combined	**7**	1	3	3	4	1	**12**
Obstetric emergencies	**8**	2	2	1	3	3	**11**
Airway management	**9**	1	2	3	1	4	**11**
Sports injuries	**10**	2	3	1	0	0	**6**
Medications	**11**	0	1	1	2	1	**5**
Total	**11**	**124**	**121**	**128**	**136**	**166**	**675**

4.2.4 Emergency care trends represented as subthemes

A total of 24 subthemes emerged from the content analysis of the 675 articles. As seen in Table 3, the following emerged in the largest number of publications: burns, the subject of 135 articles (20%) were classified into core Theme 1: Trauma Emergencies. Professional development, the subject of 117 articles (17.3%), and ethics and patients' rights, the subject of 91 articles (13.48%), were classified into core Theme 2: Ethics and Professional Practice.

Table 3. Frequency of themes and subthemes representing trends

1. Trauma Emergencies								
	Subtheme	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
1.1	Burns	27	22	22	29	35	135	20
1.2	Limb and/or pelvic fractures	8	9	14	11	13	55	8.15
1.3	Pneumo-haemothorax	4	8	8	2	6	28	4.15
1.4	Traumatic brain injury	7	2	5	4	8	26	3.85
1.5	Shock	0	1	1	0	2	4	<1
1.6	Spinal injuries	1	0	2	1	0	4	<1
	Total	**48**	**46**	**50**	**45**	**64**	**253**	**37.4**
2. Ethics and Professional Practice								
	Subtheme	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
2.1	Professional development	21	22	15	25	34	117	17.33
2.2	Ethics and patient rights	21	10	18	20	22	91	13.48
2.3	Child and elderly abuse	0	1	0	3	1	5	<1
	Total	**42**	**32**	**33**	**48**	**56**	**211**	**31.2**

3. Medical Emergencies								
	Subtheme	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
3.1	Hypoglycaemia	13	14	10	13	15	65	9.63
3.2	Acute coronary syndrome	3	7	4	3	2	19	2.81
3.3	Asthma/COPD	4	3	2	1	2	12	1.78
3.4	Seizures/CVA	1	0	3	0	3	7	1.04
3.5	Epiglottis	0	0	1	2	0	3	<1
	Total	**20**	**23**	**22**	**21**	**21**	**107**	**15.8**

4. Training and Curriculum Development								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Training and curriculum development	4	3	6	5	5	23	3.41
	Total	**4**	**3**	**6**	**5**	**5**	**23**	**3.41**

5. Specific types of traumatic Injuries								
	Subtheme	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
5.1	Penetrating trauma	2	1	0	3	3	9	1.33
5.2	Blunt trauma	0	2	2	2	1	7	1.04
5.3	Injury pattern	1	1	2	0	2	6	<1
	Total	**3**	**4**	**4**	**5**	**6**	**22**	**3.2**

6. Cardiac Arrest Management								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Cardiac arrest management	1	2	4	2	5	12	1.78
	Total	1	2	4	2	5	12	1.78

7. Trauma and Medical Emergencies Combined								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Trauma and medical emergencies combined	1	3	3	4	1	12	1.78
	Total	**4**	**3**	**6**	**5**	**5**	**23**	**3.41**

8. Obstetric Emergencies								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Obstetric emergencies	2	2	1	3	3	11	1.03
	Total	2	2	1	3	3	11	1.03

9. Airway Management								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Airway management	1	2	3	1	4	11	1.03
	Total	1	2	3	1	4	11	1.03

10. Sports Injuries								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Sports injuries	2	3	1	0	0	6	<1
	Total	2	3	1	0	0	6	<1

11. Medication								
		2013	**2014**	**2015**	**2016**	**2017**	**Total**	**%**
	Medication	0	1	1	2	1	5	<1
	Total	0	1	1	2	1	5	<1

4.3. Objective two

Describe the publication type and number of citations in the selected time frame.

Definition: Publication type and number of citations

In the context of this study, publication type referred to a term used to categorise the types of articles published in journals, as adapted by the (National Library of Medicine 2020). A citation is described by the Suny Empire State College (2020) as a reference to the source of information used in another research study.

4.3.1 Emergency care publication distribution across journals

The 675 emergency care articles published were investigated to establish from which journals these publications originated. A total of 53 journals were identified. The table below is a representation of the journal source and the frequency of publications in the journals in the selected time frame. As seen in Table 6, the majority of articles were published in the *African Journal of Emergency Medicine* during the five-year period from 2013 to 2017, with a total frequency of 143 (21.1%), followed by 74 (10.9%) articles in the *Injury Journal* and 71 (10.5%) in the *Burns Journal*.

4.3.2 Yearly comparison of articles published in different journals

A further detailed investigation was conducted to evaluate the number of articles published by each journal source, as broken down by year in the 2013 to 2017 period.

Table 4. Journal name and number of articles per year over the five-year period

Journal Source	2013	2014	2015	2016	2017	Total	%
African Journal of Emergency Medicine	26	18	34	29	36	143	21.19
Injury	11	17	17	16	13	74	10.96
Burns	12	17	12	14	16	71	10.52
Annals of Burns and Fire Disasters	7	5	9	12	15	48	7.11
Emergency Medicine Journal	6	7	4	11	4	32	4.74
Annales Francaises de Medecine d'Urgence	6	3	6	2	2	19	2.81
American Journal of Emergency Medicine	0	3	5	4	5	17	2.52
BMC Emergency Medicine	0	3	4	2	8	17	2.52
International Journal of Emergency Medicine	3	3	5	2	4	17	2.52

European Journal of Trauma and Emergency Surgery	1	4	4	1	6	16	2.37
Prehospital Emergency Care	4	3	1	1	7	16	2.37
Resuscitation	3	3	3	2	5	16	2.37
Journal of Emergency Medicine	6	4	2	3	0	15	2.22
Reanimation	2	6	0	1	4	13	1.93
World Journal of Emergency Surgery	4	2	2	2	3	13	1.93
Academic Emergency Medicine	7	1	1	1	1	11	1.63
Annals of Emergency Medicine	3	1	1	2	3	10	1.48
Journal of Child and Adolescent Trauma	2	1	0	4	3	10	1.48
Rural and Remote Health	2	3	3	1	0	9	1.33
Journal of Trauma Management and Outcomes	2	1	1	2	2	8	1.19
EMA – Emergency Medicine Australasia	1	0	0	1	4	6	0.89
Internal and Emergency Medicine	0	0	1	2	3	6	0.89
Pediatric Emergency Care	0	1	0	4	1	6	0.89
Practicien en Anesthesie Reanimation	2	1	2	1	0	6	0.89
Trauma (United Kingdom)	0	0	1	2	3	6	0.89
Trauma Case Reports	0	0	0	2	4	6	0.89
Internal and Emergency Medicine	1	2	1	1	0	5	0.74
Medizinische Klinik – Intensivmedizin und Notfallmedizin	2	3	0	0	0	5	0.74
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine	0	0	0	2	2	4	0.59
Traumatology	3	0	0	0	1	4	0.59
Wilderness and Environmental Medicine	1	1	0	1	1	4	0.59
European Journal of Emergency Medicine	1	2	0	0	0	3	0.44
Health Security	0	0	0	2	1	3	0.44
Prehospital and Disaster Medicine	0	0	0	3	0	3	0.44
Shock	0	0	2	0	1	3	0.44
Ulusal Travma ve Acil Cerrahi Dergisi	1	0	1	1	0	3	0.44
Australasian Journal of Paramedicine	0	0	2	0	0	2	0.30
Canadian Journal of Emergency Medicine	0	0	1	0	1	2	0.30
Emergency	0	0	0	1	1	2	0.30
Emergency Medicine International	0	1	1	0	0	2	0.30
Injury Extra	1	1	0	0	0	2	0.30
Journal of Burn Care and Research	0	0	0	1	1	2	0.30
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine	2	0	0	0	0	2	0.30
Trauma	0	1	1	0	0	2	0.30
Western Journal of Emergency Medicine	1	0	0	0	1	2	0.30
Acute Cardiac Care	0	1	0	0	0	1	0.15
International Journal of Critical Illness and Injury Science	0	0	0	0	1	1	0.15
Journal of Emergencies, Trauma and Shock	0	1	0	0	0	1	0.15
Notfall und Rettungsmedizin	1	0	0	0	0	1	0.15
Turkish Journal of Emergency Medicine	0	0	0	0	1	1	0.15
Unfallchirurg	0	1	0	0	0	1	0.15
Visual Journal of Emergency Medicine	0	0	0	0	1	1	0.15

As depicted in Table 6, the number of published articles per publication decreased over the 2013–2017 period. However, the journal sources, *African Journal of Emergency Medicine, Injury* and *Burns*, were the top three journals which consistently published articles on emergency care research during the time period in question, with the *African Journal of Emergency Medicine* presenting with double the total frequency of the other top two journals, namely, *Injury* and *Burns*.

4.3.3 Total frequency of citations per emergency care theme

During the data collection phase the number of citations per emergency care article was recorded. During the data analysis the articles were categorised into emergency care themes. Within the 11 emergency care themes the frequency of citations per theme was investigated. Overall, articles on ethics and professional practice were cited the most frequently in the 2013–2017 period, with the most articles, namely, 415 being cited in 2013.

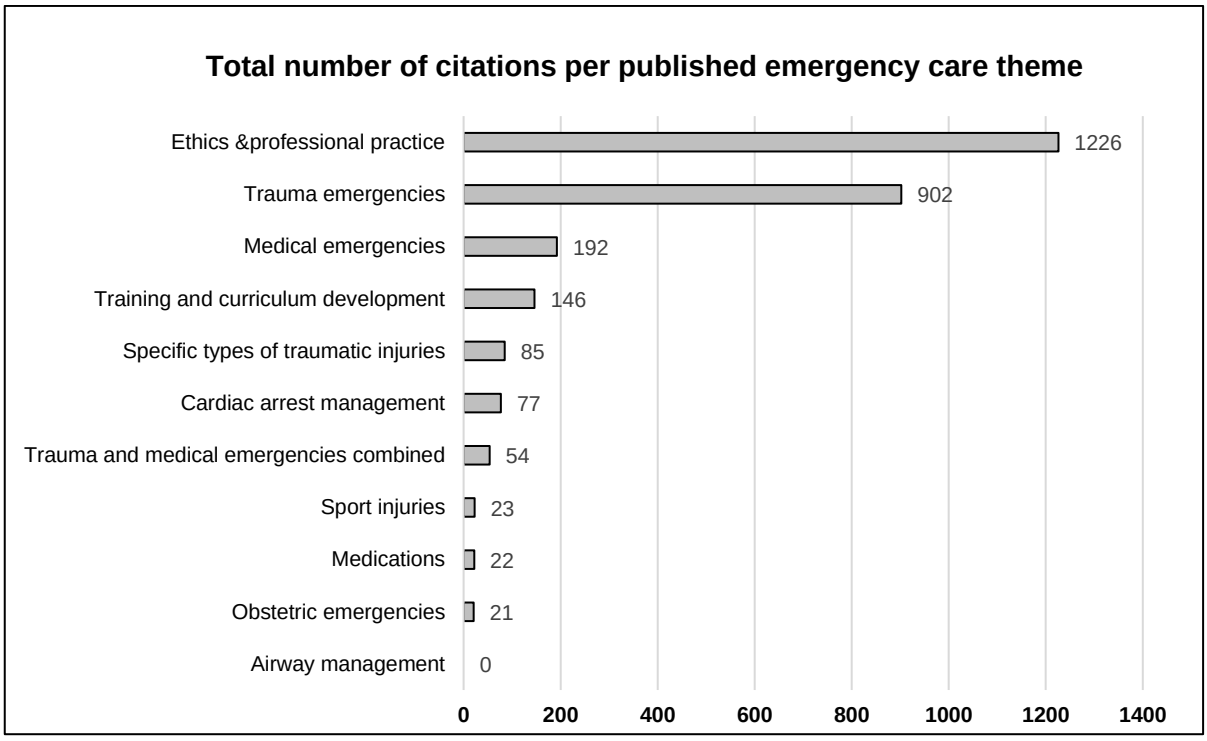


Figure 4*:* Representation of the frequency of citations per emergency care themes

4.3.4 Yearly comparison of total citations per themes

Table 5. Yearly comparison of total citations per published emergency care theme

Themes	2013	2014	2015	2016	2017	Total
Ethics and professional practice	415	227	341	137	106	**1226**
Trauma emergencies	295	253	200	95	59	**902**
Medical emergencies	59	49	39	33	12	**192**
Training and curriculum development	32	34	61	11	8	**146**
Specific types of traumatic injuries	5	27	29	16	8	**85**
Cardiac arrest management	8	12	44	5	8	**77**
Trauma and medical emergencies combined	18	8	13	15	0	**54**
Sports injuries	14	3	6	0	0	**23**
Medications	0	0	3	19	0	**22**
Obstetric emergencies	8	1	2	0	10	**21**
Airway management	0	0	0	0	0	**0**
Total	**854**	**614**	**738**	**331**	**211**	**2748**

As indicated in Table 5, while Ethics and Professional Practice and Trauma Emergencies remained consistent as the themes cited the most frequently in the five-year period, overall, the number of citations for all the themes diminished over the five years with there being 211 citations only in 2017.

4.4 Objective three

Describe the association between established publication themes and those representative of the African burden of disease.

A further categorisation was performed with the data collected being categorised according to the National Burden of Disease List for the South African National Burden of Disease Study 2 (Pillay-van Wyk *et al.* 2014). The data collected were categorised using Addendum B. The three broad causal groups included Type I: Communicable, maternal, perinatal and nutritional conditions; Type II: NCDs; and Type III: Injuries. Of the 675 emergency care articles which were analysed, 315 articles only were classified in the African Burden of Disease List. The remaining 360 (53%) did not fall into any classification, and thus a fourth category, namely “Unrelated to themes identified”, was created.

4.4.1 Classification of articles into categories representative of the African burden of disease in Africa

During the data analysis the articles were divided into four categories. Figure 3 illustrates that a total of 235 (34.8%) of the 675 published articles were classified as under the African burden of disease category Type III: Injuries.

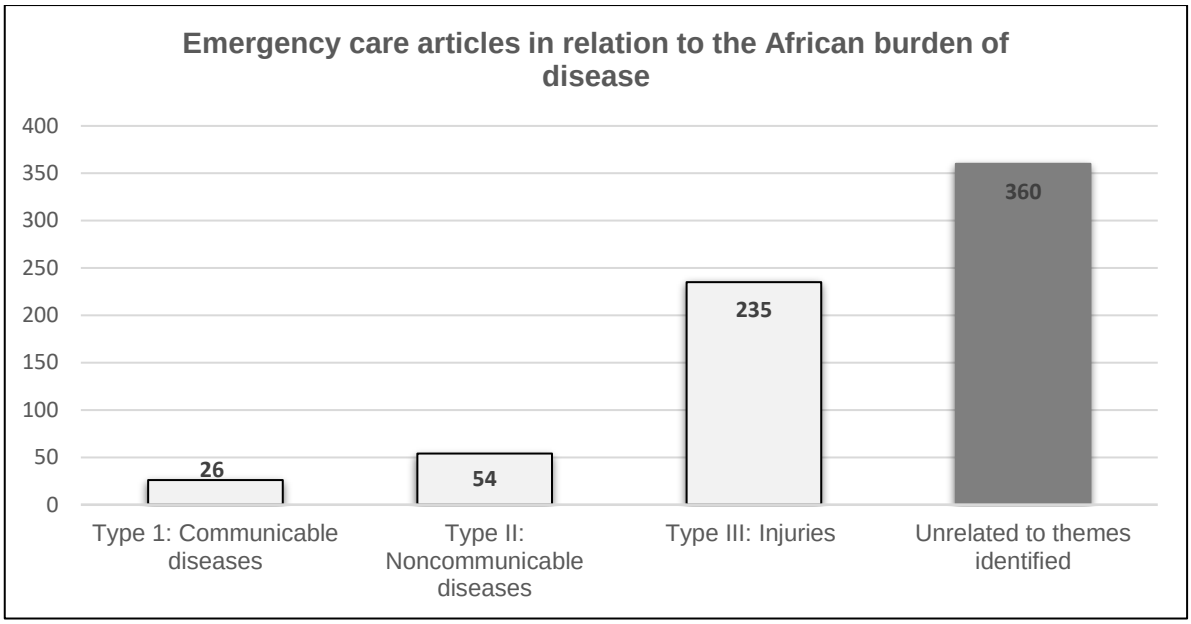


Figure 5: Classification of articles by category – African burden of disease

4.4.2 Classification of articles into subcategories representative of the African burden of disease

The categories above of the African BOD were broken down into the following 23 subcategories in total, with each one falling under one of the three main burden of disease types, namely, Type 1 – Communicable disease, Type II – NCDs and Type III – Injuries. The data collected were grouped into the categories depicted in Figure 3, with these categories being further broken down into subcategories – see Table 6.

Table 6 Total number of articles classified into African burden of disease subcategories

	Frequency	***Percentage***
Type IV: Unrelated to themes identified	***360***	***53,33***
Type III: Injuries		
Subcategory:	***235***	***34.81***
Unintentional injuries	*198*	*29.33*
Intentional injuries	*36*	*5.33*
Type II: Non-communicable diseases		
Subcategory	***54***	***8***
Cardiovascular disease	*20*	*2.96*
Respiratory disease	*8*	*1.19*
Endocrine, nutritional blood, immune disorders	*8*	*1.19*
Nervous system disorders	*6*	*0.88*
Mental disorders	*4*	*0,88*
Digestive disease	*4*	*0,88*
Sense organ disease	*4*	*0.88*
Skin disease	*1*	*0.15*
Type I: Communicable diseases		
Subcategory	***26***	***3.85***
HIV/AIDS and TB	*6*	*0.88*
Infectious and parasitic disease	*8*	*1.19*
Maternal conditions	*7*	*1.03*
Conditions originating from perinatal conditions	*4*	*0.88*
Respiratory infection	*1*	*0.15*
Total	***675***	***100.00***

As illustrated in Table 6, 360 (53,3%) emergency care articles were categorised under the newly generated category Type IV – Unrelated to themes identified, followed by 234 (34.8%) articles which were categorised under Type III – Injuries 235. The biggest subcategory comprised unintentional injuries, namely, 198 (29.33%), followed by the subcategory of intentional injuries, namely, 36 (5.33%). Both of these category types fall under the Type III – Injuries category. The next highest was the Type II – NCD category, with a total of 54 (8%) articles (highest subcategory in this category was cardiovascular disease 20 (2.96%)) and then Type I – Communicable diseases with 26 (3.85%) articles.

4.4.3 Yearly comparison of articles classified into themes representing the illnesses and injuries representing the African burden of disease

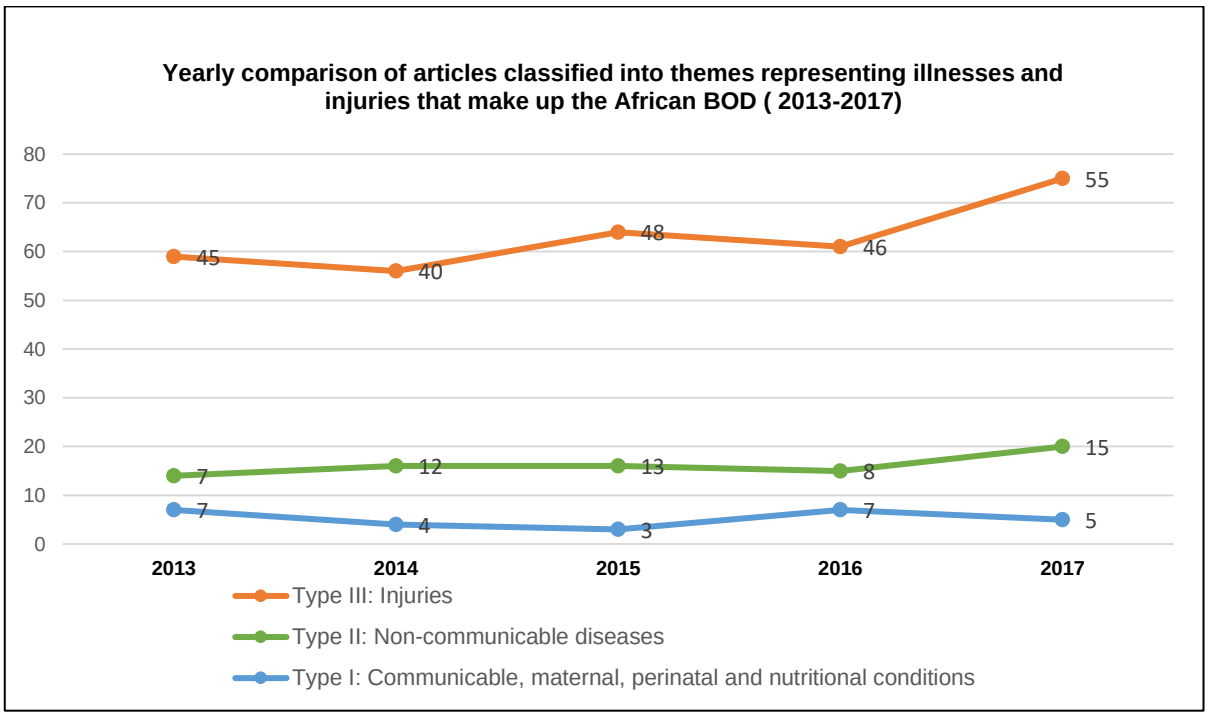


Figure 6*:* Yearly comparison of articles classified under the African Burden of Disease (2013-2017)

The majority of articles published in the time period 2013–2017 related to Type III – Injuries. As depicted in Table 6 below, a total of 75 articles related to the BOD in Africa were published in 2017. Most of the articles published in 2017 were on the Type III – Injuries, i.e. 55 (73.3%) compared to the 15 (20%) pertaining to Type II – NCDs and the five (6.6%) pertaining to Type I – Communicable, maternal, perinatal and nutritional diseases. The majority of the articles classified in the African Burden of Disease category list were on unintentional injuries, namely, 198 (62.8%), followed by intentional injuries, namely, 36 (11.4%).

4.4.4 Total number of citations as per the African burden of disease

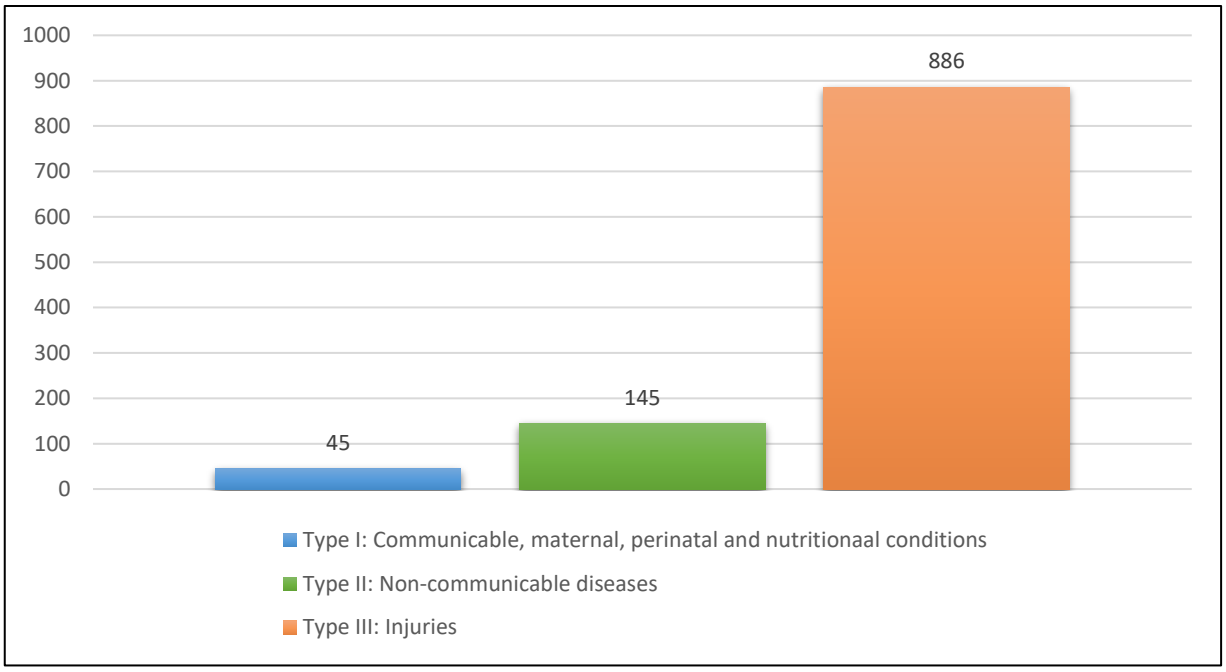


Figure 7: Total number of citations per the BOD for the period for 2013 - 2017

During the data collection phase, the number of citations relating to African BOD articles was recorded. During data analysis the articles were categorised into four categories. Within these four categories, 23 subcategories, as well as the frequency of citations per category and subcategory was investigated. Overall, articles reporting on Type III: Injuries were cited the most during the 2013–2017 period with a frequency of 886, Type II NCDs 145 and Type I Communicable, maternal, perinatal and nutritional conditions 45 over the five-year period.

4.4.5 Yearly comparison of citations classified under the African burden of disease

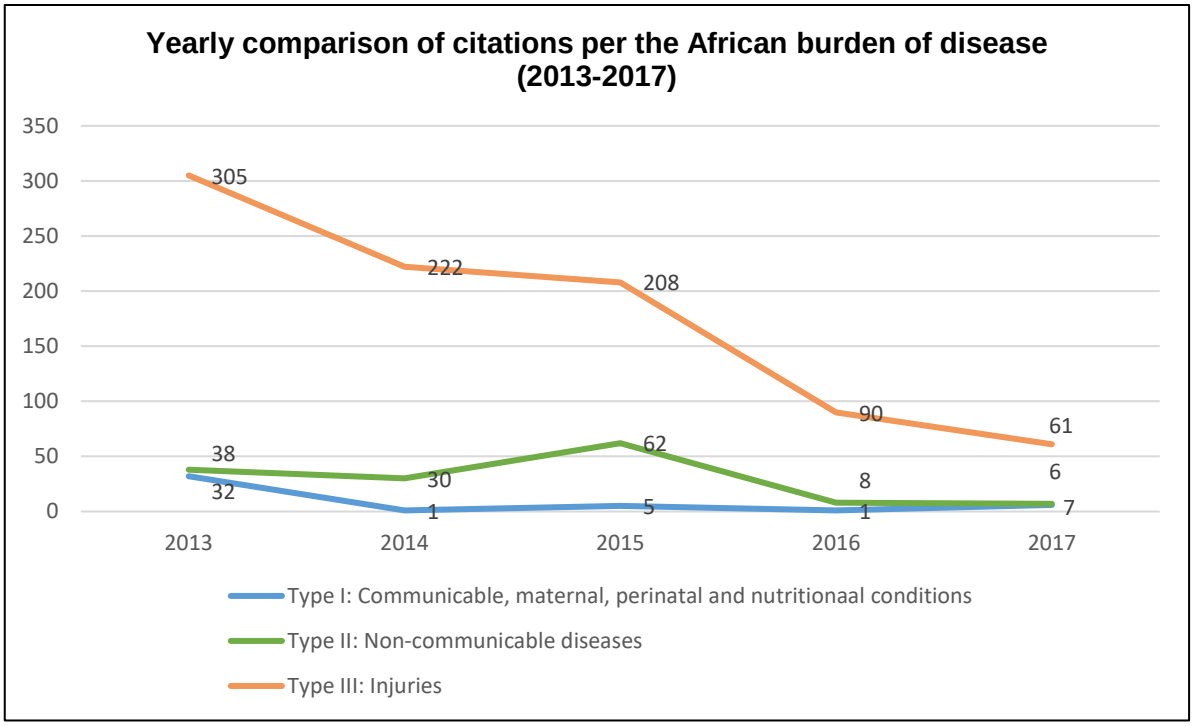


Figure 8: Frequency of citations per the African BOD category

The highest number of articles relating to Type III – Injuries were published in the 2013–2017 period. The highest number of citations appearing in 2013, namely 305, related to Type III – Injuries compared to 38 related to Type II – NCDs and 32 related to Type I – Communicable, maternal and perinatal diseases. However, as seen in Figure 4. the number of citations overall declined over time from 2013 to 2017 with the highest number of citations, namely, a total 886 over the period relating to Type III – Injuries, followed by 145 related to Type II – NCDs and 45 related to Type I – Communicable diseases. On the other hand, the highest number of citations during 2013 related to the African BOD: Type III – Injuries (305) and Type I – Communicable, maternal, perinatal and nutritional conditions (32). Thereafter a slow decrease in the number of citations over the timeframe was evident.

4.5 Association between citations and category of burden of disease

As illustrated in Table 7 below, the Kruskal-Wallis test was used to test for an association between the number of citations and the BOD category. As depicted in the table there was an association between the number of citations and the burden of disease category (p = 0.01).

Table 7 Comparison of burden of disease category and citations

Burden of disease category	Number of citations observations	Minimum to maximum	25–75th percentile
Type III: Injuries	235	0–10	0–2
Type II: Non-communicable diseases	54	0–29	0–3
Type I: Communicable, maternal, perinatal and nutritional diseases	26	0–38	0–6

The range of citations was wider in the injuries category, specifically ranging between 0 and 6.

4.6 Categorisation of emergency care articles with theme codes and burden of disease

The data collected were initially categorised under the 11 emergency care themes and the 24 subthemes. The data were then further categorised into the African BOD list. Table 7 presents a breakdown of the African burden of disease list and the theme code represented. As seen in Table 10, the majority of emergency care articles that were classified under the African BOD Type III Injuries, namely 235 (74.2%), were also aligned to the emergency care theme of core Theme 1, namely, Trauma emergencies, followed by Type II – NCDs, namely 55 (17.4%), which were aligned core Theme 3 – Medical emergencies.

Table 8. Yearly distribution of African burden of disease from 2013 to 2017

	Theme code	2013	2014	2015	2016	2017	Total
HIV/AIDS and TB	3.1	3	1	0	2	0	**6**
Infectious and parasitic diseases	3.4	1	1	2	2	2	**8**
Respiratory infections	3.3	1	0	0	0	0	**1**
Maternal conditions	8.1	2	1	0	3	1	**7**
Conditions originating in perinatal period	8.1	0	1	1	0	2	**4**
Total		**7**	**4**	**3**	**7**	**5**	**26**
Percentage		11.8%	7,14%	4.68%	11.4%	6,67%	8,25%
Endocrine, nutritional blood and immune disorders	3.4	0	0	4	1	3	**8**
Mental disorders	3.3	2	1	0	1	0	**4**
Nervous system disorders	3.4	0	1	2	0	3	**6**
Sense organ disease	3.4	0	0	1	1	2	**4**
Cardiovascular disease	3.2	4	6	4	4	2	**20**
Respiratory disease	3.1	1	2	2	1	2	**8**
Digestive disease	3.4	0	2	0	0	2	**4**
Skin disease	3.4	0	0	0	0	1	**1**
Total		**7**	**12**	**13**	**8**	**15**	**55**
Percentage		11.8%	21.4%	20,30%	13.11%	20%	17.14%
Unintentional injuries	1	38	32	39	40	49	**198**
Intentional injuries	1	7	8	9	6	6	**36**
Total		**45**	**40**	**48**	**46**	**55**	**234**
Percentage		76.2%	71.4%	75%	75,4%	73.3%	74.2%
Total		**59**	**56**	**64**	**61**	**75**	**315**

HIV, Human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; TB, tuberculosis

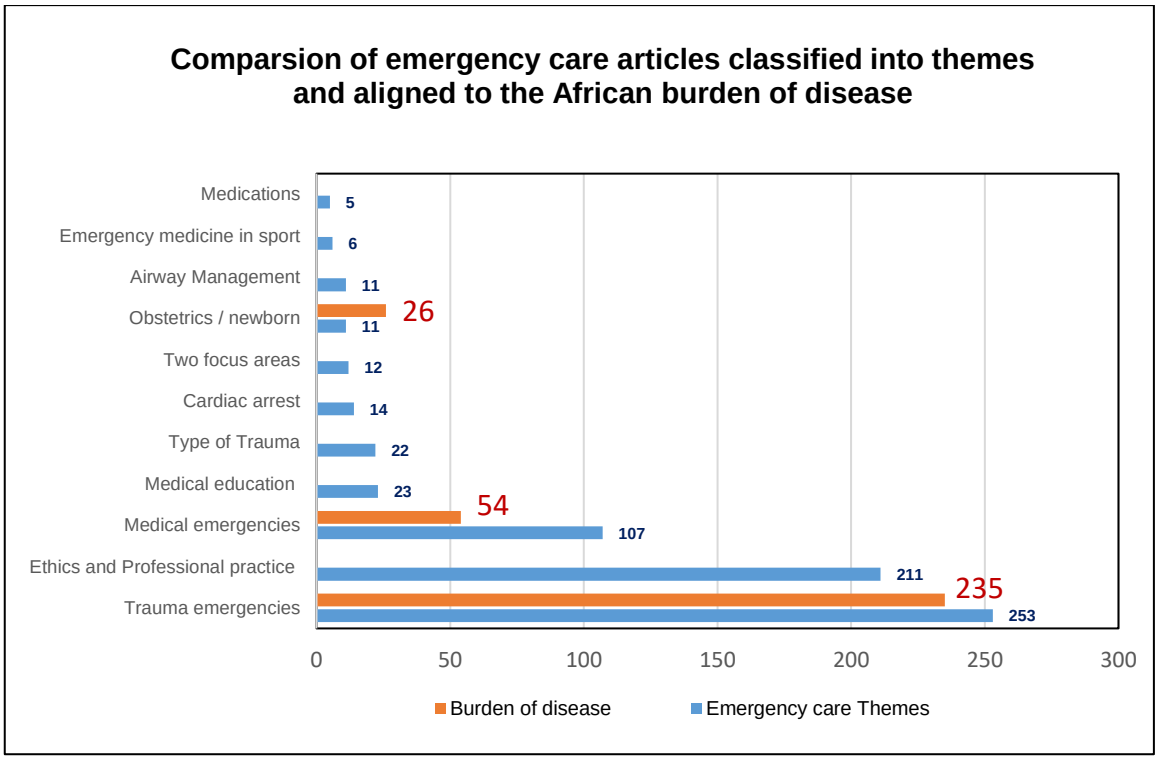


Figure 9: Comparison of emergency care themes aligned to the African BOD

Figure 8 above demonstrates the relationship between the classified emergency care themes and the African BOD. Three categories of the African BOD were comparable to the eleven emergency care themes. It was possible to relate trauma emergencies to Type III – Injuries, medical emergencies to Type II – NCDs and obstetric/neonate care to Type I –Communicable disease: maternal and condition originating from perinatal conditions.

4.7 Emergency care themes vs burden of disease category

The study found a statistically significant positive relationship between the emergency care articles classified into the themes and the emergency care articles aligned to the African burden of disease – Pearson's $r(9) = 0.73$, $p < 0.01$ measures the degree of the linear relationship between two variables. Thus, the Pearson's correlation demonstrated a relationship between two categorical data the emergency care articles which were analysed and those that were categorised under the African BOD – see Figure 10.

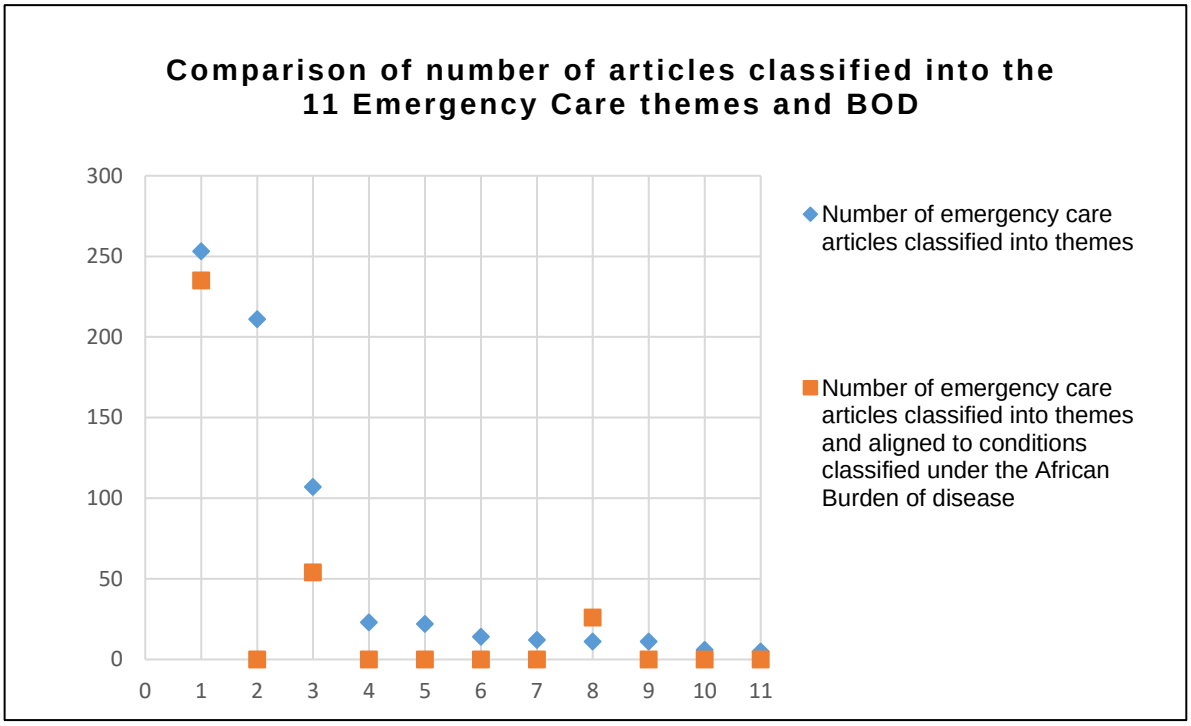


Figure 10: Number of emergency care articles specifically aligned to conditions classified under the African burden of disease

4.8 Conclusion

This chapter presented the results of the data analysis as aligned to the research objectives. The results presented revealed an increase in the number of emergency care articles published over the five-year period, with the highest number of articles being published in 2017. The majority of the articles published were related to trauma emergencies, ethics and professional practice and medical emergencies, and were found to consistently constitute the highest number of articles published in the timeframe in question. The most frequent core theme was Burns under trauma emergencies. The study found that the *African Journal of Emergency Medicine* had the most publications over the five-year period. The highest number of articles categorised under the African BOD pertained to Type III – Injuries, while the most common subcategory under the burden of disease was unintentional injuries. Chapter five presents a discussion of the research findings.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter discusses the interpretation of the results which emerged from the content analysis which was conducted. This discussion chapter is presented in a way that allows for alignment with the study's objectives. Thus, the discussion reflects an understanding of the results and also their meaning, importance and relevance within the context of published research output. Accordingly, the discussion demonstrates how the results related to the existing literature that was reviewed and discussed in chapter two, and ultimately aimed to make expositions to support the conclusions which were drawn, and which addressed the study's research objectives. These objectives included the following: (a) to describe the themes and trends in research articles published within the selected timeframe and specific to emergency care in Africa; (b) to describe the publication type and number of citations appearing within the selected time frame; and (c) to describe the association between the themes which emerged from such publications and those representative of the African BOD.

5.2 The number of and trends in research articles specific to emergency care in Africa

For the purposes of this study, emergency care trends were defined as the number of articles specific to emergency care in Africa specific to the author, location of the study conducted, the sample cohort and MeSH terms within the stipulated time frame, and which also met the study's inclusion criteria. Trends in emergency care were identified during the content analysis, with core themes and subthemes emerging which were representative of the themes in emergency care in Africa.

5.2.1 Number, type and distribution of articles

A total of 886 articles were initially identified as meeting the study's selection inclusion criteria for the planned content analysis. However, just under a quarter (24%) were removed following a closer examination and secondary screening of all the articles. Articles were excluded if they were irrelevant to the topic of emergency care, did not have a MeSH or abstract that included details that indicated that the study was set in Africa or that the cohort of participants were from Africa, and/or was available in a language other than English which the researcher did not read and/or understand. Depending on the type of journal, its popularity and its target audience,

it is not uncommon for there to be several versions of an article. Some journals publish articles in one native language and also an English version. A possible reason for this may be either funding or the type of journal. It was noted during the data collection that some articles were not available in English. There articles were, therefore, excluded from the study. Nevertheless, just 15% of initial articles identified were not eligible for analysis.

Thus, over 675 articles were included in the content analysis for the period 2013 to 2017. This number is significantly low when compared to the total number of articles emanating from developed countries with similar research agendas. It is even more unfortunate that it would appear that the number of articles has not increased much since 2015. The study found that 829 articles were published on emergency medicine in Africa to compare to the region with the highest number of publications 18 122, North America. The low publication rates in Africa may be due to certain barriers experienced in relation to the challenging environments in Africa which hamper research (Van Hoving and Brysiewicz (2017).

Such barriers may include the unconducive research conditions, which result in research capacity gaps such as inadequate training in research skills, unreliable internet access, and shortage of funds and lack of experienced supervisors. In this vein, Van Hoving and Brysiewicz (2017) found that one in five research participants had never previously been involved in research (22%), the majority of them (56%) had never published, while some of the research participants (48%) had experienced access blocks to original articles. However, these obstacles are not exclusive to Africa and/or emergency care research, but represent a global disposition in various health-related fields (Mitwalli, Al Ghamdi and Moussa 2014). For example, a study conducted in Canada by Siemens *et al.* (2010) found that medical students revealed differences in relation to their participation in and attitudes towards research. Their study also revealed challenges in respect of time commitments, a lack of sufficient training in research methodology and difficulties in finding a research supervisor. Consequently, strategies have been implemented in Africa to motivate practitioners to become more involved in research in their respective fields (Rosenkranz, Wang and Hu 2015). These strategies are related to more positive attitudes to research and increased opportunities to acquire research skills, thus resulting in the ultimate production of more and higher quality publications (Rosenkranz, Wang and Hu 2015). Van Hoving and Brysiewicz (2017) also found that research participation was

motivated mainly by intrinsic factors (improving research skills, clinical practice) rather than extrinsic factors (financial incentives, obligatory degree). It is hoped that the motivational factors and strategies mentioned above will lead to an improvement in emergency care curricula, thus enhancing emergency care research in Africa (Van Hoving and Brysiewicz 2017).

While there was not a significant difference between Bruijns' (2015) study findings and the findings of this study, it was clear that the number of articles published during the period of this study had increased over time. There are several possible explanations for this, for example the notable investments made over the recent years to encourage more emergency care research such as the launch of the *African Journal of Emergency Medicine,* which was founded in 2011. The journal's aim is to provide practical solutions for the unique problems facing emergency care in Africa, thus creating opportunities for practitioners to engage with local challenges and to create their own local guidelines and recommendations applicable to the local context (Bruijns and Wallis 2011). The gradual increase in the publication rate seen in this study could be testimony to this. In addition, the advance of emergency care as a specialty in Africa is also an example of increased investments. According to Wallis, Garach and Kropman (2008b), the latter is also dependant on the training and development of hospital staff in the emergency department as well as the growth of the emergency medicine specialty.

Emergency medicine, a new speciality in South Africa, was first introduced formally in 2003, with the College of Emergency Medicine adding emergency medicine to the list of recognised specialities in South Africa. A division of emergency medicine was established at the University of Cape Town. It has grown tremendously over the years, initially starting with a Master of Philosophy (MPhil) and then the introduction of the degree Master of Medicine (MMed) in Emergency Medicine in 2004. This is a four-year programme, divided into three-month blocks that expose the students to EMS, intensive care, obstetrics and gynaecology, internal medicine, surgery and paediatrics, but with the majority of the time being spent in the ECs. This programme has been shared with the University of Stellenbosch and similar programmes are offered at the universities of the Witwatersrand, Pretoria and Limpopo (Wallis, Garach and Kropman 2008a). As pointed out by Wallis, Garach and Kropman (2008a), this highlights the sound advance in emergency medicine in South Africa. The speciality is continuing to grow throughout the country, with an increased

emphasis on emergency care and the training and development of hospital staff in the EC, and registrars are filling specialist posts.

Nevertheless, despite the aforementioned initiatives, it would appear that articles specific to emergency care originate primarily from the developed countries such as the United Kingdom, United States of America and Australia rather than developing countries in Africa and Asia (Bruijns 2017). This may be due mainly to the financial and resource constraints in the developing countries while the developed countries have health systems with established emergency care and research centres (Bruijns (2017). However, as there is limited information on this subject there may be other, as yet unknown, reasons for this.

5.2.2 Emergency care themes and trends

Eleven core themes representing the types of and general trends in African emergency care articles emerged from the content analysis. The greatest number of articles were found to have a primary focus on trauma emergencies (37.48%), followed by those with a focus on ethics and professional practice (31.26%) and then those on medical emergencies (15.85%). In view of the fact that this type of study has not ever been conducted before and to the same extent, it was not possible to compare the study's findings with previous findings. Nevertheless, it was felt that the findings, which represented trends in relevant research, were not too suprising. The reason for this may lie in the fact that LMICs, such as African countries, account for 90% of global trauma-related mortality cases (Zaidi *et al.* 2019).

The trauma-related mortality rate in South Africa is six times the global rate, while the road traffic injury rate is double the global average (Norman *et al.* 2007b; Zaidi *et al.* 2019). The origin of trauma may be classified on the basis of intentionality as defined in the Global Burden of Disease Study (Thind *et al.* 2015; Haagsma *et al.* 2016). Intentional injuries include interpersonal violence, self-inflicted injury and collective violence, whereas unintentional injuries include injuries sustained in motor vehicle collisions, falls, burn injuries, and drowning (Zaidi *et al.* (2019). South Africa is one of the only countries in the world that has a higher rate of intentional than unintentional injuries (Norman *et al.* 2007a; Davis *et al.* 2017).

Furthermore, trauma is a well-known, leading cause of unnatural death and disability in Africa (Hardcastle *et al.* 2011) and one of the chief prehospital disease profiles, particularly in KZN, South Africa (Hardcastle *et al.* 2013). Hofman *et al.* (2005)

highlight that, in 2005, the World Health Organization estimated that 90% of deaths due to injuries occur in LMICs. Trauma is defined as an illness that is directly related to an individual's interaction with other people and the environment. On the African continent there is a contrast, with some regions being comparable to well-resourced international cities in the developed world and other being comparable to extremely poorly resourced LMICs (Brysiewicz 2001; Hardcastle *et al.* 2013). While significant resources are spent on caring for patients injured as a result of trauma at hospitals and emergency departments in LMICs, less attention is directed towards either gaining a better understanding of injury prevention or initiating organised efforts to improve trauma treatment systems. Hofman *et al.* (2005) explain that knowledge on the causes of injuries, demographic characteristics and areas where injuries occur would assist in determining how such emergency care may be enhanced, thus directly influencing both disability and mortality rates.

The results of this study also revealed that burns emergencies emerged as the highest (20%) subtheme under trauma emergencies. These results should contribute to the growing body of evidence that sub-Saharan Africa faces a disproportionate incidence of burns, which is a preventable cause of mortality and morbidity (Nthumba 2016). The results of this study highlight the significance of this emergency in Africa. Major burns, defined as > 30% of the body surface area in adults and > 20% in children, account for 320 admissions per year to major burn units in South Africa (den Hollander *et al.* 2014; Hardcastle *et al.* 2016). Studies show that the annual incidence of burns in the KZN province, South Africa, amount to between 7000 and 30 000 cases, including minor burns treated at clinics and out-patient departments (den Hollander *et al.* 2014). Furthermore, the World Health Organization (2011) reports that in LMICs, fire-related burns make up 10% of unintentional injury deaths. The death rate due to burns in LMICs is eleven times higher than in high-income countries, with deaths occurring mainly in the poorer areas (Boissin *et al.* 2019). The high incidence of trauma, particularly burns in Africa, may explain why this was the subtheme which emerged the most frequently over the study period.

However, despite the fact that these trauma cases have been detrimental to the African population, the increased trauma burden has inadvertently produced expert surgeons, orthopaedists and emergency physicians in countries such as South Africa. In addition, it has also led to major advances in both the operative and non-operative management of penetrating trauma initiated in South Africa, for example

the introduction of the Advanced Trauma Life Support (ATLS) course and the Definitive Surgical Trauma Care course pioneered in South Africa have both become a worldwide initiatives (Hardcastle and Oteng 2011). These advances have allowed South Africa to provide an accreditation system for trauma-capable hospitals. However, the challenge is to expand this to other countries which experience injury profiles similar to those in South Africa.

Furthermore, the findings of this study demonstrate that the consistent increase in the number of articles published on trauma emergencies in Africa may be due to the increased burden of prehospital trauma in South Africa compared to that in most developed countries. This results in a reduction in vital resources such as the availability of ambulances for other non-trauma emergency cases and thus consumes significantly more of the healthcare budget (Hardcastle *et al.* 2013). In addition to these challenges, Hardcastle and Oteng (2011) explain that the lack of funding from the majority of African governments creates a major problem, as the countries concerned are not able deliver a basic level of emergency medical services to their communities where the majority of cases are trauma related, thus resulting in a number of patients dying at the roadside due to a lack of access to available facilities. In Africa, the size and severity of this BOD is alarming, especially in relation to the lack of access to operative facilities and intensive care units (Chandran, Hyder and Peek-Asa 2010).

5.3 Publication type and citations

The study found that the majority of *African Journal of Emergency Medicine* was the single journal with the most publications (n = 143) over the five-year time frame The yearly analysis of articles also showed a steady increase in the number of articles published by this journal within the selected time frame. This may possibly be due to the implementation of strategies which were initiated in Africa to enable emergency care providers to become more involved in research. These strategies include early exposure to research activities as students and also the teaching of research methodology as a module at tertiary institutions during both undergraduate and postgraduate degrees. Staff were also apportioned more time during their normal work activities to allow them to concentrate on research. Key performance indicators were introduced which required staff members to focus on increasing their research outputs, which was achieved by staff taking sabbaticals in which to conduct research and undertake elective research activities. All of these resulted in a more positive

attitude towards research and also the acquisition of increased research skills (Van Hoving and Brysiewicz (2017) which may be a result of the increase in emergency care research as found in this study.

It may be that the rise of the *African Journal of Emergency Medicine* and the improvement in emergency care are responsible for the increase in the total number of publications in Africa. An interesting finding was that the third highest number of articles on emergency care was found in the *Burns Journal* (10.52%), the subtheme burns was aligned to the core theme of trauma emergencies (37.48%) – the theme which occurred the most often in the study. These results were consistent with the results discussed above that highlighted burns, a trauma emergency, as the subtheme which emerged the most often under the trauma emergencies core theme. The results were not altogether surprising, as burns is a major public health concern in South Africa and is responsible for significant morbidity and long-term physical disability among the population. This is a result of the large number of urban inhabitants living in poorly constructed, combustible accommodation (Cloake *et al.* 2017).

Citations in peer-reviewed articles referencing other articles are a widely accepted measure of scientific impact. However, Eysenbach (2011) explains the following disadvantage of citations as a metric, namely, that it usually takes an extremely long time to accumulate citations which may be difficult to obtain in an environment where the majority of the research is not easily accessible and is often available only on exclusive databases. The findings of this study further indicated that the majority of the articles categorised under the core theme 2 – Ethics and professional practice (n = 1226) and core theme 1 – Trauma emergencies (n = 902) were cited the most frequently during the period in question.

Gasparyan *et al.* (2015) explain that frequently cited articles are often methodological articles or those on burning issues and based on extensive evidence, usually large studies, trials and/or systematic reviews. The bibliographies of these scholarly articles are usually indicative of the quality and integrity of the writing, editing and publishing of such articles. It was therefore concluded from the study findings that, in Africa, researchers in emergency care have over time tended to focus on investigating research areas or themes/topics related to trauma emergencies and have used the studies of other researchers to verify their own work. However, the results of this study showed that the number of citations for each emergency care

theme had decreased over time. This declining number of citations over the study period may have been due to the fact that there has been more time in which to cite the less recent articles.

5.4 African burden of disease

According to Murray and Lopez (2013), before 1990 there were no quantifiable, measurable data on the global BOD, injuries and risk factors worldwide. In an effort to address this gap, the World Bank and the World Health Organization launched the Global Burden of Disease (GBD) Study in 1991. There have been various revisions of the GBD since 1991, specifically 1999–2002, 2004 and 2010, thus providing a comprehensive assessment of the state of health in the world (World Bank 1993). In order to deliver adequate healthcare to patients effectively, it is essential that the problems are correctly diagnosed. In addition, it is also mandatory to identify the difficulties, such as lack of resources and research outputs in order both to improve the health of populations and to ensure that healthcare systems are effective (World Health Organization 2000; Murray *et al.* 2012).

The benefit of the GBD is that exact methods are followed to critically appraise existing data on each health condition. It then becomes possible to compare and systematise in order to estimate mortality and morbidity numbers in regions where there is incomplete data and, finally, to report on the disease using standardised metrics (Murray and Lopez 2013). For the purpose of this study, the South African Burden of Disease List was used to categorise the data which were analysed under the burden of disease as guided by the criteria used in the GBD lists (Pillay-van Wyk *et al.* 2014). The revised list of the South African burden of disease was drawn up by the South African Medical Research Council and, in contrast to the Global Burden of Disease Studies, was designed to reflect the local causes of death patterns (Pillay-van Wyk *et al.* 2014). It was hoped that this would enable government, on both a national and a provincial level, both to address and reduce the disease burden and to allocate resources more appropriately in resource-constrained areas. In addition, it was anticipated that the trends in mortality would provide a comprehensive understanding of the BOD (Pillay-van Wyk *et al.* 2014).

This study found that, of the total number of emergency care articles published in Africa, the majority (53.3%) were not aligned to the African burden of disease. The study did find that the majority of emergency care articles were aligned to the African

BOD Type III Injuries (34.81%) This finding was consistent with the South African National Burden of Disease Study, which revealed that, historically, injury rates in South Africa were higher than those in any other region of the world, mainly as a result of the very high rates of intentional injuries (Hardcastle *et al.* 2016).

The second BOD study to date revealed that injuries were the cause of the fourth highest number of deaths in South Africa, accounting for 9.6% (50 737) of all deaths in South Africa in 2012 (Lutge *et al.* 2015). It is possible that researchers may have written injury-related articles due to the high incidence of trauma in Africa. This study found a significant relationship ($p = 0.01$) between results of the number of citations and the category BOD. The highest number of cited articles over the study period was in the category of Type III Injuries. As discussed earlier, the high rate of both trauma emergencies and the BOD Type III Injuries in Africa may have contributed to the high number of publications and citations, as researchers tried to explore, explain and/or describe this BOD.

5.4.1 Unintentional injuries as a major burden of disease

Trauma is the second most frequent cause of mortality, with HIV/AIDS as the leading killer KZN in South Africa (The Epidemiology Unit 2004). The results of this study show that the emergency care articles were aligned to the African burden of disease, with the majority ($n = 235$) of articles being classified under Type III Injuries. Of these articles, further classification and analysis categorised injuries according to the cause of injury. This revealed that the majority of articles published on Type III Injuries were on unintentional injuries (198; 39.3%) and also intentional injuries (36; 5.33%). Unintentional injuries are injuries that are due to fate, accidents or any other unpredictable and uncontrollable events such as falls, drownings, road traffic injuries, fires, poisonings and the adverse effects of medical and surgical treatment. On the other hand, intentional injuries refer to self-inflicted injuries, interpersonal violence (with or without firearms) and legal intervention (Pillay-van Wyk *et al.* 2014; James *et al.* 2020).

The results highlighted the high burden of injuries in Africa. For example, in KZN, violence and motor vehicle incidents comprised the majority of trauma. Another study has shown that 15 to 20% of emergency medical services cases are as a result of major trauma (Hardcastle *et al.* 2013). In South Africa, it has been found that the most common non-natural deaths are due to accidental/unintentional injuries, with

39.8% fatal injuries, and violence and homicide injuries at 39.3% (Zaidi *et al.* (2019). However, it would appear that in KZN, the pattern of fatal injuries differs, with violence and homicide accounting for 45.9% of fatal injuries and accidental injuries for 33% of such injuries (Cheddie *et al.* 2011).

Local studies by Cheddie *et al.* (2011) and Steinwall *et al.* (2012) report that patients receiving care at major dedicated trauma centres in South Africa results in less mortality and morbidity. Nevertheless, there is a high incidence of injuries in this country and in LMICs generally compared to that in developed countries. It has been found that intentional injuries, including interpersonal violence, resulted in 49.0% (24 874) of the total deaths due to injuries with unintentional injuries resulting in 51.0% (25 864) of such injuries (Zaidi *et al.* 2019). However, the second NBD study in South Africa noted a decline in deaths due to injury between 1997 and 2012, which was largely due to a decrease in deaths from interpersonal violence (Pillay-van Wyk *et al.* (2016b). This general decrease in interpersonal violence may be attributed to the introduction of the Fire Arms Control Act of 2000 (Abrahams, Jewkes and Mathews 2010). Interpersonal violence and road injuries are major contributors to premature mortality in South Africa. However, Msemburi *et al.* (2016) highlight that the frequency of injury rates remain high and that they take a heavy toll on young males. Intimate partner femicide also remains a problem. Fifty-eight people are murdered every day in South Africa, while 51% of all South African women have experienced violence at the hands of someone with whom they are in a relationship (Abrahams *et al.* 2012; Chersich *et al.* 2019). The World Health Organization (2019) estimates that 12.1 in every 100 000 South African women are victims of femicide each year. This is five times higher than the global average of 2.6. It is therefore imperative that strategies are implemented to address the violence and other injuries, for example from road accidents, in South Africa.

The study also found a further significant health burden in South Africa which is related to trauma emergencies, that is, trauma linked to alcohol abuse which is largely responsible for the high alcohol-related injury burden in South Africa (Schneider *et al.* 2007). The World Health Organization global comparative risk assessment study suggests that 28% of unintentional injuries and 12% of intentional injuries worldwide were attributable to alcohol compared to the South African statistics of 20.2% unintentional injuries and 40.9% intentional injuries (Ezzati *et al.* 2004). Brysiewicz (2001) explains that the majority of injuries in South Africa,

especially those resulting from interpersonal violence and traffic collisions, are caused by alcohol and other substance abuse. In 2001, more than 60% of violent confrontations and one-third of traffic collisions in Durban, a city in KZN, were alcohol-related (Hardcastle, Samuels and Muckart 2013). It is therefore clear that alcohol abuse results in a considerable BOD in South Africa, as intoxication mediates primarily for acute outcomes such as intentional and unintentional injuries. This also emerged from the results in this study. Even in minimal quantities, alcohol impacts on the central nervous system, which then results in a slow reaction time as well as impaired coordination and alertness. This may lead to motor vehicle accidents and thus trauma injuries (Brysiewicz 2001). Extreme volumes of alcohol may also cause disruptions in family life leading to domestic violence and child neglect, and may also be linked to unsafe sexual practices, thus increasing the risk of spreading HIV. These factors all contribute to the cause of BOD Type III Injuries in Africa, namely, unintentional and intentional injuries. There is thus a need for significant research to be conducted to determine the reasons why these factors occur to the extent to which they do in Africa.

5.4.2 Potential reasons for the high trauma rate in Africa

Alcohol misuse is a major public health issue globally, but with a greater incidence in LMICs such as South Africa than the more developed countries (Deehan, Marshall and Strang 1998; Davis *et al.* 2017). Specifically, South Africa has the highest rates of alcohol consumption globally and alcohol consumption per capita, and has seen an increase in the last decade (Davis *et al.* 2017). The reason why this is so potentially detrimental in the country is because alcohol use plays a role in approximately half of all non-natural deaths (Barron *et al.* 2020). There is a link between alcohol misuse and deaths resulting from homicide, transport accidents, vehicular deaths and injuries (Davis *et al.* 2017). In total, in South Africa, more than 13 million disability-adjusted life years, or 7% of the total disease burden seen as Type III Injuries and specifically trauma emergencies, are attributed to alcohol.

Globally, road traffic collisions are the eighth leading cause of death in children and in young adults aged five to 29 years (Peden and Puvanachandra 2019). Emergencies caused by road traffic collisions are treated as trauma emergencies in the emergency department and are one of the reasons why trauma is such a big burden in the African region. These incidence rates of road traffic collisions are the highest in Africa. This is in line with the results of this study which found trauma

emergencies to be the most common theme in articles published on emergency care. There is also a link between trauma emergencies and the burden of disease injuries, which may contribute to the growing body of evidence that these two factors have a significant impact on the quality of life, as well as the clinical and financial burdens of countries, thus constituting a major public health problem.

Homicide is also linked to trauma emergencies. According to the South African BOD study reported by Bradshaw *et al.* (2003b), homicide is the second leading cause of mortality in the country and although the overall number of homicides have decreased significantly since 1994, violent deaths from gun-related murders remain the leading cause of homicides (Abrahams, Jewkes and Mathews 2010). South Africa has the highest number of female murders by shooting in a country and not related to war, with guns being used by men to intimidate and assault woman. This is in line with the results of this study which found that intentional injuries are caused by interpersonal violence. Studies show that illegal firearms are more likely to be fired in violent crimes, whereas legally owned firearms are the main risk factor in the murder of intimate partners (Abrahams, Jewkes and Mathews 2010). Overall, the evidence shows that trauma emergencies are seen on a daily basis in South African emergency departments, but especially over weekends and holidays. This clearly highlights why trauma emergencies are a major BOD in Africa and was particularly evident in the results of this study. In addition, this may possibly be the reason why so many researchers choose to investigate these themes and trends in emergency care.

5.5 Conclusion

Overall, the findings of this study revealed that the number of articles published on emergency care in Africa increased during the 2013 to 2017 period. While the results of the study were consistent with findings in related studies, this study showed that the highest number of articles were on trauma and, specifically, on burns. A possible reason for this may stem from the continent's increasing dependency on paraffin and flammable liquids for lanterns as electricity becomes scarcer, particularly in the rural areas. The most common theme/trend which emerged from the study findings was the core themes of trauma emergencies and ethics and professional practice. Prior to this study no other studies had investigated specific research areas in emergency care in Africa, despite the growth in the newly established speciality in emergency medicine compared to other healthcare practices. As is evident in the increase in the

number of articles published on the theme/trend of ethics and professional practice, policies and procedures relating to emergency care systems and programmes have proliferated over time. A major healthcare burden in South Africa is trauma, specifically interpersonal intentional violence and road traffic collisions. This in turn is creating a burden on the South African public healthcare system and a significant portion of the emergency care burden (Hardcastle *et al.* 2016). There is little doubt that this study's findings will make a significant contribution to the existing literature which attributes the widespread trauma emergencies and the impact of the injury-related burden in South Africa (resulting in the high burden of injuries) to injuries related to interpersonal violence and road traffic collisions. It is vital that injury prevention in South Africa is prioritised. However, in order to establish the evidence base required for intervention and prevention programmes, basic research must be facilitated to investigate the causes and consequences of these injuries.

The next chapter finalises the study by presenting the study's conclusions as well as the limitations and recommendations of the study.

CHAPTER SIX: CONCLUSION

6.1 Introduction

This chapter presents a summary of the study and provides a response to the study's research objectives, as formulated in Chapter 1. This is followed by the recommendations of the study and, finally, possibilities for future research.

6.2 Summary

Despite the numerous advances in healthcare globally, it would appear that the emergency care field is undeveloped when compared to its counterpart disciplines. This is even more evident in the developing countries than in the developed countries. The review of existing literature revealed the existence of several challenges facing emergency care research in the developing countries, particularly Africa, with these challenges having a direct impact on the scale of work that is published in the region. The findings of this study demonstrated that although the rate of publications produced in the African region is low, there has nevertheless been an increase in the number of publications over time, with the majority of the research performed in Africa being on trauma emergencies, specifically burns. The latter has also been identified as one of conditions included in the list representing the African BOD. One of the findings of the study suggests that research articles on emergency care in Africa focusing on the following core themes: medical emergencies, obstetric and neonate care, types of trauma and airway management were lacking. These areas should be the focus for future research as these themes/trends are essential to the field of emergency care in Africa. The study found that articles on the African burden of disease were cited the most over the time period in question. In addition, Type III: Injuries was also found to be the category which was the subject of the majority of emergency care articles aligned to the African burden of disease.

6.3 Themes and trends in emergency care research published in Africa (2013–2017

Research objective one of the study was to describe the themes and trends in research articles published in Africa within the selected timeframe, and which were

specific to emergency care. This objective was addressed by a review and analysis of emergency care articles pertaining to the African region. It emerged from the review of the analysed articles that trauma emergencies (37.48%) constituted the most prevalent theme/trend in publications on emergency care in Africa, followed by ethics and professional practice (31.26%) and medical emergencies (15.85%). Further analysis and categorisation of these themes/trends were conducted. The most common subtheme under trauma emergencies to emerge was that of burns (20%), professional development (17.3%), and ethics and patients' rights (13.48%) emerged under ethics and professional practice, while hypoglycaemia (9.63%) emerged under medical emergencies. The study also revealed a steady increase in the volume of emergency care articles published during the period 2013 to 2017.

6.4 Publication type and number of citations of emergency care articles

The publication type and number of citations of emergency care articles in Africa were investigated. The second research objective was realised by analysing the emergency care articles published in Africa which had been identified, and investigating the journals in which these publications had appeared. The study findings revealed that the majority of these emergency care articles had appeared in the *African Journal of Emergency Medicine*, followed by the *Injury Journal* and then the *Burns Journal*.

A further investigation was conducted to identify the number of citations per theme identified. The core themes with the most citations was ethics and professional practice, followed by trauma emergencies. The number of citations aligned to the African burden of disease was found to be highest in Type III: Injuries. It was also noted that the number of citations per emergency care theme had decreased over time.

6.5 Perceived association between publication themes established and those representative of the African burden of disease

The third objective of the study was to describe the association between the publication themes which had been established and those representative of the

African BOD. This objective was realised by further categorising the data which had been collected according to the South African National Burden of Disease Study list. Although the study found that the majority of the articles did not fall into any classification, the remaining articles were categorised under the African BOD with the major category being Type III Injuries. A further investigation of the African BOD subcategories was conducted. This investigation revealed that the majority of emergency care articles were due to unintentional and intentional injuries which both fall under the category of Type III Injuries.

This study also revealed a statistically significant relationship between the number of citations and those aligned to the category African BOD Type III Injuries.

6.6 RECOMMENDATIONS

The study established that while EC research in Africa had grown over the years prior to the study, this growth had been inadequate and not sufficiently aligned to the continent's BOD. Premised on the findings of the study, the following recommendations are presented.

6.6.1 Strategies to improve research outputs

It is recommended that strategies are implemented that target the research barriers, specifically the lack of a committed platform that directs and provides structure and support for EC research in Africa. The continent does possess research capacity, and this capacity appears to be both strong and robust when compared to the discipline internationally. Nevertheless, it would seem that, in general, the research output has not been of the type, quality standard and scale to inform evidence-based policy for the continent. For research output to be valued and accepted at the level that it can actually inform, drive and ensure that clinically effective, culturally appropriate and responsive paramedicine practice is adopted in Africa, it is vital that such research stem from both a committed platform and EC research agenda that would promote collaborative, high quality, clinical, epidemiological and health services research that is translatable into practice.

6.6.2 Trends and topics in emergency care in Africa

At the time of this study, the existing field of emergency care in Africa was still in its infancy and emergency care research areas of choice unknown. In order to improve and prioritise key areas of emergency care, knowledge is required on the need to substantiate clinical care with evidence and to use clinically relevant performance measures which will guide emergency care providers to serve the population with evidence-based and relevant emergency medical care. The study found that the main focus area over time was that of burns injuries – a common trauma emergency in the African region. However, it would appear that little or no evidence of research exists on themes such as medical emergencies, obstetric and neonate care, airway management and types of trauma. In view of their relevance to the patient population, it is essential that these research areas are prioritised in order to decrease the mortality and morbidity, as high-quality healthcare suggests practice that is in line with the existing best evidence.

6.6.2 Aligning research to the African BOD

In order to plan adequate service delivery to the population, knowledge of the acuity mix of patients presenting to the emergency department is essential. It is therefore recommended that emergency care research be conducted to ensure alignment with the African BOD in the country. In addition, it is also recommended that stricter road traffic laws be legislated in an attempt to curb the incidence of road traffic collisions and mortality caused by the injuries that result from speed/reckless driving or intoxication while driving. It is also recommended that intentional injuries such as murder/homicide/femicide in South Africa be reported to ensure wider efforts nationwide to implement evidence-based, violence prevention strategies. Such strategies could include strengthening the gun control legislation and improving police investigations and the criminal justice systems, as well as prevention strategies aimed at gender-based violence.

6.6.3 Policies and procedures to mitigate the burden of disease

Violence is a multifaceted problem and must be addressed on several levels, including the biological, psychological, social and environmental levels. It is essential that violence prevention strategies are implemented in order to reduce the incidence

of violence. However, these strategies need to be implemented in childhood and sustained over time in order to increase their effectiveness. Programmes should aim to encourage healthy behaviour and attitudes in children and also to change the attitudes of those who have already become violent and/or self-harming.

6.6.4 Limitations of this study

In this study, the scope of the content analysis extended to publications on emergency care in Africa for the period 2013 to 2017 only, as well as such publications included in Scopus. This is a single platform that was chosen due to it being a powerful publishing data analyser that feeds into SciVal, no other data base has this capability, thus the reason for choosing Scopus as the database which can be seen as a limitation to the study. The specific and selected time line chosen by the researcher in this study is between 2013 and 2017 this was due to the researcher's timeline required to complete the dissertation. The data that was extracted and collected was subjected to analysis by the researcher only, this may be a limitation to the study as this could introduce bias.

6.6.5 Possibilities for future research

While there was a notable number of emergency care articles that matched with the conditions representing the African BOD, specifically, BOD Type III: fewer articles were found that addressed conditions classified as BOD Type 1 and Type 2 which includes conditions such as cardiovascular disease, respiratory disease, infectious and parasitic disease and HIV/AIDS. It is therefore recommended that future research be conducted into these other two significantly important burdens of disease in order to address the gap in the existing state of emergency care in Africa. The research in emergency care in Africa should therefore be aligned to the BOD. This is important as the overall problem in public healthcare and medicine is to effectively allocate the available resources in order both to decrease the major causes of disease burden globally and to decrease the health disparities between the poor and the wealthy populations.

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Annexure A:

Core theme & sub theme types		
Theme 1 - Trauma Emergencies		
	Haemorrhagic-, anaphylactic- and neurogenic shock/sepsis	Pathophysiology
	Concussion, closed head injuries (raised intra-cranial pressure), base of skull fracture and specific neuroprotective strategies /facial-neck trauma	Causes
	Open pneumothorax, tension- and pneumothorax, hemothorax, flail chest and cardiac tamponade	Clinical presentation
	Spinal Injuries, spinal motion restriction	Treatment
	Limb and pelvic fractures, amputations and compartment syndrome (rhabdomyolysis), the use of tourniquets/abdo trauma/vessel trauma	
	Burns (types and severity)	
Theme 2 - Ethics & Professional Parctice		
	Ethics in the EMS (types of consent)/ Emergency Care systems/EC personnel	Relevance to context of South Africa and the Health Professions Council of South Africa (HPCSA)
	Child and elder abuse	
	Professionalism (characteristics of a professional, bedside manner, patient rights, patient care documentation and handling emergency vehicles) & Development of new	
	Law (patient rights and the role of regulatory bodies in the health professions)	
Theme 3 - Medical Emergencies		
	Asthma, chronic obstructive pulmonary disease (COPD) and pneumonia	Pathophysiology
	Acute coronary syndromes (myocardial infarction and angina), chest pain, heart failure and 3-lead ECG review,ACS medication/antihypertensive drugs	Causes
	Seizures and cerebrovascular attack (CVA) /mental disorders	Clinical presentation
	Hypoglycaemic emergency and diabetic keto-acidosis, other medical emergencies /hypotherm	Treatment
	Epiglottitis, croup and dehydration in pediatrics, other pediatrics	
Theme 4- Medical education		
	Medical education/training courses	
Theme 5 - Types of Trauma		
	penetrating trauma (stabbings/GSW)	
	Blunt/road accidents	
	Injury patterns	
Theme 6 - Cardiac Arrest Management		
	Resuscitation (shockable and non-shockable arrest management), post-cardiac arrest management and declaration of death	Pathophysiology, Causes, Clinical presentation, Treatment
Theme 7 - Two focus areas		
	Both Trauma & medical in one topic	
Theme 8 - Obstetrics and Neonate care		
	Placenta previa, placenta abruptio, post-partum haemorrhage, pre-eclampsia, eclampsia, prolapsed cord presentation, breech presentation, new-born care	Pathophysiology Causes Clinical presentation
Theme 9 - Airway Management		
	ETI/RSI/airway techniques, procedures	
Theme 10 - Emergency medicine in sport		
	Sports injuries (sport related)	
Theme 11 - Medications		
	Drugs/pre-/in hospial use of drugs, effectiveness /efficacy	

Annexure B:

Category	SA NBD cause
Type I: Communicable, maternal, perinatal and nutritional conditions	
1	HIV/AIDS & TB
2	Infectious and parasitic diseases
3	Respiratory infections
4	Maternal conditions
5	Conditions originating during the perinatal period
6	Nutritional deficiencies
Type II: Non-communicable diseases	
7	Malignant neoplasms
8	Other neoplasms
9	Diabetes Mellitus
10	Endocrine, nutritionalblood and immune disorders
11	Mental disorders
12	Nervous system disorders
13	Sense organ disease
14	Cardiovascular disease
15	Respiratory disease
16	Digestive disease
17	Genito-urinary disease
18	Skin diseases
19	Musco-skeletal diseases
20	Congenital abnormalities
21	Oral conditions
Type III: Injuries	
22	Unintentional injuries
23	Intentional injuries
Type IV: Unrelated to identified themes	