BURN INJURIES IN ZIMBABWE: DEVELOPMENT OF GUIDELINES FOR PHYSIOTHERAPY REHABILITATION OF MUSCULOSKELETAL IMPAIRMENTS AND FUNCTIONAL LIMITATIONS

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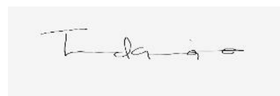

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Abstract

Background and need:

Burn injuries are a major cause of hospital admission in low-income countries such as Zimbabwe and often lead to secondary complications such as disfigurements, contractures, and scar formations. The study aimed to establish "Guidelines for Rehabilitation of Musculoskeletal Impairments and Functional Limitations for Zimbabwe for Patients with Burns" based on the best evidence available. There were three good candidates for use as the source guideline, but ultimately, the Agency for Clinical Innovation (ACI) of New South Wales in Australia guidelines[1] was chosen. The contextualisation of these guidelines for the Zimbabwean situation was informed by the outcomes of five sub-studies. A summary of the methodologies applied and the key results follow.

Methods and Results:

The Epidemiology of Burns in Zimbabwe: The characteristics of patients with burns in Zimbabwe was established through a retrospective record review (descriptive review) to characterise patients admitted with burns to the two central hospitals in Harare over fifteen months. The sample consisted of 926 admission records and 435 full patient folders were retrieved and analysed. Unfortunately, 425 full folders of children were missing and 85 folders of adults. There was a clear difference in presentation between children and adults, with children constituting over three-quarters of all admissions, but with less severe injuries.

Post-discharge follow-up: Access to rehabilitation and impact on Health-Related Quality of Life (HRQoL): The second study investigated the utilisation of post-discharge care, regarding referral after discharge and home programme. This was a study with a small sample, 14 adult and 23 child respondents. Despite referrals having been made to local rehabilitation departments, there was practically no further post-discharge contact with rehabilitation and only a single person received post-discharge rehabilitation. Both Health-Related Quality of Life (HRQoL) instruments used by the adult respondents indicated less impact on physical domains of functioning with the greatest impact in pain and emotional well-being. In the absence of trained counsellors, rehabilitation therapists might need to step into this role.

Systematic review: The broad objective of this review was to systematically evaluate the effectiveness, safety and applicability to low-income countries of therapeutic exercises utilised by physiotherapists to improve function in patients with burns. The review, which included 19 papers, established that exercises (either resistance or aerobic), are effective and generally have a positive effect on muscle strength and aerobic capacity. However, there was a risk of bias in many of the papers and the evidence is not of high quality. As most of the research enrolled paediatric patients older than seven years and no adverse effects were reported, it can be concluded that resistance exercise is safe for this group of patients. However, as most children admitted with burns are younger than seven years, exercise needs to be carefully monitored in this group as safety and efficacy have not been proven for younger children.

The results from this support the use of aerobic and resistance as an important component of a burn rehabilitation program as they have shown to improve muscle strength aerobic capacity and functional status even after hospital discharge, especially in patients with severe burns.

Documentation of the current rehabilitation practice: This phase documented clinical interventions used to treat musculoskeletal problems by observation of seven rehabilitation workers (not only physiotherapists), based in the five central hospitals, one provincial and one district hospital. The treatments of five adults and five paediatric patients were observed at each hospital, a total of 70 treatments in all. The most significant finding was that the management of patients with burns was offered by a single rehabilitation worker a Physiotherapists (PT), Occupational Therapists (OT) or Rehabilitation Technician (RT), working in Burns' Units without any specialised training or additional courses.

The management of burns across all hospitals was similar, and information saturation was reached with the planned number of observations. Passive and active movements were used almost universally, and the patients received a ward programme, which included positioning. Sitting and standing were included in some patients and patients were monitored for any adverse effects. A major weakness observed was the lack of baseline assessment or treatment progress during treatment.   No compression bandages were applied and no scar tissue massage was done.

Identification and adaptation of the suitable guidelines: Following a literature search and examination of different guidelines by two independent reviewers, the Agency for Clinical Innovation of New South Wales, Australia[1] was chosen as a candidate for amendment. The guidelines were amended based on the results of the previous studies and subjected to a Delphi process with four to six Zimbabwean rehabilitation therapists who were experienced in the field of burn management. A credible set of guidelines for Zimbabwe for the rehabilitation of musculoskeletal impairments and functional limitations was thus produced.

Conclusion:

The current study adds to the body of knowledge through the development of guidelines for the physiotherapy rehabilitation of musculoskeletal impairments and functional limitations for patients with burns in low- and middle-income countries. The thesis has provided an evidence-based framework for patients, rehabilitation workers and policymakers to inform the provision of effective management of patients with burns. The Zimbabwe Guidelines should be regarded as a first attempt rather than the final version and hopefully will be subjected to further review as they are tried out in practice.

Keywords:

Physiotherapy, Burns, Guidelines, Musculoskeletal, Rehabilitation, Function

Acknowledgements and Dedication

The thesis was completed under challenging circumstances. I was based full time at Harare Central Hospital as a senior physiotherapist until the middle of 2019. During this time, I faced severe financial and time constraints as I could not source research funding and get any sabbatical leave. Zimbabwean hospitals are facing severe challenges which include financial constraints, lack of human resources, lack of internet connectivity, and even suffer load shedding of electricity.

Given this very difficult situation, I would not have been able to complete the study without the support of my supervisor (Professor Jennifer Jelsma). Without any study funding, she used her research funds and at times her personal funds and also offered emotional support. Without this support, I doubt I would have been able to complete this study. For this, I am grateful to my supervisor, for the hard work she put in for me to complete this thesis.

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I dedicate this thesis to my family for all the support they gave me throughout the Ph.D. journey and the long hours spent working on the thesis.

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Abbreviations and Glossary

3RM	3 Repetition Maximum
ACA	Adapt – Contextualise – Adopt
ACI	Agency for Clinical Innovation
BSc	Bachelor of Science
BSHS	Burn Specific Health Scale
BU	Burns Units
CCH	Chitungwiza Central Hospital
Chi Sq	Chi-Square
CiNAHL	Cumulative index for Nursing and Allied Health Literature
DEXA	Dual Energy X-ray Absorptiometry
EMBASE	Excerpta Medica dataBASE
EQ – 5D	EuroQol five-dimension scale
GHEX	Growth Hormone and Exercise
HCH	Harare Central Hospital
HIC	High-Income Countries
HRQoL	Health-Related Quality of Life
ICF	International Classification of Impairments, Disability and Health
ISBI	International Society for Burn Injuries
LBM	Lean Body Mass
LIC	Low-Income Countries
LMIC	Low- and Middle-Income Countries
LoS	Length of Stay
MCH	Mpilo Central Hospital
Medline	Medical Literature Analysis and Retrieval System Online
mg	Milligram
MIC	Middle-Income Countries
ml	Millilitres
MMT	Manual Muscle Testing
MRPCZ	Medical Rehabilitation Practitioners Council of Zimbabwe
MRTTS	Marondera Rehabilitation Technician Training School
N/A	Non-Applicable or not mentioned
NSSA	National Social Security Association
OT	Occupational Therapy
OT Seeker	Occupational Therapy Seeker
PEDro	Physiotherapy Evidence Database
PGH	Parirenyatwa Group Hospital
PRE	Progressive Resistance Exercises
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analysis
PROSPERO	International Prospective Register of Systematic Reviews
PSYCH INFO	America Psychological Association
PT	Physiotherapist defined as “a health care professional that is committed to wellness, health, and prevention, and the treatment of illness, disease, and disability by largely exploiting non-invasive interventions including education and exercise.” P225[2]
PT	Physiotherapy

RCTs	Randomised Controlled Trial
RCWMH	Red Cross War Memorial Hospital
Rehabilitation	"A set of measures that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimal functioning in interaction with their environments." WHO World Report on Disability p96[3]
Rehabilitation Management	Treatment of medical conditions using different rehabilitation techniques
Rehabilitation Techniques	Various treatment modalities used to treat impairments and functional limitations.
Repetition	The number of times a specific exercise is performed
rHGH	Recombinant Human Growth Human
RoM	Range of Motion
RTs	Rehabilitation Technicians
RW	Rehabilitation Workers: Includes physiotherapists, occupational therapists, rehabilitation technicians etc.
SA	South Africa
SALEX	Saline and Exercises
SD	Standard deviation
Set	The number of cycles of repetitions that you complete
SMD	Standardised Mean Differences
SoC	Standard of Care
SSA	Sub–Saharan Africa
TBSA	Total Body Surface Area
TR	Translational Research
UBH	United Bulawayo Hospital
UK	United Kingdom
USA	United States of America
UZ – CHS	University of Zimbabwe – College of Health Sciences
VAS	Visual Analogue Scale
VD	Vitamin D
Vo2max	"VO_2 max (also maximal oxygen consumption, maximal oxygen uptake, peak oxygen uptake or maximal aerobic capacity) is the highest rate at which oxygen can be taken up and utilised by the body during severe exercises"[4]
WHO	World Health Organisation
WTQ	Work to Quota
WTT	Work to Tolerance
ZPA	Zimbabwe Physiotherapy Association

Chapter 1. Introduction

1.1 Background and motivation

Burn injuries are one of the most common causes of hospital admissions in low-income countries (LIC)[5–7]. It is estimated that 11 million people suffer new burns globally, with the burden of burn injuries borne disproportionately by the world's poor residing in low and middle-income countries (LMIC)[8]. According to Rybarczyk et al. (2017)[9], more than 90% of the burden of burn injury is borne by LMIC. Burn injuries are associated with high mortality and severe morbidity [10], which may lead to secondary complications such as; scars, contractures, loss of muscle strength, decrease in lean body mass, and functional outcomes as gait[5,6,11–13]. In Africa, particularly in low-income countries like Zimbabwe, burns are usually associated with poor socio-economic circumstances [14], and are often caused by scalds and open fire with children and women being mostly affected[15].

A burn injury is defined by the World Health Organisation (WHO) as "an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals"[16]. Coagulative necrosis of the skin is a characteristic of burns[10]. Burns are classified as superficial thickness, partial thickness, and full-thickness [17]. Superficial thickness burns affect the epidermis, such as the typical sunburn[17]. Partial-thickness burns affect the epidermis and dermis, while full-thickness burns affect the epidermis, dermis and the underlying subcutaneous tissues[17]. Impairments relating to burn injury range from damage to the respiratory system, the effect on internal organs, and metabolism with the most apparent impairment being skin damage and subsequent scar tissue formation[18].

There is an increasing awareness of the need for global standards of physiotherapy practice and in the management of patients with burns specifically [19] [20]. Often, the need for a standardised approach to care is reflected in developing appropriate practice guidelines. The Institute of Medicine defines clinical practice guidelines (CPG) as "statements that include recommendations intended to optimize patient care that is informed by a systematic review of evidence and an assessment of the benefit and harms of alternative care options[21]." p4. Factors that need to be considered in CPG development often include evidence for efficacy as the primary yardstick for inclusion in guidelines, however, feasibility and cost also need to be factored in, particularly in situations of constrained resources[22].

Although clinical guidelines related to the physiotherapy management of patients with burns have been developed, most originate from high-resourced countries, such as New Zealand and Australia, the UK and Ireland[23–25]. Consequently, their relevance, appropriateness and feasibility regarding the management of burns in severely-resource-constrained settings are unknown. Guidelines have been developed in South Africa (an upper-middle-income country) [26,27] for the management of patients in intensive care units, but these have not explicitly dealt with the management of patients with burns either in the acute or recovery stages[26–28]. In 2014, a review of clinical guidelines was published[29] which identified 46 sets of guidelines related to the management of patients with burns, but these were mainly targeted at medical and surgical management rather than rehabilitation. The omission

of rehabilitation protocols is unfortunate given the role of rehabilitation in the multidisciplinary management of burns[30]

More recently, in 2016, the Practice Guideline Committee of the International Society for Burn Injury (ISBI) recognised the need to develop guidelines appropriate for both high-income countries and resource-limited settings. This committee then published guidelines to improve the care of burn patients in both LMIC and high-income countries (HIC) [31] which were based on expert opinion and the best evidence. A section on the non-surgical management of burn injuries was included which made several recommendations related to the management of superficial burns, scar prevention therapy and management of hypertrophic scarring. Of relevance to Zimbabwe and other low-income countries, the committee recommended a more conservative approach to burn surgery and contracture prevention through physiotherapy and splinting[31]. The ISBI also noted the constraints experienced by rehabilitation workers living in resource-constrained countries after a survey conducted by the Rehabilitation Committee of the ISBI. They indicated that in poorly resourced environments, there is a lack of financial, educational and material resources to manage patients with burns successfully. An enormous difference in education, training and research capacity concerning the management of patients with burns was apparent between lesser resourced and high-income countries [20].

Zimbabwe has undergone significant economic decline within the past decade, and this unfortunate trend is predicted to continue. The World Bank reports that extreme poverty is estimated to have risen from 29 percent in 2018 to 34 percent in 2019, or from 4.7 to 5.7 million people. It reports sharp deterioration in economic conditions in the first half of 2019, with the real Gross Domestic Product expected to contract by 7.5 percent in 2019 [32]. In recent months (December 2019), CNN reported that the senior doctors in Zimbabwe's public hospitals had downed tools in protest against deteriorating working conditions and the firing of over 435 junior medical officers after a three months-long impasse over poor salaries [33]. Cumulatively, inadequate healthcare financing, and human resources deficits are likely to adversely affect treatment outcomes of patients with burns.

The majority of people in Zimbabwe live in rural areas rather than urban areas[34], but it was established that urban locations had higher availability of basic amenities items compared to rural locations[35]. If these guidelines are to be useful, they must be contextually relevant and feasible to address the needs of both rural and urban patients who have undergone burn trauma. However, the extent and nature of the functional impact of burns in Zimbabwe, particularly in rural areas, is not known, and there is no documented information on current management/status quo.

1.2 Nature and scope of the research project

This project was thus undertaken in light of the following. In Zimbabwe, burns account for an estimated 37.5% of hospital admissions and all require rehabilitation treatment, hence the need to standardise care through the development of CPG relevant to extreme resource-constrained settings such as Zimbabwe. Our primary goal was to develop or adapt guidelines contextually relevant to Zimbabwe.

The field of cardio-pulmonary rehabilitation after burn injury is usually regarded as a specialised field. In addition, there has been a recent publication of Intensive Care Unit guidelines in Southern

Africa[26,28], however, the management of burn injuries was not specifically examined. Similarly, emotional and behavioural consequences of the burn injury, such the post-traumatic stress disorder[36] and other psychological problems for the patient and the family[6,10], the management of these consequences are not dealt with in-depth as they fall outside the scope of physiotherapy practice. Consequently, the management of cardio-pulmonary rehabilitation and psychological disorders were not examined or included in the guidelines. In many patients, the main goals of burn-related rehabilitation are to preserve and regain functional independence and improve cosmetic outcomes[37]. In general, the primary objective of intervention in the short term is to preserve and improve RoM. In the long-term, the goals shift to developing compensatory strategies for functional losses and returning to independent living and working [37]. Taking this into account, the Guidelines were restricted to the management of musculoskeletal impairments and functional limitations.

It is also recognised that considerable resources are required to[38] develop guidelines from scratch (de novo). For this reason, an existing guideline, the Australian guidelines for burn rehabilitation were contextually and culturally adapted based on the information gathered and the consensus reached during the modified Delphi exercise.

1.3 Process of guideline adaptation

The World Health Organisation (WHO) has identified these key steps in developing guidelines which include topic selection, synthesis of evidence, recommendation formulation, peer review and consultation, distribution to stakeholders and implementation. The cycle continues with further review and updating as time goes by[22].

1.3.1 Epidemiological studies

These guidelines were informed by epidemiological data on the functional impact of burns in Zimbabwe, and the current physiotherapy management in Zimbabwe (See Section 1.3.3). These studies provided the contextual background to the guidelines, and a similar multi-method approach has been used to good effect[39]. (Chapters 2 and 3).

1.3.2 Systematic review

A systematic review of the literature on the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns was done. The review aimed to determine the best evidence on efficacy, and effectiveness of physiotherapy interventions in the acute, medium-term and chronic stages of burn recovery, with modifications for children and adults as necessary (Chapters 4 and 5).

1.3.3 Current practice

A further source of information contributing to the development of guidelines is documentation of current practice. Through observation of the practice of physiotherapists managing patients with burns, the strengths and challenges of existing physiotherapy management in Zimbabwe were determined. The observed practice status quo was thereafter compared to existent best-practices as identified during the systematic literature review. Additionally, the impact of resource limitations on practice was explored, and the responses and improvisations that might have been developed in practice were also documented. (Chapter 6).

1.3.4 Identification and adaptation of the most appropriate existing guidelines

The Adapt, Contextualize and Adopt (ACA) model is an effective method for low-resourced settings rather than de novo development or from scratch development[40]. Consequently, a review of existing guidelines and evidence-based physiotherapy interventions was undertaken, based on the Cochrane Collaboration guidelines[41]. On completion of the literature review, the Agency for Clinical Innovation (ACI) of New South Wales in Australia guidelines[1] were chosen to be adapted and contextualised. (Chapter 7).

1.3.5 Peer review and consensus forming.

Once adapted, the guidelines were subjected to a Delphi review. Information was thereafter collated, and the results and subsequent amendments were then incorporated in the draft. Local physiotherapists and occupational therapists involved in the management of patients with burns were invited to participate in the cognitive debriefing exercise. Based on their feedback, the final version of the Zimbabwean guidelines was produced. (Chapter 8).

1.4 Study setting

The five central hospitals in Zimbabwe were the setting for the study. These five centres cater to all residents in Harare and Bulawayo (the two largest cities in Zimbabwe) as well as serving as national referral centres. All these centres have a Burns' Unit, which caters for paediatric and adult patients with burns and are managed by a multi-disciplinary team. Patients discharged from these hospitals and who are resident in Harare province and neighbouring provinces were also followed up.

1.5 Clinical significance

Developing standardised guidelines based on best practice and modified to be feasible within the local context may lead to an improvement in the care of patients with burns, both centrally, within the districts in Zimbabwe and other resource-constrained settings. Further, the guidelines may; inform the teaching of burns management at both undergraduate and postgraduate levels, form the basis for continuing education programs, and provide clinicians with an appropriate model of care.

1.6 Summary description of the thesis

There was no chapter devoted to a narrative review of the impact of burns and management of patients with burns as relevant literature was reviewed at the start of each chapter. Published English literature from these databases; PubMed, CiNAHL, Cochrane, Medline, Pedro, OTseeker, Scopus and EBSCOhost amongst others was sought. Manual searches including back searches were performed to reach literature saturation. The search strategy consisted of a combination of the following search themes connected with the BOOLEAN term AND. The terms in the title were (physiotherapy) AND (burns) and was further advanced for each subsection of the thesis.

As outlined above, this thesis is structured as (See Table 1 below)

Table 1-1: Outline of the Thesis

Phase one: Background and contextual information		
Introduction and Background	1. Presents the background to the study, 2. highlights the need for the research, and 3. Gives an overall view of the scope of the work.	Chapter 1
Phase two: Characteristics and Management of Burns in Zimbabwe		
Retrospective study	1. Epidemiology of burns in Zimbabwe 2. Determine the causes and outcomes of burns in hospitalised patients	Chapter 2
Post-discharge follow-up and access to rehabilitation	1. The medium- to long-term sequelae based on home visits to discharged patients.	Chapter 3
Documentation of current rehabilitation practice	1. Reports on a prospective observational study of current physiotherapy practice 2. Necessary to place the introduction of the intervention within a clinical context.	Chapter 6
Phase three: Use of exercises in burns		
Systematic review	1. A systematic review of the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns was done. 2. Chapter 4 consists of the published protocol undertaken for the review , 3. and the results are reported in Chapter 5.	Chapter 4 and 5
Phase four: Identification, developing and reporting of guidelines		
Identification of guidelines	1. Describes identification of a suitable existing set of guidelines and the modifications made based on the above information to produce the Alpha draft.	Chapter 7
Development of guidelines	1. Reports on developing definitive guidelines for Zimbabwe which included the use of a modified Delphi technique to establish the face validity and feasibility of the Alpha draft	Chapter 8
Phase five: Synthesis of results		
Synthesis of study	1. Discussion of the study limitations , 2. Clinical and policy and 3. Areas for further research	Chapter 9

Ethical approval for the research was obtained from both the Zimbabwe Joint Research Ethics Committee (Ref: JREC/248) and the University of Cape Town (UCT) Human Research Ethics Committee of the Faculty of Health Sciences (HREC) (Ref: HREC 806/2015)) (Appendices III, IV and V).

Chapter 2. Epidemiology of burns in patients admitted to Harare Government Hospitals

2.1 Background

No country has an unlimited budget for health services, and it is important to identify relevant characteristics of patients to target intervention appropriately. This is true within the context of research-limited environments. This chapter thus explored the causes, nature, and demographic details of patients who had burn injuries.

Burn injury is a frequent cause of hospital admission not only in Africa but worldwide [5–7,12,13,42]. It is estimated that 70% of the burns occur in Africa and according to the WHO, burns are a global health problem with 180 000 burns each with most from Africa and South-East Asia [16]. Advances in technology and medical procedures have led to a decrease in mortality and reduced morbidity high--income countries (HIC) leading to an earlier return to activities of daily living (ADLs)[12]. However, there remains a high incidence of mortality and severe morbidity [10] associated with burn injuries in low-income countries (LIC) and in those living in with poor socio-economic circumstances [14].

2.2 Literature review

In Zimbabwe, they are a few published articles on burns. A scoping search using the Boolean operators "burns" AND "Zimbabwe" on PubMed yielded fifty articles with most of the publications not related to the thesis. Of the relevant articles, most of them were done at Harare Central Hospital (HCH) by Mzezewa[15,43,44] and Mpilo Central Hospital (MCH) by Muguti[45–48] in the late 1990s. A further look at the related articles yielded a few more articles by Chikwanha[49], Chirongoma[50], and Chiwaridzo [51]. Though most of the epidemiology studies are old, mostly done in the late 90s and early 2000s, they will be used in this section as they are no recent studies on the epidemiology of burns in Zimbabwe.

A study at HCH established that fires are the most common cause of burns among all patients presenting with burns, with females being the most affected[15]. In an adult population study on suicide, it was determined that most females (89%), committed intentional burns with flames (100%) causing burns after dousing themselves with paraffin[43]. A retrospective study was done in Mpilo Central Hospital (MCH), in Bulawayo (Zimbabwe) 60% of the patients with burns were aged five years or less and scalds were the most common cause of the burns (55%)[48]. About a third of occupational burns presenting at MCH were caused by open fires (32%)[46]. A study on the development of contractures, at the same facility, reported that most patients with burns presenting with contractures were aged 12 years or less (85%) and were caused by open fires (67%)[45].

In South Africa, 3.2% of the population sustains burn injuries annually, with 50% being aged 20 years and below[14]. Though South Africa is economically more stable than the rest of the Sub –Sahara, it has similar burns epidemiological characteristics [14]. In another study from a South African hospital, children under the age of two years (36%) were the most affected with scalds (83%) being the most cause of burns[52]. Elsewhere, a study in Ghana (Africa) established that children were most affected, though unlike studies in Zimbabwe, scalds (57.4%) accounted for the majority of burns and the

dominant cause of burns was accidental (98.8%)[5]. These findings are also similar to a Nigerian hospital-based study showing that 60.6% of children under two being the most affected with burns [10] with scalds (69.6%) and flame injuries (30.4%) being the common cause of burns [10].

The epidemiology of burns varies from one part of the world to another[10] but there are similarities. In Europe, children accounted for half of the admissions[53], a trend similar to low-income countries. For example, in Ireland, 36% of the admissions in the year were children less than 10 years[54]. The main cause of burns in low-income countries is due to scalds in children and open fire in adults, because of people living in conditions of poverty[9]. A study in Turkey reported that most patients with burn injuries were aged between 0 and 5 years (44.6%) with the most common cause of burns being hot liquids (scalds) 54.1% among the whole study population[55].

The impact of burn injuries is related to the context of the burn. Burns-related mortality has decreased in HIC in the past decades with the rate of child death rate in MICs and LICs being seven times higher than in HICs [16]. The high mortality in Africa and other LICs is regrettable since burns are preventable[16]. Risk factors for burns in Africa include; use of fires, kerosene stoves, children being left unattended, and low educational status; however, these risk factors differ across countries[9]. In HICs, preventive measures have been put in place which include; smoke detectors, alarms for faulty gas leakages[8], less flammable clothes in children, and use of sprinkler system[7] which has led to decreasing burns mortality [16]. Critical epidemiological findings from a systematic review revealed that children less than five years and adult females were most affected with scalds with extremities most affected [9].

From a global perspective, a retrospective study of 35 years by Saeman et al. (2016)[56] in the USA, had similar results to the studies from LMICs, with scald (42%), being the most common cause of paediatric burns. A 2012 retrospective report from America also showed similar results with scalds being the most cause of admissions in paediatric units[57]. Further, scalds (48,4%) were also the common cause of burns in a paediatric population[58] in an American population similar to other HICs[59]. Studies have also shown that unintentional burns are preventable and occur mostly in the homes [58], which is similar to burns which occur in LICs [6,15,60]. A report from the USA also showed similar trends with children accounting for a high rate of admissions[57]. It appears as if the paediatric population accounts for most admissions for patients with burns regardless of socio-economic status, country or Gross Domestic Product (GDP).

Although similarities occur between the causes of burns in children, disparities occur with mortality. LICs experience a higher rate of mortality compared to HIC, and also a better quality of life among survivors of burns is found in HIC as compared to LIC[61]. Children under the age of five are affected by burns at a higher rate in LIC and MIC as compared to HIC, even though the causes are similar[61]. Scalds are associated with paediatric burns and are the most common cause of burns in children. Overall, scalds and fires account for 80% of all reported burns cases in the world[59].

2.3 Problem statement

Burn injuries epidemiological data in Zimbabwe is both outdated and incomplete to inform the development of contextualized rehabilitation management guidelines. A study of the records of all patients admitted with burns to two central referral hospitals in Harare, the capital city of

Zimbabwe, was undertaken to determine the epidemiology of recent burn injuries. It was anticipated that the results of this study would be useful in defining the scope of the guidelines and targeting the most commonly encountered burn injuries. This would ensure that the most common presentations of burns, including age, cause and site, would be considered in the recommendations. Besides, understanding of the factors relating to the Length of Stay (LoS) in hospitals would help to quantify the "burden" of burns on the health services in Zimbabwe.

2.4 Aims and objectives

A record review was undertaken to characterise patients with burns admitted to the two central hospitals in Harare i.e. Harare Central Hospital (HCH) and Parirenyatwa Group of Hospitals (PGH) over fifteen months.

The objectives of the study were to establish

- The most common area of residence and the discharge destination as this would determine the need for support in rural areas;
- The relative proportion of adults to children to ensure that the guidelines included appropriate information for both groups;
- The causes of burns to identify target groups and inform advice regarding prevention and approach to management;
- The site and severity of the burns as determined by Total Body Surface Area (TBSA) and Length of Stay (LoS), to assist in the estimation of the type of functional problems that might occur.
- The outcome of the burns, mortality rate and factors associated with mortality.
- The seasonability of burns
- The difference in basic demographic details of patients with burns in terms of age, gender, LoS between the admission list and full notes of the patient with burns.

2.5 Methodology

A retrospective record review (descriptive review) design was used in the two Central Hospitals in Harare (HCH and PGH). These were chosen as they serve as referral centres for the provincial and district hospitals in the north of Zimbabwe and most patients with burns requiring hospitalisation for more than a few days would be referred to these hospitals. Most patients with severe burn injuries are referred to these hospitals.

2.5.1 Participants/records

Paediatric (children) for this study was defined as less than 13 years, as this is the age at which children move from primary to secondary school in Zimbabwe. Moreover, this is the cut-off age for admission to the paediatric wards.

The inclusion criteria for the study were:

- All patients of any age admitted primarily for burns as per admissions lists held by medical records
- Presenting to the surgical, paediatric or Burns' Unit at the two hospitals

- During the 15 months from 1st of October 2015 to the 31st of December 2016
- First-time admission

There were no exclusion criteria, and all patients with burns in the study period who were included in the admissions list were included, even if they did not survive to discharge.

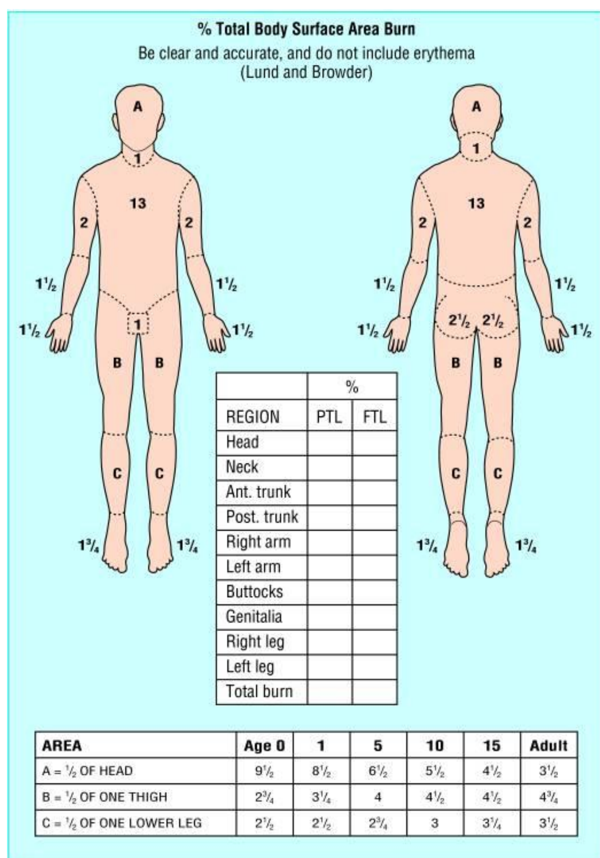
Based on available data (although outdated), the number of patients with burn injuries admitted annually to the two hospitals was anticipated to be approximately 150[15]. The sample size was calculated to ensure adequate representation of patients with full-thickness burns[49]. The prevalence of full-thickness burns (defined below in Instrumentation Section 2.5.2) was estimated to be 80% of all burns based on the data from Chikwanha et al., 2013[49], and the sample size required to determine the prevalence of patients with full-thickness burns, with a 1% level of precision and 95% confidence intervals was 147 (i.e. the researcher can be 95% certain that the true prevalence will be 1% higher or lower than the prevalence obtained from the data)[a]. It was anticipated there would be several missing records as one of the hospitals used a manual database to retrieve records. In order to accommodate for this, the data collection period was extended to 15 months to ensure that the sample size was reached.

2.5.2 Instrumentation

A project-specific data capture sheet was developed to collect data and designed by the researcher. The content was based on a review of published burns profile studies[6]. A data capture sheet (Appendix VIII) based on studies[5,6,15,62]and the 2012 America Burns Association, National Burns Repository Register. Demographics including patient age, gender, past medical history, causes of burn were captured. Medical details such as cause, the depth of the burn on the day of admission in the most severe region, the size of the burn injury or total body surface area (TBSA), and anatomical region and were recorded through inspection of medical records. The admission records are completed by the admitting medical practitioner or senior nurse.

The TBSA is calculated at the two hospitals by the admitting medical practitioner or nurse using the Lund and Browder diagram[17,59] (Figure 2-1). This method is regarded as being more accurate than the Wallace rule of nines method[17] as it compensates for the variation in body shape with age and is thus more accurate in children[17].

[a] Calculated using OpenEpi, Version 3
https://www.openepi.com/SampleSize/SSPropor.htm



From Hettiaratchy and Papini (2004)[63], P101. Reproduced without permission.

Figure 2-1: Lund Browder Chart

Burn depth is assessed as superficial, superficial partial-thickness (superficial dermal), deep partial-thickness (deep dermal) and full-thickness. The description of burn depth is shown in Table 2-1 below.

Table 2-1: Depth of Burns

Burn depth	Cause	Appearance	Pain sensation	Blanching
Superficial	Sun, flash, minor and scald	Red, glistening	Painful	Yes, brisk return
Superficial partial-thickness	Scald	Dry, whiter	Painful	Yes, slow return
Deep partial-thickness	Scald, minor flame contact	Cherry red	Painless (dull)	No
Full-thickness	Flame, severe scald, flame contact	Dry white, leathery	Painless (none)	No

*Adapted from: *Optimizing Emergency Management to Reduce Morbidity and Mortality in Pediatric Burn Patients. Pediatric emergency medicine practice 17.Suppl 6-2 (2020): 1–51.*[64]

The data were collected in English as the principal investigator was retrieving the records and understands English.

2.5.2.1 Content validity, Reliability and Pilot Study

Validation of the items: The data capture sheet was distributed to four rehabilitation experts on burn management to determine the content validity of each item on the data capturing sheet. The expert panel consisted of physiotherapists (PT) and occupational therapists (OT) with postgraduate experience in burns management. Rehabilitation experts for this purpose were chosen based on their knowledge and experience in burns[65].

To validate the data items, each item or question on the data collection sheet was rated on a Likert scale from 0 (not necessary) to 4 (very necessary) for the validation study. The experts could rate the scores of zero, one, two, three and four with two being neutral, and universal agreement among the experts was determined as being a score of three or four for each item on the data capture sheet. Changes were made to the wording /content of the items if there was disagreement on any item on the checklist until there was a score of three or four on each item.

Piloting the data capture sheet: A pilot study was undertaken a month before the main data collection started to test the inter-rater reliability and utility of the data capture sheet, and the logistics entailed in capturing information from patient records. Inter-rater reliability of the data capture sheet was tested using two blinded research assistants, to establish if they captured the same information in the same way. The data capture sheet was appropriate in retrieving all the information from the electronically and manually stored information from the two hospitals as the information retrieved was the same. The information took between five to ten minutes to retrieve from each record.

2.5.3 Procedure

The review was carried out over fifteen months, from the 1st of October 2015 to the 31st of December 2016.

Ethical considerations: Ethical approval was obtained from the Human Research Ethics Committee (HREC: 806/15) of the University of Cape Town (Appendix IV and V), the Zimbabwean Joint Research Ethics Committee (JREC: 248/16)(Appendix III). Access to records of all patients admitted to the burn's units, surgical and paediatric wards was granted at both hospitals (Appendix I and II).

There are ethical concerns regarding gaining informed consent from patients whose records are accessed retrospectively. In this study, it was not feasible to contact the discharged patients for permission. Sarkar and Seshadr (2014) [66] maintain that prior informed consent is not required for retrospective record review provided that certain criteria are met. This study adhered to these criteria in that only information relevant to the study was collected; the data controllers included the record clerks and the researcher and they were the only ones to have access to the full patient records; to maintain confidentiality, the data collection sheets were anonymised and had no information linking the information to the patient (Appendix VIII); only the researcher and his supervisor had access to the datasheet. As it was necessary to retain the names and addresses in order to contact participants for the following stage of the study, this information was kept separate

from the data collection sheets and only the researcher had access to this linking information, which was not shared with his supervisor or any other colleague. As noted above ethical clearance and permission to access the records were obtained from appropriate authorities.

Reviews of records of all patients with burns admitted during the data collection period commenced once ethical approval was obtained.

Record identification: Lists of patients admitted to the adult, surgical and paediatric wards and Burns' Units were retrieved from the medical records department at the two hospitals and eligible participants who met the inclusion criteria were identified. The list of all admitted patients was kept electronically at both the hospitals with hard copies as backups, whereas the patients' medical records at the one hospital were kept electronically whilst at the other they were kept manually in a storage facility. The lists of admitted patients at the hospitals for the fifteen-month study period were retrieved electronically from the records and a hard copy was printed. The list of the patients with burns was obtained electronically by the data entry clerk at each hospital and only included the diagnosis, demographic details of the patient (age, sex, place of residence) and the basic clinical presentation of the disease (TBSA). The hard copy was used to extract the full medical reports of the patients. The full patients' medical reports were requested from the medical records department at the two hospitals but were extracted differently between the two hospitals (manually at one and electronically at the other).

The data were entered on a paper copy and the data entry method was the same for the two hospitals. Data were extracted by the researcher and captured manually for 20 afternoons over three months.

2.5.4 Data management and analysis

The hard copies of the data collection sheet were stored in a secure location during the study. The forms with identifiable information for the patient were maintained in another secure lockable cupboard at Harare A physiotherapy department. The data will be kept for two years after the finalisation of the study in these same lockers, as required by ethics.

Data were entered and stored in a Microsoft Excel sheet. The information was cleaned and analysed using Statistica 13. Data cleaning was first undertaken to identify outliers, missing data or any inconsistencies in data. Data analysis was done in two stages with the first stage being analysis of the admission list (patient registry). The admission list consisted of demographic characteristics (age, gender, LoS). Stage two of the analysis was done on the full medical records retrieved which consisted of; (TBSA, depth of burns, the outcome of admissions, aetiology, circumstances of causing the burn). There were a large number of full records missing compared to those on the admissions list. Accordingly, the characteristics of the patients whose full records were not accessed were compared with those who were included in the admission lists to determine if there was any systematic bias concerning age on admission and LoS. Data that was missing from either the list or the medical record was recorded as missing.

The data were then described by percentages, central tendency measures (medians, means) and measures of variability (standard deviation and range). Spearman correlation coefficients were employed to estimate the association between the TBSA and Length of Stay (LoS). Independent t-tests were employed to measure the significance of differences between mean LoS between hospitals, for adults and children. Chi-square(Chi Sq) statistics were used to determine the relationships between categorical data. Categorical data consisted of the age category (adults and children), gender, the outcome of the burns (death, discharged to home or transferred to another hospital).

Reporting Checklist: The Strobe (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines[67] were used to analyse the strengths and limitations of this study.

2.6 Results of admission list

The results are presented in two subsections:

- Demographic characteristics of all patients with burns admitted at the two central hospitals whose information was included in the admission list.
- Characteristics of the burn injury concerning the sub-set of patients whose full medical records were retrievable (See Figure 2-2)

Missing data: It proved impossible to locate the records of all patients who were included in the admissions list. Limited information on patient demographics was available in the admission lists. Missing data was particularly problematic for children in Hospital A in which only 11.6% of records were retrieved (See Table 2-5 below for details). The final sample consisted of 926 admission records and 435 full patient folders, 425 full folders of children were missing and 85 folders of adults. Children constituted 78.8% of all admissions and 59.1% of accessed folders. Similar numbers of adult files were identified in each hospital and there was no hospital difference in the proportions of missing data for adults.

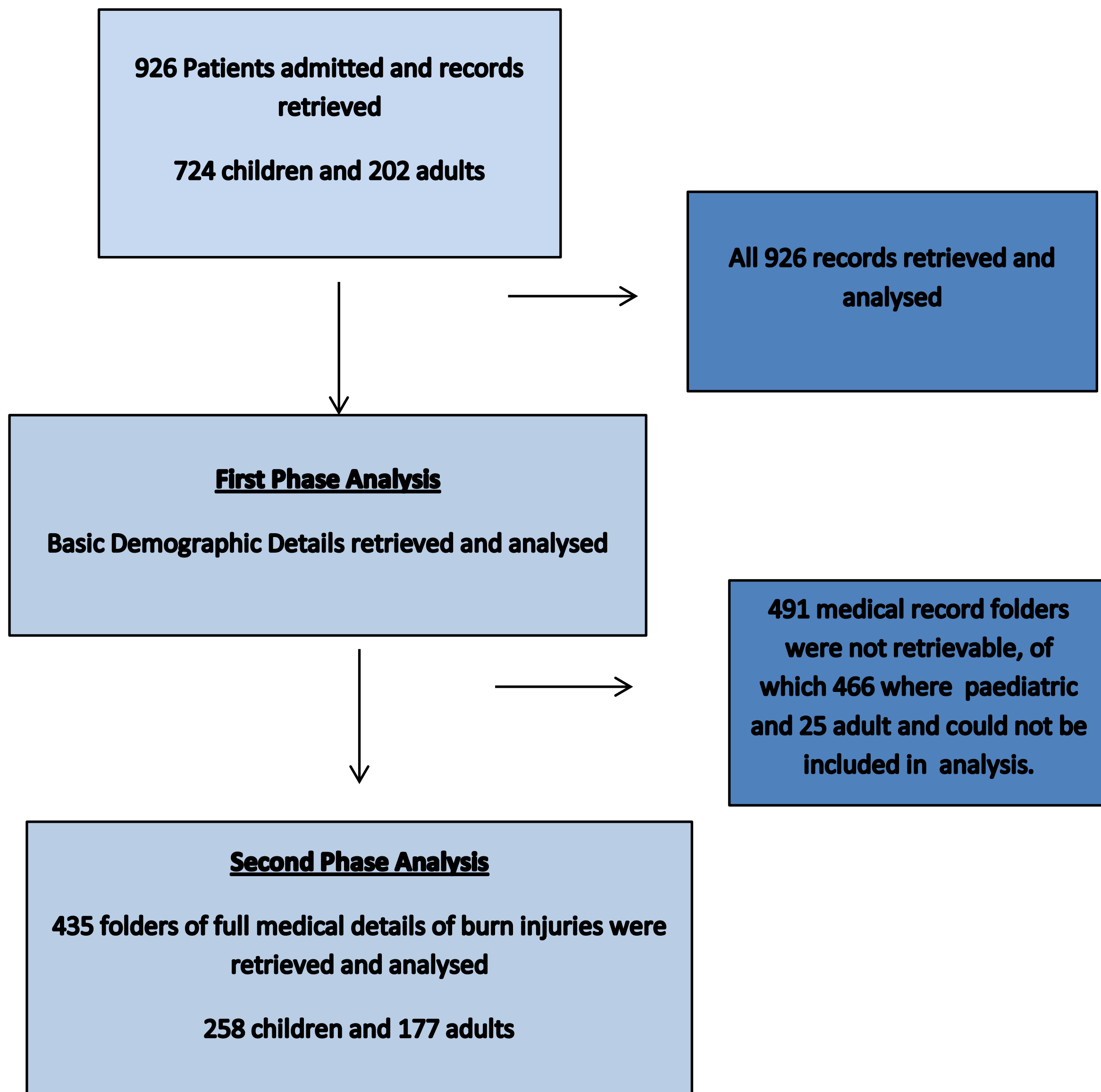


Figure 2-2: Flow Chart of folder accession

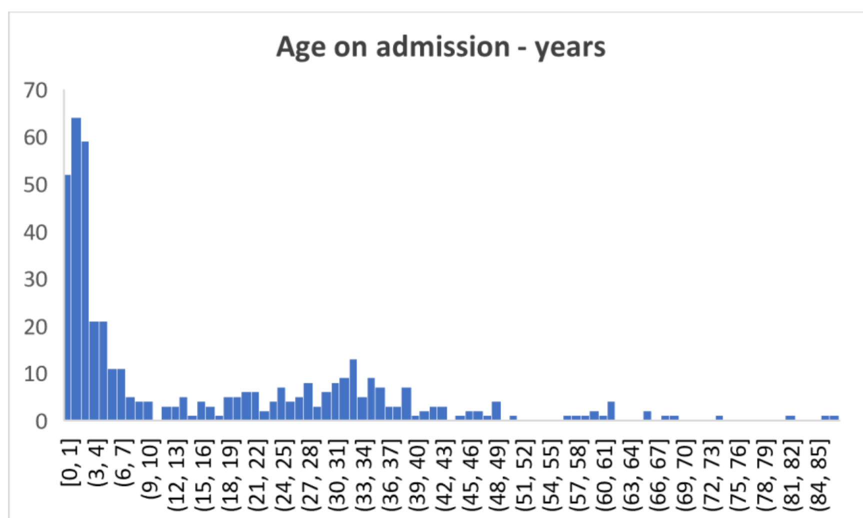
2.6.1 Age and gender

The age data of adults and children were not normally distributed (Shapiro WIlks p<.01 in each case (See Figure 2-3). The median age of children at injury (N =724) was two years (range less than one year to 12 years). The median age of the adults at injury (N=202) was 30 years (range 13 to 86 years) (Table 2-2). There were more males in the children (55.9.% male) and less in the adult samples (48.5%) and this approached significance (Chi Sq =3.51 p=0.061*).* Death was associated with gender in adults with 12.24% of males and 25% of females succumbing to their burn injuries (Chi Sq=5.38, p=.020) but not in children (p=.315).

Table 2-2: Age at admission for those on admission list.

		Valid N	Median	Minimum	Maximum	Range	Mean	Std. Dev.
Children	Age at injury	724	2	0*	12	12	2.5	2.53
Adults	Age at injury	202	30	13	86	73	32.2	13.7

**Children less than one year of age.*



N=926

Figure 2-3: Age at admission of all patients on admission list

2.6.2 Admission list results

The 926 admissions over the 15 months of the study approximated a mean of two admissions per day (926/450 days). Of these 67 patients died, a mortality rate of 7.2% (CIs=5.7-9.0%) (Table 2-3).

Table 2-3 Final outcomes of patients

Outcome of patients	Discharged home	Transferred to another hospital	Died	Row Totals
Children	689	2	31	722
Row %	95.4%	0.3%	4.3%	
Adult	164	0	38	202
Row %	81.2%	0.0%	18.8%	
Totals	853	2	69	924

Children/adult Chi Sq = 47.9, p <0.001 (excluding transfers) Missing N=2

The outcome was associated with age category, and 19% of adults died, compared to 4% of children. (The Chi Sq for a 2x2 table as the two patients who were transferred were excluded). The outcome of the patients was independent of the hospital (p=.091). Of those who died, 44.9% were children.

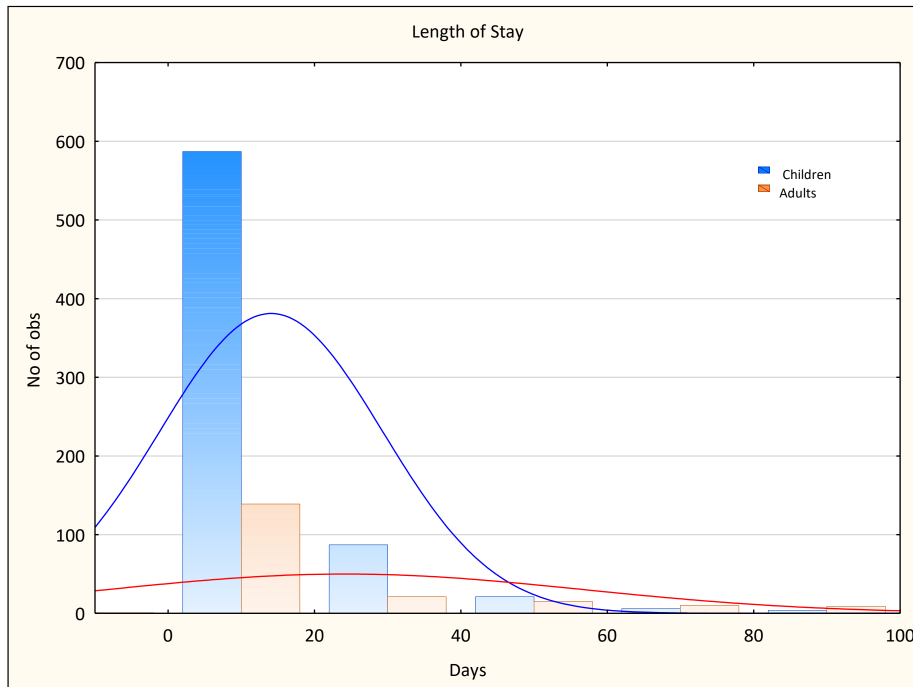
2.6.3 Length of stay

The length of stay (LoS) was calculated for those patients who survived and were discharged home. The median length of stay was 10 days in children (range 0-140) and 11.5 days (range =1-159) in adults (Table 2-4 and Figure 2-4). As the data were abnormally distributed, (Shapiro Wilks p<.001 in each case), non-parametric statistics were used for comparisons.

Table 2-4: Length of stay for those on the admission list

		Valid N	Median	Minimum	Maximum	Range
Children	Length of Stay	689	10	0	140	140
Adults	Length of Stay	164	11.5	1	159	158

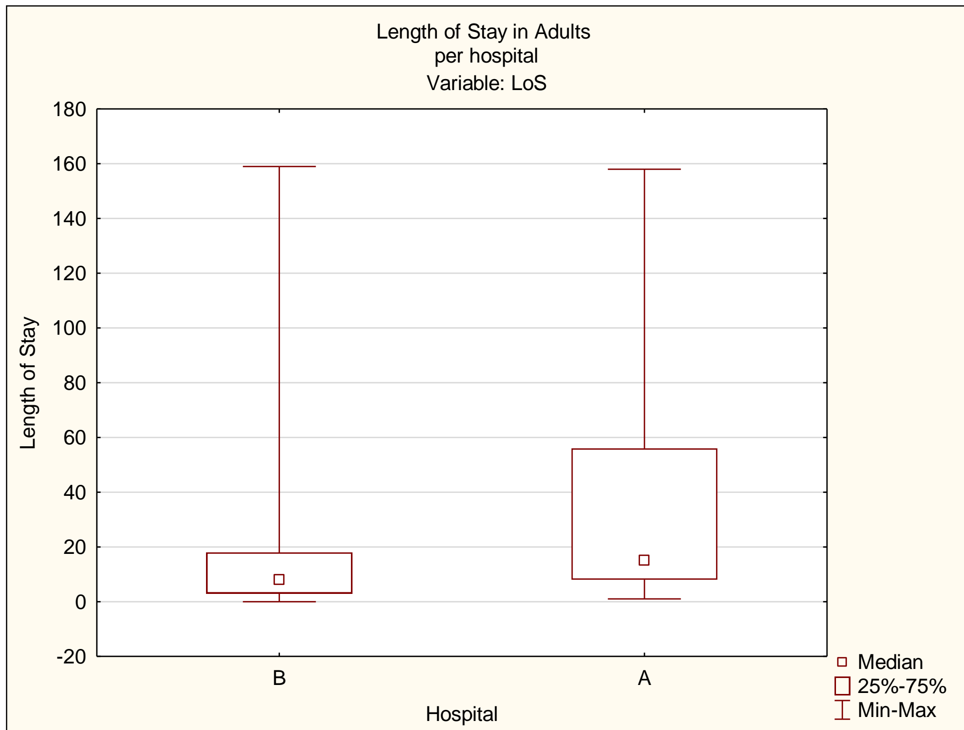
Excluding those who died, N=67 or were transferred N=2. Missing N=4



Children N=689, Adults N=164. Excluding those who died, N=67 or were transferred N=2. Missing N=4

Figure 2-4: Length of stay in days categorised by age group

There was no significant difference in the LoS between the two hospitals (z=-.949, p=0.343) or between children and adults (z=1.1, p=0.275) but the LoS in adults in Hospital A was ranked significantly longer than in Hospital B (z=-3.32, p=.001) (Figure 2-5).



Hospital A N=76; Hospital B N=126.

Figure 2-5: Comparison of length of stay of adults in the two hospitals

2.7 Results of full record review

This subsection describes the burn injuries using data extracted from the medical records reviewed at the participating hospitals.

Table 2-5: Percentage of admitted patients whose folders were retrievable.

	Hospital A			Hospital B			Total		
	Admitted	Folders retrieved	Row % retrieved	Admitted	Folders retrieved	Row % retrieved	Admitted	Folders retrieved	Row % retrieved
Children	430	50	11.6	294	208	70.7	724	258	35.3
Adults	76	58	76.3	126	119	94.4	202	177	90.3
Total	506	108	21.3	420	327	77.9	926	435	47.0

There were 435 records reviewed (47% of all admission list), of which the majority, 327 (75.2%), were from Hospital B (Table 2-5). There were 258 (59.3% of those reviewed) records of children and 177 (40.7%) of adults. The proportion of full records retrieved for children constituted 35% of those on the admissions list and 90% of adults on the admissions list (Table 2-5) and the observed number of reviewed records of children compared to adults was thus significantly less than the expected number (Chi Sq=52.5, $p<0.001$).

Table 2-6: Outcome of admission for children and adults.

		Discharged home	Referred to another Hospital	Death	Row total
Children	Frequency	242	2	12	256
	%	94.5	0.8	4.7	
Adults	Frequency	141	0	36	177
	%	79.7	0.0	20.3	
Total		383	2	48	433

Two children's records were incomplete. Chi Sq=25.7, p<.001 (2X2 table, Referral to another hospital excluded)

Of the 48 patients who died, 36 (75 %) were adults (Table 2-6), a higher proportion of adults succumbed to their injuries (20% compared to 5% in children) (p<.001) and 30 (62.5%) were females. Patient outcome was independent of admitting hospital ((p=.716), and the outcome was not associated with data sourced from the admissions list or the records in either children (Chi-Sq 0.08, p=0.777) or adults (Chi Sq=0.14, p=0.708).

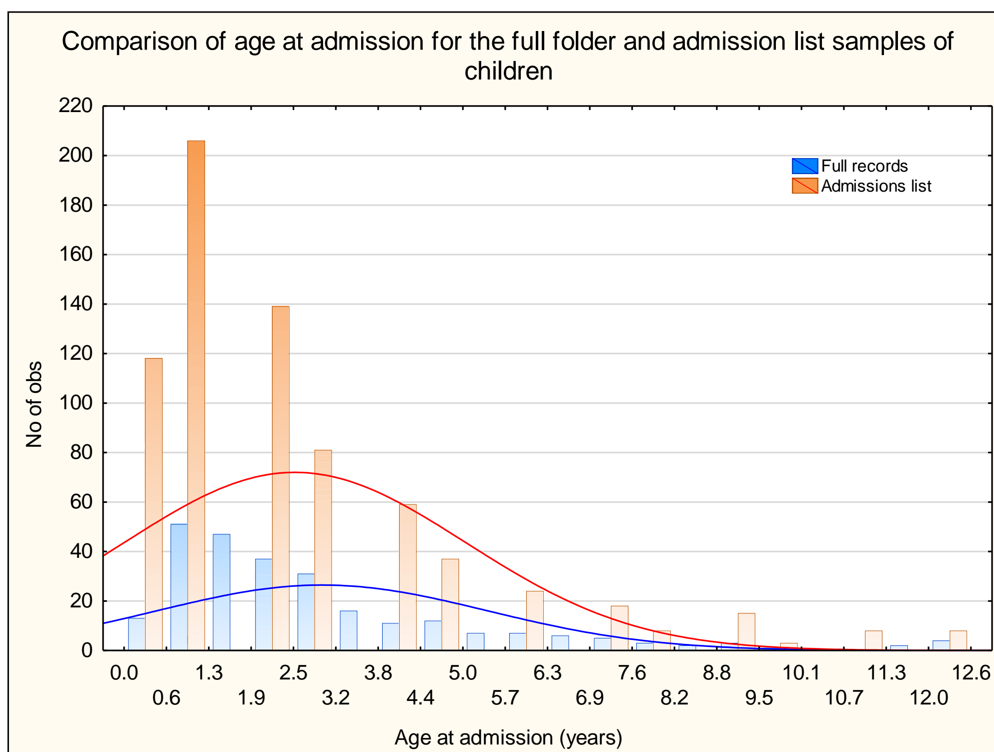
2.7.1 Age and gender

In children, 44.1% were female and in adults, 51.5% were female. These proportions were similar to that of the admissions list and the Chi-square test did not detect any association between sample group in either the children (Chi Sq=.22, p=0.639) or adult (Chi Sq=.02, p=0.888). The age of the adults whose records were reviewed (Table 2-7) was similar to the entire admissions list (Table 2-2) (z=1.17, p=242). Note that a Mann Whitney U test was used although the data were not independent.

Table 2-7: Age in Years for all Patients

		Valid N	Median	Minimum	Maximum	Range
Children	Age at injury (years)	258	2.0	0	12	12
Adults	Age at injury (years)	177	31	13	86	73

There was a difference in rank order in children (z=3.41, p=.001) and inspection of the histogram (Figure 2-6) portraying the ages indicated that the number of children under .6 years of age (7.2 months) were proportionately less than in the full folder sample.



N=294 in Folder review and N=430 in Admission list samples.

Figure 2-6: Comparison of the age at admission between the admission list and the full folder review.

2.7.2 Place of residence

Most of the records were of patients living in Harare Urban area 376 (86.5%), and residence was associated with age category i.e. more children lived in urban areas (p=.046: Table 2-8)

Table 2-8; Residence per Age Group

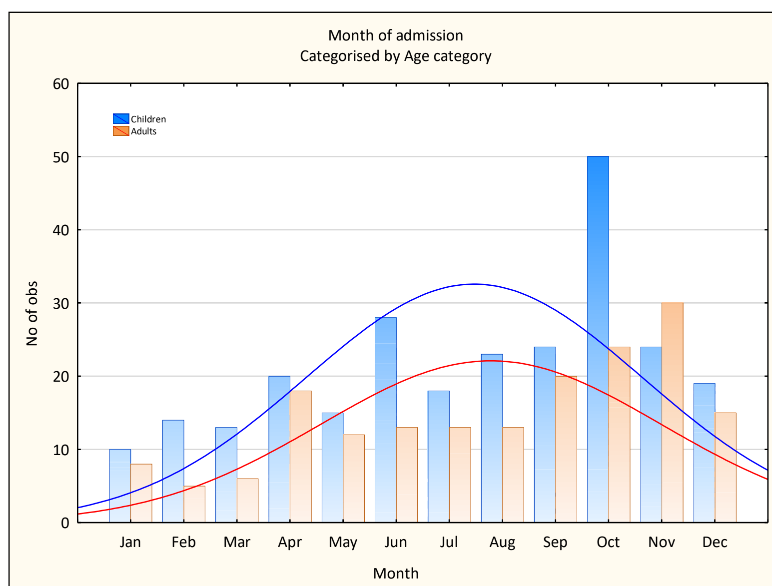
	Residence urban	Residence rural	Row Totals
Children	230	28	258
	89.2%	10.9%	
Adults	146	31	177
	82.5%	17.5%	
Total	376	59	435
	86.4%	13.6%	

Chi Sq= 3.97, p=.046

2.7.3 Month of injury

Seasonality was examined using records spanning one calendar year, from October 2015 to September 2016 (Figure 2-7). Burns in children peaked in October during which 18% of all burns occurred, this was followed by June, mid-winter, (10%). In adults October (14%) and November (17%) were the months of highest incidence.

Figure 2-7: Month of admission categorised by age



N = 278 Children, 177 Adults

Figure 2-8: Month of Burn Injury Occurrence

2.7.4 Aetiology of burns

In children, scalds (212 (82.2%)) were the major cause of burn injuries, whilst in the adults, fire (116 (65.5%)) was the most common cause (Table 2-9 below).

Table 2-9: Aetiology of Burns

Aetiology	Children		Adults		Total	%
	N	%	N	%	N	%
Scalds	212	82.8	46	26.0	258	59.6
Fire	36	14.1	116	65.5	152	35.1
Chemical	5	2.0	2	1.1	7	1.6
Electrical	2	0.8	10	5.6	12	2.8
Contact	1	0.4	3	1.7	4	0.9
Total	256		177		433	

All burns for children were reported as being accidental, whereas, for adults, accidental burns contributed 138 (78.4%) of all adult admissions for burn injury. Of these, three were work-related. Intentional abuse or assault through fire was responsible for 22 (12.4%) of adult injuries. The remainder of the burn injuries were self-inflicted (para-suicide) (16, or 9% of all records) Gender was not associated with circumstances leading to burns (Table 2-10) in the adult population (Chi Sq=2.44; p=0.295).

Table 2-10: Circumstances surrounding the burn incident in Adult Population

Gender	Accidental	Intentional assault	Self-inflicted	Total
Female	68	10	11	89
Row Percent	76.4%	11.2%	12.4%	
Males	70	12	5	87
Row Percent	80.5%	13.8%	5.8%	
Totals	138	22	16	176

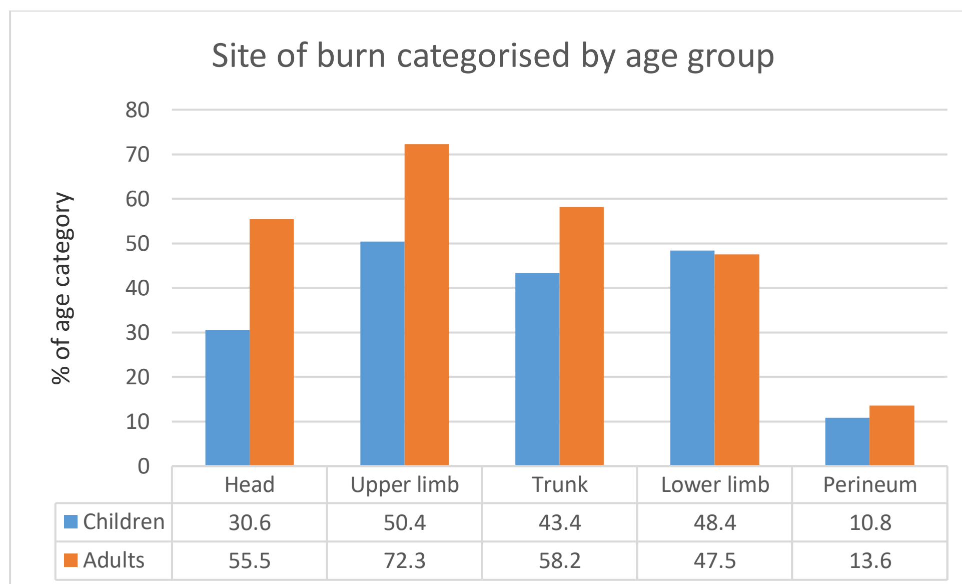
N=176, 1 missing. Chi Sq=2.44, p=.295

Of the 47 patients that died, 41 (85.4%) of the burns were caused by the open fire.

All but six incidents took place at home and these included two industrial settings, three farm locations and one recreational setting.

2.7.5 Site and depth of burns

The most common injury site was the upper limb in both children and adults, followed by the lower limb in children and the trunk in adults (Figure 2-9).



N Records: Children =238, Adults =172 (5 missing). Note that more than one site may have been burned
N sites Children=474, Adults =437.

Figure 2-9: Site of burn injury

Forty percent of children and 20% of adults had burns at a single site, with 22.5% of children and 43.5% of adults sustaining burns to three or more sites (

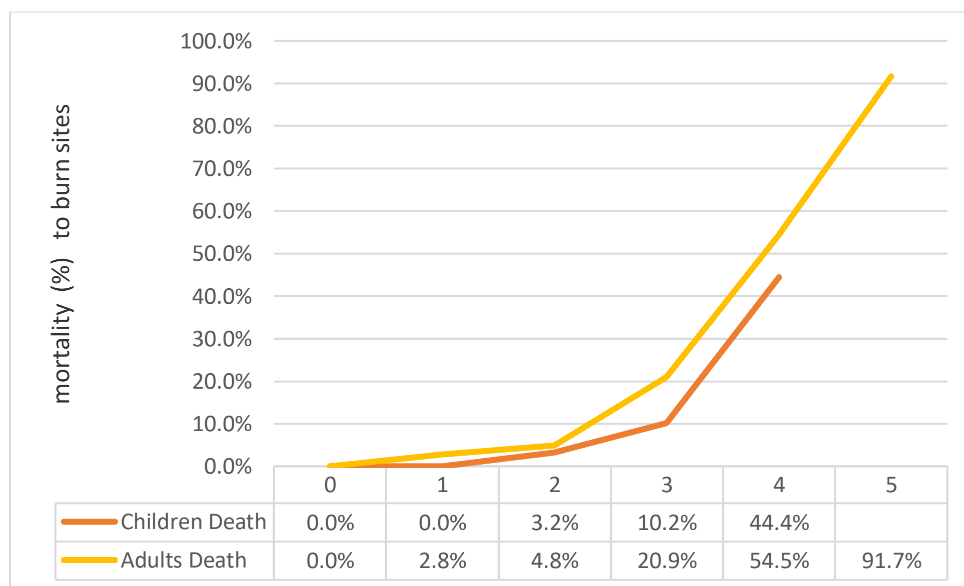
Table 2-11).

Table 2-11: Number of burn sites

	Children				Adults			
Number of sites	N	%	Cumulative N	Cumulative %	Count	%	Cumulative N	Cumulative %
Missing	3	1.2	3	1.2	2	1.1	2	1.1
1	103	39.9	106	41.1	36	20.3	38	21.4
2	94	36.4	200	77.5	62	35	100	56.4
3	49	19	249	96.5	43	24.3	143	80.7
4	9	3.5	258	100	22	12.4	165	93.1
5	0	0	258	100	12	6.8	177	99.9
	258				177			

N Records: Children =238, Adults =172, Missing= 5 N Sites: Children=474, Adults =437.

The number of sites was associated with mortality in both children (Chi Sq=43.58, p<.001) and adults (Chi Sq=70.1, p<.001). Mortality rate rose in those with three or more burn sites, rising to 44% and 54.5% in children and adults respectively, with four burn sites (Figure 2-10).



Children =238, Adults =172 (Missing= 5)

Figure 2-10: Outcome in children and adults per number of burn sites.

2.7.6 Depth of burn injury per age category

There was a significant difference in the frequencies of superficial, partial and full depth burns, with the adults sustaining more severe burns (Table 2-12)

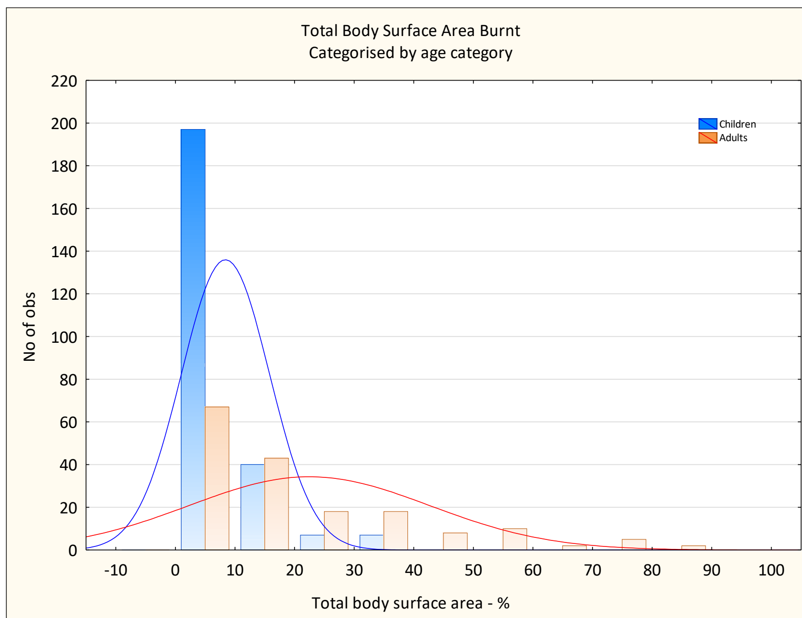
Table 2-12: Depth of burn injury per age category.

	Superficial	Partial	Full	Row Totals
Children	48	179	26	253
Row %	19.0%	70.8%	10.3%	
Adults	23	114	35	172
Row %	13.4%	66.3%	20.3%	
Totals	71	293	61	425

Chi Sq=9.46, p=.009

2.7.7 Percentage of Burn (TBSA) and Outcome

As can be seen in Figure 2-11, most children (77.7%) and about one-third of the adults (37.6%) had burns which covered less than 10% of TBSA. The mean TBSA of children was 8.3% (SD 7.4%) and this was significantly less than that of adults (Mean=22.3%, SD 20.1%) t (d_)=8.77, p<.001). Given that the data were skewed as shown in Fig 2.11, the use of mean (SD) & t-tests may not be appropriate.



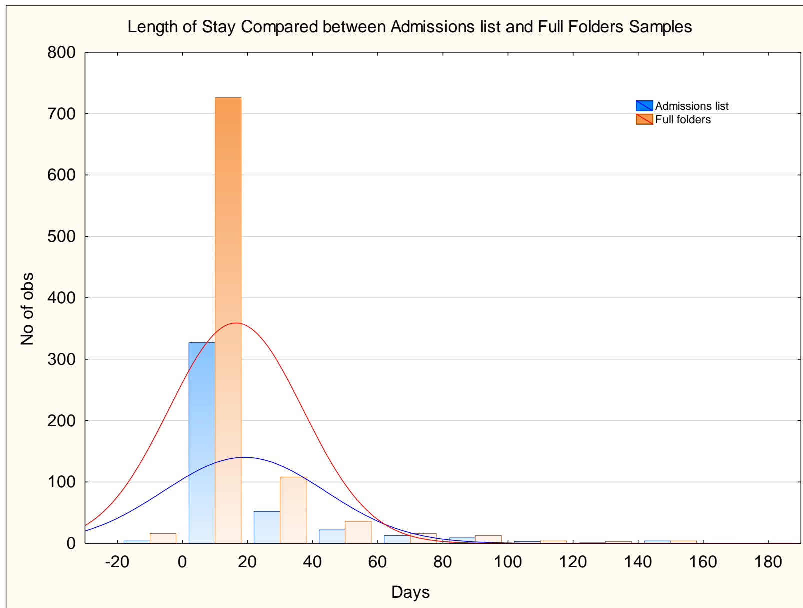
Children N=251 (7 missing information), Adults N=173 (2 missing information)

Figure 2-11: Total Body Surface Area burnt per age category

The mortality rate increased with increasing TBSA burned, and most children with a TBSA of greater than 21% died (7/11), whereas all adults with a TBSA of over 41% died.

2.7.8 Factors associated with Length of Stay

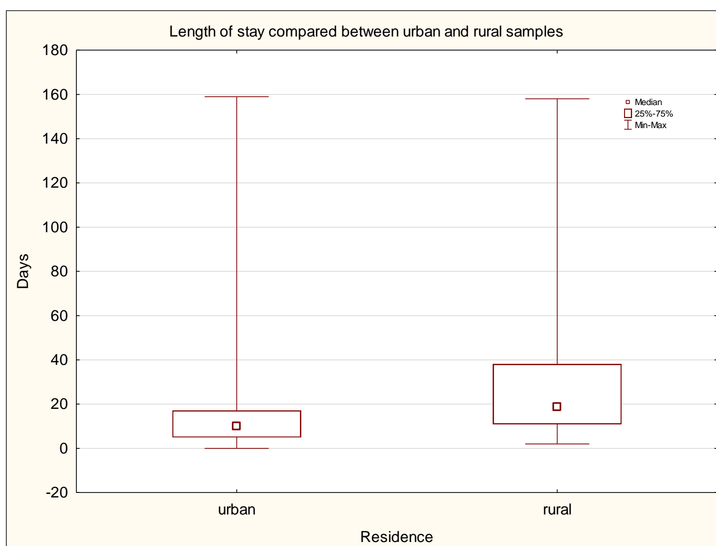
As the LoS was not normally distributed with several outliers resulting in a skewed curve, (K-S d=.273, p<.01; Lilliefors p<.01) (Figure 2-12) non-parametric statistics were used to examine the factors associated with increased LoS.



Excluding those who died. Admissions list=N=926, Full folder =435. X <= Category Boundary

Figure 2-12: Comparison of Length of stay between the Admission List and Full Folder Samples.

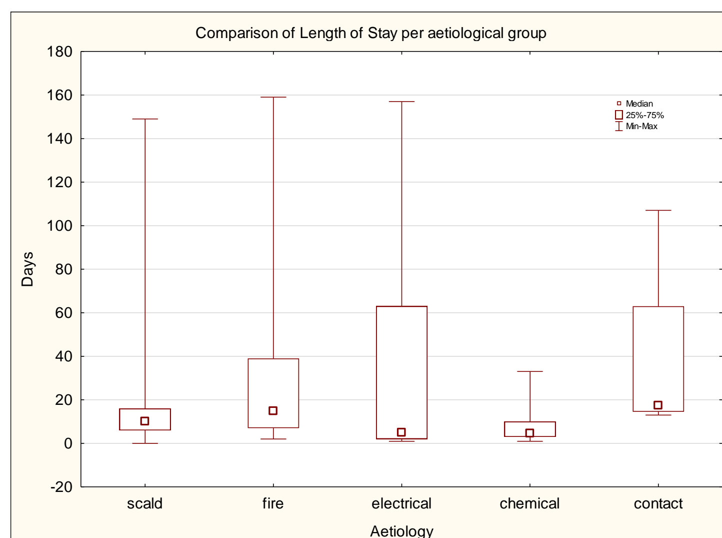
There was no difference in the rank ordering of LoS between the full folder sample and the admission lists sample (z=-.748, p=.455, note that samples were not independent), adults and children (z=-1.217, 0=.2233) or males and females (z=1.321, p=.186).



Urban N= 349 Rural N=38 Died N=48

Figure 2-13: Comparison of LoS between urban and rural participants

Participants from rural areas stayed longer than did those from urban areas (z=-3.582, p<.001; Figure 2-13).



Scald N=255, Fire =111, Electrical N=9, Chemical N=6, Contact N=4, Died N=48

Figure 2-14 : Comparison of Length of Stay between aetiological groups

There was a significant difference in length of stay associated with different aetiological causes of burns (H (4, N= 385) =21.86716 p <.001), with direct contact with the heat source resulting in the longest stay, followed by burns from an open fire (Figure 2-14).

There was a moderate positive correlation (*r = 0.402, p<.001)* between LoS and TBSA, indicating that the larger the TBSA involved, the longer LoS.

2.7.9 Summary of Results

There was a clear difference in presentation between children and adults, with children constituting over three-quarters of all admissions, but with less severe injuries. The typical profile of a child with burns injuries that emerged was thus of; a toddler of fewer than two years of age, from an urban area, more likely to be male, more likely to have sustained an accidental scald burn in October or June, and was likely to have partial burns to the upper limb, head, trunk and lower limb with the involvement of three or fewer sites. The TBSA was likely to be 16% or less (86% of children were in this category). If three or more sites are involved or if the child had a greater TBSA of 21%, there was a high likelihood that he would not survive. On average, the burnt children stayed in the hospital for twenty days or less, the longest stay was up to 140 days.

The profile of adult patients was not as clear. The patient; may be of either gender, ≤40 years of age, an urban resident, may have sustained burns between September and December, and most likely to have sustained a fire burn, or possibly a scald by hot liquids. Although they are most likely to have sustained an accidental burn, they may well have been the victim of intentional assault or self-inflicted burns. They may have partial or full-thickness burns to the upper limb, but the head, trunk, and lower limbs may also be burnt. Further, adult patients were likely to have burns to two or more sites, and if three or more sites were involved, the mortality rate increased. They are likely to have a

TBSA of 41% or less (82.5% have less) and stay in the hospital for 20 days or more with a range from one to 158 days.

2.8 Discussion

This chapter explored the epidemiology, aetiology, and presentation of all patients admitted to the two central hospitals in Harare, Zimbabwe. In general, the findings were similar to those published internationally in both high and low-income countries[8,10,11,68–70]. As has been reported in other low-income countries[6,11,15,71], burn injury in our sample was a significant contributor to both morbidity and mortality with approximately two admissions per day and a mortality rate of 7.2%.

2.8.1 Generalisability of results.

Inadequate record management in one of the hospitals made it impossible to access the records of all patients admitted, and this is a deficiency in the administration for the hospital which needs to be addressed by hospital authorities. As the retrieval rate was so much lower in children in Hospital A, it was necessary to determine if the samples from the two hospitals were equivalent or if there was any systematic bias evident in the folders that were not retrievable. We, therefore, compared the information that could be harvested from the admission list and compared it to the information from retrieved folders of which many were included in both data sets. We found no significant difference between the two samples regarding; age, gender, or length of stay in either children or adults between these two samples. Folders that were not accessible might have been the records of those children and adults with less severe injuries, we also compared the TBSA between the two hospitals as Hospital A had a higher number of missing folders of children. We could not find evidence of this as there was no significant difference in TBSA or depth of burn-in either children or adults between the two hospitals. Also, the mean LoS was shorter in Hospital A in children and longer in adults, which would indicate this sample was not systematically biased towards more severely injured patients. We, therefore, concluded that the sample was representative of patients admitted with burns to Central Hospitals in Harare.

Although the Central Hospitals are referral centres for the whole of the North of Zimbabwe, there were relatively few children or adults from rural areas in the records sample although, in 2016, the majority of Zimbabweans, 67.6%, lived in rural areas[34]. This might indicate that district hospitals manage many burn injuries and that only the more severe injuries are referred to the tertiary hospitals. This is borne out by the higher proportion of adults than children drawn from rural areas evident in the sample, and adults did have more severe injuries (see below). Another factor may be the current trend of rural to urban migration due to high levels of poverty, unemployment, and people seeking informal jobs in Harare. There has been a recent increase in informal settlements in Zimbabwe, which may contribute to the larger number of urban patients admitted.

The epidemiology and aetiology of burns reported in this chapter may, therefore not be as relevant to burns injuries to people in rural areas. However, it is unlikely that any physiotherapy guidelines developed from the urban sample will not also be relevant to the management of burns in smaller, secondary hospitals. However, contextualisation of recommendations needs to take account of differences between urban and rural service delivery issues, as rural districts are unlikely to have as many resources as tertiary hospitals.

2.8.2 Age and gender

These results are comparable to those of other sub-Saharan countries with similar economic characteristics to Zimbabwe[5,6,15]. Children are particularly at risk, and children under the age of 14 accounted for most burns admissions in South African [6,14] and Ghana[5]. In Ghana, children less than ten years accounted for 53.5% of all burn admissions [5]. A similar trend has been reported elsewhere; in Turkey, children younger than five accounted for 44.6% of the burn admissions[55]. It is clear from the above studies that children bear much of the burden of burn injury, not only in Zimbabwe but in other low- to middle-income countries. This is not surprising as Zimbabwe has a young population, with 42% of the population less than 14 years of age at the beginning of 2017[32]. The admissions lists revealed that the majority of burns were in children below the age of 40 months, with 50% being less than two years old, a finding congruent with studies done in South Africa[6,72]and in Israel[69] in which respectively 36% and 24% of burns admissions were under the age of 24 months. As at this age a child develops mobility but may not yet be able to comprehend the danger of heating sources, this finding also makes intuitive sense. This information highlights the importance of including burn prevention education in primary health and rehabilitation education. It might also point to the need to support parents who may feel guilt at not preventing the burns from happening.

In a retrospective study of fatal burns at Mpilo Central Hospital, 49 patients died during three years with paediatrics consisting of the majority (61% of those who died) [47]. Mzezwa et al.. (1999) reported an overall mortality rate of 22%, but the sample consisted of patients admitted to Burns Units at Harare Central Hospital and did not include those admitted to general or surgical wards. This may account for the higher prevalence of mortality than in this study, in which the overall mortality rate was 7.4%. The pattern has, however, altered with a greater proportion of adults succumbing to their injuries (19%) than children (4.3%), and deaths in children amounting to 45% of the total. It is difficult to speculate on the reasons for the changes seen.

2.8.3 Aetiology

The number of intentional assault victims was approximately the same across the genders, but females had twice the incidence of self-inflicted burns. This is a similar finding of a prospective study at HCH on attempted suicide or suicide during four years to which 68% of the 47 patients died[43]. All the patients in that study doused themselves with paraffin or petrol, with the majority of them being female (89%)[43]. In terms of the guidelines, the rehabilitation therapist needs to be aware of the aetiology of the burn injury as retelling an experience of assault or parasuicidal attempt could be extremely emotionally disturbing.

As with several other studies in sub-Saharan Africa [14] and elsewhere[69], scalds with hot liquid were the predominant cause of burns in this record review. Children in their toddler years, explore the environment and may knock over pots and a kettle as cooking is done mostly on the floor. Due to the increasing price of electricity and its erratic availability in Zimbabwe, people tend to cook with one plate gas stoves and open fires on the floor which are easily reached or knocked over by children leading to burns [6,7,14,73]. The situation in Zimbabwe is currently just as described by Parbhoo et al. (2010)[60], "In developing countries, where overcrowded informal housing settlements and lack of access to utilities predominates, scalding occurred when a pot or vessel of boiling liquid on a fire, or gas stove at ground level, was knocked over"[60] (p167). In addition, the literature reports that in

Harare, most of the burns occur at night (1800 hrs – 2400 hrs) under the supervision of the mother[50]. In another study by Chikwanha [49], she concurred with the previous study as most of the paediatric occurred in the home environment with the caregivers around[49]. The highest risk for burns was staying in a single room used for both cooking and sleeping[49].

These injuries, therefore arise directly out of environmental factors and are preventable [74]. Therefore, therapists need to factor in preventative strategies as part of community-based rehabilitation activities, particularly in under-resourced over-crowded areas. Secondly, parents may blame themselves for their child's injury and may carry a burden of guilt, which may need to be addressed by the physiotherapist through counselling[75], initiating a support group for parents or referral to other appropriate services.

In contrast, flame injuries were the most predominant cause of burns in the adult population, similar to most studies[6,11,71]. Despite the majority of burns in adults being accidental, intentional and self-inflicted were also common in the adult population. Self-inflicted burns are usually associated with females[15,43], but contrary to these studies, the prevalence of these types of burns was similar between males and females (although there were more females than males affected it was not statistically significant). The proportion of self-inflicted injuries was 16%, which is slightly higher than the rate of the 41% over three years reported by Mzezewa et al. (1999)[15]. The higher proportion of men than expected may be attributed to increasing poverty in Zimbabwe, as men may succumb to the pressures of not being able to fulfil the role of breadwinners in their families. The implication of this for Zimbabwean guidelines is that appropriate counselling and psychological support should be made available to the survivors of the para-suicide attempts.

2.8.4 The severity of burn injury and LoS

Although the median length of stay was the same in children and adults, 20% of adults sustained injuries to four of more body areas, compared to 3.5% of children. Similarly, the mean TBSA of adults was significantly higher than in children. In addition, the mortality rate was significantly higher in adults (19% compared to 4%), and the LoS was calculated with the exclusion of those who died. A higher TBSA in the adults can be partly attributable to the burns being self-inflicted or intentional where the perpetrator wants to inflict much damage as possible[15,43], compared to the paediatric patients in which causes were all accidental. Trunk and lower limbs were more common in the adult and were of a higher severity hence three-quarters of the whole population who died were adults.

This has implications for guidelines as, in general, children may have less residual disfigurement and impairment than adults. On the other hand, scars on joints and limbs that are still developing may result in more disability. Approximately a third of all children and half of the adults had head injuries, which might have included the face. As facial scarring may lead to social stigma[76], these patients may also require ongoing social support and counselling. More than half the patients had upper limb injuries, which are likely to lead to a limited range of movement in the shoulder and elbow and possible wrist and finger contractures. Close collaboration with occupational therapists to minimise contractures and achieve optimal hand function will be necessary. Evidenced-based methods of maintaining joint range and improving function should be included in the guidelines. In those with

trunk and lower limb injuries, (just under half of the patients), posture and gait re-education will be essential, and the guidelines will need to address the most effective way to achieve these.

2.8.5 Limitations

Although they were missing records, it did, however, appear that the sample of records available was representative of all admissions. As may be the case with retrospective studies, there was missing information in some records due to poorly maintained records. A prospective study design, along with an education program to improve record quality; may increase capture rates and better-quality data.

It would have been preferable to sample central referral hospitals in other parts of the country and to examine the records of provincial and district hospitals; a comparison between these might have yielded useful information. In addition, the study did not capture burn patients who did not present to the hospital. Environmental and health risk factors that may have contributed to burns such as unsafe home conditions, epilepsy, or insufficient child supervision were also not explored. However, funding and time constraints did not allow for such extensive data collection, and it is acknowledged that the results may not be generalisable to all burn injuries in Zimbabwe.

2.9 Conclusion and recommendations

This chapter demonstrated that burns were prevalent in both children and adults, and that there is an urgent need to consider best practice recommendations for rehabilitation to ensure that all burns victims had a good chance of recovery. The difference in aetiology and presentation between burns in children and adults was highlighted, and this information points to the need to have different guidelines concerning physiotherapy management. There is a great need for education regarding the prevention of burns[60], and an initiative similar to those of the South African Burn Society may well apply to the Zimbabwean situation as the epidemiology of burns appears to be similar. The introduction of training for burn prevention at schools may also be productive, using such curriculum such as that developed by the National Fire Protection Association adapted for South Africa "Learn Not to Burn®" A fire safety programme of the NFPA®, Preschool Programme, South Africa [77].

The location and depth of injuries will need to be considered when best evidence practice is included in the guidelines to minimise contracture and maximise function. Information relating to the long-term outcome of those patients discharged home will also inform the most effective intervention and this is studied in the following chapter. The key characteristics of patients with burns were established including demographic and medical factors. This will inform the guidelines in establishing the background of burns in Zimbabwe.

Recommendations for clinical practice will include the different types of management for the different age groups, as the causes, LOS, sites, and severity differ. Compassionate and appropriate referrals due to the different causes of the burns are needed, not only for the patients but for the caregivers and family. Policies on burn prevention should be developed by the relevant authorities. Future research in the effectiveness of health promotion is needed, including qualitative studies with burns victims exploring their lived experience of their management and their roads, such as the studies by Chirongoma et al., 2017[50] Chiwaridzo et al., 2016[51]. Hence this section is a vital stepping stone in establishing guidelines.

Chapter 3. Post-discharge follow-up: Access to rehabilitation in all patients and impact on HRQoL in adults with burn injuries

3.1 Background

To develop appropriate guidelines, the long-term impact of the injury on the patients was explored. Although the acute presentation of burn injuries is likely to be similar to that described in the literature, the medium- to long-term impact on impairments and functioning, which is more likely to be affected by the management received, has not been explored in low-income countries. For example, patients with burns from rural areas tend to have deeper and more severe burns[78]; their burns are likely to have a greater functional impact and may require different approaches to intervention[79,80]. As is often the case in under-resourced settings, there is often the least information available relating to those most in need of care. Besides a recent study in East Africa, little is known about the outcomes for children and adults who have had severe burn injuries in resource-limited and rural locations of low-income countries. It has been suggested that the International Classification of Impairments, Disability and Health (ICF) of the WHO provides a useful framework within which to explore the functional impact of burn injuries[81].

The impact of deep partial and full-thickness burns is not restricted to the acute hospital stage. Severe burns can reduce the quality of life (QoL) for the patient's beyond discharge from hospital[82]. The adverse effects of inflammation such as prolonged oedema can aggravate symptoms and potentially lead to hypertrophic scarring and delay in wound healing. In cases where there is the disruption of wound healing, contracture formation occurs due to secondary intention[83]. Secondary intention refers to healing of an open wound, from the base upwards, by laying down new tissues[84]. It is fundamental to wound reconstruction and but undesirable because of the irregularity of the results[85]. Burns can cause severe pain in the acute phase as damaged tissue repair. In the chronic phase as tissues regenerate, burns can cause secondary complications such as disfigurement, contractures and scar tissue formation which is problematic if it occurs across joints [5,6,11].

Long-term problems for burns include; persistent skin problems (e.g. scarring and contractures, itching), disturbed sleep, poor body image and adverse psychosocial outcomes[86]. Persistent muscle weakness has been reported in patients with burns over 35% TBSA after six months post burns and can be present up to nine months after the injury for no exercise burned patients[87]. Muscle weakness is partially evident during immobilisation in the acute stage which results in deconditioning and loss of muscle strength and mass. Weakness can be associated with a decrease in quality of life and functional ability in adults and children[87,88]. In adults, the majority of burn survivors may be in the most productive years of their life (30 – 55 years), and the functional impairments associated with a burn injury may negatively impact on their ability to return to paid employment and to support their family financially. [89] Other sequelae may include reduced exercise tolerance[37] and post-traumatic stress disorder[36].

In the light of these long-term sequelae, there is a need to provide supportive rehabilitation management post-hospital discharge[90]. As reported in Chapter 2, 14% of admissions to the Central Hospitals in Zimbabwe were drawn from rural areas and it may be assumed these patients had burns

severe enough to warrant referral to the tertiary institution. As the access to rehabilitation services is likely to be more limited in rural areas, it is important to review existing guidelines and determine what amendments are necessary to ensure that the rehabilitative intervention is both feasible and effective.

A considerable amount of published research on sequelae originates from high-income countries[36,82,91,92]. Unfortunately, there is little reported in LIC, although the impact in LIC might be greater due to reduced capacity to provide the most effective short- and long-term medical and rehabilitation interventions. No empirical evidence regarding the long-term problems experienced in Zimbabwe was found during a literature search in Pub Med including the keywords “Burns” AND “Zimbabwe” apart from a paper reporting on the management of contractures published in 1992 [45]. This chapter sought to provide this evidence by documenting the problems experienced by burn survivors to inform the guidelines regarding post-discharge and out-patient management.

Patients identified during the epidemiological study described in Chapter 2 were followed up to determine the medium- and long-term impact of burns. This phase aimed to determine the medium- to the long-term impact of the burn injury on the participants, and the specific objectives of this chapter were: In a group of adults and children discharged from central hospitals:

- To investigate access to and utilisation of follow up care, in terms of physiotherapy received, referral to other institutions or home programme administered.
- To examine HRQoL and functional limitations using the Burn Specific Health Scale (BSHC) in a small sample of adults. As function in children is linked to developmental stages and norms change with age, many scales, such as the Bayley Scale of Infant Development require specific training to administer. Functional data were thus not collected in children by the researcher who is not a paediatric physical therapist.

3.2 Methodology

A cross-sectional descriptive design based on interviews with people who survived major burns trauma was utilised.

3.2.1 Sample

Convenience sampling was done for both children and adults, drawn from those identified in the study on the epidemiology of burns described in Chapter 2. As described in section 2.5.1 all patients with burns of any age presenting to the adult surgical, paediatric wards or Burns’ Units at the two central hospitals for first-time admission were eligible for inclusion in the study providing that their records were available. All patients with burns between the periods 1 October 2015 to 31 December 2016 were included in the study if they had survived to discharge and met the inclusion criteria.

The inclusion criteria were:

- Records available

- One year of age and older admitted to HCH or PGH
- Diagnosed with either deep partial or full-thickness burns and a greater than 25% total body surface area (TBSA) in adults or 10% in children (defined as a major burn)[17] were eligible for inclusion in the study. This depth of burn is more likely to lead to residual disability, and was, therefore, one of the inclusion criteria.
- Discharged at least three months before the interview to allow for documentation of the functional problems experienced in the medium-term and long-term secondary to the burn injuries.

The exclusion criteria were:

- The potential participants or their parents/caregivers must have been contactable, i.e. have either a functioning cell phone number or a postal address at which they could be reached.
- As funding and time were constrained and for logistical purposes, the participants need to be resident in a radius of 30 km from Harare province to facilitate data gathering.
- Participants whose records reflected that they had sustained burns during an accident in which other people died because of the trauma were excluded as the interview might be too distressing.

3.2.2 Instrumentation

A self-designed data collection sheet (Appendix IX) was used to gather information on the demographic data, medical data and rehabilitation history. Medical details were taken from the data gathered from the epidemiological section of the study (Chapter 2).

Two of the most commonly utilised[93] HRQoL measures were utilised to measure the health related quality of life, the EQ-5D-3L (Appendix X) and the Burns Specific Health Scale (BSHS) (Appendix XI). The EQ-5D-3L is a generic health-related quality of life instrument that has been translated into Shona (a Zimbabwean native language) [94] and validated [95]. The Shona version has good measurement properties when used as an outcome measure in people living with HIV in Zimbabwe [96], but has never been used in a burns population. The EQ-5D-3L consists of a descriptor section with five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression, scored on three levels. The second part has a visual analogue scale (VAS) ranging from 0 to 100, on which participants are asked to score their HRQoL.

The BSHS for adults' instrument was used to collect data on the quality of life of patients with burns. It was developed in Sweden and validated for use in Finnish and Spanish. A revised version was also found to be a useful outcome measure in Brazil for use with patients who had burn injuries. A study by Ferreira et al. (2008)[97] developed an abbreviated version based on psychometric analysis of the different domains, the BSHS-Brief, and this was used in the current study[98]. It consists of 40-items separated into nine clinically meaningful domains. A systematic review was undertaken in 2010 [99], and it concluded that the BSHS was the most commonly utilised instrument for measuring HRQoL in patients with burns. After comparing studies using the different versions of the BSHS, the authors

recommended the BSHS-B as they conclude that the BSHS-B version has the best content validity and places the least burden on the respondent[99]. The English version of the BSHS-B was utilised as the translation of the instrument would have been time-consuming and costly (Appendix XI).

3.3 Procedure

Permission was sought from the hospital authorities. Patients who met the inclusion criteria were identified after the Epidemiology study (Chapter 2). The demographic information was obtained from the data collection sheet (Appendix VIII) to retrieve their phone number or address.

Patients with burns identified through the record review were contacted by the researcher either by mail or by cell phone to request their permission for an interview. At this stage, informed consent from the participant, parent (in the case of children) and assent form was obtained telephonically or in the paper copy of the invitation to participate (Appendix XII – XVII (English and Shona versions)).

To maintain confidentiality, it would have been ethically preferable for a third party who had been involved in the care of the potential participant during their hospitalisation to make the first contact. This was a consideration at Hospital B as the researcher had worked in the Burns Unit at Hospital A and had legitimate access to the records here. However, this was not feasible due to the time commitment that would be required by a member of the medical team to phone each of the persons whose records have been retrieved.

To clarify how the researcher had identified the person, the following was included in the Informed Consent Form (Appendix XII) "Because I wanted to find out how many people had burns and how it happened, I went through the records at the hospital and took this information from the folders, including your folder. This was how I came to get your name." As the participant might not wish to participate and might not wish for his/her data to be included in the study, they were given the option of not participating in either study and having the information already gathered removed and not included in analysis.

A date was decided upon and the researcher did a home visit. The referral was done to the nearest hospital or rehabilitation services if additional services were required which might have included counselling if deemed necessary based on the interview.

The EQ-5D-3L and BSHS were administered face to face by the researcher at the residence of the participant. The researcher filled the questionnaires in on behalf of the participant. The Shona EQ–5D–3L took approximately 15 minutes to administer and the English BSHS took approximately 30 minutes as the researcher had to explain the questions to the participants. The participants, and/or parents in the case of children, were asked to sign the Consent or Assent Forms (Appendices XII – XVII (English and Shona versions)).

The data was entered on paper questionnaires and transferred to an Excel Spreadsheet which was password protected. All questionnaires were kept in a locked secure space at HCH and the questionnaires were not coded.

3.3.1 Data analysis

Frequencies were calculated to describe the demographic and medical characteristics of patients with burns. As the Shapiro Wilks test indicated that the data were not normally distributed, Medians

and ranges of age, LoS, TBSA and discharge months were calculated. Frequencies of responses to the two HRQoL instruments were presented (EQ–5D and BSHS). No inferential statistics were undertaken as the number of adults was small and the results unlikely to be generalisable. The Chi-square test was used to determine the association between home programme prescription and age, and the Mann–Whitney U tested whether the TBSA and LoS were significantly different between those who did a home programme and those who did not. Scoring of the BSHS-B was done as reported in the literature, with a score of 0 assigned to “Extreme” difficulty and 4 to “None” [100]. The mean percentage scores were calculated for each item and each domain to facilitate comparison. Scoring of EQ-5D was done as reported in literature[101], as the sample was so small, non-Parametric tests were used. Frequencies of each of the five domains were reported as numbers. The median score of the Visual Analogue Scale was calculated.

3.3.2 Ethical considerations

Participants were allowed to refuse participation both at the initial contact and on the day of the interview. The interviews were done in a private location of their home and strict confidentiality of information was assured. As recounting the burn incident might be distressing, the participants were not asked about this (information was gathered in the epidemiological study). If the participants became distressed at any point, the interview and assessment were temporarily suspended or stopped. Any participant who required further care was referred to the appropriate hospital staff for further management. No participants requested a referral for further management.

3.4 Results

3.4.1 Demographic characteristics

There were 435 full patient folders accessed in the epidemiological stage of the study (Chapter 2). Of these 121 patients met the inclusion criteria of major burns described in section 3.2.1 of this chapter. Of these 121 participants, 71 patients were excluded because they died, lived in the rural areas, were unavailable telephonically or due to lack of a physical (Figure 3-1). Of the 50 eligible, 13 were lost to follow up.

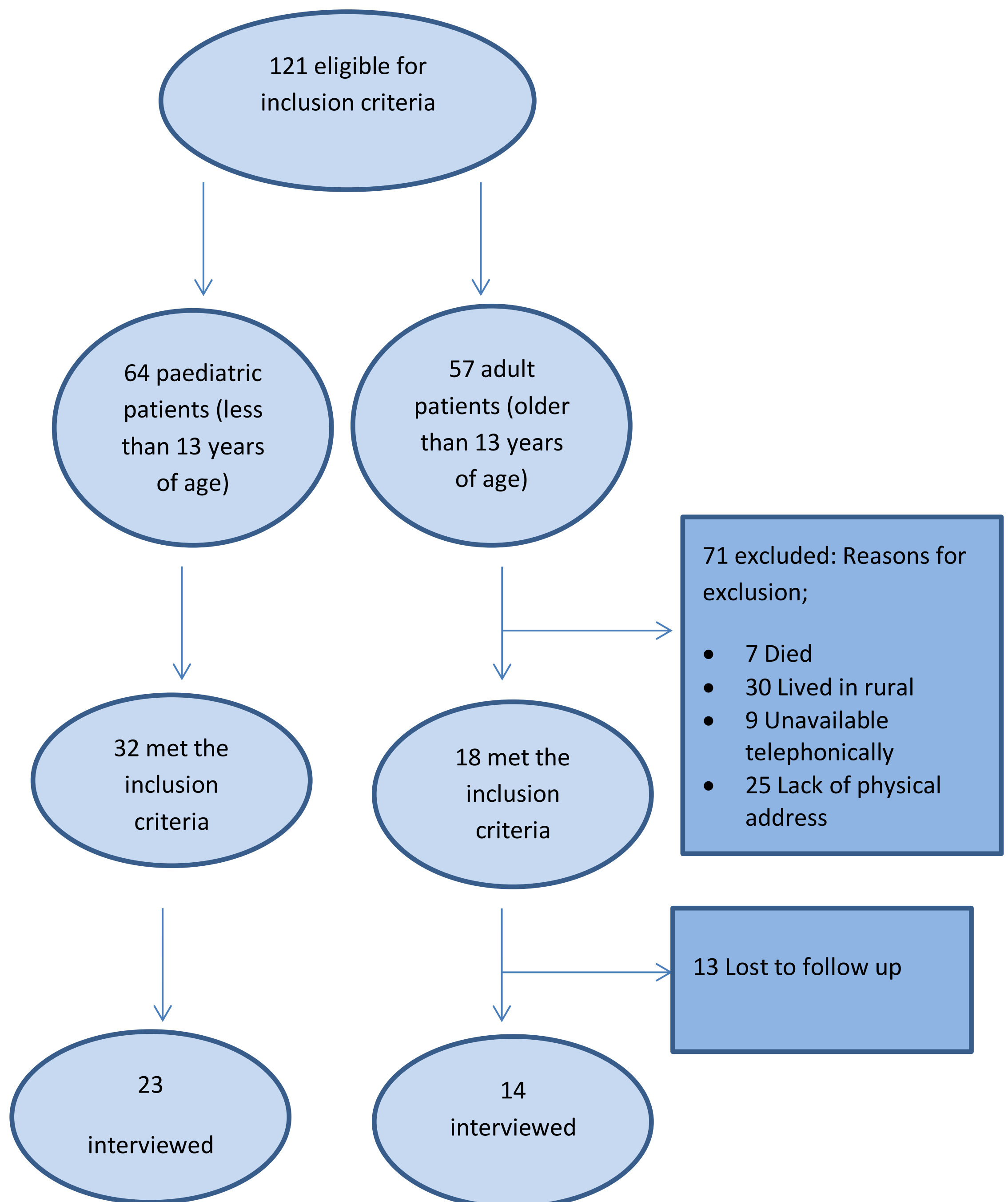
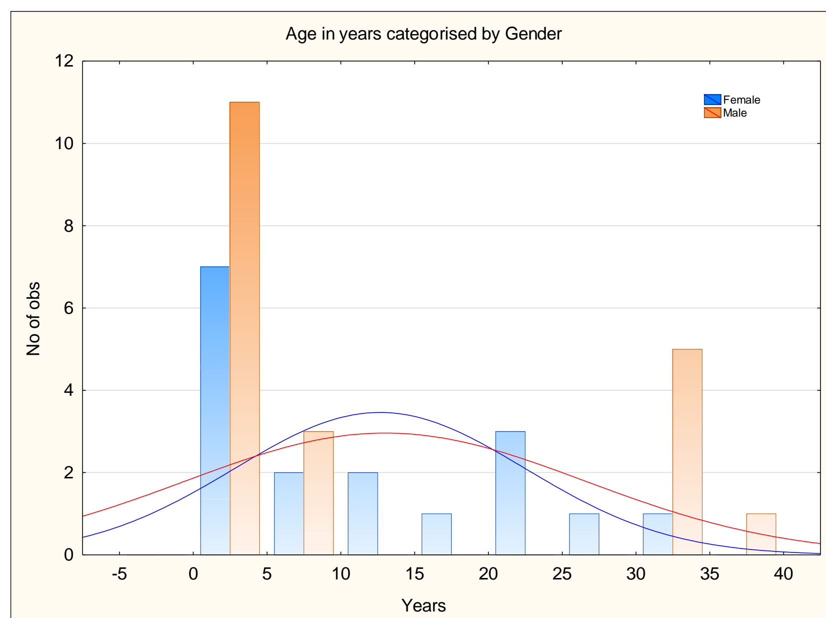


Figure 3-1: Flow Charts of Patients Eligible in the Follow - Up Study

Of the 50 eligible participants, 37 were accessed and interviewed, and of these, 17 (45.9%) were female (Figure 3-1). No-one refused to give informed consent to take part in the study or requested to have their information removed from the hospital based study. The descriptive statistics of the sample are in Table 3-1. The mean age of the sample was 12.74 years and this was not significantly

different between the males and the females (p=.928). However, the histogram in Figure 3-2 indicates that there were more males fewer than five years and over 30 years of age.



Males N =17 Females N=20

Figure 3-2: Histogram of Ages of All Patients

The ages, time from discharge and the TBSA% were not normally distributed (SW<.05 in every case), so non-parametric statistics were used.

Table 3-1: Descriptive Statistics

	N	Median	Minimum	Maximum
Adults (years)	14	28.3	13.0	35.5
Paediatrics (years)	23	3.8	2.2	8.7
Adults –Time from Discharge (months)	14	5.6	3.3	17.5
Paediatrics – Time from Discharge (months)	23	9.0	3.7	25.3
Adults – TBSA (%)	14	31.0	14	41
Paediatrics – TBSA (%)	23	15.0	10	35

The median time from discharge for the whole sample was 8.1 (range=3.3-25.3 months) and there was no statistical difference between children and adults (z=1.86, p=.063) or between males and females (z=.046, p=.964).

3.4.2 Medical characteristics of the sample

There was a significant difference (Z score 4.27; p=0.000) between TBSA for children (median = 15) and adults (median = 32), with adults suffering a higher percentage of TBSA. The sites of burns are given in

Table 3-2 below. A total of 103 areas were burnt. The most common regions burnt were the trunk and upper limbs.

Table 3-2: Site of Burns

	Children		Adults	
	Count	%	Count	N %
Head	6	26.1%	9	64.3%
Upper Limb	13	56.5%	13	92.9%
Trunk	21	91.3%	12	85.7%
Lower Limb	16	69.6%	9	64.3%
Perineum	3	13.0%	1	7.1%

N=23 children N=14 adult respondents. Note that respondents may have had more than one site of injury

Superficial partial-thickness burns accounted for 34 (91.9%) of all the patients; deep partial-thickness burns accounted for the remaining 3 (8.1%). Patients with superficial burns were excluded from the study hence the higher percentage of superficial partial-thickness burns.

3.4.3 Rehabilitation management

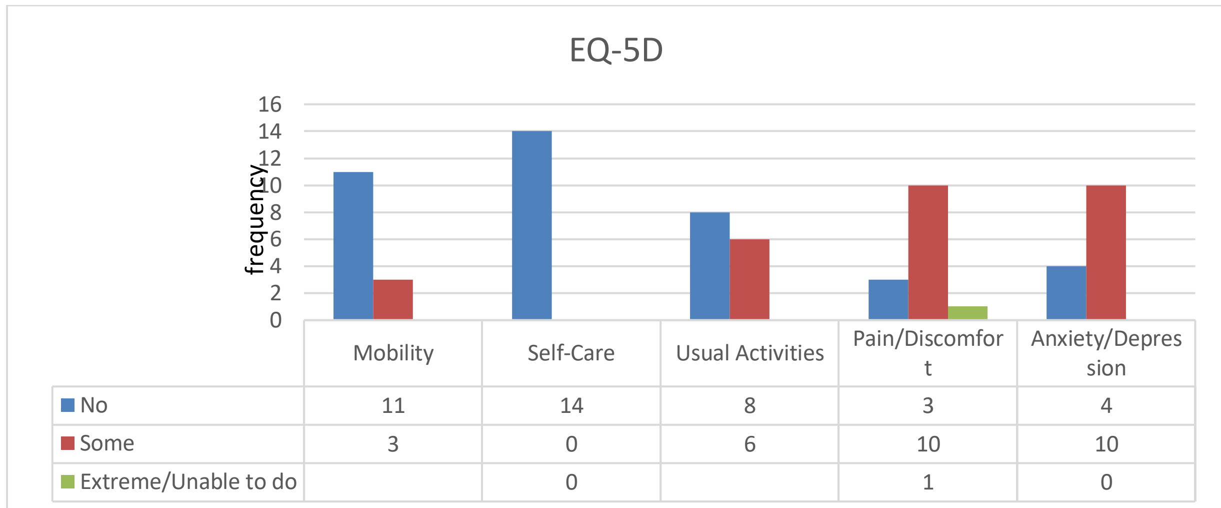
Table 3-3: Follow up of Patients after Discharge

	Children (N=24)		Adults (N=14)	
Home Programme	10	41.7%	12	92.3%
Referral made to nearest Rehabilitation Department	7	29.1%	7	50.0%
Follow-up Rehabilitation received	0	0	1	2.9%

59.5% (22) received a rehabilitation home programme upon discharge from the hospital, and 14 (37.8%) were referred to the rehabilitation department for further treatment. A single patient (2.7%) subsequently received rehabilitation after discharge. Table 3-3 depicts the rehabilitation process categorised by age.

A Mann – Whitney U test indicated that the TBSA for patients with burns who received a home programme was statistically higher than patients with burns who did not receive a home programme. Patients with more severe burns (median score = 25) were likely to be prescribed home exercise programs than those with less severe burns (median score =15); the difference was statistically significant (Z score = 2.33; p= 0.019)). A Mann – Whitney U test indicated no difference in LOS for patients with burns who received a home programme (median = 33) as compared to patients with burns who didn't receive a home programme (median = 16) (Z score = 0.804; p-value = 0.80).

3.4.4 Health-related quality of life – EQ-5D



N=14

Figure 3-3: EQ - 5D: Quality of Life for Adults Patients with burns

As can be seen in Figure 3-3, no respondent reported problems with self-care, whereas ten or more reported problems with pain/discomfort and anxiety/depression. The median score on the EQ-5D Visual Analogue Scale (VAS) of global health state was 23 (range 7-50) on the day of assessment and no association was found between the site or burn (MWU test), the length of stay or the TBSA (Spearman's correlation) and the VAS.

3.4.5 Burn Specific Health Scale for Adults

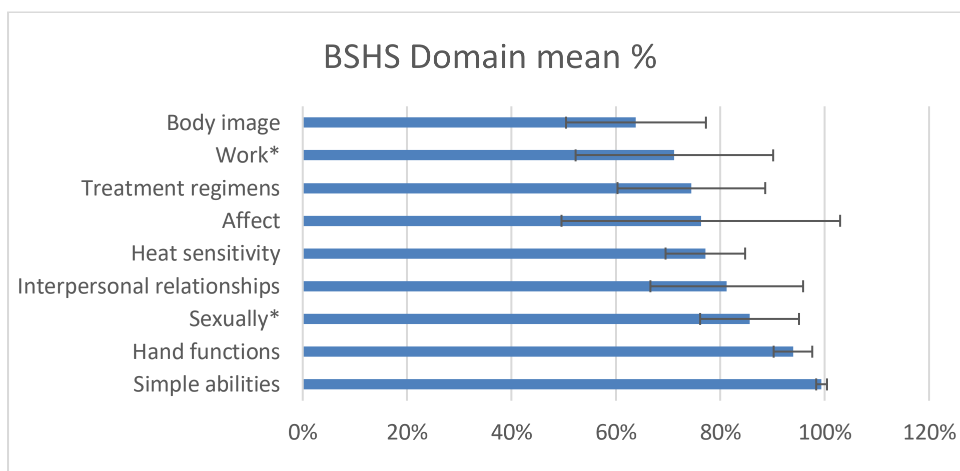
The items that had the lowest mean score were "I have no one to talk about my problems" (21%), "My burn interferes with my work" (50%) and "I feel that my burn is unattractive to others" (50%). These were followed by "I often feel sad or blue", "My general appearance really bothers me", "The appearance of scars bothers me", "Being out in sun bothers me" and "Taking care of my skin is a bother" all scoring between 60 and 65%. As can be seen in Table 3.4 and Figure 3 4 below, the domain with the lowest score was body image, followed by work and treatment regimens. The least problems were reported in the functional items, hand functions and simple abilities.

Table 3-4: Burn Specific Health Scale for Adults

Factor	Extreme	Quite a bit	Mod*	A little bit	None	∑ Score	Mean Score	Mean %	Mean domain %	SD
Score	0	1	2	3	4					
1. Heat sensitivity						Max =56	Max=4		77%	8%
Being out in sun bothers me	0	2	4	6	2	36	2.6	64%		
Hot water bothers me	0	1	3	0	9	43	3.1	77%		
I can't get out and do things in hot weather	0	1	0	8	5	45	3.2	80%		
It bothers me I can't get out in the sun	0	0	0	9	5	47	3.4	84%		
My skin is more sensitivity than before	0	0	0	11	3	45	3.2	80%		
2. Affect						Max =56	Max=4		76%	27%
I often feel sad or blue	0	0	11	0	3	34	2.4	61%		
At times I think I have an emotional problem	0	1	0	3	10	50	3.6	89%		
I am troubled by feelings of loneliness	0	0	0	3	11	53	3.8	95%		
I have feelings of being trapped or caught	0	0	2	3	9	49	3.5	88%		
I don't enjoy visiting people	0	0	2	2	10	50	3.6	89%		
I have no one to talk about my problems	7	5	0	1	1	12	0.9	21%		
I am not tolerated in doing things with my friend	0	0	2	1	11	51	3.6	91%		
3. Hand functions						Max =56	Max=4		94%	4%
Signing your name	1	0	1	0	12	50	3.6	89%		
Eating with utensils	0	0	2	1	11	51	3.6	91%		
Picking up coins from a flat surface	0	0	0	2	12	54	3.9	96%		
Unlocking a door	0	0	1	1	12	53	3.8	95%		
Tying shoelaces or boots	0	0	0	1	13	55	3.9	98%		
4. Treatment regimens						Max =56	Max=4		74%	14%
Taking care of my skin is a bother	0	3	4	3	4	36	2.6	64%		
There are things that I have been told to do for my burn that I dislike doing	0	1	1	4	8	47	3.4	84%		
I wish that I didn't have to do so many things to take care of my burn	0	3	3	1	7	40	2.9	71%		
I have a hard time doing all the things I have been told to take care of my burn	3	1	1	1	8	38	2.7	68%		
Taking care of my burn makes it hard to do other things that are important to me	0	0	1	1	12	53	3.8	95%		
5. Work (N=11)						Max =44	Max=4		71%	19%
My burn interferes with my work	0	2	8	0	1	22	2.0	50%		
Being burned has affected my ability to work	0	0	0	10	1	34	3.1	77%		
My burn has caused	0	0	0	6	5	38	3.5	86%		

Factor	Extreme	Quite a bit	Mod*	A little bit	None	∑ Score	Mean Score	Mean %	Mean domain %	SD
problems with my working in my old job and performing your old duties										
6. Sexuality (N=11)						Max =44	Max=4		86%	9%
I feel frustrated cause I can't be sexually aroused as I used to	0	0	5	1	5	33	3.0	75%		
I am sexually not interested in sex any more	0	0	0	5	6	39	3.5	89%		
I no longer hug, hold or kiss	0	0	0	3	8	41	3.7	93%		
7. Interpersonal relationships						Max=56	Max=4		81%	15%
I don't like the way my family acts around me	0	0	5	6	3	40	2.9	71%		
I would rather be alone than with my family	0	0	0	3	11	53	3.8	95%		
My family would be better off without me	0	0	0	4	10	52	3.7	93%		
My injury has put me further away from my family	0	0	7	5	2	37	2.6	66%		
8. Simple abilities						Max=56	Max=4		99%	1%
Bathing independently	0	0	0	1	13	55	3.9	98%		
Dressing by yourself	0	0	0	0	14	56	4.0	100%		
Getting in and out of a chair	0	0	0	0	14	56	4.0	100%		
9. Body images						Max=56	Max=4		64%	13%
The appearance of scars bothers me	0	0	8	5	1	35	2.5	63%		
My general appearance really bothers me	0	0	9	4	1	34	2.4	61%		
Sometimes I would like to forget that my appearance has changed	0	0	2	6	6	46	3.3	82%		
I feel that my burn is unattractive to others	1	1	10	1	1	28	2.0	50%		

N = 14. Note that questions on work and sexuality were inappropriate for adults less than 18 years, hence the total of 11 respondents Mod=Moderate



*N=14 apart from * N=11, Error bars = Standard Deviation*

Figure 3-4: Mean Domain Scores on the BSHS

3.5 Discussion

3.5.1 Results

This sub-study of the thesis was to establish the referral patterns of patients after burn injury, and to explore the medium- to the long-term impact of burns on the quality of life in adults using the EQ – 5D and BSHS. Unfortunately, the number of eligible participants that could be reached for follow-up was lower than anticipated, and we considered excluding this chapter from the thesis. However, as the purpose of the study was ultimately to inform the amendments of the guidelines, rather than provide generalisable information and certain important trends were detected, it was decided to retain this chapter. The most important findings were the almost complete lack of follow-up rehabilitation care and the HRQoL domains most affected in the participants.

A large number of patients who were lost to follow-up is not surprising as there has been persistent internal migration between urban and rural areas. This has been driven by conflicting forces resulting in movement away from commercial farming jobs due to disruption attendant on the land reform programme. In contrast, hundreds were displaced from the cities by Operation Murambatsvina[b]. Many were forced into rural areas in the short-term, but since they could not survive there, they subsequently returned to the towns. [102]

This dire situation continues, with many people moving from and to urban areas. Further, several of the patients who had given urban addresses may well have been moved to the urban area simply to obtain treatment for their injuries.

[b] Operation Murambatsvina (Restore Order/Clear Out the Trash) was a government sponsored campaign launched to raze informal settlements in urban areas and force people to return to urban areas.

As per the inclusion criteria, those who sustained more severe burn injuries were included. The section was biased towards superficial partial-thickness and deep partial-thickness degree burns as these require to follow up after discharge [103,104]. They were a high prevalence of upper limb burns in the paediatric population and lower limbs in the adult population. Though upper limbs have a low TBSA, evidence shows that emotional functioning at a young age and level of support is compromised with the involvement of the hand and full-thickness injury [105,106]. Adults in the sample had sustained more severe burns in terms of TBSA with all but two reported receiving a home programme on discharge. Prescription of a home exercise program is essential; however, the instructions and contents should be evidenced-based and feasible for the patients to implement within the confines of available resources. The BSHS responses indicated that the participants found it challenging to care for their burn scars as they had been instructed to do so and the domain of treatment regimens was scored the second-lowest.

It was likely that the adult participants needed follow-up care as their burns appeared to be more severe in this sample. However, the number of children sustaining burns over joints would indicate that continued care is necessary for them as well to avoid skin and joint contracture. Disruption in wound healing results in contracture formation due to; secondary intention and the shrinkage of the wound because of contraction of the myofibroblasts [83]. A home programme was provided to all the adults patient. About one-third of the children and half of the adults were referred to rehabilitation departments for follow-up. Unfortunately, only one participant reported receiving rehabilitation care after discharge. There is need for a medium-- and long-term structured exercise and rehabilitation improves the emotional, physical and respiratory functioning in patients with burns [106]. Exercises for burns are usually started three months post-discharge and if there is a lack of follow up, patients are deprived an opportunity to engage in a structured aerobic and strengthening exercise program which can improve their overall well-being [107]. The extremely poor follow up of patients after discharge was very concerning and needs to be addressed [31]. The importance of developing an organized system of care for persons with burns within regions is included in the first recommendation of the ISBI Practice Guidelines for Burn Care. The second recommendation states that this system should provide acute, chronic and rehabilitative care[20].

The lack of teamwork in rehabilitation was evident in this study, in that despite 14 referrals being made for further rehabilitation management; only one respondent did receive any post-discharge care. Zimbabwe appears to fall short of the British Burn Association standards regarding follow-up and communication between the referring therapist and the local rehabilitation worker[108]. This may be due to the lack of human resources in public hospitals in Zimbabwe.

A higher TBSA and increase in age has been linked to; lower QoL[109] particularly in physical function and pain, and it has also been shown to be a chronic burden and decreases quality of HRQoL two years post-burn [110]. Our results seem to support this proposition. This was evident in that the EQ-5D VAS score was very low, with a mean of 23 (range 7-50) compared to studies in South Africa which reported a mean VAS of 66.1, (SD=21.3) in people living with disabilities in rural South Africa,[111] 60.4 (SD=22.1) in those living with HIV in South Africa before antiretroviral treatment (Hughes et al..,2004)[112] and scores of 77.8 (SD=22.7)[113] in isi-Xhosa-speaking individuals in a community based urban sample. The EQ-5D indicated that besides three or four participants, all the adults reported

havening some or severe pain or discomfort and anxiety or depression. It appears that the physical impact in terms of function was less than the effect on emotional well-being. This was borne out by the many respondents reporting moderate agreement with the statement that they often felt “sad or blue”. In addition, the domains of body image and effect were amongst the four lowest-scoring domains in the BSHS, which further highlights the need for psychological support and counselling. Scar formation is one of the major causes of depression, but in LIC, few resources are devoted to cosmetic surgery as it is considered a luxury. Psychological emotions like depression in patients with burns are often neglected[82]. There is an urgent need to invest more in counselling skills among therapists as it has been shown that most burn survivors have difficulties with physical and psychosocial functioning[106]. This was highlighted by the many respondents who indicated that they did not have anyone to talk to regarding problems faced. In the absence of trained counsellors, rehabilitation therapists might need to be upskilled to provide this support.

3.5.2 Limitations of the study

There were several major limitations to the study, most of which reflect the constraints of expertise, time and budget of the researcher. The sample was small as it was confined to those who were contactable and lived in the urban area of Harare. This may have introduced selection bias as those who might have been eligible in terms of burn injury were excluded on the grounds of residence, which may have favoured those with better socio-economic circumstances. The limited travel budget of the researcher also resulted in excluding rural participants. It is, therefore, possible that the most disadvantaged and those with even less access to rehabilitation services [35] were excluded from the study.

It would have been preferable to include data on the functioning and HRQoL of children and this is a limitation of the study which should be addressed in the future. However, the assessment of children should be done by paediatric therapists who are familiar with the instruments that measure function in younger children.

A further limitation is that the nature of the home programmes and the reasons for not receiving follow-up were not explored during the interview. Additionally, the BSHS was not translated into Shona and was not validated. However, the level of education is relatively high in Zimbabwe, particularly in urban areas. UNESCO estimated the adult literacy rate to be 86.4% in 2015, ranked ninth place in Africa[114]. In addition, English is the official language of Zimbabwe. As it appeared to yield intuitively correct and useful information, it would be helpful to translate and validate the instrument for future studies.

3.6 Conclusion

Although flawed, the survey yielded useful take-home messages. The guidelines need to address the lack of post-discharge follow-up rehabilitation for patients with burns; the home exercises should be feasible and acceptable; and the psychological needs of the patients need to be addressed. Future studies should be undertaken to explore the poor follow-up and this be addressed at a policy level with the strengthening of referral systems. The research should be extended to rural areas and the impact of burn injuries on children should be explored.

Chapter 4. Effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns: Systematic review protocol

This chapter includes the full text of the published paper: Mudawarima et al.. Systematic Reviews (2017) 6:207 A systematic review protocol on the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns. DOI 10.1186/s13643-017-0592-6. Permission to include the article in the thesis was given by the Doctoral Degrees Board (see Declaration Page i of the Preliminaries). Note that the references from the article are included in the main list of references in Section 10.

4.1 Abstract

Background: Therapeutic exercises play a crucial role in the management of burn injuries. The broad objective of this review is to systematically evaluate the effectiveness, safety and applicability to low-income countries of therapeutic exercises utilised by physiotherapists to improve function in patients with burns. Population = adults and children/adolescents with burns of any aspect of their bodies. Interventions = any aerobic and/or strength exercises delivered as part of a rehabilitation programme by anyone (e.g. physiotherapists, occupational therapists, nurses, doctors, community workers and patients themselves). Comparators = any comparator. Outcomes = any measure of outcome (e.g. quality of life, pain, muscle strength, range of movement, fear or quality of movement). Settings = any setting in any country.

Methods/design: A systematic review will be conducted by two blinded independent reviewers who will search articles on PubMed, CiNAHL, Cochrane library, Medline, Pedro, OTseeker, EMBASE, PsychINFO and EBSCOhost using predefined criteria. Studies of human participants of any age suffering from burns will be eligible, and there will be no restrictions on the total body surface area. Only randomised controlled trials will be considered for this review, and the methodological quality of studies meeting the selection criteria will be evaluated using the Cochrane Collaboration tool for assessing the risk of bias. The PRISMA reporting standards will be used to write the review. A narrative analysis of the findings will be done, but if pooling is possible, meta-analysis will be considered.

Discussion: Burns may have a long-lasting impact on both psychological and physical functioning and thus it is important to identify and evaluate the effects of current and past aerobic and strength exercises on patients with burns. By identifying the characteristics of effective exercise programmes, guidelines can be suggested for developing intervention programmes aimed at improving the function of patients with burns. The safety and precautions of exercise regimes and the optimal frequency, duration, time and intensity will also be examined to inform further intervention.

Systematic review registration: PROSPERO CDR42016048370.

Keywords: Strength exercises, Aerobic exercises, Function, Burns, Muscle strength, Physiotherapy

4.2 Background

Burn injury is a frequent cause of hospital admission in low-income countries[5,7,52] and often leads to secondary complications such as disfigurement, contractures and scar tissue formation[5,11,52]. Physiotherapy has an important role to play in preventing these impairments and in maintaining and improving functioning and participation in the acute, chronic and rehabilitation phases[108,115,116]. In resource-constrained contexts, in which access to appropriate therapy may be limited, it is particularly important to identify which rehabilitation and physiotherapy interventions are the most effective in restoration of function.

Therapeutic exercises can be described as bodily movement prescribed to correct an impairment, improve musculoskeletal function or maintain a state of well- being[117]. They have been defined as a range of physical activities that focuses on restoring and maintaining strength, endurance, flexibility, stability and balance[118]. The main goal of therapeutic exercises is to return the injured patient to a fully functioning pain-free state[117,118]. Therapeutic exercises may include strengthening, endurance, flexibility, balance and coordination exercises[107].

Exercise is beneficial, not only for patients with burns but also for healthy patients[107]. The beneficial effects of exercise are improved cardiovascular health, maintaining a healthy weight, improving bone weight, improvement in self-confidence and social skills[103,107]. Exercise prescription might be beneficial for patients with burns as they are at an increased risk of bed immobility due to heavy sedation from pain medication, constant wound dressing and bandaging. These factors increase the demand to exercise due to altered biomechanics, body posture and gait.

The focus of this review is the effectiveness of therapeutic exercises in reducing impairments and functional limitations related to burn injuries. In patients with burns, the damaged tissues may give rise to severe pain[119]. Moreover, pain is one of the most common problems[116,120] related to therapeutic procedures of restoring function [120,121]during rehabilitation. Particularly, in children, not only are burns painful, but they also cause distress and anxiety to both the child and the parent[76]. Pain leads to non-compliance, and patients are at high risk of complications of immobility and bed rest. Anecdotal evidence shows that due to lack of resources in low-income countries less effective treatment is done and patients spend more days in the hospital[52]. Potential complications for increased immobility and high admission days include musculoskeletal (decreased muscle strength, decreased endurance, contractures and osteoporosis) and cardiovascular (decreased heart rate, decreased cardiac reserve, orthostatic hypotension and venous thromboembolism)[122].

A search of the Cochrane Review database using
keywords “Burns” and “Rehabilitation” or “Physiotherapy/ Physical Therapy” or exercise returned one review on the effects of stretch on contractures in people with, or at risk of, contractures[123]. It concluded that stretch on its own was not effective in preventing contractures. There have been studies done on the effect of exercise, but the two[103,107] systematic reviews could be found in the Cochrane database, the Prospero database or PEDro respectively which examined the effect of exercise did not target exercise prescription for burn patients. There is evidence that exercise might reduce the impact of secondary complications of burns[124], such as muscle weakness and decreased anaerobic capacity, and be as effective as splinting in retaining range of motion of the shoulder after

axillary burns [125] and there is thus a need for guidelines, especially those that can be implemented in low-income settings.

Most interventions were developed for first world countries[52]but may not be applicable to Africa where most of the countries have resource constraints regarding health care provision. Examples of this include lack of specialised staff, lack of state-of-the-art equipment and lack of dedicated Burns' Unit s in medical facilities. Nevertheless, there is also a need to implement evidence-based practice in the management of patients with burns in these settings, where ironically, burn injuries are more common [5].

Exercise prescription should be age-specific and individualised to meet the different needs of individuals with different level of fitness. It has been shown that exercises might be beneficial for patients suffering from burns[124], but there is a lack of guidelines on exercise prescription for these patients.

Burns may have a long-lasting impact on both psychological and physical functioning and thus it is important to identify and evaluate the effects of current and past aerobic and strength exercises on patients with burns. By identifying the characteristics of effective exercise programmes, guidelines can be suggested for developing intervention programmes aimed at improving the physical functioning and, possibly, the health-related quality of life (HRQoL) of patients with burns. The safety and precautions of exercise regimes and the optimal frequency, duration, time and intensity will also inform further intervention.

4.2.1 Objectives

The broad objective of this review is to systematically evaluate the effectiveness, safety and applicability to low-income countries of therapeutic exercises utilised by physiotherapists to improve function in patients with burns.

4.2.1.1 Key review question

1. What is the efficacy of aerobic and/or strength exercises for individuals with burns, and overall improvement of any measure of the outcome?

P = adults and children/adolescents with burns of an aspect of their bodies

I = any aerobic and/or strength exercises delivered as part of a rehabilitation programme by anyone (e.g. physiotherapists, occupational therapists, nurses, doctors, community workers and patients themselves) C = any comparator

O = any measure of outcome related to physical and psychological functioning (e.g. health-related quality of life, pain, muscle strength, range of movement, fear or quality of movement)

S = any setting in any country

4.2.1.2 Secondary review questions

2. What precautions and contraindications need to be considered during aerobic and strength exercises to individuals with burns?

3. Are the interventions applicable to physiotherapy delivered in any location in a low-income setting? This will take into consideration issues such as equipment required, staff training, cost, culture and community supports.

The literature identified from the search findings for the key review question will be further reviewed to answer the secondary review questions. Papers will be investigated for additional intervention material:

For secondary review question 1: articles which describe any attempt to monitor progress for adverse events such as fatigue (measured in any way); excessive pain (measured in any way); or describes a stopping rule (where treatment does not proceed because of safety to the patient, or high likelihood of adverse events occurring from the intervention)

For secondary review question 2: any article that describes patient samples and interventions relevant to developing countries

4.3 Methods

4.3.1 Study registration

This systematic review will be written in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analysis-Protocol (PRISMA-P)[126] and has been registered on PROS-PERO database (Ref: CDR42016048370).

4.3.2 Eligibility

In selecting studies, we will apply the following criteria:

4.3.2.1 Participants

Studies of human participants of any age suffering from burns will be eligible, and there will be no restriction on total body surface area (TBSA) affected or duration of intervention to cater for both long- and short-term outcomes in terms of exercise prescription[107]. Both males and females will be considered for the review even though exercise tolerance may differ[103]. Animal studies will be excluded due to their different anatomical structure hence difficulty in exercise prescription. Examples of how studies will be summarised are provided in Table 4-1.

Table 4-1. Characteristics of Patients with Burns of Included Studies

Article	Subjects (n)	Males (%)	Females (%)	Age (years)	TBSA	Setting
Matthew et al.. (2009)	10	0	10	3.2	20	Hospital (inpatient)
Rumbi et al.. (2007)	20	15	5	Females 4 Males 5.4	Females 10 Males 11	Hospital (outpatient)
Mhandi et al.. (1995)	25	6	19	Exercise 2 Control 33	Exercises 40 Control 35	Home (Home Programme)

Studies with patients suffering from other comorbidities will be excluded from the study as they might not be able to complete the intervention or their safety might be at risk during standard care procedures[103,107]. Studies with patients with (1) other neurological conditions and (2) patients unable to comprehend instructions either that are on mechanical ventilators or with a decreased level of consciousness will also be excluded. Studies with children who are unable to comprehend instructions and those that are too young or suffering from cognitive disorders will be excluded from this study. Studies on the management of respiratory complications due to inhalational injuries and acute respiratory distress syndrome constitute specialised care and will be beyond the scope of this review. Similarly, studies on the management of psychological effects will not be included in this review, although the impact on HRQoL will be examined. Al- though burns may also affect the patient and caregivers psychologically, leading to emotional trauma especially where infants or children are involved[10,51,52], the management of these conditions is beyond the scope of this review. Studies on the use of virtual reality[127] and behavioural therapy to manage pain have been studied but will not be included in this review as we are focusing on improving function through therapeutic exercises only.

4.3.2.2 Included study designs

Only randomised control trials (RCTs) that investigate the effects of exposure to any form of therapeutic exercise will be considered for the review.

4.3.2.3 Interventions and comparators

Exercises will include any form of exposure to strengthening (resistance) or aerobic (endurance) exercises. RCTs will only be considered if validated outcome measures were measured at least two-time points including baseline, follow-up and on completion of the exercise programme. Length of follow-up was not prescribed due to the variability in TBSA. The intervention may be supervised/un- supervised, patient-specific in combination or not in combination with standard of care commencing at any period either in a hospital setting or outpatient setting. Participants will be compared with another control group or they can act as their control. Taking cognisance that all ages and TBSA are being considered, it is necessary to limit the study only to RCTs.

4.3.2.4 Outcomes

Strength exercise outcome measures might include isometric, isokinetic or isotonic which can either be evaluated through dynamometry, manual muscle testing (MMT) or 3 repetition maximum (3RM). Lean body mass (LBM) could be measured radiographically. Aerobic exercises can be measured by a change in heart rate using heart rate monitors and change in lung capacity using VO_2 maximal out. Secondary outcomes can be measured through functional activities could include walking and stair climbing which can be used in a low income and are easily applicable in a clinical setting or outpatient department.

Table 4-2, exemplifies the Participants Interventions Comparison Outcomes (PICO) table.

4.3.2.5 Language

We will only consider full-text articles published in English.

4.3.3 Information sources

4.3.3.1 Search strategy

A comprehensive search will be conducted at the University of Cape Town library from July 2017 to August 2017. All accessible bibliographic databases of published research reports will be assessed. All databases will be searched from 1990 to date. The electronic databases will include PubMed, CiNAHL, Cochrane library, Medline, Pedro and OT seeker, EMBASE, PSYCH INFO and EBSCOhost. Manual searches of reference lists of included articles will be employed. The terms in the title ("physiotherapy" OR "physical therapy" OR "rehabilitation" OR Occupational therapy) AND ("burns" OR "burns patient" OR "patient with burns") AND ("exercises" OR "therapeutic exercises. Outline in Table 4-3 is an example of how literature will be searched in CINAHL.

4.3.4 Study records

4.3.4.1 Data management

Search results will be merged using reference management software (Covidence) which is data management software. The electronic searches will also be saved to the researcher's PUBMED account. The principal researcher will create a shared DROPBOX folder to facilitate collaboration among reviewers and to save the online versions of the articles and electronic search strategy. Summaries of all the searches are to be printed and are to be used as a physical backup for the screened articles.

4.3.4.2 Selection and data collection of studies

Two reviewers Matthew Chiwaridzo (MC) and Tapfuma Mudawarima (TM), both physiotherapists, will independently search the databases and screen the titles and abstracts for eligibility. Title and abstracts will be examined to remove irrelevant reports and full text of potentially relevant reports will be obtained; multiple reports of the same study will be linked to minimising bias of duplicate publication. The two reviewers will assess full-text reports for compliance with the eligibility criteria, and correspondence will be done with authors to clarify study eligibility, where necessary.

In case of disagreement, arbitration by a third reviewer Jennifer Jelsma (JJ) will be carried out. The full text which meets the eligibility criterion will be assessed for risk of bias and data analysis/synthesis independently by TM. The reviewers will also manually search the references for articles to include in the data extraction.

4.3.5 Outcomes and prioritisation

4.3.5.1 Outcomes

For this review, outcome measures for strength exercises will include manual muscle testing (MMT) and lean body mass (LBM) or increase in muscle bulk and for aerobic exercises will include VO_2 max and HR. Secondary outcomes will include sit-to-stand, gait, stair climbing and HRQoL measured by the burn-specific health scale or generic HRQoL scales. Patient-reported outcomes will be prioritised in the discussion.

4.4 Assessment of risk bias (or “quality”) individual studies

The Cochrane Collaboration tool for assessing the risk of bias[128] in experimental studies will be used to assess the methodological quality of the included studies. The PRISMA reporting standards will be used to guide the review report (http://www.prismastatement.org/ Extensions/Protocols.aspx).

Table 4-2: Example of a PICO table - Population, Intervention, Comparison and Outcome

Article	Sample size	Intervention	Comparison	Load, number of repetitions, sets and progression	Frequency and duration	Outcome measure(s)
Strengthening exercises						
Matthew et al.. (2009)		Ankle dorsi-flexion	Ankle dorsi-flexion	50–80%; 1RM; 2–3 sets; 1 min rest between sets	3× per week for 2 weeks	MMT (muscle strength)
		exercises with Thera	exercises			
		Band				
Aerobic exercises						
Rumbi et al.. (2007)		Cycling	Nil cycling	70% of VO2 max; 5 × 5 mins bouts; 2 min rest between each bout	3× per week × 5 weeks	VO2 max; HR and RR
Combination programmes						
Mhandi et al.. (1995)		Muscle strengthening,	Nil dynamic balance	Knee muscle strengthening, dynamic balance through ball transfer from one hand to another × 5 mins	6× per week for 2 weeks	Gait and posture
		dynamic balance				

Table 4-3: Search Strategy

Keyword	Alternative words
Physiotherapy	physical therapy OR rehabilitation OR occupational
	therapy OR physical medicine OR physiatrist
Burns	patients with burns or burns patient
Muscle strength	muscle bulk OR muscle size OR lean muscle strength
VO2 max	respiratory rate OR heart rate
Strengthening exercises	Resistance exercises
Aerobic exercises	Endurance exercises

4.5 Best evidence synthesis

A narrative synthesis of the findings from the included studies will be provided due to the likely heterogeneity of the intervention and outcome measures. The Consensus on Exercise Reporting Template (CERT) was used to review the exercise interventions of all the articles. The CERT Checklist is designed for reporting details of an exercise intervention (www.equator-network.org). checklist will be used to describe components of the exercise interventions which are reported in each included study. The exercise interventions will be described in subgroups of outcome measures of strength, aerobic and functional measures, and data within individual studies such as patient’s population and interventions will be described in a narrative summary. Information on adherence to exercises, compliance monitoring, resources used and costs incurred in the delivery and receipt of

services will be extracted, if available. If pooling is possible from the intervention data (as a whole, or in subsets of the included studies), meta-analyses will be considered. Revman software will be used for this[41].

4.6 Discussion

As far as we are aware, this will be the first review of experimental evidence related to aerobic exercises and strength training delivered in any setting, for patients of any age, suffering from burns to any part of the body. This review will provide an answer to the question of efficacy for this type of intervention for burn patients. Subsequent analysis of intervention information reported in the included literature will provide previously unavailable information on the elements of the interventions, whether specific elements are related to evidence of significant benefit, and whether the best practice can be determined for the delivery of aerobic exercises and strength training for patients with burns. Specific information on safety measures that have been put in place to prevent adverse events during aerobic exercises and strength training for patients with burns will be highlighted. Where information is available on this intervention that is relevant to burn patients in low-income countries, the authors will compile evidence-informed guidance for the safe delivery of aerobic exercises and strength training in these settings.

Chapter 5. Effectiveness of therapeutic exercises to improve function in patients with burns – Results of a systematic review

5.1 Background:

The protocol for this review was published in the Systematic Reviews (2017) 6: 2017. DOI 10.1186/s13643-017-0592-6. The review was written in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines[128]. The methodology described in Chapter 4 was followed. However, during implementation there some amendments and/or additions to the protocol and these are described below.

5.2 Methodology

5.2.1 Data management and analysis

A self-designed data extraction form was used to extract information from the studies which included the age, TBSA, setting, population, and sample size, intervention and outcome measures. Email follow-ups with corresponding authors were undertaken to confirm missing information. Search results were merged using reference management software Covidence[129].

5.2.2 Synthesis of Results

Meta-analysis was done for outcome measures with comparable data (Mean and SD) using Rev Man 5[41]. Standardized mean differences (equivalent to effect sizes as calculated using Cohens *d*) were calculated for data pooled using the meta-analysis calculator and Forest Plots were drawn in Rev Man 5. Rev Man returns the standardized mean difference, Hedges g, which represents the difference between the two means divided by the pooled standard deviation, with a correction for small sample bias [41].

A subset narrative synthesis of the findings from the included studies that were not comparable was provided. As planned, the Template for Intervention Description and Replication (TIDieR) checklist was used to describe exercise interventions components common to all studies[130,131]. Papers on the impact of the exercise interventions were grouped based on the outcome measures of strength, aerobic and functional measures, and presented in a table format. The effect size was interpreted using the Cohen's guidelines: small = 0.2; medium, = 0.5; and large, = 0.8[132].

5.3 Results

5.3.1 Database Search Results

Table 5-1. Databases Searched in the Systematic Review

Database	Initial hits	RCTs	Titles	Abstracts	Full texts reviewed
Cochrane library	22	21	7	1 (6 duplicates excluded)	1
PubMed	453	83	66	17	17
CiNAHL	447	129	9	6 (4 duplicates)	2
Scopus	100	13	13	7 (6 duplicates)	7
Web of Science	687	78	23	20 (13 duplicates)	7
Africa – Wide/NIPAD	11	5	5	1 (4 duplicates)	1

The initial electronic database search identified 1720 articles, of which 329 articles were Randomised Controlled Trials (RCTs), and 33 were duplicates. A hand search of papers yielded no additional citations. Thirty-five full articles were screened for possible inclusion in the review and 19 eligible articles were included in the review (Figure 5-1). Thirty-five papers were screened because the title and abstract met the inclusion criteria, and 16 full articles were excluded because they did not have valid outcome measures for LBM, muscle strength or any aerobic activity.

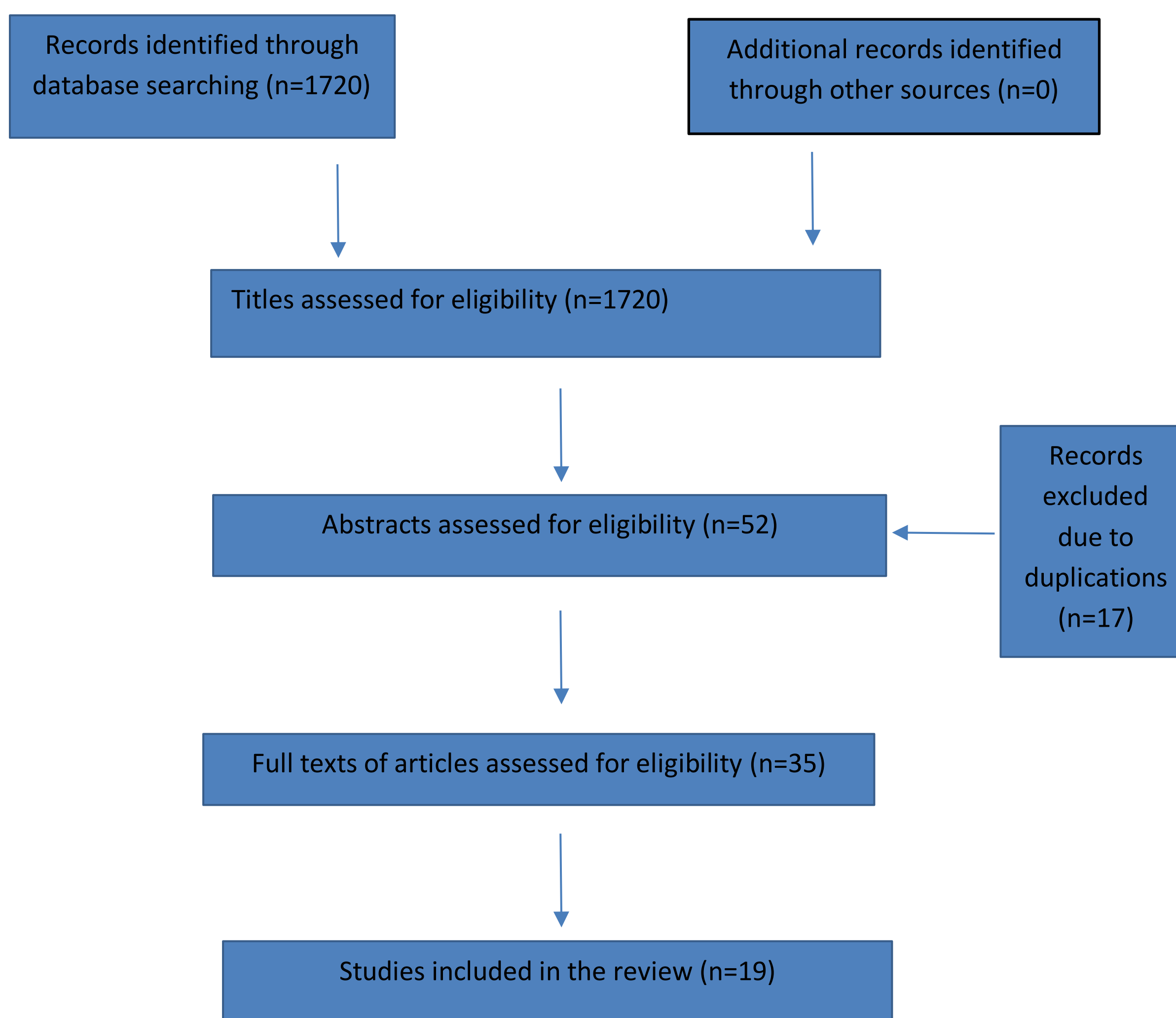


Figure 5-1: Flow Chart of Search Strategy

5.3.2 Risk of Bias

The Cochrane Collaboration tool[41] for assessing the risk of bias in experimental studies was used to assess the methodological quality of the included studies with most of the studies at high risk or unclear in performance bias and detection bias.

	9. Paratz 2012	8. Porro 2013	7. Ebid 2014	6. Hardee 2014	5. Ali 2015	4. Pena 2016	3. Wurzer 2016	2. Clayton 2017	19. Cucuzzo 2001	18. Suman 2001	17. Suman 2002	16. Celis 2003	15. Suman 2003	14. Suman and Herndon 2007	13. Przkora 2007	12. de - Lateur 2007	11. Al - Mousawi 2010	10. Ebid 2012	1. Ebid 2017
Random sequence generation (selection bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Allocation concealment (selection bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Blinding of participants and personnel (performance bias)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blinding of outcome assessment (detection bias)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Incomplete outcome data (attrition bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Selective reporting (reporting bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Figure 5-2: Risk of Bias

5.3.3 Additional analysis (post hoc report of the proposal)

In the proposal, it was reported that exercises would include any form of exposure to strengthening (resistance) and aerobic (endurance) exercises (Section 4.3.2.3). After inclusion of articles, those that reported exercises combined with a pharmacological agent (i.e. propanol, growth hormones and Oxandrolone) were included in the Meta-analysis and compared to the Standard of Care (SoC).

The outcome measures for the proposal were specified, but after reviewing the articles, secondary outcomes were reported post hoc as no HRQoL measures were reported. Secondary outcomes of function included treadmill times; cadence and Resting Energy Expenditure (REE) were included post hoc. Extraction of information on adherence to exercises, compliance monitoring, resources used, and costs incurred was impossible as no study mentioned it. As heterogeneity was present in each data set, the random-effects model was used. As two of the studies only reported within-group differences for muscle strength, the results were presented in a separate forest plot to compare the within-group differences between the Intervention and Control groups.

5.3.4 Description of included studies

As can be seen in Table 5-2, the included studies were published between 2001 and 2017. Four of the 19 articles reported studies in adults [87,89,133,134] and 15 were articles on children[12,42,88,104,124,133,135–143]. Of the 19 papers, three were published by Ebid from Cairo University [42,87,104] and the remaining articles on children originated from Shriner's Burn Hospital for Children [12,88,124,135–143]. No paper included children under the age of seven in their studies. The number of participants ranged from 20[135] to 125[140]. Apart from the three papers with missing data on the sex of the participants data[88,140,144], the number of males was reported to be approximately two to three times greater than the number of females. In all cases, participants all had second and/or third degrees burns covering more than 30% TBSA. In the five papers which described the cause of burn [87,104,133,134,140,143] flame, scald, electrical and chemical and more generally thermal burns, were listed. In three studies the site of the burns was the lower limbs [42,87,104], but the site was unspecified in the rest of the papers.

Table 5-2: Characteristics of Patients with Burns in Included Studies

Study No	Article Author	Year	Subjects	Male	Female	Age (years)	TBSA (%)	Type of Burns	Burn Site	Settings
1	Ebid et al. [42]	2017	48 Child	30	18	10 – 16 (13±1.75)	40 – 55	Unspecified	Lower limbs	Outpatient
2	Clayton et al. [140]	2017	42 Child			6 – 8	≥30	Unspecified	Unspecified	Hospital based
3	Wurzer et al. [141]	2016	125 Child	93	32	7 - 18 (12±4)	≥30	Flame, Electrical, Scalds	Unspecified	In hospital/ rehabilitation
4	Pena et al. [124]	2016	34 Child	27	7	7 – 18	≥30	Unspecified	Unspecified	Community
5	Ali et al. [144]	2015	30 Adults			20 – 40	20- 40	Unspecified	Unspecified	Outpatient
6	Hardee et al.[142]	2014	47 Child	38	9	13±1	≥40	Unspecified	Unspecified	In-hospital rehabilitation
7	Ebid et al. [104]	2014	33 Child	21	12	10 – 15	36 – 45	Thermal	Lower limbs	In-hospital rehabilitation
8	Porro et al.[143]	2013	58 Child	Unspecified	Unspecified	7-18	≥30	Electrical of Flame burns	Unspecified	In-hospital rehabilitation
9	Paratz et al.[89]	2012	30 Adults	25	5	≥18 (34.3±13.1)	≥20 42.9 ±13.3	Unspecified	Unspecified	In-hospital rehabilitation
10	Ebid et al. [87]	2012	40 Adults	26	14	18 – 35	35-55%	Thermal	Lower limbs	In hospital
11	Al-Mousawi et al. [133]	2010	21 Child	16	5	7-17	≥40%	Flame/Electrical	Unspecified	In-hospital Hospital-based
12	de Lateur et al. [134]	2007	35 Adult	26	9	38.0±13.3	19.3±15.7	Flame, scald, electrical, Chemical	Unspecified	Inpatient
13	Przkora et al. [135]	2007	51 Child	41	10	7 – 17	≥40	Unspecified	Unspecified	Inpatient
14	Suman and Herndon[8] [8]	2007	20 Child			7-18	≥40	Unspecified	Unspecified	Hospital based
15	Suman et al. [136]	2003	41 Child	37	7	7 – 17	>40	Unspecified	Unspecified	Inpatient
16	Celis et al. [12]	2003	53 Child			6 -19	>40	Unspecified	Unspecified	Outpatient
17	Suman et al. [137]	2002	31 Child	24	7	7 – 18	≥40	Unspecified	Unspecified	Hospital-based
18	Suman et al. [138]	2001	35 Child	28	7	7 – 17	>40	Unspecified	Unspecified	Hospital-based
19	Cucuzzo et al. [139]	2001	21 Child	13	8		>40	Unspecified	Unspecified	Outpatient

The details of the Interventions offered are described in Table 5-3. In four papers [87,104,133,134], the time of initiation of intervention was not reported. In the other papers, the intervention was started in the post-acute stage, either after discharge from the acute care[141,142] or in the rest of the papers, from hospital. No intervention was thus reported as being initiated in the acute stage of burn injury. In every case the intervention was offered within the hospital setting apart from one study which was based in a Community Gymnasium[124].

Table 5-3: Description of Intervention in the Included Studies

Study No	Article Author	Year	Sample Size (age (mean ± SD))	Intervention
1	Ebid et al. [42]	2017	N=48 1. Isokinetic (n=17 (12.93±1.34)) 2. Vitamin D supplementation (n=15 (13.11±145)) 3. SoC (n=16 (13.80±1047)) 4. Unburned (n=20 (12.80±1.57))	1. Isokinetic Time to begin intervention: post discharge (healed burns) Location: Hospital Outpatient Mode: Isokinetic Volume: initial dose 50% of average peak torque, Intensity: 1-5 sessions (1-5 sets), 6-24 sessions (6 sets), 25-36 sessions (10sets). Set = 10 repetitions of aerobic contraction at 150˚/s Rest: 3 min/set Frequency: 3X/week Duration: 12 weeks Additional: Placebo Vit D supplementation + SoC 2. Vitamin D supplementation Isokinetic protocol + Vit D supplementation 3. SoC + Placebo Vit D supplementation
2	Clayton et al.. [140]	2017	N=42 1. 6-week training group (18(11.3±3.8)) 2. 12-week training group (24(12.3±3.6))	1. 6-week training group Time to begin intervention: post-discharge Location: Outpatient department Mode: Resistance training and aerobics Volume: 50-60% of each individual's 3RM Intensity: increased to allow three (3) sets 70-75% 3RM with a goal of 8-12 reps Rest: 3 min/rest Frequency:3 sessions a week Duration: 20 – 40 minutes Additional: aerobic exercise on a cycle ergometer or treadmill for 3-5 days a week 1. 12-week training group same as 6-week training from 2 -6 weeks
3	Wurzer et al. [141]	2016	N=125 1. Exercise group (n=82 (12±4)) 2. Non – exercise group (n= (43(12±4))	1. Exercise group Time to begin intervention: Discharge from acute care Location: Hospital inpatient Mode: Resistance Volume: initial dose 50% of 3RM Intensity: week 1 (proper weightlifting +50% of 3RM), week 2-6 (3 sets (12-15RM)), week 6-12 (3 sets (8-12RM)) Rest: NM Frequency: 3-5 days a week (20-45 minutes) Duration: 12 weeks (outcomes measured at 12 and 24 months) Additional: Aerobic (cycle ergometer or treadmill)
4	Pena et al. [124]	2016	N=34 1. Community rehabilitation (n=12(13.7±1)) 2. Outpatient exercises (n=22((14.0±0.7))	1. Community rehabilitation Time to begin intervention: Discharge from hospital Location: Community Gymnasium Mode: Resistance Volume: 30 minutes of 3 sets Intensity:3 sets of 8 – 15 repetitions (8-15RM) Rest: NM Frequency: 3 days a week Duration: 12 weeks Additional: Aerobic. 30 – 40 minutes of 3 days at 60 – 85% of patient's peak HR, (cycle ergometer, rower, elliptical or treadmill) 2. Outpatient Exercises Time to begin intervention: Discharge from hospital Location: Outpatient department Mode: Resistance Volume: 30 minutes of 3 sets Intensity:3 sets of 8 – 15 repetitions (8-15RM) Rest: NM Frequency: 3 days a week Duration: 12 weeks Additional: Aerobic. 20 – 40 minutes of 5 days, (cycle ergometer, rower, elliptical or treadmill)

Study No	Article Author	Year	Sample Size (age (mean ± SD))	Intervention
5	Ali et al. [144]	2015	N=30 1. Aerobic (n=15(27.9±7.3)) 2. Standard treatment (n=15(29.5±6.6))	1. Aerobic Time to begin intervention:3 months post-discharge Location: Outpatient department Mode: Aerobic Volume: Intensity: graded exercise test (GXT) Rest: 3 min/rest Frequency:3 sessions a week Duration: 20 – 40 minutes Additional: SoC 2. SoC
6	Hardee et al.[142]	2014	N=47 1. Rehabilitative exercise training (RET) (n=24 (13±1)) 2. SoC n= (24 (13±1))	1. RET Time to begin intervention: Discharge from acute care Location: In-hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% of 3RM Intensity: increased to 80-85 % of 3RM at the end of the program Rest: NM Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post-treatment and 12 months post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 – 5 days a week at 70 - 85% of VO_2 peak 2. SoC
7	Ebid et al. [145]	2014	N=33 1. Isokinetic (n=16(13.46±1.18)) 2. SoC (n=17(13.60±1.12))	1. Isokinetic Time to begin intervention: NM Location: Hospital Outpatient Mode: Isokinetic Volume: initial dose 50% of average peak torque, Intensity: 1-5 sessions (1-5 sets), 6-24 sessions (6 sets), 25-36 sessions (10sets). Set = 10 repetitions of concentric contraction at an angular velocity of 150˚/s Rest: 3 min/set Frequency: 3X/week Duration: 12 weeks Additional: SoC 2. SoC
8	Porro et al.[143]	2013	N=58 1. Propanol+ exercise ((n=27(13.7±3.1)) 2. Exercise ((n=31 (13.1±3.5))	**1.** Propanol + exercise Time to begin intervention: 6 months post-discharge Location: In-hospital treatment Mode: Resistance Volume: 60% of 3RM Intensity:3 times a week with 3 sets of 8 – 12 repetitions Rest: 3 min/set Frequency: 3X/week Duration: 12 weeks Additional: Propranolol + Aerobic (treadmill, bicycle ergometer, arm ergometer, elliptical, rowing machine) at 60 – 85% of individualized VO_2 peak **2.** Exercise Supervised and individualized training at 5 days a week x 12 weeks
9	Paratz et al.[89]	2012	30 **1.** Intensive exercise group ((n=14 (42.6±14.6)) **2.** Self-directed stretching ((n=16(30.4±10.1))	**3.** Resistance exercises Time to begin intervention: soon after discharge Location: Hospital outpatient Mode: Resistance Volume:3RM (maximum weight able to be lifted a maximum of 3 times) was established and then resisted exercise was commenced at 60% of the 3RM in the first week. Intensity: Resisted exercise was then progressed weekly by 5% to 10% by increasing the number of repetitions or the weights lifted. Rest: Frequency: 3x a week for 60 minutes Duration: Additional: SoC and aerobic exercise conducted on a treadmill, exercise bike, or arm ergometer at an intensity of 80% of VO2 peak during the initial

Study No	Article Author	Year	Sample Size (age (mean ± SD))	Intervention
				assessment
10	Ebid et al. [87]	2012	N=40 1. Isokinetic (n=20(24.6±5.33)) 2. SoC (n=20(27.3±8.56))	1. Isokinetic Time to begin intervention: NM Location: Hospital Outpatient Mode: Isokinetic Volume: initial dose 60% of average peak torque, Intensity: 1-5 sessions (1-5 sets), 6-24 sessions (6 sets), 25-36 sessions (10sets). Set = 10 repetitions of concentric contraction at an angular velocity of 150˚/s Rest: 3 min/set Frequency: 3X/week Duration: 12 weeks Additional: SoC 2. SoC
11	Al-Mousawi et al. [133]	2010	N=21 1. Exercise (n=11(12.2±3.6)) 2. SoC (n=10(13.7±3.6))	1. Exercise group Time to begin intervention: NM Location: In-hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post-treatment and 12 months post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 days a week at 70 -85% of VO_2 peak for 30 minutes 2. SoC
12	de Lateur et al. [134]	2007	N=35 1. Standard functional restoration (SFR) (n=11 (34.9±14.5)) 2. Work to tolerance (WTT) (n=11 (43.5±8.9) 3. Work to quota (WTQ) (n=13 35.4±14.8))	**1.** WTQ Time to begin intervention: NM Location: In-hospital physiotherapy program Mode: Aerobic (treadmill sessions) Volume: HR at 60% Intensity: Target exercise HR and time according to pre-set quotas Rest: NM Frequency: 3 times a week (30 minutes) Duration: 12 weeks Additional: SFR **2.** WTT: HR at 60% and aerobic exercise for 30 minutes to tolerate at the targeted HR + SFR **3.** SFR = SoC
13	Przkora et al. [135]	2007	N=51 1. Oxandrolone (anabolic steroid) and exercise ((n=14) 12.1±0.8)) 2. Oxandrolone ((=9) 11.8±1.1)) 3. Placebo and exercise ((n=17) 10.9±0.9)) 4. Placebo ((n=11) 11.8±1.0))	1. Oxandrolone and exercise Time to begin intervention: 6 months post discharge Location: In-hospital treatment Mode: Resistance Volume: 1 RM for 4 repetitions Intensity: 3 RM for repetitions Rest: 1 min/set Frequency: 3X/week Duration: 12 weeks Additional: Oxandrolone + Aerobic (1.7 mph at 0% respiratory and level of incline increased at every 3 minutes) 2. Oxandrolone only 3. Placebo and exercise 4. Placebo only
14	Suman and Herndon[88]	2007	N=20 1. SoC + supervised and individualized exercise (11(11.8±1.5)) 2. SoC (9(13.4±1.8))	**1.** Exercise Time to begin intervention: after discharge Location: In-hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post-treatment and 12 months

Study No	Article Author	Year	Sample Size (age (mean ± SD))	Intervention
				post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 days a week at 70 -85% of VO_2 peak for 30 minutes **2.** SoC
15	Suman et al. [136]	2003	N=44 1. Growth Hormone + Exercise(n=10(11.0±0.8)) 2. Saline + Exercise (n=13(10.5±0.7)) 3. Growth Hormone (10(n=11.5±1.6)) 4. Saline (n=11(10.8±0.7))	**1.** Exercise Time to begin intervention: after discharge Location: In-hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post-treatment and 12 months post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 days a week at 70 -85% of VO_2 peak for 30 minutes And Growth hormones **2.** Saline and Exercise **3.** Growth hormones and SoC **4.** Saline and SoC
16	Celis et al. [12]	2003	N=53 1. Exercise group (n=27(10.5±1.1)) 2. SoC (n=26(10.9±1.2))	1. Exercise group Time to begin intervention: 6 months post-discharge Location: In-hospital resistance and aerobic program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post-treatment and 12 months post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 days a week at 70 -85% of VO_2 peak for 60 to 90 minutes SoC 2. Standard physiotherapy program
17	Suman et al. [137]	2002	N = 31 1. Exercise (17(10.6±0.96)) 2. SoC (14(10.7±1.20))	**1.** Exercise Time to begin intervention: after discharge Location: In hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post treatment and 12 months post burns) Additional: Aerobic (cycle ergometer or treadmill) 3 days a week at 70 -85% of VO_2 peak for 30 minutes **2.** SoC
18	Suman et al. [138]	2001	N=35 **1.** Structured and supervised exercise (n=19(10.5±0.92)) **2.** SoC (n=16(11.0±1.20))	**1.** Exercise Time to begin intervention: after discharge Location: In hospital physiotherapy program Mode: Resistance (free weights) Volume: initial dose 50% - 60% of 3RM Intensity:2nd – 6th week (70 – 75% 3RM @ 4 – 10 reps) increased to 80-85 % of 3RM 7th to 12th week Rest:3 minutes Frequency: 3-5 days a week (20-40 minutes) Duration: 12 weeks (outcomes measured at post treatment and 9 months post burns) **2.** SoC

Study No	Article Author	Year	Sample Size (age (mean ± SD))	Intervention
19	Cucuzzo et al. [139]	2001	N =21 1. Resistance and aerobic (11(11.9±1.2)) 2. Traditional support group (10(9.2±1.4))	1. Exercise group Time to begin intervention: 72 hours post-discharge Location: In hospital resistance and aerobic program Mode: Resistance (free weights) Volume: phase 1 maximum load for resistance training was 50% (4–10 repetitions) of the 3 RM Intensity: was increased to 70 to 85% (8–15 repetitions) of the 3 RM at the beginning of phase 2. Rest:3 minutes Frequency: 3-5 days a week 60 minutes) Duration: 12 weeks Additional: walking and conditional exercises for 1 hour 2. Traditional support group

******abbreviations used in the table: SoC – Standard of Care, Vit D-Vitamin D, RM – Repetition Maximum, RET-Rehabilitative exercise training, VO_2Peak- Maximum oxygen uptake, WTT-Work to tolerance, WTQ-Work to quotient, NM-Not mentioned.*

Aerobic exercise was used in two studies[134,144] and in addition to resistance exercises, in a further two[89,139,141]. Isokinetic training was used in three of the studies by Ebid [42,87,104] and the other 12 studies tested the impact of resistance exercises, either alone or in combination with pharmaceutical interventions[135,136,143] (four studies). Three papers [124,140,143] did not have a true control group who did not receive exercises and these compared the duration of exercise (6 weeks compared to 12 weeks) [140], the setting of the intervention (hospital compared to community)[124] and an exercise regime compared to exercise plus a pharmaceutical intervention[143]. The control or comparator groups consisted of pharmaceutical intervention in three studies [135,136,143], stretching[89] and Standard of Care (SoC) in the remaining 12 studies.

In Table 5-4, the raw outcome measures are presented. These are presented as forest plots and discussed in detail in Section 5.4 below.

Table 5-4: Outcome of Muscle Strength and Aerobic Strength described in the Included Studies

Study No	Article Author	Year	Mode	Outcome Measures	Pre - mean	Post - mean	Change – mean
1	Ebid et al. [42]	2017	Progressive Resistance Training (PRT)	Quadriceps strength by an isokinetic dynamometer (Nm)			
				SoC group	46.23±0.97	51.88±1.31	12%
				Isokinetic group	47.06±0.99	64.25±0.93	36%
				Vit D group	46.08±0.55	85.25±0.93	85%
				LBM by dual-energy x ray			
				absorptiometry (DXA (kg))	30.8±1.21	31.4±1.34	1.94%
				SoC group	30.9±1.13	33.6±1.21	8.73%
				Isokinetic group	31.7±1.24	36.5±1.31	15.45%
				Vit D group			
				Gait parameters by GAIT	82.88±1.53	90.35±1.32	9%
				Rite system (cadence)	83.50±1.55	132.63±1.36	58%
				SoC group	83.43±1.65	140.63±1.36	68%
				Isokinetic group			
				Vit D group			
2	Clayton et al. [140]	2017	6 weeks and 12 weeks (Resistance and Aerobic exercises)	Strength (Nm/kg/%) DXA			
				6 weeks	102.2±41.0	122.6±27.2	
				12 weeks	84.4±32.2	129.5±39.2	
				Peak VO_2 (ml/kg/min)			
				6 weeks	25.1±5.8	28.5±6.0	
				12 weeks	24.9±4.7	31.0±6.4	
				LBM (kg/m^2)			
				6 weeks	12.86±1.6	13.5±1.7	
				12 weeks	13.8±1.5	14.8±2.2	

Study No	Article Author	Year	Mode	Outcome Measures	Pre - mean	Post - mean	Change – mean
3	Wurzer et al. [141]	2016	PRT and aerobic exercises	Lean Body Mass Index (LBMI kg/m^2) DXA			
				Exercise	13±2	16±3	
				No exercise	13.8±3	14.4±3	
				Peak Torque per Body			
				Weight (PTBW: %)	94±34	133±36	
				Exercise	96±22	142±46	
				No exercise			
				Maximal oxygen capacity	24±6	32±8	
				(VO_2max: mL/kg/min)	27±7	35±6	
				Exercise			
				No exercise			
4	Pena et al. [124]	2016	PRT and aerobic exercises	Lean Body Mass (LBM			
				kg/m^2) DXA	13.8±0.27	14.7±0.9	
				Exercise	15.2±0.78	16.2±0.81	
				Community			
				Peak Torque per Body	87.2±5.9	141.0±7.8	
				Weight (PTBW: %)	112.3±14.1	159.3±14.7	
				Exercise			
				Community	24.0±1	25.4±2	
				Maximal oxygen capacity	32.2±1.1	36.6±2.1	
				(VO_2max: mL/kg/min)			
				Exercise			
				Community			
5	Ali et al. [144]	2015	Aerobic and SoC	VO_2peak (ml/m/kg)			
				Aerobic	21.8±2.3	33.9±3.8	55.6%
				SoC	22.4±1.9	25.8±2	14.9%
				Treadmill time			
				Aerobic	11.1±1.8	18.7±1.8	68.2%
				SoC	10.9±1.7	13.8±1.2	26.5%
				Berg balance scale			
				Aerobic	27	48	77.8%
				SoC	27	40	48.2%
6	Hardee et al.[142]	2014	PRT and aerobic exercises	Lean Body Mass (LBM			
				kg/m^2) DXA	34.3±2.2	37.6±2.6	
				Rehabilitative	34.8±3.3	35.9±3.5	
				Exercise Training			
				(RET)SoC			
				Peak Torque per Body		72±8.2	
				Weight (PTBW: %)		52±7.5	
				RET			
				SoC			
				Maximal oxygen capacity		32.1±1.3	
				(VO_2max: mL/kg/min)		28±1.3	
				RET			
				SoC			
7	Ebid et al. [145]	2014	Isokinetic	Quadriceps strength peak			
				torque (Nm)	47.23±0.97	51.88±1.31	9.84%
				SoC	47.06±0.99	79.25±0.93	68.4%
				Isokinetic			
				Quadriceps size	29.26±1.01	29.56±1.01	1.02%
				SoC	29.31±0.94	31.50±0.89	7.47%
				Isokinetic			
				Gait/ cadence (steps/min)	82.88±1.53	90.35±1.35	8.6%
				SoC	82.47±1.54	137.36±1.36	81.42%
				Isokinetic			

Study No	Article Author	Year	Mode	Outcome Measures	Pre - mean	Post - mean	Change – mean
8	Porro et al.[143]	2013	PRT and aerobic exercises	Muscle strength (quadriceps peak torque) Nm/kg			
				Exercise group	85.7±36.3	127.9±45.3	59%±45%
				Propranolol +	92.9±36.0	126.7±36.1	50%±48%
				exercise group			
				LBM (kg)	33.1±12.7	36.4±14.3	10%±9%
				Exercise group	35.6±10.1	38.4±11.2	7%±6%
				Propranolol +			
				exercise group	26.4±5.5	31.1±6.5	22%±14%
				Peak oxygen consumption	24.5±5.8	31.7±5.3	36%±27%
				(VO_2max)			
				Exercise group			
				Propranolol + exercise group			
9	Paratz et al.[89]	2012		Muscle strength 3 repetition			
			1. Intensive exercise (16)	maximum	42.86±16.84	60.36±23.08	
				SoC	46.88±24.69	13.75±37.04	
			2. SoC (14)	Exercise			
				VO_2peak	92.93±14.89	89.07±14.64	
				SoC	99.25±12.42	89.94±16.24	
				Exercise			
				Function (Quick Dash)	33.78±22.85	28.08±21.68	
				SoC	43.61±16.34	19.63±15.82	
				Exercise			
10	Ebid et al. [87]	2012	Isokinetic	Knee extensor peak torque			
				(Nm)	64.94±7.42	78.94±6.85	
				Isokinetic	60.84±8.24	66.45±9.3	
				No exercise			
				Knee flexor peak torque	57.5±9.21	66.4±6.85	
				(Nm)	56.84±8.24	59.88±10.47	
				Isokinetic			
				No exercise	72.6±7.3	92.4±4.2	27.28%
				Ambulation (speed m/min)	73.2±6	81.5±5.2	
				Isokinetic			11.34%
				No exercise			
11	Al-Mousawi et al. [133]	2010	PRT	REE (kcal/day)			
				SoC	1480±354	1510±477	
				Exercise	1533±354	1651±551	
				LBM (kg) DXA			
				SoC	35.7±16	36.6±17.0	
				Exercise	33.0±14.9	36.0±16.4	
				Peak torque			
				SoC	57.8±38.7	63.9±43.1	
				Exercise	41.2±38.7	52.3±39.9	
12	de Lateur et al. [134]	2007	Aerobic	VO_2max			
				SFR	23.2±8.6	24.7±7.3	
				WTT + SFR	21.2±5.8	26.5±4.3	
				WTQ + SFR	20.8±6.7	25.8±6.6	
13	Przkora et al. [135]	2007	Aerobic and resistance training	Lean mass (kg) DXA			
				OXEX	31.2±2.4	35.3±3	
				OX	33.1±4.9	34.9±5	
				PLEX	31.2±4.4	33±4.7	
				PL	31.5±3.9	31.2±3.9	
				Peak torque (Nm)			
				OXEX	47.4±4.4	69.7±10.3	
				OX	50.4±4.7	72.8±10.1	
				PLEX	35.4±9.8	45.7±11.3	
				PL	35.8±9.6	36.4±8.8	
				VO_{2peak}, ml 0_2/kg/min			
				OXEX	31.9±3.8	36.4±4.2	
				OX	32.5±3.5	35.4±3.4	
				PLEX	26.6±2.1	32.7±2.8	
				PL	26.9±2.8	29±2.9	

Study No	Article Author	Year	Mode	Outcome Measures	Pre - mean	Post - mean	Change – mean
14	Suman and Herndon[88]	2007	6 and 12 weeks	LBM (kg) DXA			
				Exercise	36.90±5.51	43.33±6.11	
				No exercise	34.57±4.10	36.27±4027	
				Peak torque (Nm)			
				Exercise	31.30±6.30	46.45±8.56	
				No exercise	47.57±9.21	50.88±10.47	
15	Suman et al. [136]	2003	Growth hormone and exercise	Peak torque (Nm)			
				Growth Hormone	32.9±6.2	44.6±8.4	
				and Exercise	25.9±6.1	34.4±8.0	
				(GREX)	31.4±5.8	28.7±5.8	
				Saline and	32.8±7.8	33.2±7.2	
				Exercise (SALEX)			
				Growth hormone	28.1±1.3	36.8±2.0	
				Saline	29.1±1.8	35.0±1.4	
				VO^2 Max Peak oxygen	31.0±2.5	33.7±3.0	
				consumption (ml/kg/min)	28.6±1.7	30.2±2.5	
				GHEX			
				SALEX			
				GH			
				Saline			
16	Celis et al. [12]	2003	Surgical intervention	Exercise (aerobic and PRE)			
				6 months	27	15	55%
				9 months	27	5	18%
				12 months	26	3	11%
				18 months	22	3	14%
				24 months	20	1	5%
				SoC			
				6 months	26	16	61%
				9 months	24	8	33%
				12 months	21	11	52%
				18 months	14	8	57%
				24 months	6	5	83%
17	Suman et al. [137]	2002	12 weeks	FVC			
				No exercise			10%
				Exercise			40%
				FVC_1			
				No exercise			10%
				Exercise			30%
				MVV			
				No exercise			-2%
				Exercise			40%
18	Suman et al. [138]	2001	Structured and supervised exercises	Isokinetic peak torque (Nm)			
				Exercise	26.1±4.0	39.4±7.3	
				No exercise	34.3±6.9	33.6±6.5	
				Isometric peak torque (Nm)			
				Exercise	48.1±7.4	53.4±8.1	
				No exercise	48.8±9.7	50.4±9.7	
19	Cucuzzo et al. [139]	2001	Strength and home-based	Total volume of work done			
				(strength)		19.7±2.7	15.8±3.9
				Strength 3		19.6±3.7	7.4±2.7
				repetitions			
				maximum		456±30	186±29
				Home		508±32	66±21
				Distance walked (m)			
				Strength			
				Home			

**Abbreviations used in the table: PRT-Progressive resistance training, PRE-Progressive resistance exercises, LBM-Lean body mass, DXA-Dual energy x-ray absorptiometry, Vit D-Vitamin D, SoC-Standard of Care, VO_2Peak-maximum oxygen uptake, GHEX-Growth hormone and exercises, SALEX-Saline and exercises, FVC-Forced Vital Capacity, MVV-Maximum volume ventilation.*

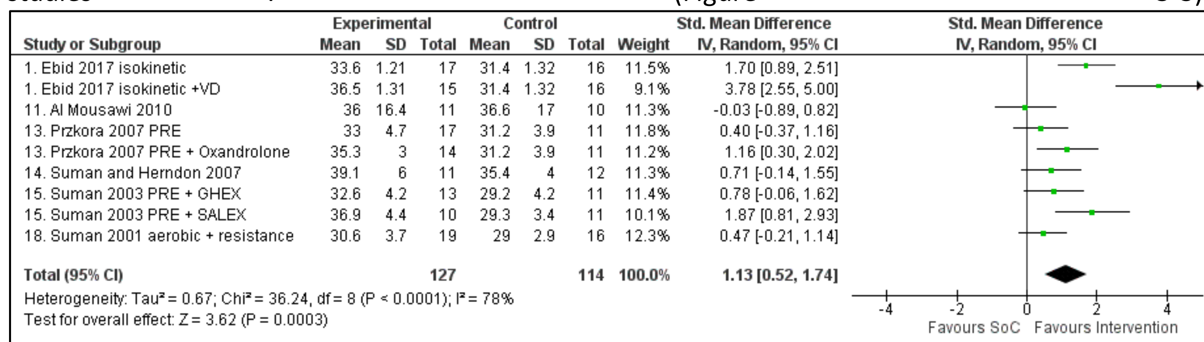
All but two studies [89,139] used peak isokinetic torque to determine muscle strength and these utilised three repetition maximum. Aerobic capacity was measured by VO^2Max when measured, apart from

one[145], which used FVC, FVC_1 and MVV. Lean Body Mass was measured using DXA in all the studies which included this measure. Functional data were collected in six studies; these included gait parameters collected by a gait analysis system [42,87,104], the Berg Balance scale [144], the Quick Dash [89], Treadmill time[42] and Distance Walked [139].

5.4 Outcomes Measures Results

5.4.1 Lean body mass

Comparable data (means and SD) were combined from nine sets of comparative data drawn from six studies[42,88,133,135,136,138]. (Figure 5-3).



Study or Subgroup	Experimental Mean	Experimental SD	Experimental Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1. Ebid 2017 isokinetic	33.6	1.21	17	31.4	1.32	16	11.5%	1.70 [0.89, 2.51]
1. Ebid 2017 isokinetic +VD	36.5	1.31	15	31.4	1.32	16	9.1%	3.78 [2.55, 5.00]
11. Al Mousawi 2010	36	16.4	11	36.6	17	10	11.3%	-0.03 [-0.89, 0.82]
13. Przkora 2007 PRE	33	4.7	17	31.2	3.9	11	11.8%	0.40 [-0.37, 1.16]
13. Przkora 2007 PRE + Oxandrolone	35.3	3	14	31.2	3.9	11	11.2%	1.16 [0.30, 2.02]
14. Suman and Herndon 2007	39.1	6	11	35.4	4	12	11.3%	0.71 [-0.14, 1.55]
15. Suman 2003 PRE + GHEX	32.6	4.2	13	29.2	4.2	11	11.4%	0.78 [-0.06, 1.62]
15. Suman 2003 PRE + SALEX	36.9	4.4	10	29.3	3.4	11	10.1%	1.87 [0.81, 2.93]
18. Suman 2001 aerobic + resistance	30.6	3.7	19	29	2.9	16	12.3%	0.47 [-0.21, 1.14]
Total (95% CI)			**127**			**114**	**100.0%**	**1.13 [0.52, 1.74]**

Heterogeneity: $Tau^2 = 0.67$; $Chi^2 = 36.24$, $df = 8$ ($P < 0.0001$); $I^2 = 78\%$
Test for overall effect: $Z = 3.62$ ($P = 0.0003$)

PRE- Progressive Resistance Exercises, VD – Vitamin D, GH – Growth Hormone, SAL- Saline, EX – Exercise

Figure 5-3: A forest plot to show the summary estimates of the average effect of exercises on LBM at three months post-intervention.

The weighted mean of the effect size calculations revealed that resistance exercises were effective in increasing LBM after 12 weeks of individualised supervised resistance strength training and demonstrate a large, statistically significant SMD (1.13, CIs 0.52 to 1.74). A medium or large effect (over .5) was evident in six of the studies/arms.

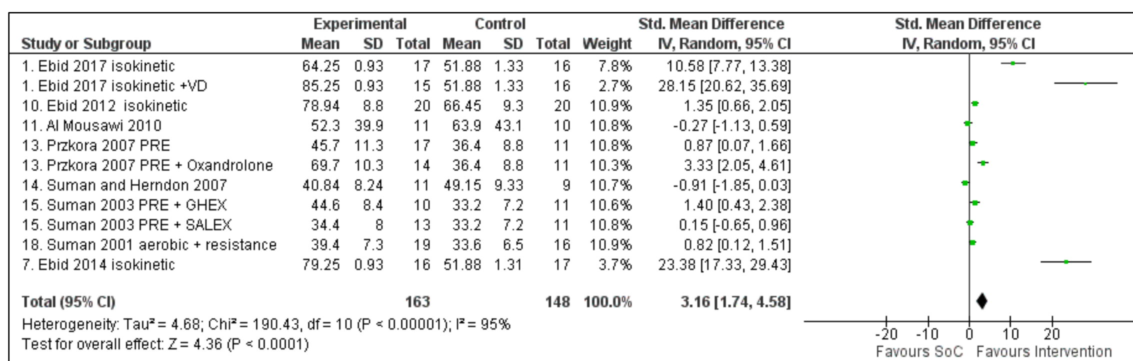
The 12-week exercise programme was started six months after the burn injury the burn wound would have fully healed. The exercises were either isokinetic[42] or Progressive Resistance Exercises (PRE)[88,133,135,136,138]. Three of the exercises programme were supplemented with pharmaceutical intervention[42,135,136]. All PRE and isokinetic studies showed effect sizes in favour of resistance exercises except Al-Mousawi et al.. (2010)[133], which showed slightly no effect. However, the study which implemented isokinetic exercises[42] yielded greater improvements than those using PRE resulted in greater improvement than those using PRE. The exception was the arms of the studies[135,136], which showed results comparable to the isokinetic study, but the exercises were supplemented with Oxandrolone, an anabolic steroid and recombinant Human Growth Hormone (rHGH). The combination of Growth Hormone and exercise resulted in a large effect size but it was reported not to produce a significantly greater increase in LBM than exercise alone [136]. The CIs of the other PRE which were not supplemented by pharmaceutical intervention all included 0 and thus did not demonstrate significant improvement. The most effective intervention was isokinetic exercise supplemented with Vitamin D in combination with isokinetic exercises [42] (SMD=3.78, CIs=2.56 to 4.99)

5.4.1.1 *Studies on the effect of resistance exercises on muscle strength not included in the Meta-analysis*

The following studies could not be included in the meta-analysis because of variability in post-intervention times and the use of a range of outcome measures.

- Clayton et al. 2017[140] compared a six week and 12-week exercise programme to determine if comparable improvements in LBM were noted. The study established that there were significant increases in LBM between discharge and the six-time points for both six-week (12.86±1.6 13.5±1.7 respectively) and 12 weeks group (13.8±1.5 14.7±2.1 respectively. However, no further improvement was seen following an additional six weeks of exercises with the 12-week exercise group[140].
- A study by Pena et al. (2016) [124] comparing two different exercises protocol (hospital-based and community-based) show that these exercise programs resulted in similar improvements in LBM (p=0.87).[143] In comparing exercises alone and exercises supplemented with propranolol, the results proved that in both groups, LBM was significantly greater after exercise training than at baseline in a 12-week program. The study also established that the percent change was not significantly greater in the propranolol group than in the control group (p>0.05).

5.4.2 Strength



Study or Subgroup	Experimental Mean	Experimental SD	Experimental Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
1. Ebid 2017 isokinetic	64.25	0.93	17	51.88	1.33	16	7.8%	10.58 [7.77, 13.38]
1. Ebid 2017 isokinetic +VD	85.25	0.93	15	51.88	1.33	16	2.7%	28.15 [20.62, 35.69]
10. Ebid 2012 isokinetic	78.94	8.8	20	66.45	9.3	20	10.9%	1.35 [0.66, 2.05]
11. Al Mousawi 2010	52.3	39.9	11	63.9	43.1	10	10.8%	-0.27 [-1.13, 0.59]
13. Przkora 2007 PRE	45.7	11.3	17	36.4	8.8	11	10.8%	0.87 [0.07, 1.66]
13. Przkora 2007 PRE + Oxandrolone	69.7	10.3	14	36.4	8.8	11	10.3%	3.33 [2.05, 4.61]
14. Suman and Herndon 2007	40.84	8.24	11	49.15	9.33	9	10.7%	-0.91 [-1.85, 0.03]
15. Suman 2003 PRE + GHEX	44.6	8.4	10	33.2	7.2	11	10.6%	1.40 [0.43, 2.38]
15. Suman 2003 PRE + SALEX	34.4	8	13	33.2	7.2	11	10.8%	0.15 [-0.65, 0.96]
18. Suman 2001 aerobic + resistance	39.4	7.3	19	33.6	6.5	16	10.9%	0.82 [0.12, 1.51]
7. Ebid 2014 isokinetic	79.25	0.93	16	51.88	1.31	17	3.7%	23.38 [17.33, 29.43]
Total (95% CI)			**163**			**148**	**100.0%**	**3.16 [1.74, 4.58]**

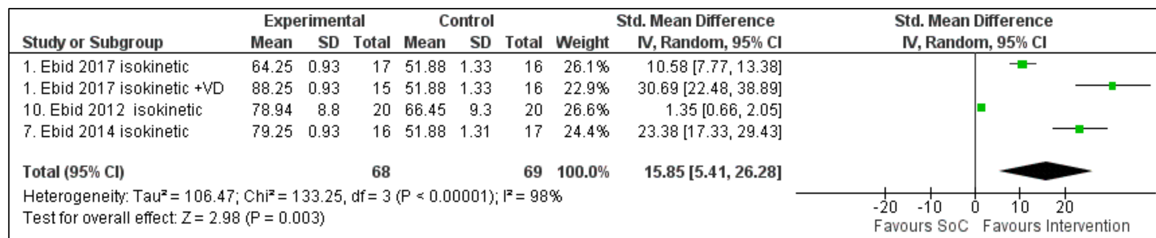
Heterogeneity: Tau² = 4.68; Chi² = 190.43, df = 10 (P < 0.00001); I² = 95%
Test for overall effect: Z = 4.36 (P < 0.0001)

VD – Vitamin D, PRE – Progressive Resistance Exercises, GH – Growth Hormone, SAL – Saline, EX – Exercise

Figure 5-4: Summary estimates of the average effect of exercise on muscle strength at three months post-intervention

Data from 8 studies were included in the meta-analysis. (Figure 5-4). However, as it was apparent that there was a difference between the effect of isokinetic exercise and PRE, as determined by the SMD; these were then analysed separately. Also, the two studies by Al Mousawi (2010) and Suman and Herndon (2007) did not have comparable baseline measurements, and despite reporting positive results for the intervention in the papers using within-group comparisons, turned in an SMD favouring the control group. These studies were then also analysed separately.

5.4.2.1 Isokinetic studies

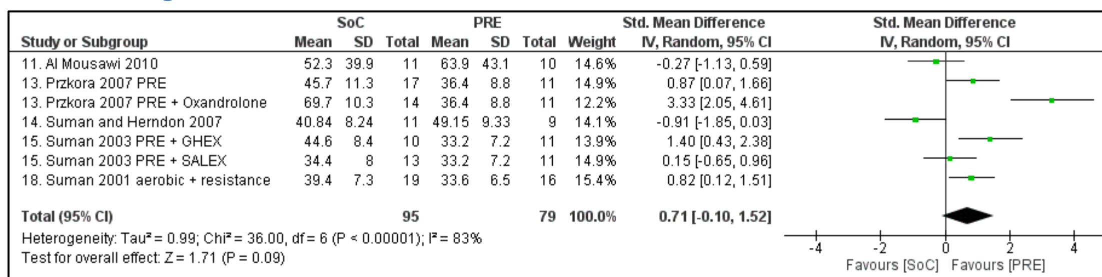


VD- Vitamin D

Figure 5-5: Summary estimates of the average effect of isokinetic exercises on muscle strength at 3 months post-intervention

All SMD were large and significant, (Figure 5-5) with the addition of Vitamin D resulting in most considerable improvement. The weighted total random effects SMD was 15.9 (CIs 5.4-26.3). However, there is a concern in that a single research group produced all the papers in this group. Although the same control group was used as the comparator in the 2017 study, it is unclear why the means and SD of the 2017 intervention groups and the 2017 and 2014 control groups are so similar.

5.4.2.2 Progressive resistance exercises

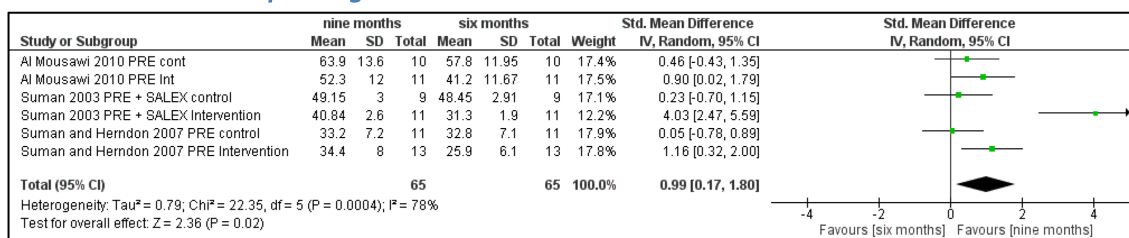


PRE – Progressive Resistance Exercises, GH – Growth Hormones, SAL – Saline, Ex – Exercise

Figure 5-6: Summary estimates of the average effects of PRE on muscle strength at three months post-intervention

Four of the PRE studies resulted in large, significant SMDs (Figure 5-6) but the CIs of the mean SDM included 0 (SMD .71(CIs -0.10-152)). Pharmaceutical supplementation resulted in the greatest improvements, and the largest effect was seen in those who received Oxandrolone, an anabolic steroid (Przkora, 2007[135]) followed by those who received growth hormone (Suman 2003[136]). However, as the baseline values differed considerably, the within-group effect was calculated below, for the three papers which did not report a significant result.

5.4.2.3 Within Group changes



PRE – Progressive Resistance Exercise, SAL – Saline, EX – Exercise, Nine months=Post-intervention, Six months=Pre-intervention

Figure 5-7: Summary estimates of the average effect of the within-group changes of PRE on muscle strength at 3 months post-intervention

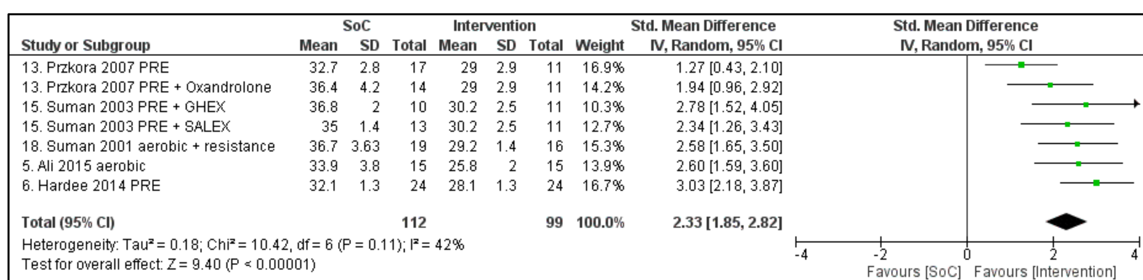
Within-group analysis (Figure 5-7) of the Al Mousawi (2010), Suman and Herndon (2003) and the Suman and Herndon (2007)[12,88,133] papers indicated that the within-group changes in the intervention groups were large and significant compared to the changes in the control groups over the three months of exercise (i.e. measures taken at six and at nine months). In contrast, the control groups demonstrated small and non-significant SMDs (CIs included 0). (The overall SMD change pre- and post-intervention was .99 (0.17-1.8) which indicates that there was a small but significant change overall in both intervention and control groups combined.)

5.4.2.4 Studies on the effect of resistance exercises on muscle strength not included in the meta-analysis

These studies could not be included in the meta-analysis because of variability in post-intervention times and the use of different outcome measures.

- Clayton et al. 2017[140] compared a six-week and 12-week exercise programme to determine if comparable improvements in muscle strength. The study established that the overall muscle strength was 38.3% greater after six weeks of training and only a 2% additional increase being seen after participation in six weeks more of rehabilitation exercises [140]. Burns that traverse the lower body joints (hip (p = 0.010) and toes (p=0.013)) were found with an associated 26Nm/kg and 33Nm/kg decrease in torque respectively[13].
- Cucuzzo et al.[139] in a study nine months post-burn injury determined that muscular strength increased in both the exercise group with an improvement of 80.1% (PRE and aerobics) greater than the SoC (37.7%) and was significantly greater in the exercise group (p< .05).
- Hardee [142] reported an insignificant mean difference in a 12-week exercise programme in muscle strength between the exercise and SoC group post-intervention (p=0.08).
- A study by [124] comparing two different exercises protocol (hospital-based and community-based) demonstrated clinical-equivalency as both led to improvements in muscle strength (p>0.12)[143]. In comparing exercises alone and exercises supplemented with propranolol, the study also proved that in both groups, muscle strength was significantly greater after exercise training than at baseline in a 12-week program. The study also established that the percent change was not significantly greater in the propranolol group than in the control group (p>0.05).

5.4.3 Aerobic



Study or Subgroup	SoC Mean	SoC SD	SoC Total	Intervention Mean	Intervention SD	Intervention Total	Weight	Std. Mean Difference IV, Random, 95% CI
13. Przkora 2007 PRE	32.7	2.8	17	29	2.9	11	16.9%	1.27 [0.43, 2.10]
13. Przkora 2007 PRE + Oxandrolone	36.4	4.2	14	29	2.9	11	14.2%	1.94 [0.96, 2.92]
15. Suman 2003 PRE + GHEX	36.8	2	10	30.2	2.5	11	10.3%	2.78 [1.52, 4.05]
15. Suman 2003 PRE + SALEX	35	1.4	13	30.2	2.5	11	12.7%	2.34 [1.26, 3.43]
18. Suman 2001 aerobic + resistance	36.7	3.63	19	29.2	1.4	16	15.3%	2.58 [1.65, 3.50]
5. Ali 2015 aerobic	33.9	3.8	15	25.8	2	15	13.9%	2.60 [1.59, 3.60]
6. Hardee 2014 PRE	32.1	1.3	24	28.1	1.3	24	16.7%	3.03 [2.18, 3.87]
Total (95% CI)			**112**			**99**	**100.0%**	**2.33 [1.85, 2.82]**

Heterogeneity: Tau² = 0.18; Chi² = 10.42, df = 6 (P = 0.11); I² = 42%
Test for overall effect: Z = 9.40 (P < 0.00001)

PRE – Progressive Resistance Exercises, SAL – Saline, Ex – Exercise

Figure 5-8: Summary estimates of the average effect of aerobic exercises on VO2 max

All the studies were done six months post-injury in children except for Ali et al. (2015) [144], which was done three months post-burn injury in adults. Ali et al.[144] was the one study which only used aerobic exercises. Apart from the study using growth hormones (Suman 2003, GHEX) (2.78, CIs 1.52-4.05), this study showed the largest SMD (2.6, CIS 1.59-3.6). (Figure 5-8). The random total SMD was large and significant in favour of the intervention group, 2.33 (CIs 1.85-2.82). All the individual studies showed large effects size in favour of PRE and aerobic exercises increasing VO_2max (Figure 5-8) in paediatric patients with major burns of > 35% TBSA. The impact of the pharmaceutical intervention was not as marked as in the muscle strength analysis.

5.4.3.1 *Studies on the effect of exercises on VO_2peak not included in the meta-analysis*

These studies could not be included in the meta-analysis because of various factors, including the variability in post-intervention times and heterogeneity of outcome measures.

- Clayton et al. 2017[140] compared a six-week and 12-week exercise programme to determine if comparable improvements in cardiopulmonary fitness. The study established that significant improvements in peak VO_2 were seen after six weeks in both groups (six weeks group 28.5±6.0 ml/kg/min: 12 weeks group 27.0±7.0 ml/kg/min) and there was an additional benefit noted in patients of the twelve group receiving a further six week of exercises training [140]. Benjamin et al. 2015[13] determined that burns that transverse the hip joint corresponds to a significant a decrease of 49 ml kg^{-1} min^{-1} (p=0.010) in the VO_2peak.
- A comparison of two different aerobic protocols, Work to Tolerance (WTT) and Work to Quota (WTQ)) [134] in adult burn survivors showed the superiority of both protocols when compared to SoC. The two groups demonstrated significantly greater improvements in the aerobic capacity as measured by VO_2max in comparison with the SoC (F=4.6 P≤0.05)[134].
- A study by Pena et al. (2016)[124] comparing two different exercises protocol (hospital-based and community-based) show that these exercise programs show similar improvements in VO_2peak (p>0.12). Porro et al. (2013) [143] in comparing exercises alone and exercises supplemented with propranolol proved that, in both groups, VO_2peak was significantly greater after exercise training than at baseline in a 12-week program. The study also established that the percent change in VO_2peak was significantly greater in the propranolol group than in the control group (p=0.028). Suman et al. (2002) [137] established that severely burned children improve in Pulmonary Function (PF) after 12 weeks in a hospital program.

5.4.4 Functional outcomes

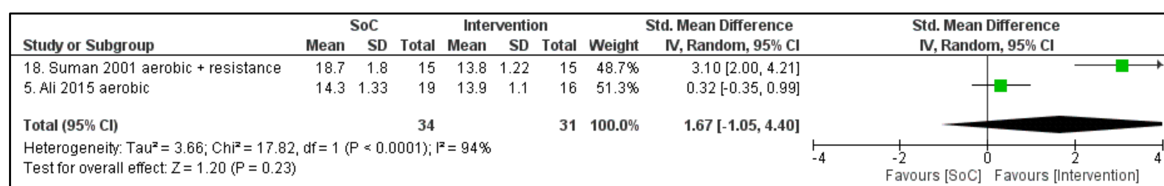


Figure 5-9: Effects Size of Exercises on Treadmill Times

Although one of the two studies [138,144] which included maximum treadmill times possible after intervention showed a large favourable SMD (3.1, CIs=2.0-4.2), the other study (Suman *et al.*. 2001) reported no significant impact and the total pooled SMD was not significant. (Figure 5-9)

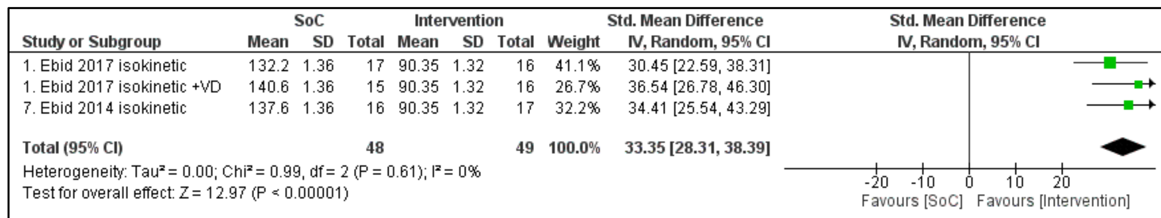


Figure 5-10: Effect Sizes of Exercises on Cadence

All three of the studies by Ebid et al.. demonstrated a very large effect size with the most substantial improvement in gait parameters in the exercises supplemented with Vitamin D group (ES = 36.56). Nonetheless, all groups had a significant increase in gait parameters[42 104]. All studies were done on paediatric patients and consisted of 12 weeks of isokinetic training with or without a supplement.

However, a major concern with these studies, as mentioned above, is that there is a duplication of values across groups which should be returning different results. For example, the subjects in the 2017 study were said to have been randomly assigned to one of three interventions. However, the same control group was used for a different research project in the 2014 study. Despite the slight discrepancy in numbers, the mean and SD of all control groups was the same. This casts doubt on the randomisation process and the results of the studies.

5.4.4.1 *Studies on the effect of exercises on functional outcomes not included in the Meta-analysis*

These studies could not be included in the meta-analysis because of various factors, including the variability in post-intervention times and the outcome measures.

- A 12-week study by Ebid et al. (2012) [87] showed no difference in the ambulation speeds between the isokinetic group versus the SoC group. In a study comparing home-based and in-hospital based aerobic and resistive exercises, the six-minute test showed a significant increase in distance walked nine months post-discharge in both groups. However, the hospital-based group showed a greater improvement (p=0.004) [139].
- Similarly, an intensive exercise program done after final grafting with a combination of aerobic and resistance exercises for six weeks shows a greater improvement in the intensive exercise group than the self-management group at 12 weeks for function. The Lower Extremity Functional Scale (p = 0.001) and the *Quick*DASH (p = 0.001) were the outcome measures used.

5.4.5 Adverse outcomes

Not all studies could be included in the meta-analysis because of variability in post-intervention times and outcome measures. Unfortunately, most studies mentioned adverse effects only in passing. Adverse effects appeared to minimal, or similar to any clinical environment or gymnasium [89,124]; A possibility for the exclusion of reporting in most studies. The pain was the most common measured adverse effect [87,134,139] and mostly measured in the pilot studies [87,139]. If they were severe pain or an exacerbation of the vital signs, then the need to stop during the testing was noted; however, all children completed the tests[139]. Benjamin et al. (2015)[13] reported a decrease in pain

measured by VAS at discharge when compared with (3.9±2.5) to (2.0±2.1) six months after discharge.

The other adverse mostly mentioned was leg discomfort or leg muscle wasting primarily due to muscle wasting and deconditioning[134]. In the same study, a physician was always there for treadmill testing to monitor the adverse effects of fatigue increase in heart rate or shortness of breath. Exercises can also have a negative effect on hypermetabolism which was measured as REE by Al-Mousawi et al. (2010) [137] and Suman et al. (2001)[142] and these studies indicate that exercises do not increase the hypermetabolic state a characteristic feature following a burn injury, especially in the paediatric population[133,138]. Burns that transverse hip joints have significantly detrimentally effect on strength (p=0.010) and cardiorespiratory (p=0.010)[13]. When propranolol was used in children, no adverse effects such as hypoglycaemia or hypotension were found[143]. However, adverse effects were not mentioned in other studies in which exercises were supplemented with drugs or vitamins, [42,135,136].

5.5 CERT Results

A Consensus on Exercise Reporting Template (CERT) was used to review the exercise interventions of all the articles. The CERT Checklist is designed for reporting details of an exercise intervention (www.equator-network.org).

As can be seen in Table 5-5 below, all papers included description of materials, mode of delivery, degree of supervision, adherence to the programme, decision rules for initiation of intervention, description of home exercise component and the dosage and location of the intervention. Five of the articles did not mention the exercise instructor[42,89,134,138,143,144] [89] and only nine included a description of the motivational strategy[89,106,135–137,139,142,146]. Although adherence to the programme of exercises was monitored, no articles described the method of exercise progression or the way in which fidelity to the prescribed exercises was maintained. Only one article provided photographs[13] of the exercises included in the intervention.

Table 5-5: CERT items performance in reviewed papers

CERT Item	Reviewed papers	Number reporting
WHAT: materials: Item 1 – Detailed description of the exercise equipment (e.g. weights, exercise equipment such as machines, treadmill, bicycle, ergometer etc)	All the articles described materials they used	19
WHO: provider: Item 2 – Detailed description of the qualifications, teaching/supervising expertise, and/or training undertaken by the exercise instructor.	11[12,88,124,133,135,137,139–142] articles specified the qualifications of the exercise trainer, exercise physiologist and personal trainer under the Academy of College Sports Medicine (ACSM). Two of the articles had a therapist undertake the exercise[87,104]. Five of the articles did not mention the exercise instructor[42,89,134,138,143,144]; the other article reported the exercise instructor as the test administrator[13]	14
HOW: delivery: Item 3 – describe whether exercises are performed individually or in a group	All the exercises from all the articles were performed individually	19
Item 4 – describe whether exercises are supervised or unsupervised and how they are delivered	All the exercises from all the articles were supervised	19
Item 5 – detailed description of how adherence to exercise is measured and reported	All the articles have a detailed description of adherence to exercise and reported it.	19
Item 6 – detailed description of motivation strategies	Visual feedback and verbal encouragement were provided to encourage a maximal level of effort during all contractions[89,106,135–137,139,142,146]. In a study by Paratz et al.[89] participants were not encouraged or motivated during the exercises. The other studies didn't mention the motivational strategies implemented[13,42,88,124,135–139,143].	9
Item 7a – detailed description of the decision rule(s) for determining exercise progression	A detailed description of the exercise progression was given in all the articles, with aerobic exercises participants exercising at 70 – 85% of their previously determined individual VO_2max. For the isokinetic and PRE the detailed progression was also given.	19
Item 7b – detailed description of how the exercise program was progressed	No articles described how they progressed the exercises for differing patients with burns.	0
Item 8- detailed description of each exercise to enable replication (e.g. photographs, illustrations, video etc.)	Only one article provided photographs[13].	1
Item 9 – detailed description of any home programme component (e.g. other exercises, stretching etc.)	All the articles had a component of the home exercise program as all patients had SoC at home	19
Item 10 – describe whether there are non–exercise components (e.g. education, cognitive, behavioural therapy, massage etc.)	Four articles had exercises in addition to pharmacological supplement[42,135,136,143].	4
Item 11 – describe the type and number of adverse effects that	Pain similar to any SoC occurred once in studies[87,134,139]. Leg discomfort occurred once in studies[13,139].	5

CERT Item	Reviewed papers	Number reporting
occurred during exercise		
WHERE: location: Item 12 – describe the setting in which the exercises are performed	The settings of all articles are as described in Table 5-2.	19
WHEN, HOW MUCH: dosage: Item 13 – detailed description of the exercise intervention including, but not limited to, number of exercise repetitions/sets/sessions, session duration, intervention/program duration	All the articles had a detailed description of the intervention and each intervention is described in The details of the Interventions offered are described in Table 5-3. In four papers [87,104,133,134,] the time of initiation of intervention was not reported. In the other papers, the intervention was started in the post-acute stage, either after discharge from the acute care141,142 or in the rest of the papers, from hospital. No intervention was thus reported as being initiated in the acute stage of burn injury. In every case the intervention was offered within the hospital setting apart from one study which was based in a Community Gymnasium124. Table 5-3.	19
TAILORING: what, how: Item 14a – describe whether the exercises are generic (one size fits all) or tailored to the individual	All the exercises from all the articles were generic.	0
Item 14b – detailed description of how exercises are tailored to the individual	N/A	
Item 15 – describe the decision rule for determining the starting level at which people commence an exercise program (such as beginner, intermediate, advanced etc.)	All the exercises were done when the burns had fully healed, after discharge. All the patients from the articles were beginners.	19
HOW WELL: planned, actual: Item 16a – describe how adherence or fidelity to the exercise intervention is assessed/ measured	Although adherence to the intervention was described, no article assessed the fidelity to the exercise intervention as described.	0
Item 16b – describe the extent to which the intervention was delivered as planned	Not described	0

**Abbreviations used in the table: VO_2Max-Maximal oxygen uptake, SoC-Standard of Care, N/A-not applicable.*

5.6 Discussion

This was the first meta-analysis to analyse the effects of therapeutic exercise in improving function in patients with burns for all age groups. The effects of exercises combined with supplements were also analysed. Since the review was completed a further systematic review by Gittings et al. (2018)[146] on the impact of resistance training for rehabilitation after burn injury was published. The current review included all the studies included in the Gittings review, with the exception of a paper by Mowafy et al. (2016) [147] in which the outcome measures included lean body mass and resting energy expenditure.

Risk of bias: Most studies had a low risk of bias, besides the high/unclear risk for blinding of therapists for all studies. It is difficult to blind subjects/therapists regarding an exercise programme, particularly as informed consent is required. However, it would be possible to have blinded assessors, but this was not reported in any study. Included studies had small sample sizes, a commonality in most RCTs in rehabilitation studies. Nevertheless, most studies reported a significant effect, either between or within-group. In the three cases where the within-group analysis was reported, randomisation had resulted in a difference in the baseline measures which favoured the control group. There was no difference in the methodology or reporting bias in the studies and the results can be attributed to the effect of PRE. As discussed below, the impact of isokinetic exercises is not as clear due to queries with the data sets. Isokinetic exercise resulted in a large to very large SMD on every outcome measure, particularly when supplemented with Vitamin D. The impact of PRE in isolation was not as clear and, although all studies demonstrated SMD which favoured the intervention, the confidence intervals generally included 0 and the SMD was small to medium.

A further threat to the validity of the results is that the Ebid et al. 2014[104] and Ebid et al. 2017[42] appear to have reported the same trial twice using the same control group. Their results may be implausible, given that the reported impact of intervention is several orders of magnitude greater than other study results. Another confounding factor is that so many of the studies originate from a single institution, the Shriner's Burns Hospital for Children (12 out of 15 papers on children). There may well be overlap in the enrolment in the different projects, but this is difficult to determine.

5.6.1 Effect of isokinetic exercises on LBM and Muscle Strength

The impact of exercise varied according to the method of application (isokinetic or PRE), and whether it was supplemented with a pharmaceutical intervention. Although the impact of isokinetic exercises on muscle strength seemed extremely large, all the studies were reported by Ebid et al. (ref). However, the methodologies of the studies by Ebid et al. are questionable as the randomization process was not accurately described. It appears as if the same control group for the three studies in 2014 and 2017 (used twice); the reported baseline measures are similar. It might be that the intervention group who received only isokinetic exercises is also the same as the 2017 study group. However, the sample size is not the same, although the intervention described is similar. No reference is made to the 2014 paper in the 2017 article apart from the comment that the results are consistent with previously reported research.

In addition, the reported figures seem to be incorrect in some cases. In the 2012 Ebid paper, the SDs varied from 8.8-9.3. In contrast, the SD of all three intervention group studies in the 2017 and 2014 papers was only .93 and the control group SD was 1.3. Although the risk of bias appeared to be low based on the examination of each article, when the results of the two papers are combined, serious concerns are raised. The SMD values are very large in these papers (greater than 10), in contrast to the Ebid 2012 paper in which the reported SMD was 1.4. However, the 2012 paper was performed on adults. It is thus difficult to conclude that isokinetic exercises, with or without Vitamin D supplementation, are effective in improving strength. The results regarding the impact on lean body mass are more credible and point to a large effect on LBM.

5.6.2 Effect of progressive resistance exercises on LBM and strength.

All studies using PRE in isolation were done in children and resulted in a small but insignificant improvement in the LBM. In contrast, muscle strength was significantly improved in all cases and demonstrated a large effect. The one exception was the Suman (2003) control group which was given injections of saline as a placebo. However, Suman et al. (2003) report that similar to the studies in which the with-in group difference was analysed, the with-in group change was larger in the SALEX group than in the GHEX and the study was included in the analysis of studies in which the baseline values in the intervention group were smaller than in the control group. As with the other studies in the within-group analysis, this study also showed a large within-group effect.

The studies which did not have comparable outcome measures to be included in meta-analysis[140,142,148], similarly reported significant improvements in muscle strength, besides Hardee et al. (2014). Of interest was the finding reported by Clayton that the greatest gain in muscle strength was seen in the first six weeks of resistance training after discharge and that an additional six weeks gave no additional benefit regarding peak torque. [124] Peña et al. (2016) was the only study to report the impact of the setting of exercise. They concluded that hospital and community-based programmes resulted in similar improvements in muscle strength in children. We conclude there is high-level evidence to support the use of PRE to increase muscle strength and some evidence to suggest that exercise increases lean body mass.

5.6.3 Effects of exercises on aerobic capacity

The aerobic capacity groups were comparable at baseline, and the summary effect size of intervention showed differences between the exercise group and SoC following individualized and supervised resistance training programmes. All the studies [135,136,138,142,144] showed clinical differences favouring the exercise group. Studies undertaken six-month post-injury showed beneficial effects of a combination of PRE and aerobic capacity in increasing the aerobic capacity of children with burns; all three studies were done with paediatric population. Studies also not included in the meta-analysis showed beneficial clinical differences in favour of exercises. Clayton et al. [140] a six-week program to a twelve-week program and concluded that, although muscle strength did not improve from six to eight weeks, aerobic capacity did. Two protocols, the WTT and WTQ were determined to be beneficial to the patients with burns as compared to SoC. Clayton et al. established that hospital-based program compared to community-based have similar improvements in aerobic capacity.

These studies have reported significant within and between-group improvements in aerobic capacity post-intervention, indicating that exercises are beneficial for patients with burns. Greater improvements were reported when exercises are combined with supplements or drugs. Blinding of patients was not done except for studies by;(de Lateur[134], Ebid 2017[42], Pena[148] and Przkora[135]. These studies were similar in all other aspects of the CCT except Porro were they were blinding of outcomes (detection bias). We conclude that there is high-level evidence to support the use of exercise to improve aerobic function.

5.6.4 Effects of exercises on functional physiological and adverse outcomes

Studies showed an improvement in effect sizes on treadmill times and gait (Ali et al. (2015)[144] and Ebid et al. (2012)[87], with an overall large effect size. The Ali study was the only study done on an adult population in the meta-analysis. Ebid et al. (2012)[87] in another study done on the adult population showed no differences in the ambulation speed. The differences in results are attributable to the different methodologies and exercise programs used in the studies. There is, therefore, inadequate evidence to conclude that function is improved by strength training, despite the improvement in muscle strength and aerobic capacity. Functional measures should be included as essential outcomes in future studies.

5.6.5 Effect of pharmaceutical intervention

Vitamin D enhanced the effect of isokinetic exercise, although the findings should be taken with caution due to the issues with these studies raised previously. Growth Hormone resulted in improvement but was not recommended by the authors (Suman et al. 2003[136]) as the injections were unpleasant for the children and did not result in a significantly more substantial increase in strength compared to placebo plus exercise. Anabolic steroids were more effective than PRE alone but the CIs of the two arms of the studies overlapped, and the expense might not be warranted, (Przkora, 2007). Propranolol was reported not to block the improvements in LBM, muscle strength, or VO_2 MAX and improved the aerobic response to exercise (Porro 2013). In summary, there is inadequate high-level evidence to support the use of pharmaceutical supplements to enhance the effects of exercise, particularly in a resource-constrained context.

5.7 Conclusions and recommendations

This chapter of the thesis established that exercises, either resistance or aerobic, may be effective and generally have a positive effect on muscle strength and aerobic capacity. However, this is based on rather poor evidence and the review has several limitations The study included inclusion of three trials which had a comparator group, rather than a control group [124,140,143]and were therefore not comparable RCT's for the subject matter. The inclusion of two duplicate studies with implausible results[104 42] and the reliance on a single institution for most of the data on interventions in children also weaken the results.

In hindsight, it was an error to include studies applying only aerobic exercises and those that included pharmaceutical interventions, particularly as these would not be of much relevance to the Zimbabwe situation.

As most of the research enrolled paediatric patients older than seven years and, no adverse effects were reported, it can be concluded that resistance exercise is safe for this group of patients. However, as most children admitted with burns are often younger than seven years, exercise needs to be carefully monitored in this group as safety and efficacy have not been proven for younger children. The results from this support the use of aerobic and resistance as a vital component of a burn rehabilitation program as they have shown to improve muscle strength aerobic capacity and functional status even after hospital discharge, especially in patients with severe burns.

Exercise should be part of the SoC, especially for patients seven years and above. Studies which support the use of isokinetic exercise appeared to have methodological flaws, and the level of evidence supporting these interventions is thus questionable. As isokinetic equipment is not available in the public sector, their use would not, in any case, be recommended for the Zimbabwean context.

Concerning the timing of exercise, most studies implemented exercise therapy treatment at 2 – 3 months post-discharge but a study by Hardee et al. (2014)[142] has shown similar benefits of improvement in muscle and the cardiorespiratory system of implementation soon after discharge. This can have beneficial effects on low-income countries, including Zimbabwe, where follow-up of patients is difficult and can increase patient compliance. As reported by Clayton et al. (2017)[140], the optimum timing of exercise appears to be the first six months post-discharge, with little further strength gained by extending the programme for an additional six weeks. However, aerobic capacity is improved, and consideration should be given to continuing aerobic exercise if exercise tolerance is a problem for the patient(s).

The setting of the exercise programme, i.e. community or hospital, did not influence outcomes in the single study in which this was examined (Pena, 2016). This is of relevance to the Zimbabwean context in which post-discharge follow-up may well take place in community settings.

Several of the primary outcome measures would not be available within low-technology settings and, particularly as the evidence for intervention is poor, it would be important to recommend routine outcome measures which could be utilised in Zimbabwe in the Guidelines. Outcome measures relevant to low-resources settings could include; muscle size, Manual Muscle Testing, Heart Rate and six-minute walk can be used for the evaluation of the impact of exercises on patient outcomes. In addition, functional outcome measures can be applied without the use of any sophisticated technology.

Though studies that combined the use of exercises and supplements, drugs, or vitamin D had the largest effect sizes, these were not significantly higher than exercise without the supplementation. However, the impact of vitamin D could be examined further as this is an affordable supplement that showed some promise in the Ebid (2017) study.

Future studies should improve the methodological quality, especially on blinding of outcomes and reporting of the RCT. Also, there is an urgent need to include children under the age of seven years in the study population as this is the group that is most affected by burns. The key findings are that exercise conditioning is a safe and effective component of burn rehabilitation. Recommendations for

clinical practice will include establishing exercises programme as routine care for all major burns post-discharge. PRE will be combined with aerobic exercises to have a general effect on the whole body. Vitamin D supplementation should also be considered as it appeared to have a favourable impact on the outcome and is affordable within a LIC.

Regarding this, exercises will form an integral part of our guidelines for patients with major burns older than seven years old.

Chapter 6. Documentation of current rehabilitation practice

6.1 Introduction

The overall aim of the thesis was to present evidence to inform recommendations regarding physiotherapy management of burns in Zimbabwe. In this chapter, the results of observation and documentation of clinical interventions are presented to describe the physiotherapy and occupational therapy techniques currently used to treat musculoskeletal problems in burn patients in Zimbabwe. This information was then used to develop the recommended amendments to the Draft Guidelines of Physical therapeutic Management of patients with burns. The study was expanded to include Occupational Therapists (OTs) and other rehabilitation workers as in some institutions, no physiotherapists were working in the Burns' Unit.

The choice of research design proved challenging, and there was considerable deliberation before the audit study design was chosen [149,150]; the possible choices in study designs are also discussed. To better understand the operational constraints and the potential limitations of physiotherapy and rehabilitation intervention, the context of the study is also described, regarding the structure of the health care system, and the training of rehabilitation workers in Zimbabwe.

6.2 Contextual information

6.2.1 Health System in Zimbabwe

Zimbabwe has both public and private hospitals, but this research was confined to the public health system. The public health system consists of a three-tier system consisting of the district, provincial and central hospitals with an integrated referral system between all levels. The central hospitals are the top-tier referral centres at which patients receive specialist care; patients with severe injuries are invariably transferred to one of the five central hospitals. Each of the central hospitals has a dedicated Burns' Unit for both paediatricians and adults, which is not the case with the eight provincial and 44 district hospitals. The health facilities in Zimbabwe are shown in Table 6-1, , taken from page five of the Zimbabwe National Health Strategy 2016 – 2020 report[35].

Table 6-1: Health Facilities Profile in Zimbabwe

Table 1: Health facilities profile for Zimbabwe			
Facility level/ Managing Authority	**All facilities**	**Hospitals**	**Primary Health Facilities**
Central Hospitals	6	6	
Provincial hospitals	8	8	
District Hospitals	44	44	0
Mission Hospitals	62	62	0
Rural Hospitals	62	62	0
Private Hospitals	32	32	0
Clinics	1,122	0	1,122
Polyclinics	15	0	15
Private clinics	69	0	69
Mission clinics	25	0	25
Council/Municipal Clinics/FHS	96	0	96
Rural Health Centre	307	0	307
Totals	**1,848**	**214**	**1,634**

Source: ZSARA, 2015

6.2.2 Rehabilitation education in Zimbabwe

In Zimbabwe, the rehabilitation of patients with burns is undertaken by physiotherapists (PTs), occupational therapists (OTs) and rehabilitation technicians (RTs), Social workers and clinical psychologists are also involved in the management of burns in the central hospitals, particularly in cases of self – inflicted injuries. The majority of therapists and rehabilitation technicians working in the public sector are trained in Zimbabwe. Two tertiary institutions offer rehabilitation education in Zimbabwe. The University of Zimbabwe, College of Health Sciences (UZ – CHS) offers two, four-year degree programs in Physiotherapy (PT) and Occupational Therapy (OT) and a two-year general Masters in Physiotherapy. At the Marondera Rehabilitation Training School, the two-year certificate in Rehabilitation is offered that trains RTs and teaches basic concepts in OT and PT. On graduation, the RTs must work under the supervision of either a PT or OT.

The PTs, OTs and RTs must register with the Medical Rehabilitation Practitioners Council of Zimbabwe (MRPCZ), the regulatory body for rehabilitation professionals. PTs and OTs are mainly based at Central hospitals, whilst RTs are primarily responsible for rehabilitation at District hospitals. Ideally, there should be an equal number of therapists and RTs at provincial hospitals. In terms of burns management, there are no specialised burns rehabilitation teams due to staffing shortages. Burns' Units in central hospitals are managed by a single rehabilitation professional (that is, a PT or OT). The rehabilitation professionals are also responsible for supervising and teaching the RTs. In this chapter, Rehabilitation Worker (RW) refers to PTs, OTs or RTs. A comparison of the techniques used by each group, although of interest, is beyond the scope of the study; it would have required a larger sample size of each type of worker, which would not be possible in the case of PTs and OTs. No hospital is named in the study to respect the autonomy of each institution.

6.2.3 Audit of clinical rehabilitation practice.

According to Health Quality Improvement Partnership (HQIP), a clinical audit is defined as "'a clinically led, quality improvement process that seeks to improve patient care and outcomes through the systematic review of care against explicit criteria and to act to improve care when standards are not met." (P. 152). An audit is recognised as an important quality assurance mechanism, and the UK National Health Services (NHS) has an established clinical audit guidance group.

https://media.nature.com/m685/nature-assets/bdj/journal/v223/n1/images/sj.bdj.2017.586-f1.jpg.

Figure 6-1: Clinical Audit Cycle

The steps outlined in Figure 6-1, are similar to those that used in curriculum development for medical education [151]. As suggested in the figure, the audit topic was identified, standards were set through the systematic review and published guidelines, data collection was undertaken and analysed. The implementation phases of the clinical audit were not included in the scope of this study. However, recommendations were made to amend existing guidelines for the management of patients with burns.

There are several reports on audits of physiotherapy practice[152–155], with only a few on the physiotherapy management of burns. A search of the PubMed database using Boolean operators "audit" and "physiotherapy" identified 369 articles, with most of them focusing on musculoskeletal conditions. When the Boolean criteria ("audit" and "physiotherapy" and "burns") were entered, only five articles were retrieved. One study was not relevant [156] as it was an RCT, rather than a prospective audit, as a new intervention was tested.

A study was undertaken at Red Cross War Memorial Children's Hospital (RCWMCH) in Cape Town (South Africa) to evaluate burn care in South Africa (SA)[157]. This study focused mainly on adherence of initial burn management to provincial hospital policy guidelines on clinical management of the burn wound[157]; it did not focus on physiotherapy management. A second paper reported on an audit exercise in Papua New Guinea[158]. The audit tool was based on the Körner Medical Records (KMR) form which includes the number of patients admitted and discharged, the clinical problems encountered, patients seen, diagnosis, consultation time spent with individuals and the number of

sessions[159]. However, the specific techniques utilised were not described as the paper focused on all the conditions which included neurological disability, orthopaedic rehabilitation, burns, arthritic and those requiring respiratory physiotherapy techniques[158]. A third audit study [160] used questionnaires to assess chronic pain drawn by patients on a body diagram and identified that drawing pain on a body diagram could be a valid and convenient screening tool for pain sensitisation. In a study to document the management of combat wounds, a retrospective cohort study was undertaken using field medical records[161].

A fourth study examined the quality of physiotherapy documentation of the management of patients with burns in South Australia through a retrospective audit of patient's records [162]. The audit tool was adapted from the Physiotherapy Department Guidelines for Documentation, produced by the department under study. A variable standard of in-patient reporting was found, but overall, out of the 42 items in the audit form, only seven were consistently absence or missing. The seven items considered absent or missing consisted of; time of consultation, patients general appearance, objective assessment, smoking history, usual sputum production, range and strength of affected and unaffected limb(s) [162]. It was concluded that the overall standard was acceptable, although there was still room for improvement. The importance of clinical documentation and the regular audit of this documentation was emphasised. A similar audit of the use of outcome measures used by OTs and PTs managing patients with burns was performed in Australia[1 56], using a questionnaire based on a literature search of published measures. A few measurement tools were found to be used routinely, some of which had been validated for use in Australia [1 56]. In the audits described previously described [162 1 56], data were collected through record reviews[162], checklists[163] or interviews[164]; each method has advantages and disadvantages. No study was found that used direct observation of intervention. Observation allows for the collection of real-time information in that first-hand information is collected. However, the disadvantage is the possible discomfort of the patient being observed. Other disadvantages are the Hawthorne effect which may cause the treatment being more thorough than usual and the subjectivity of the observer[165], which may also introduce bias. Record review through questionnaires or checklist is another form of audit, but the disadvantage is missing data or records. Interviews are another form of audit tool but can be time-consuming, and maybe difficult to transcribe.

6.3 Research design

A qualitative descriptive case study was considered, as this would allow for the collection of both numerical and narrative information)[166]. A case study approach is useful when the study aims to determine "how" or "why" certain behaviour is demonstrated; this behaviour cannot be manipulated and contextual conditions are relevant to the study. These conditions were present in the current study. Case study research typically draws on multiple data sources, including records, interviews and observation [166].
However, developing it is necessary to develop research questions to aid in case selection, identify the focus, and define the boundaries [167]. The current study has no propositions/hypotheses to be tested and the research questions, which related to the description of intervention techniques did not lend themselves to qualitative analysis. This research approach was therefore discarded.

A prospective cross-sectional descriptive study was thereafter considered with no hypotheses formulated and no interferential statistics done. However, based on the criteria of the Health Research Authority of the UK [150], the current study would not meet the criteria for research. There was no randomisation of participants; there was no change made to the treatment/patient care from accepted standards for any patients; and the results were not generalisable outside the context of data collection.

The design that appeared most relevant was a clinical audit which examines the delivery of standard care, including decisions relating to treatment regime and overall management[168]. Twycross and Shorten (2014) [169] maintain that the overall aim of an audit is to measure clinical practice against best practice guidelines using a standardised data collection tool. There is no randomisation or allocation to different treatment groups. The current study thus was best characterised as an audit of clinical practice.

6.4 Aims and Objectives

The overall aim of this sub-study was to investigate the rehabilitation management of patients with burn injuries admitted to all central hospitals, one provincial hospital and one district hospital in Zimbabwe to document the standard of care.

The specific objectives of this sub-study were to determine the rehabilitation management techniques used to manage musculoskeletal impairments and functional limitations in patients admitted with burns to hospitals in Zimbabwe regarding frequency, repetitions and method of administration. Documentation of chest therapy, psychological counselling or work or school preparation were not included. The discussion then examined if the current management was consistent with best practice as determined by the literature review.

6.5 Methods

6.5.1 Study design

The methods used in the current audit included a review of patient's records, observation of therapists and interviews to clarify the management administered to patients with burn injuries. The study participants were both the rehabilitation workers (RW) being observed, and the patients being managed during the observation. RWs employed at the five central hospitals, one provincial hospital and one district hospital were eligible. Data were collected over two consecutive weeks per hospital.

6.5.2 Identification of sites and rehabilitation workers.

The study was conducted primarily at central hospitals, and all five hospitals were used as research sites. It was anticipated that the degreed OTs and PTs would use a large repertoire of interventions with the patients. This repertoire would include most if not all, techniques applied by lesser trained RWs on patients with less severe burn injuries. However, as the role of PTs and OTs includes supervision of RTs, one district and one provincial hospital were purposively included in the sample.

A purposive sample of one provincial and one district hospital was thus chosen. The criteria included that the rehabilitation of patients with burns should be offered by RTs rather than OTs or PTs and that each should serve as training centres for therapists and RTs. This second criterion was

identified as it was assumed that on-going contact with the training centres might also result in more comprehensive and up-to-date interventions being applied. The selection of research sites was therefore made to prevent collecting redundant information but also to ensure that saturation was achieved. In the event of an RW refusing to participate, identification of another provincial or district hospital would have occurred, and the hospital would have been excluded. Fortunately, this was not necessary as all RWs consented.

6.5.2.1 Rehabilitation Workers in Burns' Unit

All RW undertake a mandatory one-year internship and rotate through all the major disciplines of rehabilitation which are neurological, orthopaedic, and cardiorespiratory and paediatrics. Additionally, OTs and RTs partake of mandatory psychiatric rotation. Working in the Burns' Unit was being done on a rotational basis at each hospital with the as the rotations vary between three months and six months, there is little chance to development specialised skills.

6.5.3 Inclusion and exclusion criteria of patients

The inclusion criteria for patients whose treatments were observed included all patients with acute burns aged three years and above, with burns of any depth, admitted to the surgical, paediatric or burns units at the selected hospitals, and treated during the two weeks of observation at that facility. Though children younger than three years were found to have the highest frequency of admissions for burns (Chapter 2), they were excluded in the study as most techniques used were play techniques, which differed considerably from those used for children older than three years. In addition, children younger than three years are unable to comprehend most of the instructions. Outcome measures for children older than three years and above are similar to adults, unlike those for three years and below.

Patients with burns who were readmitted to the surgical, paediatric and Burns' Units for the same burn injury were excluded, as the management of the burn would differ from an acute burn injury. The burn wound healing in the intermediate phase will consist of an early debrided wound, and the skin grafts would have fully healed [37]. Patients whose burn injuries were complicated by other injuries, such as fractures, traumatic brain injuries, and peripheral nerve injuries, which might have affected their prognosis and functioning, were likewise excluded. Patients with burns who were critically ill in the Intensive Care Unit and had respiratory or inhalational complications were excluded as this is a specialised area and was beyond the scope of this thesis.

Patients with burns who were critically ill and were unlikely to survive were excluded. This determination was made based on literature [17] and the results of the epidemiological study in Chapter 2 which found that most children with a TBSA of greater than 21% died (7/11), whereas all adults with a TBSA of over 41% died. In addition, the mortality rate rose in those with three or more burn sites, rising to 44% and 54.5% in children and adults, respectively, with four burn sites as described in results in Chapter 2.

6.5.4 Sample size discussion

All RWs working in the Burns' Units during the period of the research were included in the study. As this was an audit of services provided by the central hospitals, and it was not intended to generalise the results, random sampling was not appropriate. The entire population of RW and the whole

sample of patients with burns, whom they treated in these hospitals during this period, were recruited. It was anticipated that the standard of care provided by each RW would not differ significantly between patients and that observation would continue until "saturation" was achieved and no further techniques were being demonstrated. The researcher observed five adults and five paediatric patients being treated with burns at each hospital over two weeks as it was anticipated that a larger patient sample would have resulted in redundant data being collected. Thus, the treatments by the RW of ten patients who satisfied the inclusion criteria were observed initially, and this number was increased if "saturation" was not achieved and if new techniques were being utilised.

6.6 Instrumentation

The multiple data sources used to inform the research included:

- Contextual information regarding the training of RW in Zimbabwe and the health care institutions were obtained through personal contact with the institutions involved. The 2019 Physiotherapy Syllabus and Occupational Therapy Syllabus for the treatment of burns were obtained from the Department of Rehabilitation at the University of Zimbabwe.
- After obtaining permission from the patient participants, the medical records of the patients whose treatments were observed were accessed and data was collected using the same standardised checklist developed for the Epidemiological study reported in 2.5.2. (Appendix VIII).
- Observation of treatment was done to determine the frequency and duration of techniques employed. A standardised questionnaire and a self-designed checklist of techniques for the management of musculoskeletal problems in patients with burns were utilised (Appendix XXVII).

6.6.1 Management Checklist

The checklist of the management used in the treatment of patients with burns consisted of the techniques used to treat musculoskeletal impairments and functional limitations. The principal investigator noted the duration, frequency, and intensity of the techniques used by the rehabilitation team member. The checklist (Appendix XXVII) was developed by the researcher based on his work experience in burns, published literature, and discussions with physiotherapists with expertise in burns.

Table 6-2 below shows the techniques used and the definition/description of each technique. For this study, the following operational definitions were used.

Table 6-2: Techniques included in the Checklist

Technique	Definition/Description
Passive movements	A movement of the body or the extremities of a patient performed accurately, rhythmically and smoothly through the available range of motion (RoM) according to the anatomy of joints by an external force.
Active movements	These are movements of the body or the extremities performed by the patient's own muscular efforts with no assistance accurately, rhythmically and smoothly through available RoM according to the anatomy of joints, either against gravity or with gravity neutral.
Active assisted movements	These are active movements of the body or the extremities performed by patients who have inadequate muscle strength or coordination to complete the available RoM. An external force is applied to compensate for the deficiency. The movements are performed accurately, rhythmically, and smoothly through available RoM according to the anatomy of joints against gravity or not.
Resisted exercises	Force or resistance offered to the action of working muscle which can either be mechanical or manual. Resistance can either isokinetic, isometric or isotonic. 1. Isokinetic exercises are strength training exercises done at a constant speed no matter how much effort you expend through the use of machines. The machines control the pace of an exercise by fluctuating resistance through RoM. 2. Isotonic exercises are strength training exercises done at constant tone while shortening. E.g. stair climbing, squats, bicep curls, push up. 3. Isometric contractions are strength training exercises done to generate force without changing the length of the muscle.
Stretching	A specific muscle/tendon deliberately passively stretched at the end of the available RoM
Positioning	Positioning patients using proper positioning techniques to avoid contractures.
Splinting	To maintain available RoM using a rigid or flexible material.
Standing	This includes sit to stand, and time spent standing.
Walking	Movement at any regular pace with or with no assistance.
Bed Exercises	Bed exercises (Rolling and Bridging)
Ward Programme	Consisted of RoM exercises, splinting or positioning regimes to be performed in the absence of the RW, by the patient and in cases of paediatrics to be performed by the patient with or without assistance from the parents/caregivers.
Other techniques	Any other technique used in the management of physiotherapy e.g. Proprioceptive Neuromuscular Facilitation and mobilisations.

6.6.2 Content validity

The content validity of the data collection sheet was established with the help of a panel of five specialists (Table 6-3) consisting of PTs, OT, and lecturers in burns at the University of Zimbabwe. The selection of the panel was in terms of experience in epidemiological studies and an interest in the management of burns.

Table 6-3: Description of experts

Profession and place of work	Country	Qualifications
Physiotherapy lecturer University of Zimbabwe (UZ)	Zimbabwe	MPhil PT (UCT), BSc HPT(UZ), PG Cert CD and PhD Student (UCT)
Physiotherapy lecturer/Burns lecturer (UZ)	Zimbabwe	MSc PT (UCT), BSc HPT (UZ)
Occupational Therapy lecturer/Burns lecturer (UZ)	Zimbabwe	PhD (Stellenbosch), MPH (UZ), BSc HOT (UZ)
Plan International	Zimbabwe	MPH (UZ), BSc HOT (UZ)
Central Hospital Principal Therapist)	Zimbabwe	MSc HPT (UZ), BSc HPT (UZ)

Each item or question was rated on a Likert scale from 0 (not necessary) to 4 (very necessary). The experts could rate the scores of zero, one, two, three, and four with two being neutral, and universal agreement among the experts was defined as a score of three or four on each item on the data capture sheet. Changes were made if there was no universal agreement on an item on the checklist until there was a score of three or four on the item. The scores for each item on the checklist are shown in the table below Table 6-4.

Based on the responses, changes were made to PNF and mobilisations as they were listed under other techniques, experts established they were not specific to burn managements. Bed exercises were broad hence it was limited to only bridging and rolling. Pain management was added as it wasn't in the initial list though no specific techniques were listed underneath it as there are several techniques to manage pain, including distraction therapy through virtual reality.

Table 6-4: Content Validity for Checklist Items

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Number in Agreement
Passive movements	4	4	4	4	4	5
Active movement	4	4	4	4	4	5
Resisted exercises	4	4	4	4	4	5
Stretching	4	4	4	4	4	5
Active assisted	3	4	3	4	4	5
Positioning	4	4	4	4	4	5
Splinting	4	4	4	4	4	5
Walking	3	3	4	3	3	5
Standing	4	4	4	3	3	5
PNF	2	3	2	2	3	2
Mobilisations	1	3	2	3	3	2
Bed Exercises	2	3	2	2	3	2

6.7 Procedures

After ethical approval had been granted from the relevant institutions and hospitals, RWs working in the Burns' Units were approached to participate in the study. RWs that agreed to participate in the study had to sign an informed consent form (Appendix XVIII) and were subsequently enrolled in the study. After validation of the instruments, a pilot study was done.

6.7.1 Pilot study

The pilot study was undertaken two weeks before data collection at a central hospital. A research assistant conducted the pilot study. It was established during the pilot study that:

- One hour was needed to conduct the study on one patient, and the study was to be conducted after the patient has been bathed and dressed.
- The study would be conducted after the administration of pain killers.

- The researcher would have to quietly observe and only ask for verification after the treatment to respect the therapeutic relationship between the RW and patient.
- The hospital protocols of all hospitals in the research were established regarding patient's consent, privacy and confidentiality. Records were not to leave the hospitals.

6.7.2 Study procedure

Data collection took place from the 1st June 2016 to 31st July 2018. The order in which hospitals were visited was determined by random selection through computer-generated numbers. Each hospital was assigned a number between one and seven. The researcher conducted visits to all the hospitals during data collection.

Data were collected from all patients seen by the RW assigned to the Burns' Unit, surgical or paediatric wards. The study aims were explained to each participant and patients were asked for permission to observe their intervention and to access their medical records to obtain information relevant to the study. An informed sheet and consent form was signed after that (Appendix XIX and XX). Proxy consent was used for minors (Appendix XXI and XXII) and was obtained from the guardian. Assent forms (Appendix XXIII-XXVI) were used for minors. The demographic data was obtained from the patients' records, and data for the checklist were through observation of the therapist management of the patients.

6.8 Data analysis

Raw data were collated and entered into a Microsoft Excel spreadsheet. The data were analysed using STATISTICA (Version 16). Categorical data of demographic characteristics of Physiotherapists, patients and the burn injury were analysed and described as numbers and percentages. Continuous data derived from the 70 treatment observations were described using median and range as the spread of the variables were not all normally distributed as tested using the Shapiro Wilks (SW) test for normality. Bar charts of frequencies of percentages of patients receiving each intervention and techniques applied per site of burn were made using Excel packaged in Office 365 (Microsoft Corporation). As the study was descriptive and not inferential, no hypotheses were tested using statistical tests such as Chi-Square or the t-test.

6.9 Results

6.9.1 Demographic Characteristics of Physiotherapists

Of the seven hospitals, only three had physiotherapists working in their Burns' Units. It was thus necessary to include other rehabilitation workers in the sample; these include Rehabilitation Technicians, Occupational and Physiotherapists.

6.9.2 Training of RW in the management of burn injuries Zimbabwe

Post hoc, the researcher collected data on the training of RW in Zimbabwe. Head of Departments at the University of Zimbabwe – College of Health Sciences and the Marondera Rehabilitation Technicians Training School were approached to provide a curriculum (Appendix XXVIII). Based on

the curricula provided by the training institutions, and the personal experience of the researcher, the management of patients with burns is taught, as described in Table 6-5.

Table 6-5: Training of RW in Management of Burn Injuries in Zimbabwe

	Physiotherapists	Occupational Therapists	Rehabilitation Technicians
Institution	University of Zimbabwe	University of Zimbabwe	*Marondera Rehabilitation Technicians Training School
Hours spent in theoretical and training institution teaching, excluding basic clinical sciences	44	6 hours theory on burns only	
Hours of clinical placement in wards treating burns	Clinical placement for 12 weeks combined with orthopaedics	Clinical placement 8weeks	
Interventions			
• **Assessment of a patient with burns in the acute stage:**	√	√	
• **Assessment of physical status**	√	√	
• **Assessment of mental status**	√	√	
• **Identification of primary problems and suitable methods of intervention**	√		
Methods of treatment in the acute stage:			
- **General principles**	√	√	
- **Positioning**	√	√	
- **Splinting**	√	√	
- **Active/assisted/passive movements**	√	√	
- **Management of oedema**	√	√	
- **Muscle, strength maintenance**	√	√	
- **Hydrotherapy**	√		
- **Re-education of gross motor function**	√	√	
- **Treatment after surgery**	√	√	

**MRTTS didn't provide its curriculum, despite repeated requests telephonically and by e-mail.*

In addition to the above curriculum, Occupational Therapists also cover; scar tissue management, pressure garments, Activities of Daily Living assessments, Activities of Daily Living training, work assessment and placement, play in children, school readiness program, management of psychological issues in burns that include post-traumatic stress disorders, anxiety, depression, amongst other mental health conditions etc.

6.9.3 Medical record review and observation of treatment

Five central hospitals, one provincial and one district hospital, were visited by the researcher. As per protocol, the treatments of five adults and five paediatric patients were observed at each hospital, a total of 70 treatments in all. As no new techniques were observed at the end of observing 70

treatments, the researcher concluded that data saturation had been reached, and increasing the number of treatment observations was not warranted.

6.9.4 Demographic Characteristics of Rehabilitation Personnel

Due to the lack of staff in all the hospitals, only one RW was assigned to each Burns' Unit. A PT offered rehabilitation in three of the central hospitals and by an OT in the other two. In the district and provincial hospitals, patients were treated by RTs (Table 6-6). The sample consisted of four females and three males. The median age of the sample was 32 years range =28-36 years).

Table 6-6: Number of years working

Hospital		Years of experience	Years in Burns' Unit
Central			
A	Physiotherapist	9	2
B	Occupational therapist	6	4
C	Physiotherapist	8	1
D	Occupational therapist	5	2
E	Physiotherapist	6	2
District and Provincial			
F	Rehabilitation Technician	13	4
G	Rehabilitation Technician	15	5

The median number of years working as an RW was eight years (range 5-15). The median number of years of working in a Burns' Unit was two with a range of seven years (range 1-5) (Table 6-6).

6.9.5 Training in Burns

The therapists (Pts and OTs) had received their basic training in burns in their undergraduate training. No therapists received any specialist training or post-graduate certificate in burns. The RTs also had no additional training and were taught to manage patients with burns in their two-year certificate programme.

6.9.6 Demographic data and medical data of the patients

This information was taken from the hospital records and the rehabilitation records. The age ranges of children (SW W=.843, p<.001) and adults (SW W=.894, p=.003) were not normally distributed consequently both adult and children age on admission were calculated as medians and ranges. The adult median was 29 years (range 13-74) and that of children four years (range 2-9 years).

Table 6-7: Gender of the Participants

Gender	Females	Males	Row Totals
Children	21	14	35
Row %	60	40	100
Adult	15	20	35
Row %	42.9	57.1	100
Total	36	34	70

There were more female children (60%) and more adult males (57%).

Table 6-8: Characteristics of the Burn Injury

	Children N	Column %	Adults N	Column %	Total N	Column %
Aetiology						
Electrical	1	2.9	1	2.9	2	2.9
Fire	3	8.6	9	25.7	12	17.1
Scald	31	88.6	25	71.4	56	80.0
Circumstances						
Accidental	35	100	25	73.5	60	85.7
Intentional	0	0	9	26.5	9	12.9
Missing			1	2.9	1	1.4
Depth of most severe burn						
Superficial	8	22.9	6	17.1	14	20.0
Partial	25	70.5	22	77.1	47	67.1
Full	2	5.7	2	5.7	4	5.7
Missing			5	14.3	5	7.1
Site						
Head	7	20.0	14	40.0	21	30.0
Trunk	20	57.1	24	68.6	44	62.9
Upper limb	15	42.9	19	54.3	34	48.6
Lower limb	15	42.9	13	37.1	28	40.0
Perineum	8	22.9	4	11.4	12	17.1
Total sites (multiple sites per patient)	65		74		139	

Scalds were the most common cause of burns in both adults and paediatrics, followed by a fire which was the causative agent in 26% of the adult burns. All of the burns in the paediatric participants were accidental, whilst in the adult population, it was only 9 (26.5%). All of the accidental burns were non-work related. Most of the burn injuries in both groups were deep partial-thickness burns (above 70%). The trunk was the most common site of injury (63% of patients), followed by the limbs (40-49 % of patients). Children sustained half of the number of burn injuries to the head (20%) compared to adults (40%) (Table 6-8)

Table 6-9: TBSA % and Length of stay up to the day of observation of the patients

		Valid N	Median	Minimum	Maximum	Range
Children	TBSA (%)	35	8	2	30	28
Adults	TBSA (%)	35	12	2	52	50
Children	Length of Stay on the date of an assessment (days)	35	9	1	114	113
Adults	Length of Stay on the date of an assessment (days)	35	10	2	139	137

The data were not normally distributed with regard to TBSA (SW W =.800, p<.001) or LoS (SW W=.473, p<.001) and the median percentage TBSA was 8% (range 2-30%) in children and 12% (2-52%) in adults, with a large range in both. The median LoS (time from admission) was similar in adults (median =9.5 days, range 1-139) and children (median=10 days, range 2-139). (Table 6-9).

6.9.7 Techniques of management

The rehabilitation records were examined and in very few cases were there a full assessment of the physical and mental status of the patient and a treatment plan described. They used standard measures of burns but did not record the findings fully.

In every case, treatment was initiated after the administration of pain killers, bathing and dressing. RoM, pain levels were monitored and function tests, e.g. walking, were done and for patients with skin grafts precautions and contraindications were considered. The median and range of the number of repetitions is presented in Table 6-10, to allow for comparison between the different interventions, despite the small number receiving certain treatments.

Table 6-10: Management of Burn Injuries

Management	N children	Repetitions Median (range)	N Adults	Repetitions Median (range)
Passive movements	34	5 (2-9)	34	6(3-9)
Active movements	20	5 (4-7)	25	5 (1-7)
Resisted movements	5	5 (3-8)	1	*10
Positioning	26		26	
Stretching	5	2(1-2)	4	2(2-3)
Splints	6		3	
Standing	8		6	
Walking	7		2	

*No median was calculated as there was only one participant

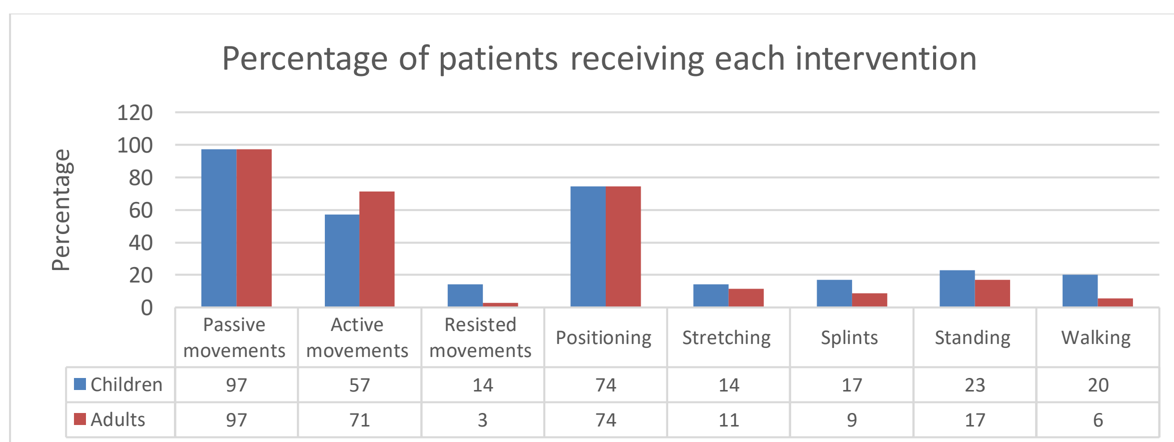


Figure 6-2: Percentage of Patients Receiving each Intervention

The most common management for burns for both adults and paediatrics was passive movements, followed by stretching and active movements regardless of site and depth of the burn. A ward programme was prescribed for all the patients (Table 6-10 and Figure 6-2.

Table 6-11: Site and Type of Management

Site	Upper limb		Head and neck		Trunk		Lower limb		Perineum	
	N	% N	N	% N	N	% N	N	% N	N	% N
Burn injury at that site	34	100	21	100	44	100	28	100	12	100
Passive movements	34	100.0	21	100.0	44	100.0	28	100.0	12	100.0
Active movements	20	58.8	15	71.4	26	59.1	17	60.7	10	83.3
Resisted movements	1	2.9	1	4.8	3	6.8	3	10.7	2	16.7
Positioning	22	64.7	17	81.0	33	75.0	21	75.0	9	75.0
Stretching	4	11.8	1	4.8	6	13.6	6	21.4	2	16.7
Splints	3	8.8	4	19.0	5	11.4	5	17.9	5	41.7
Standing	4	11.8	2	9.5	8	18.2	10	35.7	4	33.3
Walking	2	5.9	1	4.8	4	9.1	7	25.0	4	33.3
Ward programme	34	100.0	21	100.0	44	100.0	28	100.0	12	100.0

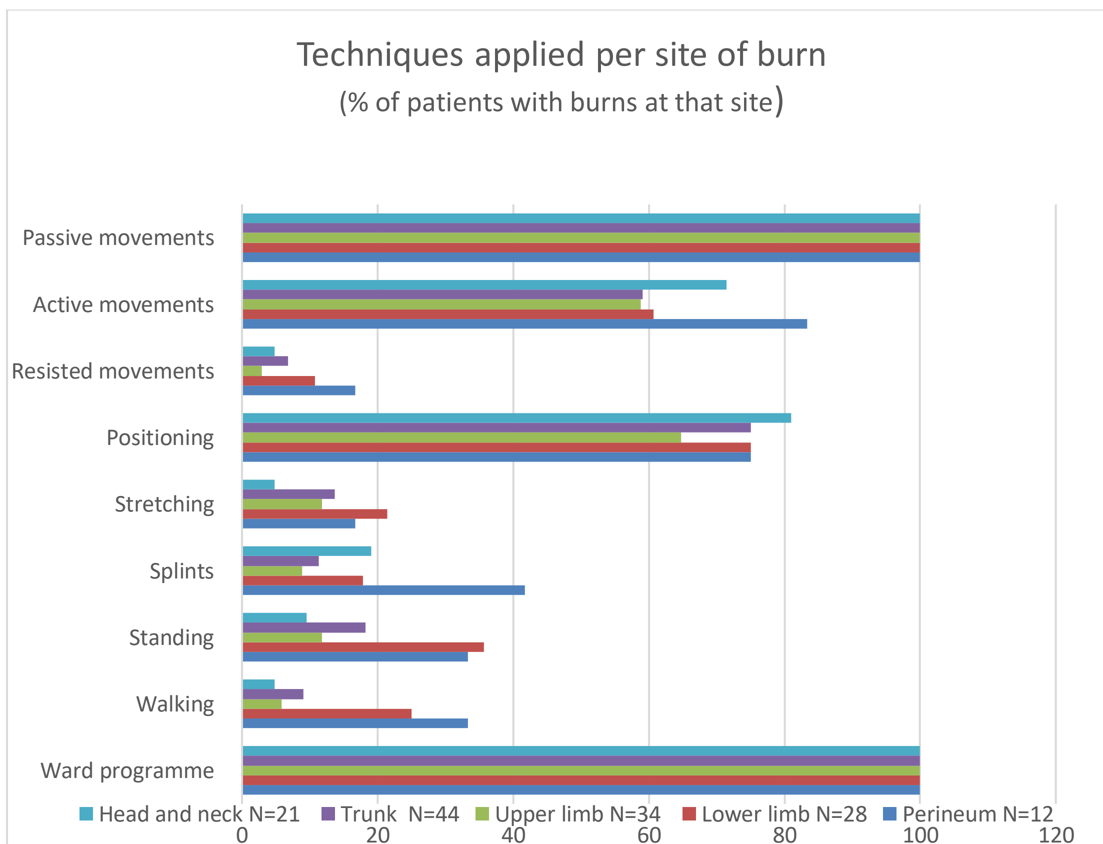


Figure 6-3: Techniques Applied per Site of Burn.

6.9.8 Passive movements [c]

Sixty-eight (97.1%) of the participants were managed using passive movements as one of the methods of treatment. The treatment was administered regardless of the age, depth, site and depth of burn injury. The median number of repetitions was six (range 2 – 9). Repetitions were defined as moving the joint through the full Range of Movement (RoM) from outer to the inner range. The median number of sets done was one (range 1 – 3) in both children and adults.

Passive Range of Motion (PROM) exercises were applied to both paediatric and adult patients with burns, and the method of application was similar. PROM exercises where done in anatomical planes and did not incorporate functional movements in both paediatrics and adults. Play was not incorporated during PROM for paediatrics.

The PROM exercises were done in the position in which the patient was most comfortable. The position could have either be sitting, lying in prone or supine and standing. PROM exercises were done in the affected limbs/ or joint and were done once a day (in the morning). The PROM exercises were done after dressing and pain medication. In all patients with burns, no exercises were done on the affected limb except in patients with lower limbs and trunk burns.

There was no difference between the applications of PROM exercises between the PTs, OTs and RTs. Patient comfortability was assessed throughout the treatment using PROM exercises. Grimacing was used to assess comfortability for children and oral feedback was used for adults. No RW used the visual analogue scale (VAS) and pain rating scale (PRS) toassess comfortability during PROM exercises. Effectiveness of the PROM exercises in increasing ROM was done visually, and no RW used objective measurement such as goniometry. All the regions of the body, i.e. head and neck (21), upper limb (34), trunk (44), lower limbs (28) and perineum (12), received PROM exercises across anatomical planes. PROM was only used to increase ROM by all the professionals when the patient was uncooperative or was at risk of reduced ROM.

6.9.9 Active movements

Forty-five (64.3%) of the participants were managed using active range of movement exercises (AROM), 57% of children and 71% of adults treated. The median number of sets was one (range 1 – 3 in adults, 1-2 in children). (Table 6-10). AROM exercises were done in anatomical planes in adults and did not incorporate functional movements. In children under five years, the movements were performed incorporating play. The AROM exercises were done in the position the patient was comfortable in. The position could have either be sitting, lying in prone or supine and standing. AROM exercises were done in the affected limbs/ or joint and were done once a day (in the morning). The AROM exercises were done after dressing and pain medication. In all patients with burns, AROM exercises were also done in the unaffected limbs.

There was little difference between the applications of AROM exercises between the PTs, OTs and RTs. OTs did incorporate the use of play activities in most of their treatments with children but did not incorporate functional activities in adult patients. AROM exercises were similar between PTs and OTs.

[c] The definition of sets and repetitions is in the Abbreviation and Glossary table

Patient comfort was assessed throughout the treatment using AROM exercises. Grimacing was used to assess comfort in children and oral feedback was used in adults. The visual analogue scale (VAS) and Pain Rating Scale (PRS) were not used to assess comfortability during PROM exercises by any RW professionals. Effectiveness of the AROM exercises in increasing ROM was done visually; no RW used an objective measure such as goniometry. AROM was applied to all the regions of the body with the most sensitive regions of the body, i.e. the perineum (83.3%), and head and neck (71.4%) receiving most treatment. All RWs stopped when the patient experienced distress through excessive pain.

6.9.10 Resisted movements

Ten (14.3%) of the participants were managed using resistive movements (RM), 14 % of the children and 3% of the adults. The median number of repetitions was five (range 3 – 10), and the median number of sets was one (range 1-2) as shown in Table 6-10. Of all the ROM exercises, resisted movements were the least frequently utilised. Resisted movements were done mostly for the perineum (16.7%) and lower limbs (10.7%); PTs used these mostly. Resisted movements were done manually with the PTs producing the force hence the amount of force applied was not consistent. There was no use of sandbags or the use of machines for resistance exercises. Play incorporating the use of resistance was used with children.

Resisted movements were stopped when the patient was fatigued or complained of excessive pain. The effectiveness of treatment was assessed using the Manual Muscle Test (MMT). There was no evidence of knowledge of exercise prescription. There was no use of adjunct therapies such as electrotherapy. No functional activities were done using resistance exercises for adults or children over the age of five years old.

6.9.11 Standing and walking

Eight of the children, 22.3% and six (17.1%) of the adults were able to stand. The rest were not able to stand due to various reasons including; pain, recent burn and poor muscle strength. The average time taken was 2.5 ± 1.38 minutes for adults, and for paediatrics, it was 2.9 ± 1.24 minutes. Of the six adults, only two did sit to stand exercises with repetitions of three and four respectively. All the RWs performed functional activities which included standing and walking. PTs were the only ones to perform sit-to-stand exercises, whilst OTs and RTs only performed sitting. Sitting was stopped when patients felt dizziness, blurred visions and showed signs of fatigue, and these symptoms were continuously checked. Time spent was the outcome measure using an ordinary watch. The RWs did not provide aids; neither was any assistance given.

Of the six adults able to do sit-to-stand exercises, two were able to walk. Patients with lower limbs (25%) and perineum (33.3) burns were mobilised the most. The distance walked was not measured, but patients were mobilised to the point of fatigue. Seven of the children were allowed to walk, play activities, and no set distance was measured for the children. Walking was stopped when the participant started feeling fatigued. The quality of the gait and posture was not monitored during the mobility exercises. Increasing exercise tolerance and physical fitness were not specifically addressed.

6.9.12 Other types of management

All the participants received a ward programme at the different hospitals. Positioning was prescribed as part of the ward programme and was part of a multidisciplinary chart. Each patient had the chart pinned on top of the bed but it was not patient-specific. An example of a similar chart found in the wards is shown below in *Reproduced without permission.*

Figure 6-4.

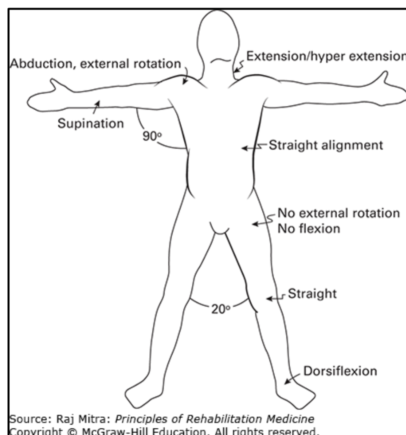


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Figure 6-4: Illustration of Bed Positioning of Patients with Burns

All RWs performed positioning and a positioning chart was provided in all institutions. For the head and neck (81%), of patients with burns were positioned correctly as no pillow was provided. On every bed at the hospitals were instructions that there should be no pillow for head and neck injuries. Positioning incorporates splinting, but not all patients received splinting. Of those with head and neck injuries, 19% received splints; the RTs and OTs mostly did the splints. Perineum burns received the most splints (41.7%), whereas, only 8.8% of those with upper limb burns were splinted. The splints were done in the abduction position as shown in Fig 6-4 and made with Plaster of Paris or the abduction foam. Stretching was incorporated into PROM. Stretching was done mostly by PTs and was done mostly in the lower limbs (21.4%). Positioning, splinting and stretching were stopped when the joints/ limbs reached their full RoM or when the patient complained of excessive pain. There was no difference in the positioning, stretching and splinting applied to children and adults.

The ward protocols of the hospitals were different, depending on staffing and the needs of the patients. All had two hourly turns for bed-ridden patients and positioning charts for each patient. A multi-disciplinary approach was used for two hourly bed turns, with nurses performing the turns. All the patients were positioned by both the RWs and nurses. The patients with burns were seen once a day (in the morning after medication). No active assisted movements were performed for adults or children. All the patients received at least one-bed exercise; either rolling or bridging which was either with minimal, maximal or no assistance. This was done mostly for adults while patients less than five years were assisted as they could not comprehend instructions.

Techniques specific to physiotherapy were not performed even by the PTs themselves. These techniques include central and peripheral mobilisations and PNF. Electrotherapy and thermal agents and the use of virtual reality were not done by any of the RWs. No pressure garments had been issued and pressure bandaging was not observed.

6.10 Discussion

This chapter documented the current rehabilitation management in Burns' Units in Zimbabwe. The first finding of significance was that the management of patients with burns was offered by a single rehabilitation worker, working in Burns' Units with no specialised training or additional courses. This is problematic for several reasons. Firstly, a multidisciplinary team approach is regarding as being foundational to the management of patients with burn injuries both in the acute and long-term stages of their recovery[164] and it has been suggested that an individual therapist cannot deliver quality and excellence in burn care in isolation [31]. The Australia and New Zealand Burn Association (ANZBA) guidelines list eleven professions that should be involved in the care of patients with burns. This list includes play therapists, speech and language pathologists, psychologists, and social welfare officers[24]. Far from there being a multidisciplinary team, a single RW was responsible for each Burns' Unit in Zimbabwe and due to the scarcity of physiotherapists, the management of burns was undertaken by other rehabilitation technicians in several of the hospitals.

Use of a solitary discipline means that the specialised skills of each discipline, occupational therapy and physiotherapy were not available to each patient. This is further evident by more splinting being offered by the OTs, and a greater emphasis on sitting to standing and resisted exercise in the treatments of the PTs. This limited the range of techniques and blurred the distinction between the two disciplines, although the ACI Guidelines[1] acknowledge that the roles of OTs and PTs in the management of patients with burns overlap. Besides, the purposively chosen district and provincial hospital rely solely on the generically trained rehabilitation technicians to manage patients with burns. This further undermines the development of specialist discipline-specific skills, such as physical conditioning and fitness training offered by PTs and work hardening and management of psychological disorders by OTs (particularly for those with self-inflicted burns).

The ideal solution would be to employ more RWs in public hospitals, particularly in central, referral hospitals but, in the light of the on-going economic crisis in Zimbabwe, this may not be a viable option. It is thus recommended that expanding and developing a joint curriculum for the training of under-graduate physiotherapy and occupational therapists in the management of burn injuries be explored. This would ensure that a wider spectrum of techniques would be available to OTs and PTs working in this area and patients with burns would not be deprived of necessary profession-specific treatments.

It would also appear there is a dearth of post-qualification training in the field of burn management, and even though the RWs had a median of two years' experience with burn injury management, they had not attended any refresher courses. This is despite the requirement to undergo continuous professional development training to retain registration with the governing body Medical Rehabilitation Practitioners Council of Zimbabwe (MRPCZ). The RWs therefore, either rely on the knowledge and skills gained during their training or may access on-line sources of information. The

implications of this are that the only source of the knowledge and skills of RWs appears to be the training that they received. As the range of years since qualification varied from five to nine years in OTs and PTs and over thirteen years in the RTs, the lack of continuous professional education is concerning. In addition, the body of knowledge related to the management of burn injuries continues to grow, and RWs need to keep themselves abreast of new developments [31]. The cost of data and the financial situation in Zimbabwe may limit access to the internet and international journals and RWs may have little opportunity to improve their burn-specific skills and management. Unfortunately, the self-learning activities and the limitations thereof were not explored and this omission is acknowledged as a limitation of the current study. Continuing professional education with regards to the management of patients with burns should be explored in future studies.

Post-qualification courses in burns management should be offered by the training institutions, and that refresher courses be sponsored by the Ministry of Health, possibly run by regional experts. These would be justified by the many patients admitted to hospitals with burns as described in the section on Epidemiology (Chapter 2) and the impairments and functional limitations arising from these injuries (described in Chapter 3). Furthermore, there is an obvious need for guidelines which are supported by the most recent evidence available.

Whereas the results of this study were not intended to be generalisable, the demographic and medical characteristics of the sample were compared to the larger sample described in the chapter on Epidemiology, Chapter 2. In this sample, the median age of the adults was similar (the early thirties), but the children were older (median age was four compared to two and a half years in the larger sample). This reflects the decision not to observe the treatment of the youngest children, which in hindsight may have been a limitation to the study. The aetiology of the burn injuries was similar, although there were more scalds in adults in the current sample and fewer burns from the fire. Similar to the sample in the epidemiological section of the thesis and other studies[7]. Adult patients had more severe burns than children although the burn injuries were less severe in the current sample with a smaller percentage of full-thickness burns (6% compared to 14%). The current sample thus included those with less severe injuries, which is likely to reflect the inclusion of secondary hospitals in the research sites. It is thus likely that the spread of techniques observed did cover the spectrum of interventions offered in central hospitals in Zimbabwe and many of those used at the district and provincial levels. This contention is supported by a study in Zimbabwe of 30 patient medical notes showed that physiotherapy intervention for children with burn injuries mainly included active and passive joint range of motion exercises (96.8 %), chest physiotherapy (90.3 %), muscle strengthening exercises (87.1 %), patient education and ward exercise programme (71.0 %), out of bed mobilisation (67.7 %), soft tissue massage (54.8 %) and posture correction 48.4 %) [51].

The management of burns across all hospitals was similar and saturation was reached with the planned number of observations. The uniformity of much of the treatments offered is unsurprising, since generic treatments, rather than profession-specific techniques, formed the mainstay of treatment. In addition, all RWs had been trained in Zimbabwe by a relatively small pool of physiotherapy and occupational therapy lecturers and would have been exposed to similar intervention strategies in the clinical placements which are accessed by occupational therapy, physiotherapy, and rehabilitation technician students.

A major weakness observed was the paucity of assessment of treatment progress during treatment; few no objective, standardised outcomes measures such as goniometry were used. The Manual Muscle Test was the only test used by PTs to determine the level of resistance required during resisted movements. Simple assessment techniques such as pain scales were not utilised despite the severe pain that is a hallmark of burn injuries, and pain being a subjective phenomenon. Assessment of patients constitutes a large section of the PT curriculum (See Appendix XXVIII). The PT students receive 44 hours of theoretical and practical training, of which a large proportion is dedicated to learning to assess patients with burns in the acute stage. This section includes; the assessment of physical and mental status, and the identification of primary problems and suitable methods of intervention. Current practice, therefore, falls far below Standard 1 of the Standard British Burns Guidelines (2005)[23] which stipulates, "The therapeutic management of the burn patient is determined by thorough assessment and formulation of a detailed list of problems/ treatment goals and a detailed treatment/management plan. The patient is subject to regular, on-going therapeutic re-assessment and review with subsequent changes to the problem list/treatment goals and management plan." P4.

The reasons for this inadequate monitoring of the patients' problems and progress may be related to the workload of the RWs who single-handed manage busy units. However, documentation and assessment are essential requirements for safe and effective management, and the importance thereof needs to be emphasised in training and guideline development. It is recommended that a minimum set of standard instruments be identified and that these should be routinely applied for all patients. A comprehensive list of such instruments is included in the Association of New Zealand Burns Association Guidelines[24].

All the patients were managed with PROM, regardless of the site of the burn, age, LoS, TBSA and depth of burns, and this is done in accordance with literature regarding contractures prevention[1 6]. In contrast, a systematic review by Prabhu et al.[68] on the effect of passive movements on joint RoM in people with neurological conditions at risk of contractures reported a small increase in RoM in the intervention group. However, the review concluded there was inadequate evidence to conclude that PM is effective for the treatment and prevention of contractures[68] and that further research is needed. As so much time and energy are expended on PM, which in many cases may be uncomfortable or even painful for the patients, a strong evidence base must be established. Though every therapist included PM in therapy, there was no set standard regarding optimal dosage. The repetitions ranged from two to nine and the number of sets ranging from one to three. The optimal dosage of PM remains elusive across literature[170]. Stretching is mostly incorporated into passive movements[1,24,171,172], but in this study, only nine (12.9%) patients received stretching, which is a vital part of burns management.

Active movements are also important in preventing contractures. Forty-five (64.3%) of the participants were managed using AM, though there were no set dosage standards. In addition, only 14.3% of the participants were managed using resistive movements; most of the participants observed had acute-medium-term burns. Resistive exercises are mostly done in long-term burns rehabilitation [103,173]. Though the exercise frequency, intensity, time and type for PM, AM, and RM varied in this study, this is consistent with global trends where exercises are individualised for each

patient [1]. However, there was inadequate attention to building up exercise tolerance and physical fitness; although there is evidence that this is effective in patients with burns injuries.

Positioning was done in 74.3 % of the patients, and every Burns' Unit had a standardised burn positioning chart to prevent mostly flexion contractures. Unfortunately, in several cases, the positioning protocol was not adhered to. The lack of compliance is partially attributable to patients having multiple sites of injuries and a possilbe lack of teamwork between the therapists and nursing staff in complying with the positional chart. In children, a lack of compliance with the positioning protocol can be attributed to the fidgety nature of children as most were between the ages of three years and nine years. Positioning is accepted as best practice, and the ISBI Practice guidelines state that it is critical to producing good functional outcomes. It should be implemented during the whole course of recovery. [31].

Though positioning is mostly accompanied by splinting[1], there were only a few cases of splinting in this observed study population. Splints are mostly used for the head, neck and upper limb (wrist region)[1,24], and in this sample, there were few cases of head and neck burns. The limited use of splinting may also be attributed to a lack of resources as most patients cannot afford splints, and most hospitals did not have stocks. Plaster of Paris splints could have been more utilised and other low-cost options for splinting material could have been explored, such as wood, cane, cardboard, plaster rolls, metal rods, rubber bands, and foam[31]. There may be a need for RWs to be innovative and improvise in the wake of resource limitations.

Functional management incorporated standing and walking; sit-to-stand was done in only two of the patients. A six-minute walk test was never applied and the distance walked was not measured. Patients were monitored for fatigue, dizziness and respiratory distress. As the systematic review revealed that aerobic capacity can be improved by exercise in patients with burns, the need to improve exercise tolerance and physical fitness needs to be emphasised (Section 5.6.3.1).

Although oedema management was not specifically addressed, positioning; elevation, splinting, compression, bandaging, pressure garments, active and passive movements, and participation in activities of daily living (ADLs) contribute to the reduction of oedema [1]. Many of these techniques were employed but there should be more emphasis on the need to reduce swelling, particularly in the hands and fingers.

No other forms of management of patients with burns were observed by the therapist; e.g. the use of compression therapy, pressure garment, massage or silicon therapy. This is concerning as scarring is one of the greatest challenges in the management of burns. There is anecdotal but weak evidence that dark skin is related to the development of hypertrophic scarring[174]. Scar massage was not done, although treatment was admittedly in the acute phase of burn, and most wounds were still not healed. A meta-analysis on the effect of scar tissue massage concluded that there was some initial evidence to support the use of scar massage to decrease scar height, pain, pruritus and depression and improve vascularity and pliability in hypertrophic burns scaring[175]. However, the poor quality of evidence and lack of consistent and valid scar assessment tools was noted. There is also evidence to support the effectiveness of these techniques in softening scars and pliability [175,176]. Massage using petroleum jelly should be included in the treatment of healed scars.

Usually supplied by OTs, the use of pressure garments to reduce scare formation is an essential tool to reduce scar formation and improve/retain RoM in patients with burns. However, the ISBI Practice Guidelines warn that until further evidence is produced, the potential costs and complications of pressure garment therapy be weighed up against the limited evidence for its role in the prevention of abnormal scarring after burn injury. They quote studies suggesting that pressure garment therapy may decrease scar height but does not alter global scar scores [31]. It may therefore not be warranted to invest in either expensive ready-made pressure garments or to import PGT raw material. Pressure garments should be applied for at least 23 hours a day until the maturation of the hypertrophic scar (typically ~2 years post-injury). In hot climates such as Zimbabwe, with limited rehabilitation follow-up (See 3.4.1), and difficulty in managing the recommended skincare regimens (3.4.3), this protocol would be extremely difficult to implement.

Patients have prescribed ward programmes which were supplemented by diagrams depicting correct positioning. Using ward posters and patient education should be encouraged as physiotherapy education in patients with burns is reported to have a positive effect on the promotion of physical health level and also improvement of their HRQoL[177]. The education of nursing staff is also essential for effective multi-disciplinary team, and this should lead to improved compliance with positioning[1].

Pain management was only managed through pain killers although distraction therapy through music and the use of virtual reality has been found to be effective[178]. Other forms of pain management by electrotherapy were not administered, Modalities that have been found to be effective in reducing pain in patients with burns include continuous and intermittent electrical nerve stimulation [179], TENS [180] and high-voltage electric stimulation of the donor site of skin grafts[181]. In addition, TENS has been reported to be a useful adjunct for reducing itch in patients with limited areas of pruritus [182]. As the application of TENS is included in the undergraduate curriculum at the University of Zimbabwe, it was disappointing that it was not applied. However, this may be due to the erratic supply of electricity or due to high prices of purchasing and maintaining electrotherapy equipment.

On a positive note, a recent study on the attitudes towards physiotherapy care of 34 caregivers of children below the age of 12 years a diagnosis of burns, in the Harare Central Hospitals reported satisfaction with the care received by their children [51]. Twenty-nine (93.5 %) of the caregivers were satisfied to very satisfied with the overall physiotherapy services in the ward for their child. In addition, the majority (n = 27, 87.1 %) of the caregivers noticed benefits arising from physiotherapy treatment, and all the caregivers strongly agreed that they would want their child to continue with physiotherapy when given an option to choose. However, there may have been inherent bias as the caregivers were interviewed by physiotherapists which might have resulted in socially acceptable answers.

6.11 Study limitations

Although the primary objective of the study was achieved and the nature of musculoskeletal targeted intervention for patients with burns was documented, there are some limitations and recommendations for further study. In hindsight, it was an error to exclude the younger children. As

using play is the treatment standard for children under two, an approach which is supported by the ANZ Burns guidelines which recommend that, taking the depth, size and location of the burn into account, most young children may not require specific ROM exercises [24] and that movement should be encouraged through play, activity and developmental facilitation. Although in the experience of the researcher, the primary techniques applied were play and developmental stimulation in the institutions under study, it would have been useful to observe and document the implementation of this approach. For example, information regarding the use of assessment techniques, equipment such as toys, positioning, and the role of the mother or caregiver in providing treatment would have informed the guidelines regarding this vulnerable group of patients.

A further limitation is that the continuing professional development of the RWs was not specifically explored and it would have been interesting to discover whether individuals had been exposed to informal training courses and to what extent online sources were utilised to provide evidence for their treatment choices.

The study targeted the acute management of patients with burns as the PTs are primarily involved in management at a tertiary hospital level. However, as the impairments related to burns injuries may increase over time, particularly with full thickness burns and in children, as they grow, the long-term management should be documented in any future studies.

6.12 Conclusion and Recommendations

The observation of patient treatments provided useful insight into the management of patients with burns within the context of hospitals in Zimbabwe. The treatments included the methods described in many texts on the rehabilitation of burns, passive and active movement, positioning and splinting, and functional re-education, which is encouraging. However, the lack of assessment and treatment monitoring can result in treatment that is routine and not tailored to the needs of the individual patient. The limited repertoire of techniques may also point to the need for further continuing professional education. It is recommended that the possibility of forming clinical links with similar but better-resourced institutions within the region and internationally should be explored. Exchange visits of clinical staff would expose those RW treating burns to the recent advances in the rehabilitation of patients with burns. Hosting experienced rehabilitation clinicians with post-graduate qualifications in the management of burn injuries would also bring in much-needed expertise to provide upgrading and training within the Zimbabwe context.

There is a need to improve the assessment and the use of standardised outcome measures. In the absence of pressure garments or silicone covering, pressure bandages should be considered to reduce the impact of scar formation. Splinting should be done using alternative materials whenever indicated. Future research should be targeted at monitoring the effectiveness of the treatments applied.

Chapter 7. Development of draft guidelines (Alpha version)

7.1 Introduction

As planned, information gained from different sources was used to allow physiotherapists active in the management of patients with burns in Zimbabwe to make informed decisions regarding management options. The importance of translational research (TR) is increasingly recognised, and the underlying driver is that scientific findings should be applied as soon as possible to improve patient outcomes. TR has been defined as “research that translates new information or knowledge that is created in one area to another application” p179 [183]. The National Centre for Advancing Translational Health of the US Department of Health states that “Translation is the process of turning observations in the laboratory, clinic and community into interventions that improve the health of individuals and the public — from diagnostics and therapeutics to medical procedures and behavioural changes”[184].

A useful method to facilitate translational research is guidelines development, implementation and dissemination. The World Confederation of Physical Therapy (WCPT) endorses the use of clinical guidelines as a practical tool to assist therapists in applying the results of high-quality research to their own practice[185,186]. Guidelines are defined as: “Systematically developed statements which help the practitioner and patient make decisions about appropriate health care in specific circumstances[187]. Clinical guidelines should provide recommendations for practice based on the best evidence available[186].

Typically guidelines are developed based on a systematic review of relevant interventions complemented by expert input[185]. This expert input has frequently been obtained through the Delphi Technique[39]. The Delphi method is a forecasting process framework based on the results of multiple rounds of questionnaires sent to a panel of experts[40]. This method has now been adopted into medical, nursing and health services, and various forms of it being implemented[188].

In addition to the systematic reviews, existing guidelines developed in HIC have been used as the basis for developing country appropriate guidelines for LIC. This approach was used in the Philippines to develop guidelines for the physiotherapy management of patients with strokes and with low back pain[40]. The AGREE II is a useful guideline appraising tool for the identification of appropriate guidelines for adaption. [189]. Appraisers must assess the development process, the presentation, and the completeness of reporting and the clinical validity of the guideline. A shorter version, the AGREE Global Rating Scale (GRS) tool was developed for lesser-resourced contexts[189].

There was discussion as to whether a single generic guideline for the rehabilitation of burns should be produced as there is obvious overlap between the roles of the different rehabilitation workers (Chapter 6) and indeed, OTs would contribute to the development of these Guidelines. This was, however, rejected and a set of Guidelines for PTs specifically developed for the following reasons:

- There is little teamwork and patients either receive treatment from an OT, a PT or a generically trained RT. Whereas this is the situation on the ground in Zimbabwe, it is not ideal. Much is lost when the different rehabilitation specialities do not apply their specific

areas of expertise. The researcher is a physiotherapist and is not well-positioned to determine what the most appropriate content of a guideline for OTs or RTs should contain concerning their special skills related to, e.g. pressure garment management, prosthetic and splint making, work readiness (OTs) and community-based care and integration (RTS). It was decided that it would be beyond the scope of the professional knowledge of the researcher to attempt to produce a guideline which would encompass the best practice in all these areas. It would further entrench the perception that the PTs, OTs and RTs are interchangeable and that there is no need for a rehabilitation department to employ distinct professions. This would serve the professions poorly in the long run.

- A second consideration was that the intention was to amend existing guidelines and as a physiotherapy guideline was identified, it would have been beyond the scope of the study to include OT specific content rather than merely modifying the existing content.
- The guidelines, though developed for physiotherapists, can still be applied by occupational therapists and rehabilitation therapists to some extent due to duplicity of the roles of these professions in clinical areas concerning patients with burns.

This chapter describes the process of developing the Alpha Draft of guidelines for the physiotherapy management of burns in Zimbabwe. The first step was to identify appropriate published guidelines to serve as a basis for the Zimbabwe guidelines. This was done as the researcher did not have the resources required to develop a new set of guidelines from scratch. The Australian Guidelines were chosen, and the researcher extracted the practice recommendations and reviewed each recommendation in the light of the systematic review, the epidemiological studies, and the audit of practice. This Alpha draft was then subjected to a Delphi exercise and circulated to local and international physiotherapists experienced in the management of patients with burns, and was, therefore, regarded as the experts. This section outlines the steps taken to identify and amend the most appropriate guidelines.

7.2 Identification of the most appropriate published guidelines

A literature review was undertaken with the keywords; “Physiotherapy” OR “Physical Therapy” AND “Guidelines” AND “Burns”. PubMed, CiNAHL, and Google Scholar were searched for articles. Snowballing was also used to identify unpublished guidelines. Specific Burns Associations were accessed for relevant guidelines, and these included; American Burn Association, Australia and New Zealand Burn Association, and the South African Burn Society. However, no Guidelines could be accessed through some of these associations as it was limited to members only. Of the databases searched, 90 articles were retrieved using the title, and of these, three articles were of relevance; Further, two guidelines were excluded as they were in a specialised field of burns[190,191], i.e.:

1. Practice Guidelines for cardiovascular fitness and strengthening exercise prescription after-burn injury[190].
2. Management of scars updated. Practical guidelines and use of silicones[191]

One paper was identified as a potential guideline for adaptation (Occupational and Physiotherapy for the Patients with Burns: Principles and Management Guidelines)[24]. From Google scholar using the same keywords “physiotherapy” and “Guidelines” and “Burns”, 11 articles of relevance were retrieved. Of these, two were excluded as they were of a specialised field of burns[54,192] i.e.

- Physiotherapy in Burns, Plastic and Reconstructive Surgery (https://www.physio-pedia.com/images/3/30/Burns_and_Plastics.pdf)[54] which was concerned with physiotherapy management after reconstructive surgery.
- Burn Clinical Practice Guideline (http://tetaf.org/wp-content/uploads/2016/01/Burn-Practice-Guideline.pdf)[192] which was devoted to management and resuscitation in the immediate post-burn stage.

Five articles were duplicates and were removed. The remaining five articles were identified as potential for guidelines adaptation[1,23,24,108,193]. Of these five, two were updated versions[1,108] of the previous editions of guidelines[23,193]. Hence three articles were identified as potential guidelines for adaptation[1,24,108] and were appraised using the Appraisal of Guidelines Research and Evaluation Global Rating Scale (AGREE GRS)[189] as shown in Table 7.1 below.

The AGREE II tool has become the international standard for appraising the quality of guidelines; however, the 23 items make the instrument long, and complex. Consequently, a shorter appraisal tool was developed and tested, the GRS, which is more appropriate in resource-constrained contexts and the use of a comprehensive tool is not feasible [191].

The GRS version includes rating the quality of the Process of development, Presentation style, Completeness of reporting, Clinical validity and an Overall assessment. Each of these is operationally defined in the scoring sheet. Each of the items is scored from 1 (lowest quality) through to 7 (Highest quality).

The AGREE GRS scale[189] was filled in by two appraisers independently, both of them physiotherapists. Criteria were set by the researcher to assist in choosing the most appropriate set of guidelines. The criteria included; an AGREE GRS score of 16 or higher, the feasibility of use in the Zimbabwe context, and conciseness as the audit indicated that guidelines would be used by rehabilitation personnel of different levels of training and with different expertise.

7.2.1 Results of the identification process

Three appropriate guidelines were identified as listed below;

1. Occupational Therapy and Physiotherapy for Patient with Burns: Principles and Management Guidelines of the Australian and New Zealand Burns Association[24].
2. Clinical Practice Guidelines Burns: Physiotherapy and Occupational Therapy developed by the Statewide Burn Injury Service of the Agency for Clinical Innovation (ACI) New South Wales, Australia[1].
3. Standards of Physiotherapy and Occupational Therapy Practice in the Management of Burn Injured Adults and Children 2017 of the British Burns Association[108].

Table 7-1. AGREE GRS scores for included Guidelines

Guideline Developer	Sourced	Mean AGREE GRS Score	Applicable to the Zimbabwe Context	Length and detail	Comment
Allied Health Workers[24]	PubMed	7	Whereas this set of guidelines would be an excellent learning tool, it was too detailed and comprehensive to adapt which was not the focus of the Zimbabwe Burn Guidelines	243 pages and contains components of nursing and medical care	The Guidelines are very comprehensive and focused on all burn care management including, nutritional needs. However, it was too long to consider for adaptation.
Burn Therapy Standards Working Group 2017 (BBA)[108]	Under the British Burn Association website	7	Most of the content was applicable to Zimbabwe but focused more on ICU management, which was not the central core of Zimbabwe guidelines.	31 and practice	They were contextualised to the UK in terms of their standards and policies.
Agency for Clinical Innovation Statewide Burn Injury Service[1]	Under ACI website	7	Most of the content was applicable to Zimbabwe except in relation to silicone, scar softening products and skin care	28 pages and Precise	The Guidelines were concise and focused on scar management and burn therapy similar to the planned focus of the Zimbabwe Burn Guidelines.

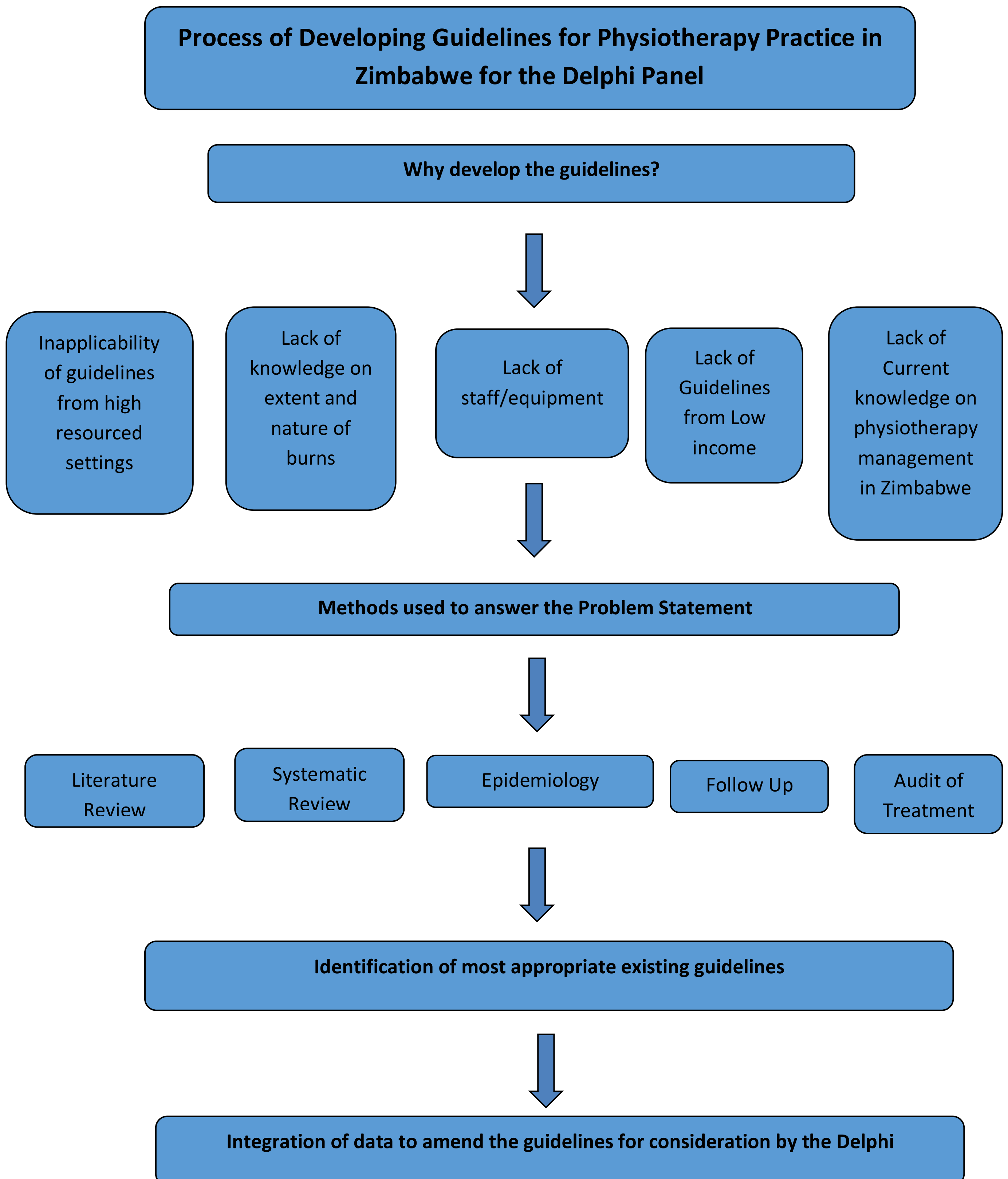

Figure 7-1: Schematic diagram of the process of developing Guidelines for presentation to the Delphi Panel.

7.3 Modification of existing guidelines

There were several good candidates for use as the source guideline. Ultimately, the ACI guidelines[1] were chosen as they had items that were feasible for the Zimbabwe guidelines. In addition, ACI guidelines are concise and concentrated on the techniques that would be of most use. There is currently a 4th Edition available, but this was only published in 2019, too late for inclusion in this study. The ACI was approached belatedly, and consent to adapt the guidelines was received (Appendix XXIX).

The Zimbabwe guideline template was then developed based on the existing Australian guidelines[1]. The "ACA" approach was used to write up the draft guidelines. ACA is an acronym for Adopt – Contextualise – Adapt approach. The ACA method is effective in medium- and low-income countries where resources are limited as compared to the *de novo* approach [194 40]. A study in the Philippines[40] established that the ACA approach is the best way to adapt guidelines from the HIC to the LIC and MIC. An alternative to the "ACA" approach is the ADAPTE framework which promotes a systematic approach to modifying the adaptation of guidelines developed in one context into a different cultural or organisational setting [195]. This method has also been described as an alternative to *de novo* guidelines[195].

The ACA approach was used because the ADAPTE framework, does not consider the contextualisation of the guidelines. Dizon et al.[196] defined contextualise as, "to place a word, phrase, or idea, within a suitable context" P4. The guidelines identified from the search strategy were all from the high-income countries [1,108,115] hence the need to contextualise the guidelines. The guidelines needed to be contextualised in terms of; health care resources (human resources and medicine), power shortages (18 hours load shedding), dilapidated and lack of infrastructure, dependence on donor funds, lack of/and old equipment and a linear referral system. The guidelines were then "adapted" to address the needs of Zimbabwe, i.e. clinical guidelines were altered to meet local needs based on relevant contextual evidence [196].

The ACI guidelines were precise and focused on "Scar management and Burn therapy" which were similar to the guidelines being developed, that focused on musculoskeletal and functional limitations. All the major items were which were considered minimum care of standard were included, that is:

- Oedema management
- Exercise
- Splinting and positioning
- Compression garments
- Massage

Items excluded were:

- Silicone and scar softening products
- Aspects of skincare particularly relating to the use of expensive sunscreen products.

Though the items excluded are essential needs for scar management, and psychological care, they were excluded because of the high costs and unavailability in the local market. The cost of these products is beyond the budget of public hospitals which mostly depend on donor funds for drugs and other medical consumables. The full modifications of the items included in the guidelines are detailed in Appendix XXXI in relation to the resources available.

The full amended guidelines for Zimbabwe are presented in Appendix XXXIII and an example is presented below in Table 7-2. As it was decided to concentrate on the management of musculoskeletal impairments and functional limitations, all relevant techniques were included. Specialised intensive care management and respiratory therapy were not included.

Table 7-2: Example of Zimbabwe Guidelines

Australian Guidelines	Zimbabwe Guidelines	Justification	Source	Participants Comments
Education to prevent burn injuries is vital	It is vital that health promotion/education is done by all health professionals including physiotherapists	Most of the burns which occur are preventable. The common cause of burns is open fire and scalds	Epidemiology	
		Most of the patients with burns are from the urban area/slum areas which lack electricity	Epidemiology	
		Physiotherapists should be part of the health promotion/education team as they perform community-based rehabilitation/outreaches	Audit	
Education to patients with burns/caregivers on prognosis, management, nursing care, rehabilitation and outcome of the condition	Physiotherapists need to play a role in the education of patients in line with the management set for the patient by the team through ward rounds/meetings, posters and peer survivors	Ward rounds/meetings, posters and peer survivors have been shown to be a cost-effective way for a multidisciplinary approach to educating the patient on his condition.	Literature review/audit	
Physiotherapists need to know infection control measures for staff and patients with burns	Physiotherapists need to familiarise with the infection control policy of hospitals and Burns' Unit	Lack of physiotherapists on committees for infection control policies	Audit	

7.4 Discussion and Conclusions

The guidelines were developed systematically following steps in guideline development[197], as depicted. The ACA approach proved useful and resulted in a credible adapted version of the ACI guidelines with an adequate face and content validity. The developed Alpha draft guidelines can be a catalyst for the closure of the gaps/disconnect between policies, best practice, local context, and patient choice[194]. Though the guidelines are targeted at physiotherapists, several guidelines identified through the search strategy were both for physiotherapy and occupational therapy showing a close linkage between the two professions. It was anticipated that the new set of guidelines would be suitable for all rehabilitation professionals, and this will be best suited for Zimbabwe where a single rehabilitation professional is assigned to the Burns' Unit.

Chapter 8. Production of the Final Set of Guidelines for the Physiotherapy Management

8.1 Introduction

The Alpha draft of the guidelines was produced based on published literature and on the empirical data that the researcher had collected. However, stakeholder engagement is an essential element of guideline development[185]. The stakeholders should consist of people with clinical skills/expertise and people with expertise in guideline methodology[185]. As it was not the intention of this research to develop guidelines from first principles, stakeholders' engagement was restricted to experts in burn rehabilitation in reviewing and amending the Australian Guidelines to make them fit for purpose in Zimbabwe.

Named after a Greek Oracle, the Delphi process aims to obtain a collective, consensus view from different individuals in situations where the evidence base is lacking and the opinion of stakeholders is important. The process may bring people of diverse views together and enable cohesion, group ownership and possible consensus building[198]. The Delphi process is a way of identifying whether there is any consensus in an expert group and clarifying any agreement which exists[199]. Further, Van der Linde[39] describes the Delphi technique as consisting of structured communication resulting in detailed critical examination and discussion rather than a quickly attained compromise. A Delphi is an iterative process consisting of either two or three phases of feedback from experts (participants) and the researcher[188,198,199]. This is accomplished through consecutive rounds of a questionnaire completed by a panel of experts[199]. There is no universally agreed proportion on the levels of consensus as it depends on the sample numbers, aims of research and resources[188].

There is controversy regarding what an expert is, and how to select an expert without any consensus between the different authors. Thangaratinam[198] defines an expert as an individual with "relevant knowledge and experience of a particular topic" and this also depends upon the setting and objectives of the Delphi in question.

There is also no consensus regarding the reporting of the methodological approach with some papers reporting the results using a qualitative paradigm and others a quantitative, and more analytical approach [199]. Data analysis can be guided by three stages

1. Canvassing of opinions
2. Process of determining opinions from the experts
3. Managing of the opinions from the experts[188]

There is also variance in reporting findings[188,198,199]. Data from the first round can be analysed using content analysis[188] as it is often qualitative. Subsequent rounds need to identify convergence, descriptive, and inferential measures are used for statistical summaries which include means or median depending on the type of data [188]. Greatorex et al.[199] state that most studies do not report the results of each round in the study, with only the consensus by the panel reported.

8.2 Aims and objectives

8.3 Methodology

A modified Delphi process was used to finalise the Alpha draft of the guidelines, similar to that used in other studies to develop guidelines [39]. The Delphi study was done for seven months, from May 2019 to November 2019 and consisted of three rounds. Participants were given three months to complete the first and second rounds, with the third round being done in one month. The final aim was to produce a feasible, effective and cost-appropriate set of guidelines based on the Alpha draft of the Guidelines. The specific objectives were:

- To inform the decision making of the participants through the dissemination of the results of the previous three studies
- To reach consensus on the form and structure that the guidelines should take
- To approve each specific recommendation for practice.

8.3.1 Study population

The participants included all professional rehabilitation personnel currently or previously involved in the clinical or teaching of the management of patients with burns in Zimbabwe. The inclusion criteria were rehabilitation personnel with more than two years of experience in the management of the patient with burns. Management defined as either assessment or treatment of patients with burns in any setting. The panellists were required to have a post-graduate qualification (Masters or PhD) or postgraduate certificate in burns therapy or a basic degree but involved in the teaching of rehabilitation professionals.

Participants were recruited through the University of Zimbabwe (Department of Rehabilitation), the central hospitals, provincial rehabilitation structures and the private health sector. Purposive sampling was done and the sample was limited by the number of therapists engaged in this area of work and had a post-graduate qualification. Identification of people with postgraduate qualifications was done through the Zimbabwe Physiotherapy Association (ZPA) and the regulatory body of rehabilitation professionals (Medical Rehabilitation Practitioner Council of Zimbabwe) MRPCZ) and snowballing through the identification of possible “experts” by those already recruited.

Departments, with a physiotherapist or occupational therapist who met the above criteria, were approached. Rehabilitation professionals who met the inclusion criteria were contacted through an email, and an informed consent sheet (Appendix XXX) was included. The information and consent sheet covered all the phases of the Delphi process.

8.3.2 Instrumentation

The Alpha draft of the Zimbabwe guidelines was developed as described in Chapter 7. A document was then developed that compared the original guidelines with the proposed Zimbabwe Guidelines and asked for grading of each item. This was prefaced with a summary of the Epidemiological Chapter, and the source of the information that was utilised to make each recommendation was referenced (e.g. literature review, audit) (Appendix XXXI). Open-ended questions were asked at each stage of the Delphi Process. The first round dealt with the structure and presentation of the Alpha

draft as well as the content validity regarding the impairments and functional limitations that should be included.

The guidelines for the second iteration, Beta draft, were divided into two sections, i.e. prevention and treatment. The major components and comments for each section are described in Table 8-3, under five subsections of, (1): consisting of education and infection control, (2): pain management, (3): Non – pharmacological pain management, (4): assessment and (5): treatment

For this section, experts had to rate each component of the Beta draft of the guidelines in terms of importance. The rating of the responses was done on a five-point Likert scale with ratings of

0. Not at all important
1. Slightly important
2. Moderately important
3. Very important
4. Absolutely essential

The alpha draft had fields for scores and comments (Appendix XXXI).

8.3.3 Procedure

Identified experts were approached to take part in a three-stage modified Delphi through e-mail and sent the information sheet and informed consent. Once consent was obtained, open-ended questionnaires were sent (see Figure 8-1 below).

- Round 1. Consisted of questionnaires with open-ended responses constructed by the researcher and based on theoretical principles. The questions sought responses on three main principles (1) frameworks for burns (2) assessment of burns and (3) interventions in burns.
- Round 2. The Australian (ACI) set of guidelines [1] were adopted, and responses from round 1 of the Delphi were incorporated into the findings. The Alpha version of the guidelines was developed. The Alpha version was distributed in the second-round phase of the Delphi.
- Round 3. This information from the second round was incorporated to structure the next version of the guidelines, the Beta version (Round 3).
- Based on the responses from Round 3, a final version of the guideline was then developed.

Each discrete section was individually circulated to participants, for example, the section on maintaining range of motion, or section on increasing exercise tolerance and fitness and the questions asked as listed in the Instrumentation section. Once these comments had been gathered for each section, they were analysed in the light of the results of the previous studies, and judicious changes made to the relevant section. The amended section was then subject to one further round of review, and based on these comments, the final recommendations were incorporated into the Beta version of the guidelines.

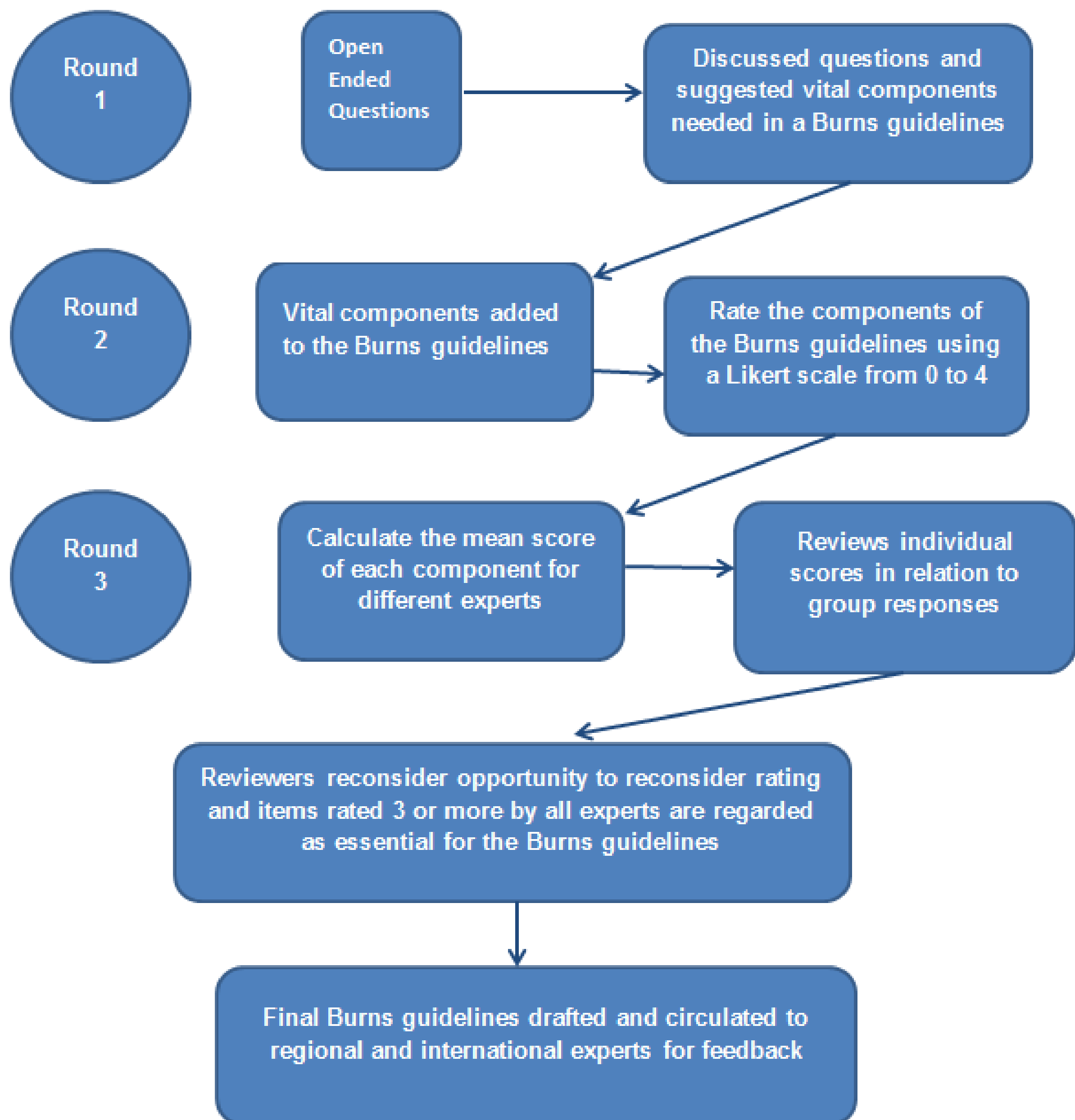

Figure 8-1: The Delphi Stages for Generating the Guidelines

8.3.4 Data Analysis

Email respondents of all experts were saved, and transcripts made. As far as possible, the researcher attempted to obtain consensus on the structure of the guidelines,the scope and content of the guidelines, and the specific interventions that should be included. If consensus was not reached, the researcher motivated for his choice, based on the systematic review and the other studies. Results of each stage were subsequently used to inform the questions asked in the next iteration.

8.4 Results

Six experts were initially approached, after the invitation via email and all of them responded to the first phase of the Delphi round. There were no physiotherapists working in the private sector who met the entrance criteria and all the respondents worked in government institutions. Round 1 had all respondents participating (6/6 – 100%). In Round 2, two of the experts dropped out in the second round, citing lack of internet connection due to erratic power supply, family commitments, and lack of time. Follow-up emails were sent weekly if no response was received. In the final round, all four remaining experts (100%) responded. The characteristics of the six experts from the first round are described in Table 8-1.

There is a predominance of physiotherapists in the sample, with one occupational therapist and one public health specialist. All participants had more than 10 years of experience in their fields (although not necessarily in the management of burn injuries).

Table 8-1: Characteristics of Expert Panel

Characteristics	Number
Gender	
• Males	2
• Females	4
Occupation*	
• Lecturer	4
• Physiotherapist	3
• Public health specialist	2
• Occupational therapist	2
Current Employment Role*	
• Clinical	1
• Research	5
• Teaching	4
Number of years of experience	
• 0 – 4 years	0
• 5 – 9 years	0
• 10 – 19 years	6
Highest Qualification	
• PhD	2
• **Masters	3
• **Bachelor's degree	1

**Some participants reported multiple occupations and roles **Two of the experts dropped out after Round 1.*

8.4.1 First Round Iteration

The open-ended questions generated 40 items are listed in the answers section of Table 8-2 below..

Table 8-2: First Round Alpha draft Delphi Questionnaires

Delphi survey first round questions		
Burns: these questions are applicable to both in-patient and outpatient. Please specify whether its in-patient or outpatient.		Amalgamated answers N=6
Frameworks	Are there any theoretical frameworks or guiding principles that you base your treatment and assessment of patients with burns? Frameworks can include theories or concepts. If you don't use any respond "none".	Yes
	Are there any books, articles or authors that you refer to when thinking about patients with burns?	Yes
	What factors relating to the individual do you believe are important in burns management e.g. body structures, functions, systems, processes or attributes.	Area affected, location of burns, depth of wound, size of the wounds, type of burns, age of a person, gender, occupation, patient's motivational level, prior exercise experience
	What factors related to activity or participation restriction do you believe are important in burns management? I.e. what is the person doing and how they are doing it.	Movements affected, functional movements compromised, functional abilities and disabilities, performance ability
Assessment of burns	How do you assess burns in How do you assess burns in - Infants (0-1 years) - Young children (1-5 years) - Primary school (5 -13 years) - Secondary school (13 -18 year) - Adults (18 – 65 years) - Geriatrics (>65years)I.e. assessment items, tests or observations etc.	Complete history taking, head to toe physical examination, calculation of TBSA, Lund Browder chart, airways and breathing assessment, pain and wound assessment, ROM and strength assessment, quality of life assessment
Interventions	What exercise strategies do you consider effective in treating or in burns management? E.g. exercises or active therapy approaches. Please indicate which ages are relevant and how much is needed to be effective?	Positioning –all ages Splinting-all ages Static stretching Dynamic stretching AROM exercises PROM exercises Early mobilisation Massage- friction massage Strengthening-progressive resisted muscle strengthening -all ages for all.
	What other interventions do you consider effective in the management of burns e.g. equipment, medication, surgery ?	Medication Surgery/plastic surgery Patient education Counselling
	Are there any strategies or activities that are effective that you find difficult to provide? Please indicate if this is due to inadequate - Information skills - Funding - Working hours - Equipment - Environment	Splinting-equipment and environmental issues

8.4.2 Second Round Iteration

Using the ACI guidelines[1], the 40 items from round one were incorporated into the guidelines under five categories: (1) prevention, (2) pain management, (3) non – pharmacological management, (4) assessment, and (5) treatment. The five categories were emailed to respondents for a ranking using a 5-point Likert scale. The responses are listed in Table 8-3 below. Using the criteria of Dewar et al. [200], the Round 2 responses were classified into four categories:

1. *Consensus:* An item reached consensus if 75% of respondents agreed "very important" or "absolutely essential".
2. *Discarded:* An item was discarded if all of the respondents disagreed "moderately important", "slightly important" or "not at all important".
3. *Unknown:* items that 1 of respondents selected "not sure" or "no comment" (i.e., responses could not achieve 100% "very important" or "absolutely essential".
4. *Discordant:* for all of these items, 50% of the respondents could not agree, the items were retained and then re-presented without a change in round 3 (see Figure 8-1)

The scores from the experts are shown in Appendix XXXII and the median was calculated as shown in Table 8-3 below.

Table 8-3: Second iteration components and experts scores and comments

Components	Median	Summarised experts' comments	Response category
1. PREVENTION			
Education			
It is vital that health promotion/education is done by all health professionals including physiotherapists	4	Patient education and empowerment are key aspects of physiotherapy management Education is very important	Consensus
Physiotherapists need to play a role in the education of patients in line with the management set for the patient by the team through ward rounds/meetings, posters, and peer survivors	4	Emphasis on education	Consensus
Infection control			
Physiotherapists need to familiarise with the infection control policy of hospitals and Burns' Unit	4	Physiotherapists are more hands-on therefore are the greatest source of spreading infection	Consensus
		To enhance infection control and complement all health personnel in combating	Consensus
2. PAIN MANAGEMENT			
Physiotherapists need to know the dosage, effects and side effects of drugs used on patients with burns	3.5	The Zimbabwe one is too summarised, it is not bringing out the key aspects highlighted in the Australian one. Need to revise this statement	Consensus
		Very necessary it cannot be overemphasised	
3. NON – PHARMACOLOGICAL PAIN MANAGEMENT			
Pain should be managed using hands-on therapy such as massage, mobilisations and exercises	4	Very important	Consensus
Massage		Pain reduction is very important in patients with burns.	
Mobilisations			
Exercises			
4. ASSESSMENT			

Components	Median	Summarised experts' comments	Response category
Physiotherapists need to have knowledge of depth and degree of burns, Lund and Browder, rules of nines. There is lack of knowledge on BSHS and Burns Outcomes Questionnaire for infants and children	4	Can't you summarise the Lund and Browder, rule of nines under the heading of knowing the extent of the burns. Then include the outcome tools that can be used in our setting, those that are applicable	Consensus
		Very necessary	
5. TREATMENT			
RoM	4	The point needs revision too for it to be as detailed as the Australian one. Which affected areas should we focus on to prevent contractures too.	Consensus
AROM and PROM should be done every day and stretches need to be incorporated in every treatment session			
Mobility/ambulation	4	Guidelines should also include the waiting periods in the case of mobilising grafts area	Consensus
Mobility to commence as soon as possible to prevent secondary complications and restoration of function and independence.			
Functional retraining	3.5		Consensus
Incorporate easy exercises into patients' daily routine which doesn't involve expensive materials/equipment		Not clear, how do we define easy exercise? Maybe to be specific on the types of exercises to be done can be helpful	
Follow up and work-related assessment is needed.			
Work assessment in combination with National Social Security Association (NSSA), is needed for back to work assessments and compensation		Yes, very necessary. Burn rehab management is not complete after discharge but until the patient is fully restored and able to participate fully in ADLs, occupational and recreational or leisure activities	
Strengthening	4		Consensus
There is a need to do strengthening exercises for patients with burns, for both adults and paediatrics.		Maybe also consider giving examples of resources that can be used for strengthening in a low resource setting	
Progressive resistance exercises should be incorporated at all stages of burn healing process.			
Aerobic exercises	4	Very necessary to offset the deconditioning effects of burns	Consensus
Walking and Running should be incorporated in all stages of the burn healing process especially after discharge.		Important. Walking very important for all burns, running not as much	
Splinting and positioning	4	This conditional on burn type and location.	Consensus
Adequate knowledge of anatomy, biomechanics and wound healing. A clear scheduled and routine which is individual to each patient.		Zimbabwe guidelines need to be revised to show that we are talking about splinting.	
Splints to be done in a position to maximise range of motion.		Splint to achieve ROM and not limit function of the patient too. Therefore, the need for the balance	
Use of POP as the main method for splinting		Very necessary	
A different splinting regimen and schedule should be adopted for the **paediatric** population with use of POP			
Massage	4		Consensus
Use of petroleum jelly as an alternative for moisturiser			
Compression	3.5		Consensus
Pressure bandaging should be applied for 12 weeks over joints particularly in adults and children with TBSA ≥ and depth of		I agree with this but pressure garments should be sourced for facial burns if possible	
		Not only facial, even the other parts of the body and should work with OTs to make these	
		Consider costs too	
Silicone There is need to provide an alternative method for hypertrophic scar management through the use of silicone	2		Discordant
		No comment am not sure here	

Components	Median	Summarised experts' comments	Response category
Cosmetic Tattooing to be an option for cosmetic	2	Use of cheap post skin graft applications rather than Biobrane and Integra	Discordant
		Cultural perceptions about tattoos in our setting	
Reconstructive surgery Early intervention is needed to minimise surgical	4	Neutral	Consensus
		Important	

8.4.3 Third Round iteration

In Round 3, respondents were asked to re-evaluate the two "discordant" items: the use of silicone and tattooing for cosmetic reasons. (Item 15 and 16 in Appendix XXXII). Two of the experts (50%) had a score of 2 (moderately important) the other two responded "unknown" or "neutral". After the third round, all the respondents decided not to change their scores, and these items were discarded as they were inappropriate to the Zimbabwe setting.

Though there was consensus in all the other items, one expert had 2 (moderately important) on three items: Item 4 (pain management), Item 6 (assessment) and Item 7 (RoM); these were incorporated into the final guidelines. The final guidelines consisted of recommendations under four main headings: Prevention, Pain management, Non-pharmacological management and Assessment with 14 sub-headings as listed in Table 8-3 (excluding Items 15 and 16). These 14 items were then adapted for both the paediatric and adult populations (Appendix XXXIII).

8.5 Discussion and Conclusions

The ACI Guidelines appeared to be an appropriate choice for developing the adapted guidelines. Almost all the items were endorsed by the Delphi panellists and were subsequently incorporated into the final Zimbabwe Guidelines.

Purposive selection of experts was done as Delphi studies rely on expertise rather than attempting to get representative samples. In addition, random selection of experts was unrealistic as the pool of experts was small [198,199]. Six experts were used initially with two defaulting; however, the sample size is acceptable as there are no hard and fast rules regarding a suitable minimum panel size[188,198,199]; panel sizes can range from four to 3000[198]. Although it is useful to have regional and international experts on the panel [3 4,175,184,185], it was decided a priori that the first three phases of the study should involve only local experts as they have first-hand information on the socio-economic status of Zimbabwe. The inclusion of international experts in the panel was considered, but it was then concluded that the international perspective would be provided by using a set of international guidelines as the starting point. What was needed was the local experience and contextual knowledge to interpret these guidelines. In hindsight, it was a mistake not to approach experts in neighbouring and other low- to middle-income countries who would have had experience in similar contexts. This is acknowledged to be a weakness of the study, which may limit the generalisability of the results to other countries.

This study identified the vital components of physiotherapy burns management. The Delphi generated a consensus led agreement of the shortlisted categories in burns management; there was a high rate of agreement among the participants especially concerning prevention through education and infection, non-pharmacological pain management, assessment, and treatment.

It was noted in Chapter 6 Documentation of Clinical Practice that few, if any RWs, monitored the outcome of intervention using standardised outcome measures. Noting this lack, the panel universally agreed that outcome measures should be regularly implemented. In the first iteration, they endorsed the need for complete history taking, head to toe physical examination, calculation of TBSA, Lund Browder chart, airways and breathing assessment, pain and wound assessment, ROM and strength assessment and quality of life assessment. In the next iteration, it was suggested that the guidelines should include outcome tools that would be useful in the local context. Consequently, locally applicable instruments that were specifically identified in the Guidelines for long-term assessment included the Lund and Browder chart[17], measures of functional mobility and a health-related quality of life scale, the EQ-5D in English and Shona[95] (Appendix XXXIII, Section 1).

Items which generated much discussion were pharmacological management with one expert specifying there is a need for in-depth knowledge of pharmacological effects drugs used in burns with regards to; dosage, half-life, side effects, and also with regards to drugs used for cosmetic purpose. Others regarded having a basic knowledge of the drugs used in burns being sufficient. Hence the guidelines included the need to know the pharmacological effects of drugs but not have detailed knowledge of their actions.

Consensus was reached with regards to cosmetic appearance and it was agreed that silicone and use of tattoos may not be appropriate for low-income countries. Silicone is costly and no local hospital was currently able to afford it. In addition, the Zimbabwe government of Zimbabwe only allocated 7.7% of the budget to the Health Ministry and some hospitals have an erratic supply of electricity, running water, let alone scalpels and painkillers[201]. The private sector also has no silicone products for burns management (Personal communication with a pharmacist working in government). Though silicone products are effective and safe for the management of hypertrophic scars, their use was not included in the final guidelines because of its cost and unavailability.

Regarding tattoos, it was agreed that they can be used as part of cosmetic surgery for burns but may not be culturally appropriate. In addition, the costs of getting a tattoo is high and the larger the scar the higher the price and many Zimbabweans cannot afford even basic needs[201].

All the experts agreed that compression therapy is vital in the management of burns and that pressure bandaging can be used as an alternative to pressure garments. They reached consensus in that facial burns may lead to stigma and everyone with facial burns should receive a pressure garment as a priority. Collaboration between physiotherapists and occupational therapists should be done with cheap alternative material needed to make pressure garments being made available by the government. This suggestion was highlighted as the most appropriate intervention for cosmetic purposes due to the high costs of silicone gels and tattoos. It was agreed that it was essential that patients with deep partial or deep burns should receive pressure garment or pressure bandaging to minimise post-burn hypertrophic scarring. The scarring has been identified as a great unmet need in

burn rehabilitation and can lead to decreased quality of life and depression[176] reported in 3.4.2 in the follow-up survey of burn survivors. As discussed in 6.7, pressure garment therapy may decrease scar height but fail to alter global scar scores significantly[31].

The experts reached consensus that exercise and mobilisation were vital in the management of burns and feasible in an under-resourced setting. They recommended that all type of exercises (AROM, PROM and early mobilisation) be included for adults and children and that AROM, and PROM should be done daily with stretches included in every treatment session (Table 8-3). The exercises should focus mainly on preventing flexion contracture. The use of splinting and positioning was also universally endorsed, but with the provision that there should be a balance between functional needs and immobilisation in the correct position. This is consistent with other guidelines such as the ISBI guideline[31] which suggests that consistent RoM in conjunction with appropriate splinting is essential to prevent deformities.

Mobilisation should be commenced in association with aerobic exercises as soon as the patients' vital signs are stable. Waiting periods in the case of grafts need to be incorporated in the guidelines. Endurance exercises such as walking and running should be done after discharge. Experts agreed that the prescription of exercises should vary according to the patients' levels of fatigues through observation of shortness of breath, pallor, cyanosis, light-headedness and dizziness.

The poor follow-up of discharged patients reported in Chapter 7 was considered and there was universal agreement that follow-up was essential. One participant noted that rehabilitation was not complete after discharge and should continue until the patient was fully restored and able to take part in everyday work, leisure and recreational activities. The need for follow-up was included in the Guidelines under Functional Re-training, Section 2.

8.5.1 Study strengths and limitations

The original research proposal included a two -day face to face workshop to present all the findings of the supporting studies and to collaboratively adapt the identified guidelines. However, due to time and financial constraints, this was not done and an on-line Delphi exercise was undertaken. This reduced the amount of in-depth discussion possible.

Experts were only drawn from Zimbabwe for the first three rounds of the Delphi. Although they do have some access to international perspectives, it is acknowledged that this recruitment produced a predominantly Zimbabwe perspective. The recommendations made might therefor not be of direct relevance within other contexts and might need further adaptation. The study should have incorporated international experts from other LIC or MIC, with similar socio-economic status as Zimbabwe such as India and South Africa; hence future studies need to explore this. It was disappointing that two of the experts did not complete the study, despite repeated requests to respond. However, this may reflect the large caseload of the participants and the intermittent and poor internet accessibility in Zimbabwe.

The Guidelines concentrated on the practice of hands-on therapy and unfortunately, the problems of poor referral and follow-up were not adequately addressed. In addition, the need for psychological support, increased therapist skills in counselling and community integration were not

addressed as these usually fall within the domain of other RWs. These are omissions which will have to be remedied in future versions of the Guidelines. It is strongly recommended that these guidelines will be expanded in the future to address the specific roles of OTs and RTs in the process of rehabilitation patients with burns

8.5.2 Conclusions

A Delphi study was concluded and Guidelines for Physiotherapy management for acute care in Zimbabwe were established. It has been shown that most of the evidenced-based interventions such as exercise therapy can be adapted to be effective within a lower-resourced context, but that therapists may have to modify and use alternative resources. The prevention of hypertrophic scars and cosmetic surgery remains a challenge; there are no cheap alternative methods besides firm bandaging. This may cause a higher than necessary prevalence of hypertrophic scars amongst survivors of more severe burn injuries.

Chapter 9. Conclusions and Recommendations

This chapter gives an overview of the results of each study. It concludes with recommendations regarding physiotherapy practice, policymakers and areas for future research.

9.1 Synthesis of study outcomes

The overall aim of the study was to establish "Guidelines for Rehabilitation of Musculoskeletal Impairments and Functional Limitations for Zimbabwe for Patients with Burns". The guidelines were developed systematically per steps in guidelines development. There were three good candidates for use as the source guideline[1,108,115], but the Agency for Clinical Innovation (ACI) of New South Wales in Australia guidelines[1] were ultimately chosen. The ACI guidelines focus on musculoskeletal problems (including scar management) similar to the focus of these guidelines and were short and concise. The contextualisation of these guidelines for the Zimbabwean situation was based on the following studies.

9.1.1 The Epidemiology of Burns in Zimbabwe

The characteristics of patients with burns in Zimbabwe were established through a retrospective record review (descriptive review) to characterise patients admitted with burns to the two central hospitals in Harare over fifteen months. The sample consisted of 926 admission records and of which 435 full patient folders were retrieved. Unfortunately, 425 full folders of children were missing and 85 folders of adults respectively. There was a clear difference in presentation between children and adults, with children constituting over three-quarters of all admissions, but with less severe injuries. The *typical profile of a child with burns injuries* that emerged was:

- A toddler of less than two years of age
- From the urban area
- More likely to be male, who sustained an accidental scald burn in October or June.
- Likely to have partial burns to the upper limb, but burns of the head, trunk and lower limb burns are also common, with the involvement of three or fewer sites.
- The TBSA is likely to be 16% or less (86% have less).
- If three or more sites are involved or if he has a greater TBSA of 21%, there is a high likelihood that he will not survive.
- He will stay in the hospital for twenty days or less, but some may stay as long as 140 days.

The profile of *adult patients* that emerged was not as clear i.e.;

- The patient may be either male or female and of less than 40 years of age.
- An urban resident, who may have sustained burns between September and December.
- They are most likely to have sustained a fire burn, or possibly a scald by hot liquids.
- Although they are most likely to have sustained an accidental burn, they may well have been the victim of intentional assault or self-inflicted burns.
- They may have partial or full-thickness burns to the upper limb, but the head, trunk and lower limbs may also be burnt.
- The majority have burns to two or more sites, and if three or more sites are involved, the mortality rate increases.

- They are likely to have a TBSA of 41% or less (82.5% have less). They will stay in the hospital for 20 days or more with a range from one to 158 days.

The implication of this for Zimbabwean guidelines is the difference in aetiology and presentation between burns in children and adults was highlighted, and this information points to the need to have different guidelines concerning physiotherapy management. There is also a great need for education regarding the prevention of burns[6]. An initiative similar to those of the South African Burn Society[202] may apply to the Zimbabwean situation as the epidemiology of burns appears to be similar. The introduction of training for burns prevention at schools may also be productive. Appropriate counselling and psychological support should be provided to all patients with severe burns, particularly to survivors of the parasuicide attempts.

9.1.2 Post-discharge follow-up: Access to rehabilitation and impact on HRQoL.

The second study investigated the utilisation of post-discharge care, in terms of referral after discharge and home programme. This was a study with a small sample, 14 adult and 23 child respondents. There was practically no further post-discharge contact with rehabilitation, although referrals had been made to local rehabilitation departments. Both adult HRQoL instruments showed a greater impact on pain and emotional domains with respondents least affected in the physical domains. In the absence of trained counsellors, rehabilitation therapists might need to step into this role.

This phase also revealed the need for the guidelines to address the lack of post-discharge follow-up rehabilitation for patients with burns. It is recommended that future research be undertaken to explore the poor follow-up and that this be addressed at a policy level with the strengthening of referral systems. The research should be extended to rural areas, and the impact of burn injuries on children should be explored.

Prescribed home exercises should be feasible and acceptable.

9.1.3 Systematic review

The broad objective of this review was to systematically evaluate the effectiveness, safety and applicability to low-income countries of therapeutic exercises utilised by physiotherapists to improve function in patients with burns. The review, which included 19 papers, established that exercises either resistance or aerobic are effective, , and generally have a large effect on muscle strength and aerobic capacity although the evidence is not of a high quality. As most of the research enrolled paediatric patients older than seven years and, no adverse effects were reported; it can be concluded that resistance exercise is safe for this group of patients. However, as most children admitted with burns were younger than seven years, exercise needs to be carefully monitored in this group as safety and efficacy have not been proven for younger children. The results from this support the use of aerobic and resistance as a vital component of a burn rehabilitation program as they have shown to improve muscle strength aerobic capacity and functional status even after hospital discharge especially in patients with severe burns.

9.1.4 Documentation of the current rehabilitation practice

This phase documented clinical interventions used to treat musculoskeletal problems by observation of seven rehabilitation workers (not only physiotherapists), based in the five central hospitals, one provincial and one district hospital. The treatments of five adults and five paediatric patients were observed at each hospital, 70 treatments in all. Although the original intention was to observe physiotherapists, the study was expanded to include Occupational Therapists (OTs) and other rehabilitation workers as in some institutions, no physiotherapists were working in the Burns' Unit. The most significant finding was that the management of patients with burns was offered by a single rehabilitation worker (PTs, OTs or RTs), working in Burns' Units without any specialised training or additional courses.

The management of burns across all hospitals was similar, and saturation was reached with the planned number of observations. Passive and active movements were used almost universally, and the patients received a ward programme, which included positioning. Sitting and standing were included in some patients and patients were monitored for any adverse effects. A major weakness observed was the lack of baseline assessment or treatment progress during treatment. No compression bandages were applied, and no scar tissue massage was done. Information that could be included in the guidelines included the improvement of assessment and using standardised outcome measures. Massage using petroleum jelly should be included in the treatment of healed scars. In the absence of pressure garments or silicone covering, pressure bandages should be considered to reduce the impact of scar formation. Splinting should be done using alternative materials whenever indicated.

9.1.5 Identification and adaptation of the suitable guidelines

Following a literature search and examination of different guidelines by two independent reviewers, the Agency for Clinical Innovation (ACI) of New South Wales, Australia was chosen as a candidate for amendment. The ACI guidelines were amended based on the results of the previous studies and subjected to a Delphi process with four to six Zimbabwean rehabilitation therapists experienced in the field of burn management. The specific objectives were to: inform the decision making of the participants through the dissemination of the results of the previous three studies, reach consensus on the form and structure that the guidelines should take and approve each specific recommendation for practice. A three-round Delphi process was undertaken. Round 1 consisted of open-ended questions and suggested vital components that should be incorporated into the Burns Guidelines. Round 2 examined vital components that should be added and Round 3 finalised the content. A credible set of guidelines for Zimbabwe for the rehabilitation of musculoskeletal impairments and functional limitations was thus produced.

9.2 Critique of Study Methodology

The study outcomes need to be interpreted with caution, given some methodological limitations. The epidemiological study relied on retrospective record review, and a large number of missing medical records in children might have introduced bias. It might be preferable to use a prospective design in future. This could be preceded by a program to improve record quality to avoid having missing data , increase capture rates and produce better-quality data. A qualitative study through focus group discussions could be done to explore reasons for the poor record keeping. A further

flaw was that the study did not capture patients with burns who did not present to the hospital and was limited to Harare Central Hospitals where burns might present differently from other areas in Zimbabwe.

The section on the post-discharge impact of burns was unfortunately limited to urban areas, and those who were most in need of follow-up rehabilitation might have been excluded. Further weaknesses of this study include the lack of translation and validation of one of the HRQoL instruments and that no data were collected for children apart from the contact with rehabilitation services. These weaknesses should be addressed in future studies.

The systematic review was limited to the exercise management of musculoskeletal impairments. It would have been useful to examine the impact of other modalities. It became apparent that physical functioning was not the major functional limitation; pain, skin management, and psychological support emerged as the most required services.

The Zimbabwe Guidelines were ultimately appropriate for use in the urban areas of Zimbabwe, but the generalisability to other contexts may be limited due to the choice of samples. The guidelines should be tested in different conditions to ensure that they are fit for purpose. Besides, it seems essential that the guidelines be expanded to address the problems of poor rehabilitation referral uptake, and the need for psychological support and counselling.

9.3 Recommendations

9.3.1 Physiotherapy practice

First and foremost, the Zimbabwe Guidelines need to be taught at an undergraduate level and introduced at a national level to qualified therapists. This will hopefully raise the awareness of the best practice and motivate the rehabilitation workers to improve the quality and variety of their management strategies.

The picture that emerged was of physiotherapists and other rehabilitation workers, doing as best they could, with little or no continuing education related to the management of patients with burns. There is an urgent need to revamp the physiotherapy undergraduate curriculum and to emphasise the importance of appropriate assessment methods and using evidence-based therapy. The formation of a Burns Interest Group would provide further support and could prove a strong advocate for the improvement in resources dedicated to the care of these patients. The interest group needs to be multi-disciplinary, possibly recruiting social welfare officers and psychologists to participate in improving the mental well-being of the survivors.

The management of the patient with burns was being offered by a single rehabilitation worker working in the Burns' Unit which implies that specialised skills of each discipline, occupational therapy and physiotherapy were not available to each patient. It is thus recommended that the development of a joint curriculum of undergraduate physiotherapy and occupational therapists in the management of burn injuries be explored. The ideal solution would have been to employ more

rehabilitation workers in public hospitals but, in the light of the ongoing financial crisis in Zimbabwe, this may not be a viable option.

Another interesting possibility would be to approach international organisations and institutions to assist in upskilling rehabilitation workers. The International Society of Burn Injuries, for example, has acknowledged the problems faced by lesser-resourced countries in providing excellent care and might be able to provide support and guidance.

9.3.2 Future studies

Several important unanswered questions arose from this study.

- It was clear that many of the burn injuries were preventable, but effective methods of prevention need to be explored. Can an intervention aimed at educating adult caregivers about the causes, prevention and first aid management of burns reduce the incidence and severity of burn admissions in children?
- The follow-up study yielded useful information; however, the sample was small, and the functional status of children was not explored. Future studies with burn survivors might yield be helpful. Many patients of the adult patients did receive a home programme but found it difficult to follow. The nature of the programme could be investigated to make it less onerous and more relevant to the patient. The reasons for the very poor post-discharge rehabilitation management need to be explored to plan for improved long-term care. A mixed methodology design could help to determine if the low rate of follow-up was due to the patients not perceiving that they needed further assistance, the difficulty in accessing the services or the absence of appropriate care.
- In the observation of management, children less than two years were excluded, hence it vital to get information on the management of this vulnerable group. Studies could explore assessment techniques, equipment such as toys, positioning, the role of the mother/caregiver in providing treatment.
- Future studies need to focus on the overall well-being of the patient with burns and mothers/caregivers. Qualitative studies need to be done focusing on the psychological aspect of the patients with burns and also on the caregivers. Studies have shown that caregivers also suffer psychological trauma for caring for patients with burns. Studies need to explore social support, stress and quality of life of primary caregivers[203]. Since burns are common and preventable, studies into the child and mothers/caregiver characteristics may be done to predict burn injuries[204].
- Unfortunately, continuing professional development of rehabilitation workers was not specifically explored, and it would be interesting to discover whether individuals have been exposed to informal training courses and to what extent online sources were utilised to provide evidence for their treatment choices.
- The study focused on the musculoskeletal impairments and functional limitations, and further studies are needed to explore specialised areas such as burns in ICU, inhalational burns (respiratory complications), management of scar tissue and psychological consequences of severe burns. This could expand the Zimbabwe Guidelines and lead to the inclusion of a wider range of management recommendations.

9.3.3 Policymakers

Policymakers need to champion preventative strategies as most burns are preventable. There is a need to introduce a national injury prevention programme with specific targets and timelines related to children and adolescents. Introducing training for burns prevention at schools may also be productive, using a curriculum such as that developed by the National Fire Protection Association adapted for South Africa "Learn Not to Burn® A fire safety programme of the NFPA®, Preschool Programme, South Africa"[77].

There is lack of opportunity to improve skills and management of burn injuries; hence it is recommended that post-qualification courses in burns management be offered by training institutions and that refresher courses be sponsored by the Ministry of Health and Child Welfare.

The multi-disciplinary teamwork needs to be developed and expanded, particularly the inclusion of social welfare officers and psychologists within the team. The referral chain from central to satellite rehabilitation departments also needs to be strengthened.

9.4 Conclusion

The current study adds to the body of knowledge through the development of guidelines for the physiotherapy rehabilitation of musculoskeletal impairments and functional limitations for patients with burns in low- and middle-income countries. The thesis has provided an evidence-based framework for patients, rehabilitation workers and policy to inform the provision of effective management of patients with burns. It is hoped that the process of developing these guidelines has in itself contributed to greater awareness of the need to provide effective rehabilitation management, based on a sound evidence base, to patients who have had burns injuries. The Zimbabwe Guidelines should be regarded as a first attempt rather than the final version and hopefully will be subjected to further review as they are tried out in practice.

In retrospect, the scope of this doctoral thesis may have been too broad, and the research was limited by the constrained resources available to the researcher. The lack of financial resources, limited internet access and the time constraints of the researcher who was employed full time during his study in a clinical rather than academic setting, may have resulted in a more superficial investigation than the topics warranted. Ironically, the constraints experienced by the researcher are precisely those faced by many other clinicians and researchers in the rehabilitation fields in Zimbabwe. The challenges facing researchers in resource-constrained contexts was recognised by Serghiou et al. (2016) "In some cases, the problem is not knowledge, skill and ability to practice burn rehabilitation, but rather having the resources to do so due to financial difficulties." P1053[20].

The challenges facing low- and middle-income countries in providing appropriate and effective rehabilitation care to patients with burns are immense. We anticipate that the methodology used in this thesis will aid in developing physiotherapy guidelines for other debilitating conditions especially for SADC countries in situations where *de novo* guidelines are difficult to develop. However, it is hoped this is only the first version of the Guidelines and that it will remain a living document which will be modified and amended in response to feedback as it is used by rehabilitation workers at all levels of the health system.

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Appendices

Appendix I: Harare Central Hospital Ethical Clearance

Telephone: 621100-19
Fax: 621157

Reference: HCHEC 040316/16

HARARE CENTRAL HOSPITAL
P. O. Box ST 14
SOUTHERTON
Harare

20 April 2016

Mr. Tapfuma Mudawarima
985 Msana Street
Glen Norah A
HARARE

Dear Tapfuma,

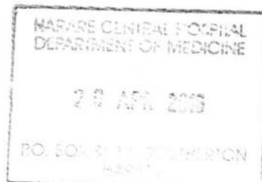
REF: BURNS IN ZIMBABWE: EPIDEMIOLOGY AND PHYSIOTHERAPY MANAGEMENT

I am glad to advise you that your application to conduct a study entitled: **Burns in Zimbabwe: Epidemiology and Physiotherapy Management** (**Ref: HCHEC 040316/16**), has been approved by the Harare Hospital Ethics Committee.

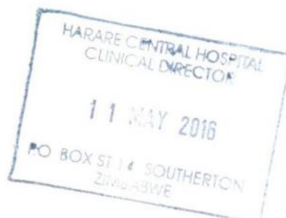
This approval is premised on the submitted protocol. Should you decide to vary your protocol in any material way please submit these for further approval.

You are advised to avail the results of your study whether positive or negative to the hospital through the committee for our information.

Yours sincerely,



DR. C. Pasi
Chairman Harare Central Hospital Ethics Committee



Appendix II: Parirenyatwa Group of Hospitals Ethical Clearance

Photocopy x 100

MEDICAL RECORDS

FORWARD TO JREC

PLEASE COMPLETE THIS FORM TOGETHER WITH YOUR APPLICATION

APPLICATION FOR RESEARCH AT PARIRENYATWA HOSPITAL

31/08/16

NAME OF APPLICANT: MUDAWARIMA TAPFUMA

ADDRESS OF APPLICANT: 985 GLEN NORAH A, HARARE

PARIRENYATWA GROUP OF HOSPITALS
CLINICAL DIRECTOR
31 AUG 2016
P.O.BOX CY 198 CAUSEWAY
HARARE

NAME OF INSTITUTION
UNIVERSITY OF CAPE TOWN

NAME OF SUPERVISOR
PROFESSOR J JELSMA / DR FC MUCHEMWA

PROJECT PROPOSAL
BURNS IN ZIMBABWE: DEVELOPMENT OF GUIDELINES FOR PHYSIOTHERAPY PRACTICE

OBJECTIVES
1. To establish the epidemiology of burns and to establish the standard of burns care.

METHODOLOGY
1. A retrospective twelve months record review for consecutively admitted patients with burns at Parirenyatwa hospital for the period 1 April 15 to 31 March 2016

TIMETABLE September – october 2016

PATIENT INCLUSION CIRETRIA
All burns patients of any age presenting to the surgical, paediatric & burns unit @ Parirenyatwa hospital for the first time

USE OF RESULTS

for attainment of a higher degree PhD and dissemination to hospitals

REFERENCES

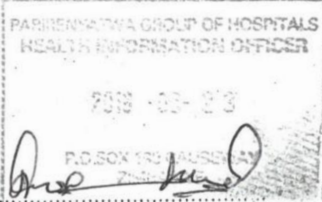
DR F C MUCHEMWA - UNIVERSITY OF ZIMBABWE

PROFESSOR J JELSMA - UNIVERSITY OF CAPE TOWN

MR M CHIKWARIDZO - UNIVERSITY OF ZIMBABWE

I promise to forward the Conclusions of the study to the CLINICAL DIRECTOR

NAME: MUDAWARIMA T SIGNATURE: [signature]



STATION PERMISSION

1. CONSULTANT

   NAME: A GOREDEMA

   Agree/~~Do not~~ Agree

2. WARD MANAGER

   NAME:……………………………

   Agree/Do not Agree

Appendix III: JREC Ethical approval

Parirenyatwa Group of Hospitals

Joint Research Ethics Committee For The University of Zimbabwe, College of Health Sciences and Parirenyatwa Group of Hospitals

University of Zimbabwe College of Health Sciences

JREC Office No. 4, 5th Floor College of Health Sciences Building
Telephone: +263 4 708140/ 791631 Exts 2241/2242
Email:jrec.office@gmail.com/jrec@medsch.uz.ac.zw, website:www.jrec.uz.ac.zw

APPROVAL LETTER

Date: 2nd November 2016 **JREC Ref: 248/16**

Names of Researcher: **Tapfuma Mudawarima**
Address: University of Zimbabwe - Department of Rehabilitation

RE: **BURNS IN ZIMBABWE-DEVELOPMENT OF GUIDELINES FOR PHYSIOTHERAPY PRACTICE.**

Thank you for your application for ethical review of the above mentioned research to the Joint Research Ethics Committee. Please be advised that the Joint Research Ethics Committee has reviewed and approved your application to conduct the above named study. You are still required to obtain MRCZ approval and if required by the nature of your study, RCZ approval as well, before you commence the study.

- **APPROVAL NUMBER:** JREC/248
- **APPROVAL DATE:** 2nd November 2016
- **EXPIRY DATE:** 1st November 2017

This approval is based on the review and approval of the following documents that were submitted to the Joint Ethics Committee:

a) Completed application form
b) Full Study Protocol
c) Informed Consent in English and/or appropriate local language
d) Data collection tool version

After this date the study may only continue upon renewal. For purposes of renewal please submit a completed renewal form (obtainable from the JREC office) and the following documents before the expiry date:

a. A Progress report
b. A Summary of adverse events.
c. A DSMB report

- **MODIFICATIONS:**

  Prior approval is required before implementing any changes in the protocol including changes in the informed consent.

- **TERMINATION OF STUDY**:

  On termination of the study you are required to submit a completed request for termination form and a summary of the research findings/ results.

Yours sincerely,

Professor MM Chidzonga
<u>JREC Chairman</u>

Appendix IV: Ethical approval: HREC of UCT

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

---

18 August 2015

HREC REF: 379/2015

Prof J Jelsma
Health & Rehab
F-Floor, OMB

Dear Prof Jelsma

PROJECT TITLE: BURNS IN ZIMBABWE - EPIDEMIOLOGY AND PHYSIOTHERAPY MANAGEMENT (PhD-candidate- Mr T Mudawarima)

Thank you for responding to the Faculty of Health Sciences Human Research Ethics Committee.

The HREC note the title change, and that all the issues raised for the first two phases of this study have been addressed.

In addition, we note that all references to the randomised controlled trial have been removed from the amended protocol.

The HREC therefore formally approve the amended study.

The HREC also note that the intervention aspect of this study will be submitted as a sub-study of this protocol at a later stage.

Approval is granted for one year until the 30th August 2016.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Tapfuma Mudawarima will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

HREC 379/2015

Appendix V: Ethical approval: HREC of UCT

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

14 January 2016

HREC REF: 806/2015

Prof J Jelsma
Physiotherapy
Health & Rehab
F-floor, OMB

Dear Prof Jelsma

PROJECT TITLE: BURNS IN ZIMBABWE- DEVELOPMENT OF GUIDELINES FOR PHYSIOTHERAPY PRACTICE (PhD candidate Mr T Mudawarima)

Thank you for your response to the Faculty of Health Sciences Human Research Ethics Committee dated 11 December 2015.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study subject to the following:

- Please correct the typo error on page 32 of the assent form: "There should be pain", should be corrected to "there should be no pain".

Approval is granted for one year until the 30th January 2017.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Mr Tapfuma Mudawarima will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 806/2015

Appendix VI: Annual Progress Report/Renewal

UNIVERSITY OF CAPE TOWN

HUMAN RESEARCH ETHICS COMMITTEE
26 OCT 2018
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30/10/2019
☐ Not approved	See attached comments		
Signature Chairperson of the HREC	[signature]	Date Signed	27/10/2018

Comments to PI from the HREC
Thank you for deviation form [signature]

Principal Investigator to complete the following:

1. Protocol Information

Date (when submitting this form)	24 October 2018		
HREC REF Number	806/2015	Current Ethics Approval was granted until	30 January 2017
Protocol title	Burns in Zimbabwe – Development of Guidelines for Physiotherapy Practice		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes x☐ No		
If yes, could you please provide the HREC Ref's for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Emeritus Professor Jennifer Jelsma		
Department / Office Internal Mail Address	Jennifer.jelsma@uct.ac.za		

12 March 2018 Page 1 of 5 FHS016

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

1.1 Does this protocol receive US Federal funding?	☐ Yes	x☐ No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval? **Note:** Any annual approvals for **Full Committee** review MUST be submitted on the monthly HREC submission dates. (Please send electronic copy for full committee review to hrec-enquiries@uct.ac.za)	☐ Yes	x☐ No

If yes in 1.2 please complete section 1.3 below for invoicing purposes	
1.3 Annual Approval for **full committee** review	- R 3420 (inclusive of vat)
For invoicing purposes, please provide:	
Sponsor's name	
Contact person	
Address	
Telephone number	
Email Address	

2. List of documentation for approval

3. Protocol status (tick ✓)

☐	Open to enrolment
☐	Closed to enrolment (tick ✓)
☐	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
x☐	Research-related activities are complete, data analysis only
☐	Main study is complete but sub-study research-related activities are ongoing
☐	Study is closed → Please submit a Study Closure Form (FHS010)

4. Enrolment

Number of participants enrolled to date	853
Number of participants enrolled, since last HREC Progress report (continuing review)	853

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Additional number of participants still required	0

5. Refusals

Total number of refusals (participants invited to join the study, but refused to take part)	13

6. Cumulative summary of participants

Total number of participants who provided consent	120
Number of participants determined to be ineligible (i.e. after screening)	0
Number of participants currently active on the study	0
Number of participants completed study (without events leading to withdrawal)	107
Number of participants withdrawn at participants' request (i.e. changed their mind)	0
Number of participants withdrawn by PI due to toxicity or adverse events	0
Number of participants withdrawn by PI for other reasons (e.g. pregnancy, poor compliance)	0
Number of participants lost to follow-up. Please comment below on reasons for loss of follow-up.	13
Patients were lost to follow up due to change of physical address	
Number of participants no longer taking part for reasons not listed above. Please provide reasons below:	

7. Progress of study

Please provide a brief summary of the research to date including the overall progress and the progress since the last annual report as well as any relevant comments/issues you would like to report to the HREC:
The following chapters have been completed but still need review and editing: 1. Systematic review of exercise interventions for patients with burns 2. Epidemiology of patients with burns admitted to the Harare Central hospitals 3. Long term functional impact of burns The last two chapters on audit of practice and the development of guidelines for the treatment of patients with burns are still to be completed. Audit of practice data needs to be analyzed and the guidelines to be completed.

8. Protocol violations and exceptions (tick ✓ all that apply)

x☐	No prior violations or exceptions have occurred since the original approval
☐	Prior violations or exceptions have been reported since the last review and have already been acknowledged or approved

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

☐	Unreported minor violations that have occurred since the last review, as well as significant deviations not yet reported, are attached for review

9. Amendments (tick ✓ all that apply)

x☐	No prior amendments have been made since the original approval
☐	Prior amendments have been reported since the last review and have already been approved
☐	New protocol changes/ amendments are requested as part of this continuing review (See note below)

Note: If new protocol changes are being requested in this review, please complete an amendment form (FHS006).
Specific changes in the amended protocol and consent/assent forms must be **bolded**, *italicised* or tracked and all changes must include a rationale.

10. Adverse events

10.1 Please provide below or attach a narrative summary of serious adverse events and/ or unanticipated problems since the last progress report. Please indicate changes made to the protocol and informed consent document(s) as a result (if not already reported to the HREC). Please comment on whether causality to any study procedure or intervention could be established.
No adverse events noted

10.2 Have participants received appropriate treatment/ follow-up/ referral when indicated (e.g. in the case of abnormal or incidental clinical findings, distress or anxiety)?		
X ☐ Yes	☐ No	☐ Not applicable
If yes, please describe:		
Patients requiring psychological support have been referred to appropriate services provided by the government.		

11. Summary of Monitoring and Audit Activities (tick ✓)

11.1 Was this study monitored or audited by an external agency (e.g. SAHPRA, FDA)?		
☐ Yes	☐ No	x☐ Not applicable

11.2 Did a Data and Safety Monitoring Board publish a report?		
☐ Yes	☐ No	x☐ Not applicable

11.3 If yes, please identify the agency and attach a summary of the findings.					
Agency Name		Report attached	☐ Yes	☐ No	x☐ Not applicable
		DSMB report attached	☐ Yes	☐ No	x☐ Not applicable

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

11.4 Has there been any agency, institutional or other inquiry into non-compliance in this study, or any finding of non-compliance concerning a member of the research team?	
☐ Yes	x☐ No
If yes, please explain:	

12. Level of risk (tick ✓)

12.1 In light of your experience of this research, please indicate whether the level of risk to participants has:	
☐	Increased
☐	Decreased
x☐	Shown no change
If there has been a change, please explain:	

12.2 Please provide a narrative summary of recent relevant literature that may have a bearing on the level of risk.
The study was a low level risk with most of the study being epidemiological in nature, with data being obtained in the notes.

13. Statement of conflict of interest

Has there been any change in the conflict of interest status of this protocol since the original approval? (tick ✓)	
☐ Yes	x☐ No
If yes, please explain and if necessary attach a revised conflict of interest statement (Section #7 in the New Protocol Application Form FHS013):	

14. Signature

My signature certifies that the above is complete and correct.			
Signature of PI		Date	

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Appendix VII: Study Closure Report

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

RESEARCH ETHICS COMMITTEE
19 MAR 2020

Form FHS010: Study Closure Report

HREC office use only (FWA00001637; IRB00001938)			
Noted and filed. This serves as acknowledgement that this study is closed.			
☐ Approved	Study closure report		
☐ Not Approved	Study closure report		
Chairperson of the HREC signature		Date	21/3/2020

1. Principal Investigator to complete the following:

Date (when submitting this form)	18 March 2020
HREC REF Number	806/2015
Protocol Title	Burns in Zimbabwe – Development of Guidelines for Physiotherapy Practice
Protocol number (if applicable)	
Principal Investigator	Emeritus Professor Jennifer Jelsma
Department / Office Internal Mail Address	jennifer.jelsma@uct.ac.za

2. Please confirm (tick ✓)

This study is closed to enrollment	X Yes	☐ No
Participants have completed all research-related interventions	X Yes	☐ No
Participants have completed all research-related follow-up	X Yes	☐ No
Data analysis is complete	X Yes	☐ No
Your sponsored protocol is closed	X Yes	☐ No
If you answered 'no' to any of the above questions, you must keep your study open until all research activity is completed.		

11 September 2014 Page 1 of 3 FHS010

3. What is the reason for closing the study? (tick ✓)

Research completed	X	No time	
Terminated due to toxicity/adverse event		PI left UCT or affiliated sites	
Slow accrual		Insufficient funding	
Loss of interest		Research never began	
Other. Please specify:			

4. For clinical trials, please describe the arrangements for provision of care after research, including (where applicable) post-trial access to the investigational product.

5. Please explain how the research findings have been disseminated to participants, communities, and/or stakeholders.

One of the protocol was published in a systematic review journal.

a. A systematic review protocol on the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns.

Mudawarima T, Chiwaridzo M, Jelsma J, Grimmer K, Muchemwa FC. Syst Rev. 2017 Oct 23; 6(1):207. doi: 10.1186/s13643-017-0592-6.PMID: 29058641 Free PMC Article

The other findings will be presented as meetings to stakeholders, participants will be notified through posters and leaflets to communities and participants.

6. Please confirm (tick ✓)

Have you submitted a final report to the Provincial Health Research Committee?	☐ Yes	☐ No	☒ N/A
Please note: Researchers must submit final reports to the relevant research co-ordinator/research directorate at City Health Department, GSH, RXH, TBH, PGWC (for non-tertiary hospitals) within six months of completion of the study and may be required to report the findings of the study to other relevant authorities including the PHRC.			

7. Please indicate how, and for how long, the data will be stored and protected.

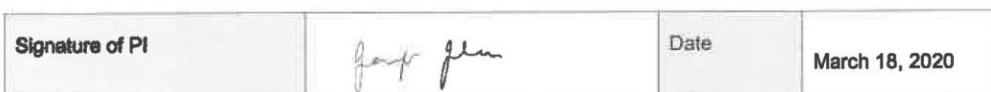
The data will be kept as password protected excel sheet in Dropbox for a maximum of ten years.

8. Please list or attach any papers, abstracts, presentations or other outputs generated from this study.

A systematic review protocol on the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns.

Mudawarima T, Chiwaridzo M, Jelsma J, Grimmer K, Muchemwa FC. Syst Rev. 2017 Oct 23; 6(1):207. doi: 10.1186/s13643-017-0592-6.PMID: 29058641 Free PMC Article

9. Signatures



Signature of PI	[signature]	Date	March 18, 2020

Appendix VIII: Data Collection Sheet for Study 1

RESEARCH NUMBER………

SECTION A: DEMOGRAPHIC DATA

Date of Admission	___ (DD)/___ (MM)/_______ (YYYY)
Date of Birth	___ (DD)/___ (MM)/_______ (YYYY)
Date of Discharge	___ (DD)/___ (MM)/_______ (YYYY)
Or Date of Death	___ (DD)/___ (MM)/_______ (YYYY)

Age (full years attained) _____

Gender Males ☐ females ☐

Place of Residence (Suburb only) ______________________________

BURN HISTORY

Aetiology/cause (tick only one box)

1. Open fire ☐
2. Scalds (water, grease or steam) ☐
3. Electrical ☐
4. Chemical (acid, alkali or unknown) ☐
5. Contact with hot object ☐

Circumstances (tick only one box)

1. Accidental
   - Work related ☐
   - Non – work related ☐
2. Self-inflicted ☐
3. Intentional Assault/ abuse ☐

Place of occurrence (tick only one box)

1. Home ☐
2. Industrial ☐
3. Farm ☐
4. Mine ☐
5. Recreation ☐
6. Other specify ☐______________

PHYSICAL EXAMINATION

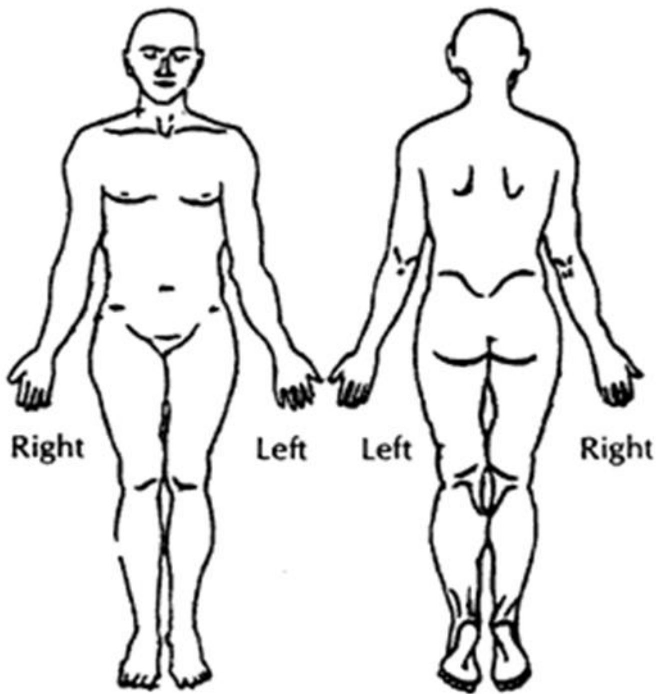
Total Body Surface Area (TBSA %) [d]_____

Anatomical region (tick where appropriate)

1. Head/ neck ☐
2. Upper limbs ☐
3. Trunk ☐
4. Lower limbs ☐
5. Perineum ☐

Please draw the area affected on the body chart below

[d] The rule of nines will be used to measure the body surface area that has been burnt for adults. For children the Lund – Browder chart will be used to assess the burnt body area in children



Depth of burns (tick only one box)

1. First degree (Epidermal burn) ☐
2. Second degree (superficial dermal burn) ☐
3. Third degree (Full thickness burn) ☐

OUTCOME

Death

Discharge to other hospital

Discharge home

(END QUESTIONNAIRE)

Appendix IX: Data Collection Form for Follow-up Impact Study.

RESEARCH NUMBER………

DEMOGRAPHIC DATA (Gained during the epidemiological study)

Date of Admission ___ (DD)/___ (MM)/_______ (YYYY)

Date of Birth ___ (DD)/___ (MM)/_______ (YYYY)

Date of Discharge ___ (DD)/___ (MM)/_______ (YYYY)

Or Date of Death ___ (DD)/___ (MM)/_______ (YYYY)

Age (full years attained) _____

Gender Males ☐ females ☐

Place of Residence (Suburb only) ______________________________

BURN HISTORY

Aetiology/cause (tick only one box)

6. Open fire ☐
7. Scalds (water, grease or steam) ☐
8. Electrical ☐
9. Chemical (acid, alkali or unknown) ☐
10. Contact with hot object ☐

Circumstances (tick only one box)

4. Accidental
   - Work related ☐
   - Non – work related ☐

5. Self-inflicted ☐
6. Intentional Assault/ abuse ☐

Place of occurrence (tick only one box)

7. Home ☐
8. Industrial ☐
9. Farm ☐
10. Mine ☐
11. Recreation ☐

12. Other specify ☐______________

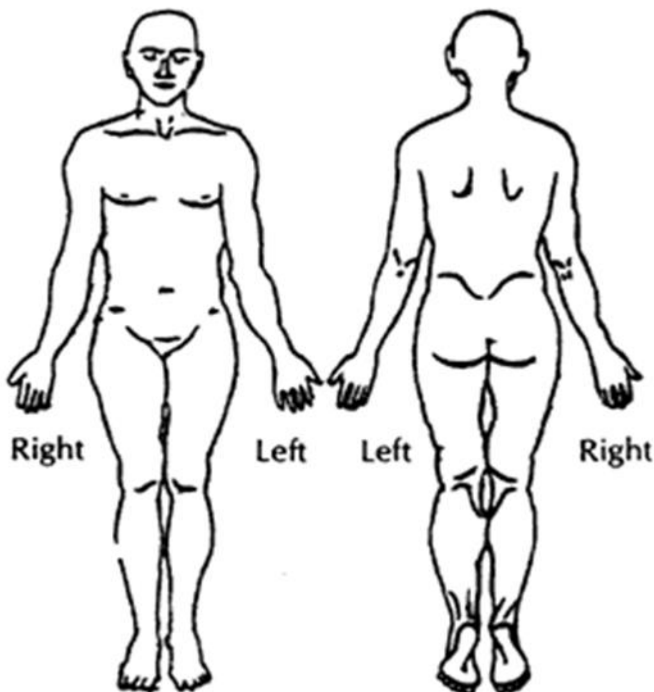
PHYSICAL EXAMINATION

Total Body Surface Area (TBSA %) [e]_____

Anatomical region (tick where appropriate)

6. Head/ neck ☐
7. Upper limbs ☐
8. Trunk ☐
9. Lower limbs ☐
10. Perineum ☐

Please draw the area affected on the body chart below



Depth of burns (tick only one box)

4. First degree (Epidermal burn) ☐
5. Second degree (superficial dermal burn) ☐
6. Third degree (Full thickness burn) ☐

---

[e] The rule of nines will be used to measure the body surface area that has been burnt for adults. For children the Lund – Browder chart will be used to assess the burnt body area in children

Outcome

Discharge to other hospital

Discharge home

follow-up

1. Did you get a rehabilitation home programme when you were discharged from hospital? Y/N
2. Were you referred to a rehabilitation department for more treatment when you were discharged from hospital? Y/N
3. Have you been receiving rehabilitation since you were discharged from hospital? Y/N
4. How many treatments have you received? ______

Appendix X: English and Shona EQ-5D

EQ - 5D

Health Questionnaire

(UK English version)

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility

I have no problems in walking about ❑

I have some problems in walking about ❑

I am confined to bed ❑

Self-Care

I have no problems with self-care ❑

I have some problems washing or dressing myself ❑

I am unable to wash or dress myself ❑

Usual Activities (*e.g. work, study, housework, family or leisure activities)*

I have no problems with performing my usual activities ❑

I have some problems with performing my usual activities ❑

I am unable to perform my usual activities ❑

Pain/Discomfort

I have no pain or discomfort ❑

I have moderate pain or discomfort ❑

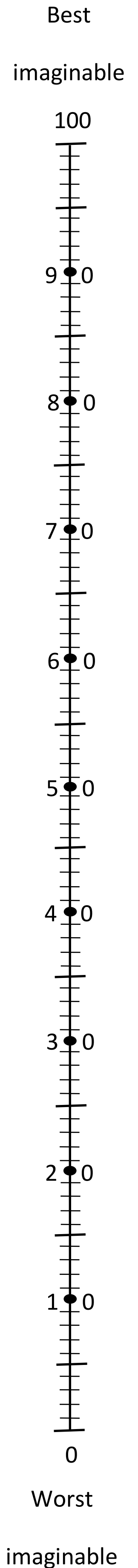
I have extreme pain or discomfort ❑

Anxiety/Depression

I am not anxious or depressed ❑

I am moderately anxious or depressed ❑

I am extremely anxious or depressed ❑



To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

Your own

health state

Bvunzo re Utano

MuchiShonacheku Zimbabwe

(Shona version for Zimbabwe)

Muchikwata chimwe nechimweche
mhindurodzinotevera,
isamucherechedzomukabhokisikarikumuchetoseizvi�pamhinduroimwecheteyaunofunga
kuti ndiyoinonyatso tsanangura utanohwako PARINHASI.

Kugonakufamba

Handinetsekikufamba ❑

Kufambakunondinetsa ❑

Handigone kana nekufambakose ❑

Kuzvishambidza

Ndinogona zvangukuzvishambidza ❑

Handinyatsogonakuzvigezesa kana kuzvipfekedza ❑

Handigonekuzvigezesa kana kuzvipfedza ❑

Mabasaenguvadzose*(Akafanana ne: kushanda, kudziidzamabhuku, kuita basa remumba kana repamba, kutandara kana kuvaraidzananemhuri)*

Handinetsekinokuitamabasaanguandinowanzoita nguva dzose ❑

Ndinonetseka kuita mabasaanguandinowanzoitamazuvaose ❑

Handichagoni kuita mabasaanguandaiwanzoitamazuvaose ❑

Kurwadziwa/ Kusagadzikana

Handisi kurwadziwa ❑

Ndinorwadziwazwanguzvishoma ❑

Ndinorwadziwazvakanyanya ❑

Kunetsekanamupfungwa / Kuremerwa

Hapana zvinondinetsamupfungwa ❑

Ndine zvinodinetsazwakati kuti ❑

Ndirikushushikanazvakanyanya ❑

Kuti tibatsirevanhu kuti vaonekunaka kana kushatakwakaitautanohwavoparinhasi, takupachikeroichichekupimisa nacho utanohwako. Chine nhambadzinobvirapasipana 0 kusvika kumusorokuna 100. 0 anoratidzautanohwakadzikirahwemunhuanorwarazvakasvoipisa. 100 anoratidza utano hwakaisvonakisa hwemunhu asingarware.

Tinokumbira kuti unongedzenhambapachikero apa yaunofunga kuti ndiyoinoratidzaipochaipo pane utanohwakonhasiuno. Ita izvi nokunyoramutsetseunotangira kubva pachibhokisichiri pazasi ichowakananganechekurudyiukokunechikerouchinogumaipochiapo pane nhambayawasarudzayaunofungira kuti ndiyochaiyoinoratidzapavaneutanohwakonhasi.

Appendix XI: Burn Specific Health Scale – Brief for Adults and Older Children

Factor	1	2	3	4	5	6	7	8	9
1. *Heat sensitivity • Being out in sun bothers me • Hot water bothers me • I can't get out and do things in hot weather • It bothers me I can't get out in the sun • My skin is more sensitivity than before									
2. *Affect • I often feel sad or blue • At times I think I have an emotional problem • I am troubled by feelings of loneliness • I have feelings of being trapped or caught • I don't enjoy visiting people • I have no one to talk about my problems • I am not tolerated in doing things with my friend									
3. *Hand functions • Signing your name • Eating with utensils • Picking up coins from a flat surface • Unlocking a door • Tying shoelaces or boots									
4. *Treatment regimens • Taking care of my skin is a bother • There are things that I have been told to do for my burn that I dislike doing • I wish that I didn't have to do so many things to take care of my burn • I have a hard time doing all the things I have been told to take care of my burn • Taking care of my burn makes it hard to do other things that are important to me									
5. Work • My burn interferes with my work • Being burned has affected my ability to work • My burn has caused problems with my working in your old job and performing your old duties									

6. Sexually • I feel frustrated cause I can’t be sexually aroused as I used to • I am sexually not interested in sex any more • I no longer hug, hold or kiss									
7. *Interpersonal relationships • I don’t like the way my family acts around me • I would rather be alone than with my family • My family would be better off without me • My injury has put me further away from my family									
8. *Simple abilities • Bathing independently • Dressing by yourself • Getting in and out of a chair									
9. *Body images • The appearance of scars bothers me • My general appearance really bothers me • Sometimes I would like to forget that my appearance has changed • I feel that my burn is unattractive to others									

*Items to be used with children over seven years of age.

Appendix XII: Information Sheet and Consent Form for Patients with Burns for the Follow-up Impact Study (English Version)

Dear Participant

My name is Tapfuma Mudawarima. I am a PhD student at the University of Cape Town, as part of my PhD; I am conducting a research project entitled "Burns injuries in Zimbabwe: Development of Guidelines for Physiotherapy Rehabilitation of Musculoskeletal Impairments and Functional Limitations". The overall aim is to draw up a booklet on how best to give physiotherapy treatment for patients with burns. You have been selected as a participant because of the burns you sustained. Because I wanted to find out how many people had burns and how it happened, I went through the records at the hospital and took this information from the folders, including your folder. This was how I came to get your name.

To help you make an informed decision regarding your participation in this study, I have prepared some information for you below.

WHAT YOU SHOULD KNOW ABOUT THIS RESEARCH STUDY?

Before you decide whether or not to volunteer for this study, you must understand its purpose, how it may help you, the risks to you, and what is expected of you. This process is called informed consent. The form is given to you so that you may know about the purpose, risks and benefits of this research study. Please review this form carefully. Ask any questions before you make a decision. Your participation is voluntary

PURPOSE OF THE STUDY?

The main goal of this study is to gain knowledge on the how burns have made a difference to what you are able to do and what problems you still have. We will then use this information to draw up a booklet to help physiotherapists treat patients who have had burns better.

PROCEDURES INVOLVED IN THE STUDY?

We will be visiting …… Hospital on ……. (Date) and we are asking you to come to the hospital on that day. Transport and lunch will be provided and all participants in that district or province will be invited to attend on the same day. You will be examined and asked a series of questions by a researching physiotherapist. The physiotherapist examination will test how well you walk, whether you get short of breath, whether you still have stiff joints and ask questions about whether the burns interfere with the things you wish to do. The testing should not take longer than 60 minutes but getting to and from the hospital will take longer.

RISKS OR DISCOMFORTS

You should not experience any pain although you may get a bit short of breath while walking. You may feel a bit upset talking about how the burns have caused problems in your life. If you feel very sad, we will send you to the rehabilitation department and ask them to give you some help.

BENEFITS AND/OR COMPENSATION

If you do take part in this study, you will not get anything out of it for yourself. We will not be giving you any money for taking part and will not be giving you treatment. But the information that you give us will help us to plan physiotherapy treatment better for others, like you, who get burnt in the future. If you do need any further help, we will write a letter to the rehabilitation department at this hospital so they can give you treatment if you need it.

HOW MUCH WILL PARTICIPATING IN THIS STUDY COST YOU?

You will not incur any costs by participation in this study

CONFIDENTIALITY

Your information from this research will be stored in the investigator's research file and will be identified only by a code number. The code key connecting your name to the number will be kept in a separate secure location.

If your data is used for publication in the medical literature or for teaching purposes, your name will not be used. Data and all information from this study will be made available to my academic supervisors. Under some circumstances, the ethics committee may need to review its record for compliance audits.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary and you may refuse to participate. If you decide not to participate in this study, it will not affect your dealings with the Ministry of Health and Child Welfare (Zimbabwe), their personnel and associated hospitals. If you decide to participate, you are free to withdraw your consent and to stop taking part at any time without penalty and there will be no loss of benefits due to you from this study as described above. This is also true of the information that we collected at the hospital. If you do not want us to use this information, we will remove it and not use it. Refusing to take part or withdraw from the study will not affect your current or future health care.

WHAT IF SOMETHING GOES WRONG?

The University of Cape Town (UCT) has insurance cover for the event that research-related injury or harm results from your participation. The insurer will pay all reasonable medical expenses in

accordance with the South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines in the event of an injury or side effect resulting directly from your participation in the trial. You will not be required to prove fault on the part of the University.

The University will not be liable for any loss, injuries and/or harm that you may sustain where the loss is caused by

- The use of unauthorised medicine or substances during the study
- Any injury that results from you not following the protocol requirements or the instructions that the study doctor may give you
- Any injury that arises from inadequate action or lack of action to deal adequately with a side effect or reaction to the study medication
- An injury that results from negligence on your part

"By agreeing to participate in this study, you do not give up your right to claim compensation for injury where you can prove negligence, in separate litigation. In particular, your right to pursue such a claim in a South African court in terms of South African law must be ensured. Note, however, that you will usually be requested to accept that payment made by the University under the SA GCP guideline 4.11 is in full settlement of the claim relating to the medical expenses. "

An injury is considered trial-related if, and to the extent that, it is caused by study activities. You must notify the study doctor immediately of any side effects and/or injuries during the trial, whether they are research-related or other related complications.

UCT reserves the right not to provide compensation if, and to the extent that, your injury came about because you chose not to follow the instructions that you were given while you were taking part in the study. Your right in law to claim compensation for injury where you prove negligence is not affected. Copies of these guidelines are available on request.

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over. You may ask more questions about the study at any time. You will be informed of any significant new findings discovered during the course of this study which might influence your continued participation. If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the Medical Research Council of Zimbabwe is available to talk with me. A copy of this consent form will be given to me to keep for careful rereading.

The UCT Faculty of Health Sciences Human Research Ethics Committee (Professor Blockman) can be contacted on 021 406 6338 in case participants have any questions regarding their rights and welfare as research subjects on the study or you may also contact the Joint Research Ethics Committee (+263 4 708140)

Your participation is appreciated. Should you have any questions please contact Tapfuma Mudawarima Phone Number: +263 772328439

Supervisor: Professor Jennifer Jelsma (University of Cape Town)

+27846116681

If you chose to participate, please sign the attached consent form

INFORMED CONSENT FORM

Title: Burns in Zimbabwe – Epidemiology and Physiotherapy Management

Name of researcher: Tapfuma Mudawarima

Phone Number: +263 772328439

I --- ID number -- have read (or had read to me by ---) the information sheet. I understand what is required of me and I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so on my free will. I know that I can withdraw at any time if I so wish and that it will have no bad consequences for me.

Signed:

-- --

Participant date and place

-- --

Researcher date and place

-- --

Witness date and place

Appendix XIII: Information Sheet and Consent Form for Patients with Burns for the Follow-up Impact Study (Shona Version)

Dear participant

TIRI KUEDZA KUITA SEI?

Zita rangu ndinoitwa Tapfuma Mudawarima. Ndiri mufundi we PhD ku University of Cape Town, South Africa. Ndiri kutsvagiridza maererano nemarapirwo ephysiotherapy evarwere vakatsva. Ndinoda kudaira mibvunzo yekuti physiotherapy inobetsera sei varwere vakatsva mu Zimbabwe. Kuti ndikwanise kudaira mibvunzo iyi ndinotairisira kushandisa magwaro ekurapwa kwenyu nekuongorora muchirapwa naphysiotherapist. Varwere vane zvironda zvekutsva vanoongororwa pavanenge vachirapwa kamwechete. Tsaumba idzi dzinowedzera ruzivo rwedu pakurapwa kwekutsva nephysiotherapy. Kukubatsirai kuita sarudzo yenyu maerarano nefundo iyi, ndandakugadzirirai, zvimwe zvamunoda kuziva pazasi.

NEMHAKA YEI TABATA IMI?

Tabata imi nekuti makabuda muchipatara nemhaka yezvironda zvekutsva, tikuda kuona kuti chi chichiri kunetsa pamaka buda muchipatara

ZVAMUCHAKUMBIRWA KUTI MUITE?

Hapana zvamunokumbirwa kuti muite asi mutsvakiridzi anenge achiongorora muchirapwa, nekuongoora zvamunotadza kuita. Izvi hazvifanire kutora nguva yakareba yenyu.

NDINOWANEI

Hapana muripo wamunowana pakubatsira fundo iyi. Tinotarisira kuti tichadzidza zvakawanda pakurapa varwere vakatsva. Munguva pfupi hapana kubatsikana kwakanangani nemi. Hapana chakashata chinoitika kwamuri kana mukasabatsira.

Kuramba kana kuzosiira pakati pefundo iyi hakukanganise kuonekwa kwehutano hwenyu nebazi rezveutano nekurapwa kwevana (Ministry of Health and Child Care).

VANHU VANGAZIVE HERE MHINDURO DZANDAPA

Zviwanikwa zvese zvinosanganiswa pamwechete uye hapana anokwanisa kuziva kuti ndiani apa mhinduro ipi kunze kwevawongorori, pamwewo nevanoona kuti vese vabatsira mutsvakiridzo iyi

vakadzivirirwa neveku Ethics Committee of the University of Cape Town. Zita renyu haripiwe kune chero munhu kana kunyorwa papi zvapo. Zvichabuda mutsvakiridzo iyi zvichashandiswa muzvipatara nenharaunda dze science asi hazvinongedzere kwamuri nenzira ipi zvayo.

SUNUNGUKAI KUBVUNZA MIBVUNZO

Musati masaina bepa rino ndapota bvunzai mibvunzo pese pasina kukujekerai. Munogona kutora nguva yakareba zvakafanira kunyatsofunga.

Munongona kubata Faculty of Health Sciences Human Research Ethics Committee (+27 21 4066492). Kana mukava nemibvunzo kana kunetseka zvichiendera nekodzero dzenyu mufundo iyi kana Medical Research Ethic Committee of Zimbabwe (+263 4 791792)

Rubetsero rwenyu runotendwa chose. Mukava nemubvunzo batai Tapfuma Mudawarima (+263 772328439)

Supervisor: Professor Jennifer Jelsma (University of Cape Town): +27846116681

Mukasarudza kuva mufundo, saina bepa rakabatanidzwa pano.

BEPA REMVUMO WE RUZIVO

- Ndinobvuma kuti mutsvakiridzi Tapfuma Mudawarima akanditaurira maererano nemaitirwo nezviri kuitirwa tsvakiridzo iyi.
- Ndakatambira ndikaverenga bepa reruzivo rakabatanidzwa maererano nefundo iri pamusoro.
- Ndakapiwa mukana wekubvunza mibvunzo.
- Ndakawana ruzivo rwakakwana uye ndakanzwisisa zvese zvinodiwa nefundo.
- Ndiri kuziva kuti zvese zvichabuda, neruzivo rwakauganidzwa kusanganisira ruzivo rwakanangana neni zvichachengetedzwa zvakahwanda uye zvicharamba zvakadaro mumagwaro ese efundo iyi.
- Ndine kunzwisisa kuti ndinogona kusiira izvi pane ipi nguva zvayo asi hapana murango ungazouya kwaari nekuda kwekusiya kwaanenge aita.

- Ndanzwisisa zvese zvatsanangurwa kwandiri maererano nefundo iri pamusoro uye ndinobvuma kuti ndibatsirwe mufundo iyi.
- Ndinoziva kuti kusaina pazasi kunoreva kuti ndinobvuma kuva mufundo iyi.

Signature: ……………………… Date and Place: ……………………………

Witness: ………………………. Date and Place: ……………………………...

Maita basa

Appendix XIV: Assent Form for Patients with Burns Aged Between 7 to 13 Years for the Follow-up Impact Study (English Version)

Instructions

- Designed for children 7 to 13 years olds

- After describing participation and obtaining assent, the researcher will instruct the child to write his/her name. The researcher will then print his/her own name and sign the sheet. A copy of the completed sheet will be given to the family, while the original form will be saved in the research file with the parental permission form.

WHAT IS A RESEARCH STUDY?

Research studies help us learn new things. We can test new ideas. First, we ask a question. Then we try to find the answer.

This paper talks about my research and the choice that you have to take part in it. We want you to ask us any questions that you have. You can ask questions any time.

Important things to know…

- You get to decide if you want to take part.
- You can say 'No' or you can say 'Yes'.
- No one will be upset if you say 'No'.
- If you say 'Yes', you can always say 'No' later.
- You can say 'No' at any time.
- We would still take good care of you no matter what you decide.

WHY ARE WE DOING THIS RESEARCH?

We are doing this research to find out more about patients with burns and better ways to treat them

WHAT WOULD HAPPEN IF I JOIN THIS RESEARCH?

If you decide to be in the research, we would ask you to do the following:

- Talking: A person on the research team would ask you questions. Then you would say your answers out loud.
- Examination: A person on the research team will find out what's wrong with you
- Examination: We would watch you whilst you move about
- Medical records: We have already looked at your medical information and would like to use information about your care.

COULD BAD THINGS HAPPEN IF I JOIN THIS RESEARCH?

There should be pain but if there is, we will stop whatever is making you sore. We will make sure that no bad things happen.

You can say 'no' to what we ask you to do for the research at any time and we will stop.

COULD THE RESEARCH HELP ME?

Mostly, I hope to learn something from this research on the best way to treat kids like you. And someday we hope it will help other kids who need help like you do

WHAT ELSE SHOULD I KNOW ABOUT THIS RESEARCH?

If you don't want to be in the study, you don't have to be.

It is also OK to say yes and change your mind later. You can stop being in the research at any time. If you want to stop, please tell me.

You will not be paid to be in the study.

You can ask questions any time. You can talk to me or anyone in the team. Ask us any questions you have. Take the time you need to make your choice.

IS THERE ANYTHING ELSE?

If you want to be in the research after we talk, please write your name below. If you cannot write, make a mark. We will write our name too. This shows we talked about the research and that you want to take part.

Name of Participant ____

(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima

Signature of Researcher ____

___________ _____________

Date Time

Appendix XV: Assent Form for Patients with Burns Aged Between 7 to 13 Years for the Follow-up Impact Study (Shona Version)

Dear participant

Instructions

- Zvakagadzirirwa vana vane makore manomwe kusvika gumi nematatu
- Mushure mekutsanangura zvichangwe zvichiitwa, mutsvagiridzi achaudza mwana anyore zita rake. Mutsvakiridzi anobva anyorarawo zita rake obva asaina. Bepa rakafanana nerasainwa rikapera rinopiwa kumhuri yemwana, rimwe racho rinosara nemutsvakiridzi uye neremvumo kubva kumubereki.

CHII CHINONZI TSVAKIRIDZO YEFUNDO?

Tsvakiridzo yefundo inobatsira kudzidza kuitsva. Tinozama pfungwa dzitsva. Kutanga tinobvunza mibvunzo. Tobva taedza kutsvaga mhinduro.

Bepa iri rinotaura nezvetsvakiridzo yangu nesarudzo yako kuva mukati mayo. Tinoda kuti ubvunze mubvuzo upi zvawo waunawo. Unobvunza chero ipi nguva.

Zvinhu zvakakosha zvekuziva……

- Unosarudza kana uchida kuva mukati mefundo.
- Unogona kuti ‘Kwete’ kana kuti ‘Ehe’.
- Hapana anotsamwa ukati ‘Kwete’.
- Kana ukati ‘Ehe’ unokwanisa kuti ‘Kwete’ munguva inotevera.
- Unogona kuti ‘Kwete’ panguva ipi zvayo.
- Tinoramba tichikuchengetedza zvakanaka zvisinei nesarudzo yako.

NEMHAKA YEI TIRI KUITA TSVAKIRIDZO IYI?

Tiri kuita tsvakiridzo kuti tiwane zvakawanda maererano neva rwere vakatsva uye nzira dziri nani dzekuvarapa.

CHII CHINOITIKA NDIKAVA MUTSVAKIRIDZO IYI?

Ukasarudza kuva mutsvakiridzi iyi tinokukumbira kuita zvinotevera:

- Kutaura: Munhu ari pachikwata chevatsvakiridzi achakubvunza mibvunzo. Unobva wataura mhinduro dzako zvinonzwika.
- Zamanishoni:Tinenge tichikuwongorora paunenge uchirapwa.
- Magwaro ekurapwa: Tinenge tichitarisa ruzivo rwekurapwa nekushandisa ruzivo rwemachengeterwo ako.

ZVAKAIPA ZVINGAITIKA HERE NDIKAPINDA MUTSVAKIRIDZO IYI?

Panange pasina kurwadziwa uye tinoona kuti hapana zvakaipa zvinoitika.

Unogona kuti ‘Kwete’ kune zvatinenge takukumbira kuti uite mutsvagiridzo munguva ipi zvayo tinobva taregedza.

TSVAGIRIDZO IYI INGANDIBATSIRA HERE?

Kunyanya, ndinotairisira kudzidza zvimwewo mutsvakiridzo iyi. Nerimwe zuva ndinotarisira kuti inozobatsirawo vamwe vana vanoda rubatsiro kunge iwewe.

ZVII ZVIMWE ZVANDINOFANIRA KUZIVA MAERERANO NETSVAKIRIDZO IYI?

Kana usingade kuva mutsvakiridzo iyi, unokwanisa kurega.

Hazvina kuipa kuti ehe wozochinja pfungwa pamberi. Unogona kumira kuva mutsvakiridzo panguva ipi zvayo. Kana uchida kusiya ndapota ndiudze.

Haubhadharwe kuva mufundo iyi.

Unogona kubvunza mibvunzo chero nguva. Unogona kutaura nenikana umwe munhu ari muchikwata. Tibvunze chero mubvunzo waunawo. Tora nguva yese yaunoda kuita sarudzo yako.

PANE ZVIMWE ZVE HERE?

Kana uchida kuva mutsvakiridzo mushure mekunge tataura ndapota nyora zita pazasi. Kana usingakwanise kunyora ita chidhindo kana vara. Tichanyorawo redu zita. Izvi zvinorakidza tataura nezvetsvakiridzo uye unoda kuita zviri pamusoro.

Name of Participant ____

(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima

Signature of Researcher ____

___________ _____________

Date Time

Appendix XVI: Assent Form for Patients with Burns Aged Between 13 To 18 Years for the Follow-up Impact Study (English Version)

Instructions

- Designed for children 13 to 18 years olds

- After describing participation and obtaining assent, the researcher will instruct the child to write his/her name. The researcher will then print his/her own name and sign the sheet. A copy of the completed sheet will be given to the family, while the original form will be saved in the research file with the parental permission form.

WHAT IS A RESEARCH STUDY?

Research studies help us learn new things. We can test new ideas. First, we ask a question. Then we try to find the answer.

This paper talks about my research and the choice that you have to take part in it. We want you to ask us any questions that you have. You can ask questions any time.

Important things to know…

- You get to decide if you want to take part.
- You can say 'No' or you can say 'Yes'.
- No one will be upset if you say 'No'.
- If you say 'Yes', you can always say 'No' later.
- You can say 'No' at any time.
- We would still take good care of you no matter what you decide.

WHY ARE WE DOING THIS RESEARCH?

This is a study about how having had burns has made a difference to your life. I want to find out this out because we want to draw up a booklet to help physiotherapists chose the best way to give exercises to young people like you who have been burnt. What you tell us will help us decide what on the best advice to give. I am doing it because I am studying at the University of Cape Town and have to do a study to pass.

To help you make an informed decision regarding your participation in this study, I have prepared some information for you below.

WHAT WOULD HAPPEN IF I JOIN THIS RESEARCH?

There is no payment/reward for taking part in the study. Nothing bad will happen to you if you do not take part. You will be asked to walk, we will see whether you get short of breath, we will see how stiff your joints are and we will ask you about the things that you find difficult to do. We also looked at your hospital records before we came here to find out more about your burns.

COULD BAD THINGS HAPPEN IF I JOIN THIS RESEARCH?

There should be no pain while we are testing you but if there is, we will stop immediately. We will make sure that no bad things happen to you. You can say 'no' to what we ask you to do for the research at any time and we will stop.

COULD THE RESEARCH HELP ME?

The research may not help you but it may help others who have had burns because the physiotherapists will have a better idea of what treatment to give.

WHAT ELSE SHOULD I KNOW ABOUT THIS RESEARCH?

If you don't want to be in the study, you don't have to be. You can also ask us not to use the information that we got from the hospital records.

It is also OK to say yes and change your mind later. You can stop being in the research at any time. If you want to stop, please tell me.

You will not be paid to be in the study.

You can ask questions any time. You can talk to me or anyone in the team. Ask us any questions you have. Take the time you need to make your choice.

No-one will know what answers you gave as your name will not be given to anyone outside of the study.

IS THERE ANYTHING ELSE?

If you want to be in the research after we talk, please write your name below. If you cannot write, make a mark. We will write our name too. This shows we talked about the research and that you want to take part.

Name of Participant ____

(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima

Signature of Researcher ____

___________ _____________

Date Time

Appendix XVII: Assent Form for Patients with Burns Aged Between 13 To 18 Years for the Follow-up Impact Study (Shona Version)

Dear participant

Instructions

- Zvakagadzirirwa vana vane makore manomwe kusvika gumi nematatu

- Mushure mekutsanangura zvichangwe zvichiitwa, mutsvagiridzi achaudza mwana anyore zita rake. Mutsvakiridzi anobva anyorawo zita rake obva asaina. Bepa rakafanana nerasainwa rikapera rinopiwa kumhuri yemwana, rimwe racho rinosara nemutsvakiridzi uye neremvumo kubva kumubereki.

CHII CHINONZI TSVAKIRIDZO YEFUNDO?

Tsvakiridzo yefundo inobatsira kudzidza kuitsva. Tinozama pfungwa dzitsva. Kutanga tinobvunza mibvunzo. Tobva taedza kutsvaga mhinduro.

Bepa iri rinotaura nezvetsvakiridzo yangu nesarudzo yako kuva mukati mayo. Tinoda kuti ubvunze mubvuzo upi zvawo waunawo. Unobvunza chero ipi nguva.

Zvinhu zvakakosha zvekuziva……

- Unosarudza kana uchida kuva mukati mefundo.

- Unogona kuti 'Kwete' kana kuti 'Ehe'.

- Hapana anotsamwa ukati 'Kwete'.

- Kana ukati 'Ehe' unokwanisa kuti 'Kwete' munguva inotevera.

- Unogona kuti 'Kwete' panguva ipi zvayo.

- Tinoramba tichikuchengetedza zvakanaka zvisinei nesarudzo yako.

NEMHAKA YEI TIRI KUITA TSVAKIRIDZO IYI

Ndiri mufundi we PhD ku University of Cape Town, South Africa. Ndiri kutsvagiridza maererano nemarapirwo ephysiotherapy evarwere vakatsva. Ndinoda kudaira mibvunzo yekuti physiotherapy

inobetsera sei varwere vakatsva mu Zimbabwe. Kuti ndikwanise kudaira mibvunzo iyi ndinotairisira kushandisa magwaro ekurapwa kwenyu nekuongorora muchirapwa naphysiotherapist.

Varwere vane zvironda zvekutsva vanoongororwa pavanenge vachirapwa kamwechete. Tsaumba idzi dzinowedzera ruzivo rwedu pakurapwa kwekutsva nephysiotherapy.

Kukubatsirai kuita sarudzo yenyu maerarano nefundo iyi, ndakakugadzirirai, zvimwe zvamunoda kuziva pazasi.

CHII CHINOITIKA NDIKAVA MUTSVAKIRIDZO IYI?

Hapana zvamunokumbirwa kuti muite asi mutsvakiridzi anenge achiongorora muchirapwa. Hapana muripo wamunowana pakubatsira fundo iyi. Hapana chakashata chinoitika kwamuri kana mukasabatsira.

ZVAKAIPA ZVINGAITIKA HERE NDIKAPINDA MUTSVAKIRIDZO IYI?

Panenge pasina kurwadziwa uye tinoona kuti hapana zvakaipa zvinoitika. Unogona kuti 'Kwete' kune zvatinenge takukumbira kuti uite mutsvagiridzo munguva ipi zvayo tinobva tarega.

TSVAGIRIDZO IYI INGANDIBATSIRE HERE?

Zvamungawana munguva pfupi mukuva kwenyu mufundo iyi kuva nemarapirwo ephysiotherapy akafanira varwere vane matuzu. Muripo mukuru kuziva nemarapirwo anonyatsoshanda anenge awanikwa kuburikira nefundo iyi.

ZVII ZVIMWE ZVANDINOFANIRA KUZIVA MAERERANO NETSVAKIRIDZO IYI?

Kana usingade kuva mutsvakiridzo iyi, unokwanisa kurega.

Hazvina kuipa kuti ehe wozochinja pfungwa pamberi. Unogona kumira kuva mutsvakiridzo panguva ipi zvayo. Kana uchida kusiya ndapota ndiudze.

Haubhadharwe kuva mufundo iyi.

Unogona kubvunza mibvunzo chero nguva. Unogona kutaura nenikana umwe munhu ari muchikwata. Tibvunze chero mubvunzo waunawo. Tora nguva yese yaunoda kuita sarudzo yako.

PANE ZVIMWE ZVE HERE?

Kana uchida kuva mutsvakiridzo mushure mekunge tataura ndapota nyora zita pazasi. Kana usingakwanise kunyora ita chidhindo kana vara. Tichanyorawo redu zita. Izvi zvinorakidza tataura nezvetsvakiridzo uye unoda kuita zviri pamusoro.

Name of Participant ____

(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima

Signature of Researcher ____

____________ ______________

Date Time

Appendix XVIII: Information sheet and Consent Form for Rehabilitation Workers taking part in the Audit study

WHAT ARE WE TRYING TO DO

I am a PhD student at the University of Cape Town, South Africa. I am doing a research on the current physiotherapy management of burns. I want to answer questions on the common physiotherapy management being used in Zimbabwe? In order to answer these questions, we would like to observe physiotherapists treatment of patients with burns for a period of two weeks.

Physiotherapists who participate will be observed whilst treating five adults and five children with burn injuries through a checklist during a two-week period. This information will contribute to our knowledge on the physiotherapy management of burns.

To help you make an informed decision regarding your participation in this study, I have prepared some information for you below.

WHY WE HAVE CONTACTED YOU

We have contacted you because you are a physiotherapist working with patients with burns either in the Burns unit, surgical unit or the paediatric burns unit.

WHAT YOU SHOULD KNOW ABOUT THIS RESEARCH STUDY

Before you decide whether or not to volunteer for this study, you must understand its purpose, how it may help you, the risks to you, and what is expected of you. This process is called informed consent. The form is given to you so that you may know about the purpose, risks and befits of this research study. Please review this form carefully. Ask any questions before you make a decision. Your participation is voluntary

PURPOSE OF THE RESEARCH STUDY

The main goal of this study is to gain knowledge on the management of patients with burns that may help in establishing the standard physiotherapy treatment of patients with burns in Zimbabwe.

ARE THERE ANY RISKS OR DISCOMFORTS?

There wouldn’t be any physical harm for you participating in this study but you might feel nervous being observed whilst treating patients with burns which lead to a bit of discomfort.

BENEFITS AND/OR COMPENSATION

The immediate benefit of participating in the study is in establishing the standard physiotherapy treatment in patients with burns. The greater benefit will be an effective treatment method would be obtained from the study. You will receive no monetary benefits from taking part in this study.

CONFIDENTIALITY

If you participate in this study by signing this document, we plan to disclose the results of the study (not for personal information) to the hospitals and also to publish it in journals so as to help in burns prevention and treatment guidelines formulation. However, your name will not be made known to anyone and no-one will know that you have taken part in the study. Any information that is obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. Data and all information from this study will be made available to my academic supervisors. Under some circumstances, the ethics committees may need to review its record for compliance audits.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary and you may refuse to participate. If you decide not to participate in this study, your decision will not affect your future relations with the Ministry of Health and Child Welfare (Zimbabwe), their personnel and associated hospitals. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty and there will be no loss of benefits due to you from this study as described above.

HOW MUCH WILL PARTICIPATING IN THIS STUDY COST YOU?

Participants will also not incur any costs by participation in this study

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

The UCT Faculty of Health Sciences Human Research Ethics Committee (Professor Blockman) can be contacted on 021 406 6338 in case participants have any questions regarding their rights and welfare as research subjects on the study or you may also contact the Medical Research Council of Zimbabwe (+263 4 791792)

Your participation is appreciated. Should you have any questions please contact Tapfuma Mudawarima Phone Number: +263 772328439

Supervisor: Professor Jennifer Jelsma (University of Cape Town)

+27846116681

If you chose to participate, please sign the attached consent form

INFORMED CONSENT FORM

Dear participant

Please read the attached information sheet

We hope that this research will establish a standard treatment for patients with burns. All checklists are anonymous and records will be kept strictly confidential.

You are welcome to contact the investigator T. Mudawarima +263772 328 439, Medical Research Council of Zimbabwe (MRCZ), or the Human Research Ethic Committee of the UCT for further details about the research or your rights. This

This research is voluntary and refusal to participate/ decision to withdraw at any time will involve no penalty or loss of benefits to which you, the participant is otherwise entitled.

I ---have read the information sheet. I understand what is required of me and I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so on my free will. I know that I can withdraw at any time if I so wish and that it will have no bad consequences for me.

Signed:

-- ---

Participant date and place

-- ---

Researcher date and place

-- ---

Witness date and place

Appendix XIX: Information sheet and Consent Form for Patients taking part in the Audit study (English Version)

WHAT ARE WE TRYING TO DO?

I am a PhD student at the University of Cape Town, South Africa. I am doing a research on the current physiotherapy treatment of patients with burns. I want to answer questions on how physiotherapist treats patients with burns in Zimbabwe. In order to answer this question, we would like to use your medical records and observe you being treated with the physiotherapist.
Patients with burns who participate will be observed whilst being treated once. This information will contribute to our knowledge on the physiotherapy treatment of burns.
To help you make an informed decision regarding your participation in this study, I have prepared some information for you below.

WHY WE HAVE CONTACTED YOU

We have contacted you because you are currently in hospital because you sustained burns.

WHAT WILL YOU BE ASKED TO DO

You will be asked to do nothing, but the researcher will just observe you being treated. We would also like permission to get some details about your condition from your medical records. This will include the date and cause of your burns, the areas that were burnt and what medical treatment you have received.

WHAT WILL I GET IF I TAKE PART?

There is no payment/reward for taking part in the study. We hope that we will learn more on how to treat patients with burns. In the short term there will be no direct benefit to you. Nothing bad will happen to you if you do not take part.
Refusal to take part or withdraw from the study would not affect your current or future healthcare with the Ministry of Health and Child Care.

CONFIDENTIALITY

Any information that is obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. Data and all information from this study will be made available to my academic supervisors. Under some circumstances, the ethics committees may need to review its record for compliance audits. Your name will not be given to anyone and will not be listed anywhere. The results of the project will be made available to the hospitals and the scientific community but will not be linked to you in any way.

OFFER TO ANSWER QUESTIONS
Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.
You may contact the Faculty of Health Sciences, Human Research Ethics Committee (+27 21 4066492) if you have any questions or concerns regarding your rights or welfare as a participant in this study or the Joint Research Ethics Committee (+263 4 708140)
Your participation is appreciated. Should you have any questions please contact Tapfuma Mudawarima Phone Number: +263 772328439
Supervisor: Professor Jennifer Jelsma (University of Cape Town)
+27846116681
If you chose to participate, please sign the attached consent form

INFORMED CONSENT FORM
Dear participant
Please read the attached information sheet
We hope that this research will establish a standard treatment for patients with burns. All records will be kept strictly confidential.
You are welcome to contact the investigator T. Mudawarima +263772 328 439, Medical Research Council of Zimbabwe (MRCZ), or the Human Research Ethic Committee of the UCT for further details about the research or your rights. This
This research is voluntary and refusal to participate/ decision to withdraw at any time will involve no penalty or loss of benefits to which you, the participant is otherwise entitled.
I --have read the information sheet. I understand what is required of me and I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so on my free will. I know that I can withdraw at any time if I so wish and that it will have no bad consequences for me.
Signed:
-- ---
Participant date and place
-- ---
Researcher date and place
-- ---
Witness ………………………………. Date……………………………………….

Appendix XX: Information Sheet and Consent Form for Patients with Burn Injuries For The Audit Study (Shona Version)

Dear participant

TIRI KUEDZA KUITA SEI

Ndiri mufundi we PhD ku University of Cape Town, South Africa. Ndiri kutsvagiridza maererano nemarapirwo ephysiotherapy evarwere vakatsva. Ndinoda kudaira mibvunzo yekuti physiotherapy inobetsera sei varwere vakatsva mu Zimbabwe. Kuti ndikwanise kudaira mibvunzo iyi ndinotairisira kushandisa magwaro ekurapwa kwenyu nekuongorora muchirapwa naphysiotherapist.

Varwere vane zvironda zvekutsva vanoongororwa pavanenge vachirapwa kamwechete. Tsaumba idzi dzinowedzera ruzivo rwedu pakurapwa kwekutsva nephysiotherapy.

Kukubatsirai kuita sarudzo yenyu maerarano nefundo iyi, ndandakugadzirirai, zvimwe zvamunoda kuziva pazasi.

NEMHAKA YEI TABATA IMI

Tabata imi nekuti muri muchipatara nemhaka yezvironda zvekutsva

ZVAMUCHAKUMBIRWA KUTI MUITE

Hapana zvamunokumbirwa kuti muite asi mutsvakiridzi anenge achiongorora muchirapwa

NDINOWANEI

Hapana muripo wamunowana pakubatsira fundo iyi. Tinotarisira kuti tichadzidza zvakawanda pakurapa varwere vakatsva. Munguva pfupi hapana kubatsikana kwakanangani nemi. Hapana chakashata chinoitika kwamuri kana mukasabatsira.
Kuramba kana kuzosiira pakati pefundo iyi hakukanganise kuonekwa kwehutano hwenyu nebazi rezveutano nekurapwa kwevana (Ministry of Health and Child Care).

VANHU VANGAZIVE HERE MHINDURO DZANDAPA

Zviwanikwa zvese zvinosanganiswa pamwechete uye hapana anokwanisa kuziva kuti ndiani apa mhinduro ipi kunze kwevawongorori, pamwewo nevanoona kuti vese vabatsira mutsvakiridzo iyi vakadzivirirwa neveku Ethics Committee of the University of Cape Town. Zita renyu haripiwe kune chero munhu kana kunyorwa papi zvapo. Zvichabuda mutsvakiridzo iyi zvichashandiswa muzvipatara nenharaunda dze science asi hazvinongedzere kwamuri nenzira ipi zvayo.

SUNUNGUKAI KUBVUNZA MIBVUNZO

Musati masaina bepa rino ndapota bvunzai mibvunzo pese pasina kukujekerai. Munogona kutora nguva yakareba zvakafanira kunyatsofunga.

Munongona kubata Faculty of Health Sciences Human Research Ethics Committee (+27 21 4066492). Kana mukava nemibvunzo kana kunetseka zvichiendera nekodzero dzenyu mufundo iyi kana Medical Research Ethic Committee of Zimbabwe (+263 4 791792)

Rubetsero rwenyu runotendwa chose. Mukava nemubvunzo batai Tapfuma Mudawarima (+263 772328439)

Supervisor: Professor Jennifer Jelsma (University of Cape Town): +27846116681

Mukasarudza kuva mufundo, saina bepa rakabatanidzwa pano.

BEPA REMVUMO WE RUZIVO

- Ndinobvuma kuti mutsvakiridzi Tapfuma Mudawarima akanditaurira maererano nemaitirwo nezviri kuitirwa tsvakiridzo iyi.
- Ndakatambira ndikaverenga bepa reruzivo rakabatanidzwa maererano nefundo iri pamusoro.
- Ndakapiwa mukana wekubvunza mibvunzo.
- Ndakawana ruzivo rwakakwana uye ndakanzwisisa zvese zvinodiwa nefundo.
- Ndiri kuziva kuti zvese zvichabuda, neruzivo rwakauganidzwa kusanganisira ruzivo rwakanangana neni zvichachengetedzwa zvakahwanda uye zvicharamba zvakadaro mumagwaro ese efundo iyi.
- Ndine kunzwisisa kuti ndinogona kusiira izvi pane ipi nguva zvayo asi hapana murango ungazouya kwaari nekuda kwekusiya kwaanenge aita.
- Ndanzwisisa zvese zvatsanangurwa kwandiri maererano nefundo iri pamusoro uye ndinobvuma kuti ndibatsirwe mufundo iyi.
- Ndinoziva kuti kusaina pazasi kunoreva kuti ndinobvuma kuva mufundo iyi.

Signature: ……………………… Date and Place: ……………………………
Witness: ………………………. Date and Place: …………………………....
Maita basa

Appendix XXI: Information Sheet and Consent Form for Parents/Guardians for the Audit Study (English Version)

WHAT ARE WE TRYING TO DO

I am a PhD student at the University of Cape Town, South Africa. I am doing a research on the current physiotherapy treatment of patients with burns. I want to answer questions on how physiotherapist treats patients with burns in Zimbabwe. In order to answer this question, we would like to use your child's medical records and observe him/her whilst being treated with the physiotherapist.

Children with burns who participate in this study will be observed whilst being treated once. This information will contribute to our knowledge on the physiotherapy treatment of burns.

To help you make an informed decision regarding your child's participation in this study, I have prepared some information for you below.

WHAT YOU SHOULD KNOW ABOUT THIS RESEARCH STUDY?

Before you decide whether or not to volunteer your child for this study, you must understand its purpose, how it may help your child, the risks to your child, and what is expected of your child. This process is called informed consent. The form is given to you so that you may know about the purpose, risks and benefits of this research study. Please review this form carefully. Ask any questions before you make a decision. Your child participation is voluntary

WHY WE HAVE CONTACTED YOU

We have contacted you because your child is currently in hospital because he/she sustained burns.

WHAT WILL YOU CHILD BE ASKED TO DO

Your child will be asked to do nothing, but the researcher will just observe him/her being treated. We would also like permission to get some details about his/her condition from your medical records. This will include the date and cause of the burns, the areas that were burnt and what medical treatment he/she have received

WHAT WILL I GET IF I TAKE PART?

There is no payment/reward for taking part in the study. We hope that we will learn more on how to treat patients with burns. In the short term there will be no direct benefit to your child. Nothing bad will happen to your child if he/she does not take part.

Refusal to take part or withdraw from the study would not affect your current or future healthcare with the Ministry of Health and Child Care.

CONFIDENTIALITY

Any information that is obtained in connection with this study that can be identified with your child will remain confidential and will be disclosed only with your permission. Data and all information from this study will be made available to my academic supervisors. Under some circumstances, the ethics committees may need to review its record for compliance audits. Your child's name will not be given to anyone and will not be listed anywhere. The results of the project will be made available to the hospitals and the scientific community but will not be linked to your child in any way.

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

The UCT Faculty of Health Sciences Human Research Ethics Committee (Professor Blockman) can be contacted on 021 406 6338 in case participants have any questions regarding their rights and welfare as research subjects on the study or you may also contact the Joint Research Ethics Council (+263 4 708140)

INFORMED CONSENT FORM

 I hereby confirm that I have been informed by the researcher, Tapfuma Mudawarima on the purpose and nature of the research project entitled: "Burn Injuries in Zimbabwe: Development of Guidelines for Physiotherapy Rehabilitation of Musculoskeletal Impairments and Functional Impairments and Functional Limitations".

 I have received and read the attached information sheet regarding the above study.

 I was given an opportunity to ask questions.

 I have received enough information and understand all that the study needs.

 I am aware that all the results and information collected, including personal details of my child, will be strictly confidential and will remain anonymous in all reports relating to the study.

 I understand that my child may withdraw from the study at any stage and that there will be no adverse consequences following his/her withdrawal.

 I have understood everything that has been explained to me regarding the above study and I consent to my child participating in this study.

 I know that by signing below indicates that I have permitted my child to participate in the study.

Signature: ……………………… Date and Place: ……………………………
Witness: ………………………. Date and Place: …………………………....
Thank You So Much

Appendix XXII: Information Sheet and Consent Form for Parents/Guardians for the Audit Study (Shona Version).

Dear parents/guardians

TIRI KUEDZA KUITA SEI

Ndiri mufundi we PhD ku University of Cape Town, South Africa. Ndiri kutsvagiridza maererano nemarapirwo ephysiotherapy evarwere vakatsva. Ndinoda kudaira mibvunzo yekuti physiotherapy inobetsera sei varwere vakatsva mu Zimbabwe. Kuti ndikwanise kudaira mibvunzo iyi ndinotairisira kushandisa magwaro ekurapwa kwemwana wenyu nekuongorora achirapwa naphysiotherapist.

Vana vane zvironda zvekutsva vanoongororwa pavanenge vachirapwa kamwechete. Tsaumba idzi dzinowedzera ruzivo rwedu pakurapwa kwekutsva nephysiotherapy.

Kukubatsirai kuita sarudzo yenyu maerarano nefundo iyi, ndakakugadzirirai, zvimwe zvamunoda kuziva pazasi.

ZVAMUNOFANA KUZIVA MAERERANO NETSVAKIRIDZVO YEFUNDO IYI?

Musati masarudza kuti mwana ave kana kusava mufundo iyi munofanira kunzwisisa chinangwa chayo, kuti inogona kukubatsirai sei mwana wenyu, kana kukukanganisirai sei mwana wenyu, uye zvinotarisirwa kubva kune mwana wenyu. Izvi zvinonzi informed consent. Bepa rinopiwa kwamuri kuti muzive basa, zvakashatira nezvakanakira tsvakiridzo iyi. Ndapota verengai bepa iri. Bvunzai chero mibvunzo musati maita sarudzo yenyu. Rubatsiro rwemwana wenyu mahara.

NEMHAKA YEI TABATA IMI?

Tabata imi nekuti mwana wenyu ari muchipatara nemhaka yezvironda zvekutsva.

MWANA WENYU ZVAACHAKUMBIRWA KUTI AIITE

Mwana wenyu hapana zvaacha kumbirwa kuti aiite asi mutsvakiridzi anenge achioongororwa achirapwa. Tinokumbirawo bvumo futi yekuongoroora magwaro ekurapwa kwemwana wenyu . Tinenge tichitarisa ruzivo rwekurapwa nekushandisa ruzivo rwema chengeterwe ake.

NDINOWANEI

Hapana muripo wamunowana pakubatsira fundo iyi. Tinotarisira kuti tichadzidza zvakawanda pakurapa varwere vakatsva. Munguva pfupi hapana kubatsikana kwakanangani nemwana wenyu. Hapana chakashata chinoitika ku mwana kana mukasabatsira.
Kuramba kana kuzosiira pakati pefundo iyi hakukanganise kuonekwa kwehutano hwenyu nebazi rezveutano nekurapwa kwevana (Ministry of Health and Child Care).

VANHU VANGAZIVE HERE MHINDURO DZANDAPA

Zviwanikwa zvese zvinposanganiswa pamwechete uye hapana anokwanisa kuziva kuti ndiani apa mhinduro ipi kunze kwevawongorori, pamwewo nevanoona kuti vese vabatsira mutsvakiridzo iyi vakadziviririrwa neveku Ethics Committee of the University of Cape Town. Zita renyu haripiwe kune chero munhu kana kunyorwa papi zvapo. Zvichabuda mutsvakiridzo iyi zvichashandiswa muzvipatara neharaunda dze science asi hazvinongedzere kwamuri nenzira ipi zvayo.

SUNUNGUKAI KUBVUNZA MIBVUNZO

Musati masaina bepa rino ndapota bvunzai mibvunzo pese pasina kukujekerai. Munogona kutora nguva yakareba zvakafanira kunyatsofunga.

Munongona kubata Faculty of Health Sciences Human Research Ethics Committee (Professor Blockman pa 021406 6338. Kana mukava nemibvunzo kana kunetseka zvichiendera nekodzero dzenyu mufundo iyi kana Medical Research Ethic Committee of Zimbabwe (+263 4 791792)

Rubetsero rwenyu runotendwa chose. Mukava nemubvunzo batai Tapfuma Mudawarima (+263 772328439)
Supervisor: Professor Jennifer Jelsma (University of Cape Town): +27846116681

Mukasarudza kuva mufundo, saina bepa rakabatanidzwa pano.

BEPA REMVUMO WE RUZIVO

- Ndinobvuma kuti mutsvakiridzi Tapfuma Mudawarima akanditaurira maererano nemaitirwo nezviri kuitirwa tsvakiridzo iyi.
- Ndakatambira ndikaverenga bepa reruzivo rakabatanidzwa maererano nefundo iri pamusoro.
- Ndakapiwa mukana wekubvunza mibvunzo.
- Ndakawana ruzivo rwakakwana uye ndakanzwisisa zvese zvinodiwa nefundo.
- Ndiri kuziva kuti zvese zvichabuda, neruzivo rwakauganidzwa kusanganisira ruzivo rwakanangana nemwana wangu zvichachengetedzwa zvakahwanda uye zvicharamba zvakadaro mumagwaro ese efundo iyi.
- Ndine kunzwisisa kuti mwana wangu anogona kusiira izvi pane ipi nguva zvayo asi hapana murango ungazouya kwaari nekuda kwekusiya kwaanenge aita.
- Ndanzwisisa zvese zvatsanangurwa kwandiri maererano nefundo iri pamusoro uye ndinobvuma kuti mwana wangu batsirwe mufundo iyi.
- Ndinoziva kuti kusaina pazasi kunoreva kuti ndinobvumidza mwana wangu kuva mufundo iyi.

Signature: ……………………… Date and Place: ……………………………
Witness: ………………………. Date and Place: …………………………....
Maita basa

Appendix XXIII: Assent Form for Patients with Burns Aged Between 7 To 13 Years for the Audit Study (English Version)

Instructions

• Designed for children 7 to 13 years olds

• After describing participation and obtaining assent, the researcher will instruct the child to write his/her name. The researcher will then print his/her own name and sign the sheet. A copy of the completed sheet will be given to the family, while the original form will be saved in the research file with the parental permission form.

WHAT IS A RESEARCH STUDY?

Research studies help us learn new things. We can test new ideas. First, we ask a question. Then we try to find the answer.

This paper talks about my research and the choice that you have to take part in it. We want you to ask us any questions that you have. You can ask questions any time.

Important things to know…

• You get to decide if you want to take part.

• You can say 'No' or you can say 'Yes'.

• No one will be upset if you say 'No'.

• If you say 'Yes', you can always say 'No' later.

• You can say 'No' at any time.

• We would still take good care of you no matter what you decide.

WHY ARE WE DOING THIS RESEARCH?

We are doing this research to find out more about patients with burns and better ways to treat them

WHAT WOULD HAPPEN IF I JOIN THIS RESEARCH?

If you decide to be in the research, we would ask you to do the following:

• Talking: A person on the research team would ask you questions. Then you would say your answers out loud.

• Examination: We would watch you whilst you are being treated

• Medical records: We will look at your medical information and use information about your care.

COULD BAD THINGS HAPPEN IF I JOIN THIS RESEARCH?

We will make sure that no bad things happen.

You can say 'no' to what we ask you to do for the research at any time and we will stop.

COULD THE RESEARCH HELP ME?

Mostly, I hope to learn something from this research though. And someday we hope it will help other kids who need help like you do

WHAT ELSE SHOULD I KNOW ABOUT THIS RESEARCH?

If you don't want to be in the study, you don't have to be.

It is also OK to say yes and change your mind later. You can stop being in the research at any time. If you want to stop, please tell me.

You will not be paid to be in the study.

You can ask questions any time. You can talk to me or anyone in the team. Ask us any questions you have. Take the time you need to make your choice.

IS THERE ANYTHING ELSE?

If you want to be in the research after we talk, please write your name below. If you cannot write, make a mark. We will write our name too. This shows we talked about the research and that you want to take part.

Name of Participant ____

(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima

Signature of Researcher ____

___________ _____________

Date Time

Appendix XXIV: Assent Form for Patients with Burns Aged Between 7 To 13 Years for the Audit Study (Shona Version)

Dear participant

Instructions

- Zvakagadzirirwa vana vane makore manomwe kusvika gumi nematatu
- Mushure mekutsanangura zvichangwe zvichiitwa, mutsvagiridzi achaudza mwana anyore zita rake. Mutsvakiridzi anobva anyorarawo zita rake obva asaina. Bepa rakafanana nerasainwa rikapera rinopiwa kumhuri yemwana, rimwe racho rinosara nemutsvakiridzi uye neremvumo kubva kumubereki.

CHII CHINONZI TSVAKIRIDZO YEFUNDO?

Tsvakiridzo yefundo inobatsira kudzidza kuitsva. Tinozama pfungwa dzitsva. Kutanga tinobvunza mibvunzo. Tobva taedza kutsvaga mhinduro.
Bepa iri rinotaura nezvetsvakiridzo yangu nesarudzo yako kuva mukati mayo. Tinoda kuti ubvunze mubvuzo upi zvawo waunawo. Unobvunza chero ipi nguva.

Zvinhu zvakakosha zvekuziva……

- Unosarudza kana uchida kuva mukati mefundo.
- Unogona kuti 'Kwete' kana kuti 'Ehe'.
- Hapana anotsamwa ukati 'Kwete'.
- Kana ukati 'Ehe' unokwanisa kuti 'Kwete' munguva inotevera.
- Unogona kuti 'Kwete' panguva ipi zvayo.
- Tinoramba tichikuchengetedza zvakanaka zvisinei nesarudzo yako.

NEMHAKA YEI TIRI KUITA TSVAKIRIDZO IYI?

Tiri kuita tsvakiridzo kuti tiwane zvakawanda maererano neva rwere vakatsva uye nzira dziri nani dzekuvarapa.

CHII CHINOITIKA NDIKAVA MUTSVAKIRIDZO IYI?

Ukasarudza kuva mutsvakiridzi iyi tinokukumbira kuita zvinotevera:

- Kutaura: Munhu ari pachikwata chevatsvakiridzi achakubvunza mibvunzo. Unobva wataura mhinduro dzako zvinonzwika.
- Zamanishoni:Tinenge tichikuwongorora paunenge uchirapwa.
- Magwaro ekurapwa: Tinenge tichitarisa ruzivo rwekurapwa nekushandisa ruzivo rwemachengeterwo ako.

ZVAKAIPA ZVINGAITIKA HERE NDIKAPINDA MUTSVAKIRIDZO IYI?

Panange pasina kurwadziwa uye tinoona kuti hapana zvakaipa zvinoitika.

Unogona kuti 'Kwete' kune zvatinenge takukumbira kuti uite mutsvagiridzo munguva ipi zvayo tinobva taregedza.

TSVAGIRIDZO IYI INGANDIBATSIRA HERE?

Kunyanya, ndinotairisira kudzidza zvimwewo mutsvakiridzo iyi. Nerimwe zuva ndinotarisira kuti inozobatsirawo vamwe vana vanoda rubatsiro kunge iwewe.

ZVII ZVIMWE ZVANDINOFANIRA KUZIVA MAERERANO NETSVAKIRIDZO IYI?

Kana usingade kuva mutsvakiridzo iyi, unokwanisa kurega.

Hazvina kuipa kuti ehe wozochinja pfungwa pamberi. Unogona kumira kuva mutsvakiridzo panguva ipi zvayo. Kana uchida kusiya ndapota ndiudze.
Haubhadharwe kuva mufundo iyi.
Unogona kubvunza mibvunzo chero nguva. Unogona kutaura nenikana umwe munhu ari muchikwata. Tibvunze chero mubvunzo waunawo. Tora nguva yese yaunoda kuita sarudzo yako.

PANE ZVIMWE ZVE HERE?

Kana uchida kuva mutsvakiridzo mushure mekunge tataura ndapota nyora zita pazasi. Kana usingakwanise kunyora ita chidhindo kana vara. Tichanyorawo redu zita. Izvi zvinorakidza tataura nezvetsvakiridzo uye unoda kuita zviri pamusoro.

Name of Participant ____
(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima
Signature of Researcher ____

___________ _____________
Date Time

Appendix XXV: Assent Form for Patients with Burns Aged Between 13 To 18 Years for the Audit Study (English Version)

Instructions

• Designed for children 13 to 18 years olds

• After describing participation and obtaining assent, the researcher will instruct the child to write his/her name. The researcher will then print his/her own name and sign the sheet. A copy of the completed sheet will be given to the family, while the original form will be saved in the research file with the parental permission form.

WHAT IS A RESEARCH STUDY?

Research studies help us learn new things. We can test new ideas. First, we ask a question. Then we try to find the answer.

This paper talks about my research and the choice that you have to take part in it. We want you to ask us any questions that you have. You can ask questions any time.

Important things to know…

• You get to decide if you want to take part.
• You can say 'No' or you can say 'Yes'.
• No one will be upset if you say 'No'.
• If you say 'Yes', you can always say 'No' later.
• You can say 'No' at any time.
• We would still take good care of you no matter what you decide.

WHY ARE WE DOING THIS RESEARCH?

I am a student at the University of Cape Town, South Africa. I am doing a research on physiotherapy treatment of patients with burns. I want to answer questions on how physiotherapists treat patients with burns in Zimbabwe. In order to answer this question, we would like to use your medical records and observe you being treated with the physiotherapist.

Patients with burns who participate will be observed whilst being treated once. This information will contribute to our knowledge on the physiotherapy treatment of burns.

To help you make an informed decision regarding your participation in this study, I have prepared some information for you below.

WHAT WOULD HAPPEN IF I JOIN THIS RESEARCH?

You will be asked to do nothing, but the researcher will just observe you being treated. There is no payment/reward for taking part in the study. Nothing bad will happen to you if you do not take part.

COULD BAD THINGS HAPPEN IF I JOIN THIS RESEARCH?

We will make sure that no bad things happen. You can say 'no' to what we ask you to do for the research at any time and we will stop.

COULD THE RESEARCH HELP ME?

The immediate benefit of participating in the study is in establishing best physiotherapy treatment for patients with burns like you.

WHAT ELSE SHOULD I KNOW ABOUT THIS RESEARCH?

If you don't want to be in the study, you don't have to be.

It is also OK to say yes and change your mind later. You can stop being in the research at any time. If you want to stop, please tell me.

You will not be paid to be in the study.

You can ask questions any time. You can talk to me or anyone in the team. Ask us any questions you have. Take the time you need to make your choice.

IS THERE ANYTHING ELSE?

If you want to be in the research after we talk, please write your name below. If you cannot write, make a mark. We will write our name too. This shows we talked about the research and that you want to take part.
Name of Participant ____
(To be written by child/adolescent)
Name of Researcher: Tapfuma Mudawarima
Signature of Researcher ____

___________ _____________
Date

Appendix XXVI: Assent Form for Patients with Burns Aged between 13 To 18 years for the Audit Study (Shona Version)

Dear participant

Instructions

- Zvakagadzirirwa vana vane makore manomwe kusvika gumi nematatu
- Mushure mekutsanangura zvichangwe zvichiitwa, mutsvagiridzi achaudza mwana anyore zita rake. Mutsvakiridzi anobva anyorawo zita rake obva asaina. Bepa rakafanana nerasainwa rikapera rinopiwa kumhuri yemwana, rimwe racho rinosara nemutsvakiridzi uye neremvumo kubva kumubereki.

CHII CHINONZI TSVAKIRIDZO YEFUNDO?

Tsvakiridzo yefundo inobatsira kudzidza kuitsva. Tinozama pfungwa dzitsva. Kutanga tinobvunza mibvunzo. Tobva taedza kutsvaga mhinduro.
Bepa iri rinotaura nezvetsvakiridzo yangu nesarudzo yako kuva mukati mayo. Tinoda kuti ubvunze mubvuzo upi zvawo waunawo. Unobvunza chero ipi nguva.

Zvinhu zvakakosha zvekuziva……

- Unosarudza kana uchida kuva mukati mefundo.
- Unogona kuti 'Kwete' kana kuti 'Ehe'.
- Hapana anotsamwa ukati 'Kwete'.
- Kana ukati 'Ehe' unokwanisa kuti 'Kwete' munguva inotevera.
- Unogona kuti 'Kwete' panguva ipi zvayo.
- Tinoramba tichikuchengetedza zvakanaka zvisinei nesarudzo yako.

NEMHAKA YEI TIRI KUITA TSVAKIRIDZO IYI

Ndiri mufundi we PhD ku University of Cape Town, South Africa. Ndiri kutsvagiridza maererano nemarapirwo ephysiotherapy evarwere vakatsva. Ndinoda kudaira mibvunzo yekuti physiotherapy inobetsera sei varwere vakatsva mu Zimbabwe. Kuti ndikwanise kudaira mibvunzo iyi ndinotairisira kushandisa magwaro ekurapwa kwenyu nekuongorora muchirapwa naphysiotherapist.
Varwere vane zvironda zvekutsva vanoongororwa pavanenge vachirapwa kamwechete. Tsaumba idzi dzinowedzera ruzivo rwedu pakurapwa kwekutsva nephysiotherapy.
Kukubatsirai kuita sarudzo yenyu maerarano nefundo iyi, ndakakugadzirirai, zvimwe zvamunoda kuziva pazasi.

CHII CHINOITIKA NDIKAVA MUTSVAKIRIDZO IYI?

Hapana zvamunokumbirwa kuti muite asi mutsvakiridzi anenge achiongorora muchirapwa. Hapana muripo wamunowana pakubatsira fundo iyi. Hapana chakashata chinoitika kwamuri kana mukasabatsira.

ZVAKAIPA ZVINGAITIKA HERE NDIKAPINDA MUTSVAKIRIDZO IYI?

Panenge pasina kurwadziwa uye tinoona kuti hapana zvakaipa zvinoitika. Unogona kuti 'Kwete' kune zvatinenge takukumbira kuti uite mutsvagiridzo munguva ipi zvayo tinobva tarega.

TSVAGIRIDZO IYI INGANDIBATSIRE HERE?

Zvamungawana munguva pfupi mukuva kwenyu mufundo iyi kuva nemarapirwo ephysiotherapy akafanira varwere vane matuzu. Muripo mukuru kuziva nemarapirwo anonyatsoshanda anenge awanikwa kuburikira nefundo iyi.

ZVII ZVIMWE ZVANDINOFANIRA KUZIVA MAERERANO NETSVAKIRIDZO IYI?
Kana usingade kuva mutsvakiridzo iyi, unokwanisa kurega.
Hazvina kuipa kuti ehe wozochinja pfungwa pamberi. Unogona kumira kuva mutsvakiridzo panguva ipi zvayo. Kana uchida kusiya ndapota ndiudze.
Haubhadharwe kuva mufundo iyi.
Unogona kubvunza mibvunzo chero nguva. Unogona kutaura nenikana umwe munhu ari muchikwata. Tibvunze chero mubvunzo waunawo. Tora nguva yese yaunoda kuita sarudzo yako.

PANE ZVIMWE ZVE HERE?
Kana uchida kuva mutsvakiridzo mushure mekunge tataura ndapota nyora zita pazasi. Kana usingakwanise kunyora ita chidhindo kana vara. Tichanyorawo redu zita. Izvi zvinorakidza tataura nezvetsvakiridzo uye unoda kuita zviri pamusoro.

Name of Participant ____
(To be written by child/adolescent)

Name of Researcher: Tapfuma Mudawarima
Signature of Researcher ____

___________ _____________
Date Time

Appendix XXVII: Management of Burns Checklist

Instructions

- Check each box and state where necessary

EXERCISES

	Done	Day post admission (state)	Frequency (seconds)	Repetitions	Sets
Passive movements					
Active assisted movements					
Active movements					
Resisted exercises (State kgs)					
Stretching					

POSITIONING AND SPLINTING

	Done	Day post admission	Patient's position(state)	Frequency (state hrs) 24hrs, night-time or daytime
Positioning				
Splinting				

WALKING AND STANDING

	Done	State metres walked
Walking		

	Done	Frequency (minutes)
Standing		

OTHER TECHNIQUES

PNF(state techniques used)	Done	Post day admission	Frequency	Sets	Repetitions

PNF(state techniques used)	Done	Post day admission	Frequency	Sets	Repetitions

Other techniques (state techniques used)	Done	Post day admission	Frequency	Sets	Repetitions

Appendix XXVIII: Joint Syllabus for the Physiotherapy and Occupational Therapy Course in Management of Burns, Dermatological Conditions and Peripheral Nerve Injuries

This course is taught in Part III of the programmes and includes the following sections:

Burns

Dermatology

Peripheral Nerve Injuries

These sections are not examinable separately.

A **Objectives**:

At the conclusion of this course, the student will be able to assess, and plan and implement appropriate treatment for patients suffering from burns, dermatological conditions amiable to physiotherapy intervention, and peripheral nerve injuries.

B **Course Content**:

BURNS

1. Introduction:

Causes

Signs and symptoms of burns

Medical and surgical management (complementary to Clinical Sciences)

2. Assessment of a patient with burns in the acute stage:

Assessment of physical status

Assessment of mental status

Identification of primary problems and suitable methods of intervention

3. Assessment of a patient with burns in the chronic stage:

Assessment of physical status

Assessment of mental status

Identification of primary problems and suitable methods of intervention

4. Methods of treatment in the acute stage:

General principles

Positioning

Splinting

Active/assisted/passive movements

Management of oedema

Muscle strength maintenance

Hydrotherapy

Re-education of gross motor function

Treatment after surgery

5. Methods of treatment in the chronic stage:

Hypertrophic scarring

General Principles

Methods to maintain and increase joint range

Positioning

Splinting

Role of pressure garments

Treatment after corrective surgery

Advice regarding care of the scarred area

6. Psychological aspects of burn injury

7. Management of respiratory complications of burns

DERMATOLOGY

1. Introduction:

Methods of treatment of dermatological conditions

Assessment and recording

2. Psoriasis:

Signs and symptoms

Management

3. Acne vulgaris:

Signs and symptoms

Management

4. Skin infections:

Signs and symptoms

Management

5. Pressure sores:

Signs and symptoms

Assessment

Prevention

Management

6. Wound care

Cleaning and dressing the wound

Management of infected wounds

PERIPHERAL NERVE INJURIES

1. Introduction:

Aetiology

Signs and symptoms

Prognosis related to grade of injury

Surgical management

2. Assessment of patients with peripheral nerve injuries:

Physical signs

Electrical diagnosis

Identification of primary problems and methods of intervention

3. Principles of management:

Aims

Methods

Home advice

4. Management of the following nerve injuries:

N Peroneus Communis

N Radiali

N Median and Ulnaris

N Axillaris

Klumpke's palsy

Erb's palsy

N. Dorsalis Longus

N Facialis - including Bell's palsy

5. Leprosy

Signs and symptoms and medical and surgical management

Methods of assessment and treatment

6. Poliomyelitis

Signs and symptoms and medical and surgical management Methods of assessment and treatment

Appropriate aids and appliances

Post-polio syndrome

C Hours Allocated:

BURNS

1.	Introduction	2 hours
2.	Assessment - acute	3 hours
3.	Assessment - chronic	3 hours
4.	Treatment - acute	4 hours
5.	Treatment - chronic	3 hours
6.	Psychological aspects	1 hour
7.	Respiratory complications	2 hours
	Total	**16 hours**

DERMATOLOGY

1.	Introduction	2 hours
2.	Psoriasis	1 hour
3.	Acne vulgaris	1 hour
4.	Skin infections	1 hour
5.	Pressure sores	3 hours
6.	Wound care	2 hours
	Total	**14 hours**

PERIPHERAL NERVE INJURIES

1.	Introduction	2 hours
2.	Psoriasis	1 hour
3.	Principles of management	2 hours
4.	Management of specific injuries	1 hour
5.	Leprosy	3 hours
6.	Poliomyelitis	3 hours
	Total	14 hours

TOTAL FOR COURSE 44 hours

D Methods of Student Assessment:

Written paper	1 hour	150
Clinical Examination	1 hour	200
Continuous Assessment		200
Total		**600**

E Course Textbooks:

Fisher S.V Helm P.A (1984): Comprehensive Rehabilitation of Burns Williams and Wilkins, Baltimore, London.

Appendix XXIX: Gaining consent to adapt the ACI Guidelines

From: **Anne Darton (Agency for Clinical Innovation)** <Anne.Darton@health.nsw.gov.au>
Date: Sat, Dec 14, 2019 at 10:56 AM
Subject: Re: guidelines
To: Tapfuma Mudawarima <tamudawarima@gmail.com>
Cc: Siobhan Connolly (Agency for Clinical Innovation) <Siobhan.Connolly@health.nsw.gov.au>

Dear Mudawarima,

I am happy for you to use the guidelines and glad you think they may be useful in your setting. Please just acknowledge where you have got them and that you have adapted to your setting.

When I return to work, I can send you a form that I understand you should complete for our records.

Interestingly I am on leave at the moment and in Livingstone Zambia visiting my daughter who lives here.

Regards

Anne Darton

Sent from my iPad

On 13 Dec 2019, at 1:08 pm, Tapfuma Mudawarima <tamudawarima@gmail.com> wrote:

Dear Anne Darton

I am Tapfuma Mudawarima a PhD student at University of Cape Town, with an interest in the management of patients with burn injuries. I currently work at DDT College of Medicine in Botswana, was previously employed at Harare Central Hospital in Zimbabwe.

My doctoral thesis is entitled BURN **INJURIES IN ZIMBABWE: DEVELOPMENT OF GUIDELINES FOR PHYSIOTHERAPY REHABILITATION OF MUSCULO-SKELETAL IMPAIRMENTS AND FUNCTIONAL LIMITATIONS.** The purpose of the study is to develop guidelines for the rehabilitation management of patients with burns in low income and middle-income countries as there are no guidelines that we could source specifically developed for low- and middle-income countries contexts in which resources are severely constrained.

I realised that It was going to be difficult to develop *de novo* guidelines because of time and financial constraints, hence the need to adapt developed guidelines. During my Boolean search for guidelines

I found your guidelines and I thought they could also apply to Zimbabwe as they are precise, concise and focus mostly on musculoskeletal impairments. Using the ACA concept “Adapt, contextualize, adopt”, I contextualised and adapted the ACI Statewide Burn Injury Service: Physiotherapy and Occupational Therapy Clinical Practice Guidelines without your permission and I am sorry for that oversight. I made changes based on epidemiological studies, a systematic review of therapeutic exercise for patients with burns, an audit of clinical physiotherapy practice and the results of a modified Delphi exercise with local experts in burn management.

I am kindly asking for your permission to modify your guidelines to suit a low resourced country like Zimbabwe. The amended guidelines will only be used within the local context and will not be published, although available on request. The purpose of modification is to ensure that they are culturally and socially relevant and feasible within our context.

I am very willing to send you a copy of my proposed guidelines and thesis if you should so wish.

--

Regards

Mudawarima Tapfuma (PhD student UCT)

Senior Physiotherapist (Harare Central Hospital)

Appendix XXX: Information Sheet and Consent Form for Physiotherapists Taking Part in the Guideline Development

Dear Physiotherapist,

My name is Tapfuma Mudawarima. I am a PhD student at University of Cape Town, as part of my PhD; I am conducting a research project entitled "Burns injuries in Zimbabwe: Development of Guidelines for Physiotherapy Rehabilitation of Musculoskeletal Impairments and Functional Limitations "The overall aim is to draw up a booklet on how best to give physiotherapy treatment for patients with burns. I have approached you because you have experience in the management of burns.

WHAT YOU SHOULD KNOW ABOUT THIS RESEARCH STUDY?

Burn injury is one of the most common causes of hospitals admission in low income countries[5–7]and often leads to secondary complications such as disfigurements, contractures, and scar tissue formation[5,6,11]. There is a high incidence of mortality and severe morbidity [10], which may lead to psychological problems for the patient and the family[6,10].Burns in Africa, particularly in low income countries like Zimbabwe, are usually associated with poor socio-economic circumstances [14], and are often caused by scalds and open fire [15]. In addition children and women are most commonly affected[15].

Clinical guidelines, which are defined as "systematically developed statements to assist practitioners and patient decisions about appropriate health care for specific circumstances"[22], assist the clinician in making the best decisions with regard to patient management. In some cases, evidence for efficacy is the primary yardstick for inclusion in guidelines; however, feasibility and cost also need to be factored in, particularly in situations of constrained resources.[22] Clinical guidelines related to the physiotherapy management of patients with burns have been developed, but these have been in high resourced countries, such as New Zealand and Australia, the UK and Ireland[23–25], and their relevance to management in a severely resource constrained setting is unknown.

This research aims to gather information to develop clinical guidelines for the physiotherapy management of burns in Zimbabwe. The World Health Organisation have identified the following key steps in the process of developing guidelines: "selection of the topic, synthesis of evidence, formulation of recommendations, consultation and peer review, dissemination and implementation, review and updating."[22]

A systematic review of the literature on existing guidelines and evidence based physiotherapy interventions has been undertaken, based on the Cochrane Collaboration guidelines[41]to determine the best evidence on efficacy, and if possible, effectiveness, of physiotherapy interventions in the acute, medium term and chronic stages of burn recovery, with modifications for children and adults as necessary.

Once the guidelines have been developed, they will be subject to a Delphi review panel of local and international physiotherapists for modification and final validation. These processes should ensure that the final guidelines are feasible within the local context and acceptable to the community of local and international physiotherapists.

I am now inviting you to take part in the development and validation of the guidelines.

PROCEDURES INVOLVED IN THE STUDY?

Electronic media will then be used to reach consensus on the content of the guidelines. At this stage, the international experts will be involved and they will receive electronic copies of the Beta and Delta versions. It is acknowledged that not all therapists will have access to the internet but it will not be practical to have repeated face to face meetings with therapists who come from all over Zimbabwe and internationally. Each discrete section will individually be circulated to participants, e.g. section on maintaining range of motion, or section on increasing exercise tolerance and fitness. The participants will be asked about the content and whether it should be excluded or expanded.

Once these comments have been gathered for each section, they will be analysed in the light of the results of the previous studies and judicious changes made to this particular section. The amended section will then be subject to one further round of review and based on these comments, the final recommendations will be incorporated into the Delta version of the guidelines.

The Delta version will then be discussed at a second face to face meeting of the local therapists and the final version produced.

In other words, the research will entail two half day meetings at the University of Zimbabwe, Department of Rehabilitation. In addition, it will require responding within one week to the electronic versions.

RISKS OR DISCOMFORTS

There are no physical risks or discomfort related to the study. However, you may feel uncomfortable sharing your experiences during the face to face meetings.

BENEFITS AND/OR COMPENSATION

We will reimburse you for your travel to Harare and provide lunch for the days of the face to face meetings. You will not be paid anything further than that. The benefits of participation to you include that you will be more up to date with the management of patients with burns and will be acknowledged in the booklet as a contributor. The benefits to the patients who have burn injuries is

that they will be managed in a standard manner across Zimbabwe with the best evidence-based interventions that are feasible within the local conditions.

HOW MUCH WILL PARTICIPATING IN THIS STUDY COST YOU?

There is no cost to take part in this study.

CONFIDENTIALITY

We cannot guarantee confidentiality during the face to face meetings but we will ask every participant to respect the views and privacy of the other discussants. We will only include your name in the guideline booklet if you wish us to do so. No one who is not at the meetings will be able to ascribe specific comments or opinions to you as your name will not be linked to any statements in the report.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you decide not to participate in this study, it will not affect your dealings with the Ministry of Health and Child Welfare (Zimbabwe), their personnel and associated hospitals. If you decide to participate, you are free to withdraw your consent and to stop taking part at any time without penalty and there will be no loss of benefits due to you from this study as described above. Refusing to take part or withdrawal from the study will not affect your current or future relationship with the researchers or other institutions.

OFFER TO ANSWER QUESTIONS

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over. You may ask more questions about the study at any time. You will be informed of any significant new findings discovered during the course of this study which might influence your continued participation.

The UCT Faculty of Health Sciences Human Research Ethics Committee (Professor Blockman) can be contacted on 021 406 6338 in case participants have any questions regarding their rights and welfare as research subjects on the study or you may also contact the Joint Research Ethics Committee (+263 4 708140)

Your participation is appreciated. Should you have any questions please contact Tapfuma Mudawarima Phone Number: +263 772328439

Supervisor: Professor Jennifer Jelsma (University of Cape Town)

+27846116681

If you chose to participate, please sign the attached consent form

INFORMED CONSENT FORM

Title: Burns in Zimbabwe – Epidemiology and Physiotherapy Management

Name of researcher: Tapfuma Mudawarima

Phone Number: +263 772328439

I -- ID number -- have read (or had read to me by --) the information sheet. I understand what is required of me and I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so on my free will. I know that I can withdraw at any time if I so wish and that it will have no bad consequences for me.

Signed:-- ---

Participant date and place

-- ---

Researcher date and place

-- ---

Witness

Appendix XXXI: Guidelines Questionnaire

Clinical Practice Guidelines for Physiotherapy Management in Zimbabwe: Draft Guidelines

Background and need

Clinical guidelines support evidence-based care and improve health outcomes. These are standard guidelines are designed to assist and guide therapists in the management of a patient with burns in Zimbabwe. Therapy management in ward settings, outpatients and High Dependency Unit (HDU) were included. Therapy management in Intensive Care Unit, and inhalational burns were excluded from the guidelines as these are specialised conditions.

The Zimbabwe guidelines were developed based on and contextualising western existing guidelines, modified to include evidence-based practice as identified through

- Epidemiology of Burns in Zimbabwe
- Systematic review on the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns
- Audit of evidence Practice in Zimbabwe.
- Long term impact of burns on health-related quality of life and functioning.

Current state of burns in Zimbabwe

There is a clear difference in presentation between children and adults, with children constituting over three quarters of all admissions, but with less severe injuries. The typical profile of a child with burns injuries that emerged was thus of a toddler of less than two years of age, from the urban area, more likely to be male, who sustained an accidental scald burn in October or June. He is likely to have partial burns to the upper limb, but head, trunk and lower limb burns are common with the involvement of three or less sites. The TBSA is likely to be 16% or less (86% have less). If three or more sites are involved or if he has a greater TBSA of 26% there is a high likelihood that he will not survive. He will stay in hospital for twenty days or less but some may stay as long as 140 days.

The profile of adult patients that emerged was not as clear. The patient may be either male or female, and of less than 40 years of age, an urban resident, who may have sustained burns between September and December. They are most likely to have sustained a fire burn, or possibly a scald by hot liquids. Although they are most likely to have sustained an accidental burn, they may well have been the victim of intentional assault or self-inflicted burns. They may have partial or full thickness burns to the upper limb, but the head, trunk and lower limbs may also be burnt. The majority have burns to two or more sites and if three or more sites are involved, the mortality rate increases. They are likely to have a TBSA of 41% or less (82.5% have less). They will stay in hospital for 20 days or more with a range from one to 158 days.

Children below the age of 13 years were the most affected, as reported in other studies in low income countries[5,6,15]. This is not surprising as Zimbabwe has a young population, with 42% of the

population less than 14 years of age at the beginning of 2017[32]. The admissions lists revealed that the majority of burns were in children below the age of 40 months, with 50% being less than two years old, a finding congruent with a studies done in South Africa[6,72]and in Israel[69] in which respectively 36% and 24% of burns admissions were under the age of 24 months. As it is at this age that a child develops mobility but may not yet be able to comprehend the danger of heating sources, this finding also makes intuitive sense.

As with several other studies in sub-Saharan Africa [14] and elsewhere[69], scalds with hot liquid were the predominant cause of burns. Children in their toddler years, explore the environment, and may knock over pots and kettles as cooking are done mostly on the floor. Due to the increasing price of electricity and its erratic availability in Zimbabwe, people tend to cook with one plate gas stoves and open fires on the floor which are easily reached or knocked over by the children[6,7,14,73]. The situation in Zimbabwe is currently just as described by[60], "In developing countries, where overcrowded informal housing settlements and lack of access to utilities predominates, scalding occurred when a pot or vessel of boiling liquid on a fire, or gas stove at ground level, was knocked over"[60] (p167). These injuries therefore arise directly out of the environmental factors and are therefore preventable[74].

The implications of this are that firstly therapists need to factor in preventative strategies as part of community-based rehabilitation activities, particularly in under-resourced over-crowded areas. A second aspect is that parents may blame themselves for their child's injury and may carry a burden of guilt which may need to be addressed by the physiotherapist through counselling[75], initiating a support group for parents or referral to other appropriate services.

In contrast, flame injuries were the most predominant cause of burns in the adult population, similar to most studies[6,11,71]. Despite most burns in adults being accidental, intentional and self-inflicted were also common in the adult population. Self-inflicted burns are usually associated with females[15,43] but contrary to these studies the prevalence of these type of burns was similar between male and females(although there were more females than males affected it was not statistically significant. The number of self-inflicted injuries was 16, which is slightly higher than the rate of the 41 over three years reported by[15]. The higher proportion of men than expected may be attributed to increasing poverty in Zimbabwe, as men may succumb to the pressures of not being able to fulfil the role of breadwinners in their families. The implication of this for Zimbabwean guidelines is that appropriate counselling and psychological support should be made available to the survivors of the para-suicide attempts.

Australian Guidelines	Zimbabwe Guidelines	Justification	Source	Score	Participants Comments
Education to prevent burn injuries is vital	It is vital that health promotion/education is done by all health professionals including physiotherapists	Most of the burns which occur are preventable. The common cause of burns is open fire and scalds Most of the patients with burns are from the urban area/slum areas which lack electricity Physiotherapists should be part of the health promotion/education team as they perform community-based rehabilitation/outreaches	Epidemiology Epidemiology Audit		
Education to patients with burns/caregivers on prognosis, management, nursing care, rehabilitation and outcome of the condition	Physiotherapists need to play a role in the education of patients in line with the management set for the patient by the team through ward rounds/meetings, posters and peer survivors	Ward rounds/meetings, posters and peer survivors have been shown to be a cost-effective way for a multi – disciplinary approach to educate the patient on his condition	Narrative literature review/audit		
Physiotherapists need to know infection control measures for staff and patients with burns	Physiotherapists need to familiarise with the infection control policy of hospitals and Burns' Unit	Lack of physiotherapists on committees for infection control policies	Audit		
• **Pain management: Pharmacological management Opioids are the common management for patients with burns, physiotherapists need to know the half-life of the drugs and side effects (vomiting, nausea, drowsiness, and**	Physiotherapists need to know the dosage, effects and side effects of drugs used on patients with burns	There is need in continuous education in pharmacology for physiotherapists dealing with patients with burns	Audit		

Australian Guidelines	Zimbabwe Guidelines	Justification	Source	Score	Participants Comments
dizziness). • **Physiotherapists should liaise with the nursing staff to know the timetable for administering and perform treatment when pain is minimal.**					
Pain is the main cause for non – compliance for rehabilitation hence the need to minimise it using non – pharmacological techniques (TENS, massage, hot and cold therapy, US, music therapy, acupuncture, virtual reality). Physiotherapists need to know the precautions and contraindications of these therapies to a patient with burns	Pain should be managed using hands on therapy • Massage • Mobilisations • Exercises	Use of massage, mobilisations and exercises have been shown to be effective as electrotherapy and alternatives as music therapy, acupuncture and virtual reality.	Narrative literature		
Physiotherapists need to be well versed in assessment tools **1. Depth of burns** **2. Degree of burns** **3. Lund and Browder Chart** **4. Rules of Nines** **5. Burns Specific Health Scale** **6. Burns Outcomes Questionnaire for infants and children**	Physiotherapists need to have knowledge of depth and degree of burns, Lund and Browder, rules of nines. There is lack of knowledge on BSHS and Burns Outcomes Questionnaire for infants and children	Physiotherapists need to have adequate knowledge on long term management outcome measures. Long term outcome materials should be available at each institution	Audit		

Treatment

This section of the guidelines will focus mainly on treatment and the subheadings are listed below. It is essential for physiotherapists to be able to manage burns from acute stage to the rehabilitation stage. Treatment will be managed under the following headlines

1. Respiratory management
2. Limited Range of Motion
3. Maintaining and managing muscle strength
4. Functional activities in the ward
5. Activities of Daily Living
6. Scar Management
7. Psychological Management
8. Exercise management

Australian Guidelines	**Zimbabwe Guidelines**	**Justification**	**Source**	**Score**	**Participants comments**
Range of movement (ROM) to end of range is essential. Active ROM is encouraged as soon as possible. Active-assisted ROM and passive ROM are useful adjuncts to obtain end of range particularly if the patient is unable to actively participate. Stretches need to be low repetitions but long in duration to provide a sustained stretch. • The location of the burn is important to consider in terms of predicting potential scarring and contracture of joints. Areas of the body to be particularly aware of are; o Face o Neck o Axillae o Elbows o Hands and wrists o Knees – flexor surfaces o Ankles and feet	AROM and PROM should be done every day and stretches need to be incorporated in every treatment session	Scheduled limb and joint movements should be done every day to decrease oedema, prevent skin/scar contractures and decrease pain Stretches were not incorporated in most burn treatment observed No machines are needed for AROM and PROM exercises	Literature review and systematic review Audit of practice Literature review		
Mobilisation/ambulation • Commence ASAP dependent on post-op protocols • Commence mobilisation in ICU (with intubated patients where possible) planning around dressing changes, surgery and sedation. • Educate on donor site healing	Mobility to commence as soon as possible to prevent secondary complications and restoration of function and independence.		Literature review and systematic review Literature review		

and issues such as blood rush when standing and walking (donor sites are commonly located on the lower limbs) • Combine breathing exercises with mobility. • Frequency of mobilisation is dependent on wound location, wound size (%Total Burn Surface Area) and amount of oedema • Only consider wheelchairs and walking aids when normal walking is not yet possible. Aim for independent premorbid ambulation as soon as possible					
Functional Re-training • Encourage independence with activities of daily living (ADLs)/function as soon as possible. Aim for full independence rehabilitation. Only use adaptive devices for early success for the patient and wean off as soon as possible. • Incorporate exercises into the patient's daily routine. • Incorporate specific exercises as indicated e.g. proprioception, balance and plyometrics • Aim to return to work, sport, school, pre-morbid activities as early as possible. • Individuals with severe burns may require a fit to drive assessment from the Road and Maritime Services and patients with smaller burn injuries will require medical clearance for driving from their GP or treating doctor. Link to NSW Road & Maritime Services RMS regarding fitness to drive	Need for follow up of patients after being discharged. Lack of follow up after discharge. Incorporate easy exercises into patient's daily routine which doesn't involve expensive materials/equipment Follow up and work-related assessment is needed. Work assessment in combination with NSSA, is needed for back to work assessments and compensation.	There was no follow up of patients with burns after discharge. Simple exercises like walking and running help in maintaining RoM and muscle strength and are inexpensive. Though work-related burns were few, there is need to incorporate work-related burns	; Long term follow-up		
Strength • The principles of strength training after burn injury are no different to strength training	There is need to do strengthening exercises for patients with burns,	No strength training exercises were	Systematic review Narrative		

following other injuries e.g. musculoskeletal injuries. Antigravity functional exercises should be used as soon as possible. Use the patient's own body weight as resistance. Resistance can also be created by such adjuncts as; – TheraBand®, TheraFoam®, pegs, free weights. • Bed exercises can be used when the patient is unable to perform other more effective strengthening exercises.	for both adults and paediatrics. Progressive resistance exercises should be incorporated at all stages of burn healing process.	done post discharge of patients with burns.	literature		
Aerobic exercise • Participation in aerobic exercise is dependent on the patient and wound status. Common types of aerobic exercise include walking, cycling and jogging. Swimming must only be commenced once all wounds are healed. • Long-term restrictive lung injury is common in patients with inhalation injury, and should be considered as appropriate	Walking and Running should be incorporated in all stages of the burn healing process especially after discharge.	This is a cheap alternative to hydrotherapy, cycling and swimming.	Narrative literature		
When determining the use and application of splinting and positioning, consider the location of the injury. Splinting and positioning must be applied to maximise the lengthening of the skin of the affected area. A clear schedule and routine which is individual to each patient is important. The plan must be communicated to the other MDT members and education of the patient, family and carers to ensure compliance with the regime. The splinting regime is determined by the patient's ability to maintain the maximum range with active exercise. For example, following a skin graft procedure the splint may remain on until the graft is stable and then may be reduced to night-time wear. Advice should be sought from experienced Burns' Unit therapists if unsure. • Splints used for patients with burn injury patients may not be in a 'functional' position as they may be for other types of patient groups. Where possible, splint a joint or joints at the end of range	Adequate knowledge of anatomy, biomechanics and wound healing. A clear scheduled and routine which is individual to each patient. Splints to be done in a position to maximise range of motion.	POP is a cheap alternative to splinting.			

to maximise the stretch of burn scars or pull on burn area to prevent contractures. • Special considerations for difficult joints such as axilla, hips, neck (collar, pillow), palms, hands, knees, wrists, toes					
Types of splinting materials that can be utilised are varied e.g. plaster of Paris, thermoplastics. Topical Negative Pressure dressing can act as a splint by immobilising the area • If the joint is losing range, consider serial casting **Paediatrics** • The principles of splinting in the paediatrics population differ to those in adults with splinting generally done more frequently, for longer periods in any given 24 hours and for longer over the course of active scar management period. • Splint if the wound takes longer than 2 weeks to heal as it may scar, and scarring will decrease movement. • Splinting position at end of range or close to can be tolerated well in children e.g. children can be positioned in axilla splints that hold the shoulder in a position greater than 90° abduction. Splinting can be closer to 160deg in most children and involves some degree of forward flexion and external rotation • Initially splints are worn 24 hours and removed only for exercise and dressing changes. This guarantees both child and parents becoming accustomed to the splints early in the admission. Maintaining full range of movement and prevention of any contractures are of primary importance. • Splints will be worn at night for up to nine months and during the day initially. Gradually the day regime includes more periods with splints off e.g. two hours on two hours off. Splinting regimes are balanced with activities during the day e.g. mealtimes, bath times, swimming. Splints are always on	Use of POP as the main method for splinting. A different splinting regimen and schedule should be adopted for the paediatric population with use of POP.				

for a day sleep					
<u>Massage</u> Encourage patient's participation, if in an area they can reach. Otherwise carers/parents need to be taught • It is recommended to massage the scar with moisturiser several times per day; the skin is dry more frequent massage with moisturiser will be required • If the patient has a large scar area, or difficulty donning/doffing garments, it is impractical to massage several times during the day; for these patients, massage can be incorporated into skincare when moisturisers are applied. • Massage with firm pressure – so the skin blanches • Massage in slow circular motions using a flat hand/fingers. If very thick use a pinch and roll technique • Massage should be continued until the scar is mature. Ceasing massage before scar maturation may result in contractures • It is not expected that therapists see patients for the provision of scar massage, as often the review of ROM, splinting or function requires higher priority for therapy time. For this reason, it is important that patients are taught how to complete massage themselves.	Use of petroleum jelly as an alternative for moisturiser	Petroleum jelly has been shown to be a cheap alternative to expensive massage oils	Literature review		
<u>Compression</u> Pressure Garments should be applied to all scars for 12 months The aim of compression garments and other methods of compression is to keep developing scars flat and prevent raised scarring. It is hypothesised that compression reduces the excessive blood flow that delivers scarring mediators. Compression can be achieved in a variety of ways e.g. Coban®, Tubigrip®, bandaging, compression or pressure garments (customised or off the shelf) Compression garments can also be used to assist with holding scar softening products. It is recommended that pressure remain between 24 and 40mmHg and be replaced or tightened regularly to maintain this pressure. The type of compression used	Pressure bandaging should be applied for 12 weeks over joints particularly in adults and children with TBSA ≥ and depth of	Bandaging is not as effective as pressure garments but does have an effect Pressure garments are not available Most of the young children had less severe burns Keloid formation was found to be a long-term impairment Bandages can be used but are not	Systematic Review Audit Hospital survey Hospital survey Audit		I agree on this but pressure garments should be sourced for facial burns if possible.

depends on wound healing, area of body affected, time since healing and individual patient needs.		practical for whole body and will not be readily available in rural areas			
Silicone Medical grade silicone products are generally used to soften red, raised or thickened (hypertrophic) scars. Silicone is available in sheet, putty and liquid forms. It is usually used in sheet form e.g. Cica-Care® Liquid silicone e.g. Kelo-cote® is usually used on areas where it is difficult to secure the sheet form (e.g. the face or digits). Silicone putties can be used to fill concave areas to both give extra pressure and softening (E.g. Otoform K2® in the palm of a hand). Silicone preferably should be used in conjunction with pressure garments and splints.	There is need to provide an alternative method for hypertrophic scar management using silicone	Topical silicone gel is safe and effective treatment for hypertrophic and keloidal scars. It is easy to apply and cosmetically acceptable.	Narrative literature		
Cosmesis Camouflage make-up Some patients may choose to use camouflage make-up for special occasions particularly when scarred areas are on faces and other exposed areas. There are companies that specialise in camouflage make-up e.g. Veil® Dermablend™ Microskin™ Tattooing Medical tattooing can be an option for changing the appearance of scars particularly with pigment loss after burn injuries. This is not a service provided by the Burns' Unit s but is up to individual patients to pursue. Seek advice from a burn's specialist	Tattooing to be an option for cosmesis	Tattooing is a safe and alternative to cosmesis and cheaper than surgery	Narrative literature		
Reconstructive surgery Preventing the need for reconstructive surgery is always the first aim. This is done through careful primary surgery and rehabilitation including early debridement and grafting, avoiding wide meshed skin grafts wherever possible, early healing, early mobilisation, therapy, compression etc. However, the need for reconstructive surgery despite best efforts cannot always be avoided. The indications for reconstructive surgery include; • functional restrictions – contraction	Early intervention is needed to minimise surgery	Surgical intervention is expensive hence the need for early intervention to prevent contractures, and deformity.	Literature review		

• role of growth in children • tissue loss • cosmetic enhancement Types of surgery that are done in reconstruction include excision of scar tissue and grafting, z-plasty, full thickness grafting, skin and muscle flaps. To gain the optimal result from any reconstructive surgery scar management as above needs to recommence and be followed through till scars are mature and optimal range of movement gained.					

Appendix XXXII: Expert Likert scores responses to the draft guidelines

Items	Expert 1	Expert 2	Expert 3	Expert 4
Education				
Item 1	4	4	4	4
Item 2	4	4	4	4
Infection control				
Item 3	2	4	4	4
Non – pharmacological treatment				
Item 4	4	4	4	4
Pain management				
Item 5	4	4	2	4
Treatment				
Item 6	4	4	2	4
Item 7	4	4	2	4
Item 8	4	4	3	3
Item 9	3	4	4	4
Item 10	4	3	4	4
Item 11	4	4	3	4
Item 12	4	4	4	4
Item 13	4	4	3	3
Item 14	4	4	4	4
Item 15	4	No comment	4	2
Item 16	2	Neutral	3	3
Item 17	4	4	4	4

Appendix XXXIII: Final Clinical Practice Guidelines for Physiotherapy Management in Zimbabwe

Clinical Practice Guidelines for Physiotherapy Management in Zimbabwe

Background and need

Clinical guidelines support evidence-based care and improve health outcomes. These standard guidelines are designed to assist and guide therapists in the management of a patient with burns in Zimbabwe. Therapy management in ward settings, outpatients and High Dependency Unit (HDU) were included. Therapy management in the Intensive Care Unit, and inhalational burns were excluded from the guidelines as these are specialised conditions.

The Zimbabwe guidelines were developed based on and contextualising western existing guidelines[1], modified to include evidence-based practice as identified through;

- Epidemiology of Burns in Zimbabwe
- A systematic review of the effectiveness of therapeutic exercises utilised by physiotherapists to improve function in patients with burns
- Audit of evidence Practice in Zimbabwe.
- The long-term impact of burns on health-related quality of life and functioning.

Current state of burns in Zimbabwe

There is a clear difference in presentation between children and adults, with children constituting over three-quarters of all admissions, but with less severe injuries. The typical profile of a child with burns injuries that emerged was:

- A toddler of fewer than two years of age,
- From the urban area, more likely to be male, who sustained an accidental scald burn in October or June.
- He is likely to have partial burns to the upper limb, but head, trunk and lower limb burns are common with the involvement of three or fewer sites.
- The TBSA is likely to be 16% or less (86% have less).
- If three or more sites are involved or if he has a greater TBSA of 26% there is a high likelihood that he will not survive.
- He will stay in the hospital for twenty days or less, but some may stay as long as 140 days.

The profile of adult patients that emerged was not as clear;

- The patient may be either male or female, and of less than 40 years of age,

- an urban resident, who may have sustained burns between September and December.
- They are most likely to have sustained a fire burn, or possibly a scald by hot liquids.
- Although they are most likely to have sustained an accidental burn, they may well have been the victim of intentional assault or self-inflicted burns.
- They may have partial or full thickness burns to the upper limb, but the head, trunk and lower limbs may also be burnt.
- The majority have burns to two or more sites, and if three or more sites are involved, the mortality rate increases.
- They are likely to have a TBSA of 41% or less (82.5% have less). They will stay in the hospital for 20 days or more with a range from one to 158 days.

Children below the age of 13 years were the most affected, as reported in other studies in low-income countries[5,6,15]. This is not surprising as Zimbabwe has a young population, with 42% of the population less than 14 years of age at the beginning of 2017[32]. The admissions lists revealed that the majority of burns were in children below the age of 40 months, with 50% being less than two years old, a finding congruent with studies done in South Africa[6,72]and in Israel[69] in which respectively 36% and 24% of burns admissions were under the age of 24 months. As it is at this age that a child develops mobility but may not yet be able to comprehend the danger of heating sources, this finding also makes intuitive sense.

As with several other studies in sub-Saharan Africa [14] and elsewhere[69], scalds with hot liquid were the predominant cause of burns. Children in their toddler years, explore the environment and may knock over pots and kettles as cooking are done mostly on the floor. Due to the increasing price of electricity and its erratic availability in Zimbabwe, people tend to cook with one plate gas stoves and open fires on the floor which are easily reached or knocked over by the children[6,7,14,73]. The situation in Zimbabwe is currently just as described by[60], "In developing countries, where overcrowded informal housing settlements and lack of access to utilities predominates, scalding occurred when a pot or vessel of boiling liquid on a fire, or gas stove at ground level, was knocked over"[60] (p167). These injuries therefore, arise directly out of the environmental factors and are therefore preventable[74].

The implications of this are that firstly therapists need to factor in preventative strategies as part of community-based rehabilitation activities, particularly in under-resourced and over-crowded areas. A second aspect is that parents may blame themselves for their child's injury and may carry a burden of guilt which may need to be addressed by the physiotherapist through counselling[75], initiating a support group for parents or referral to other appropriate services.

In contrast, flame injuries were the most predominant cause of burns in the adult population, similar to most studies[6,11,71]. Despite most burns in adults being accidental, intentional and self-inflicted were also common in the adult population. Self-inflicted burns are usually associated with females[15,43] but contrary to these studies the prevalence of these type of burns was similar between

males and females (although there were more females than males affected it was not statistically significant). The number of self-inflicted injuries was 16, which is slightly higher than the rate of the 41 over three years reported by[15]. The higher proportion of men than expected may be attributed to increasing poverty in Zimbabwe, as men may succumb to the pressures of not being able to fulfil the role of breadwinners in their families. The implication of this for Zimbabwean guidelines is that appropriate counselling, and psychological support should be made available to the survivors of the parasuicide attempts.

Basic knowledge for burns management

This section of the guidelines will focus mainly on prevention, pain management (pharmacological and non – pharmacological) and assessment. The following subheadings were used

1. Prevention (Education and infection control)
2. Pain management
3. Non – pharmacological management
4. Assessment

Section 1: Prevention

Education

It is vital that health promotion/education is done by all health professionals including physiotherapists

Physiotherapists need to play a role in the education of patients in line with the management set for the patient by the team through ward rounds/meetings, outreach, Community Based Rehabilitation (CBR) and peer survivors.

The table below shows the various ways education can be done to prevent burns in adults and children

Table: Ways of promoting prevention messages

Adults	Children
Posters	Posters at crèches/schools
Radio/ television shows	Cartoons
Advertisement	Roadshows
Road show	Outreach/ immunisation clinics
Support groups/ peer survivors	CBR/ Immunisation clinics
Outreach/immunisation clinics	Lessons at schools*

CBR/immunisation clinics	

*reference material for education – Learn Not to Burn© Pre-schoolers Programme: South Africa. (A fire safety programme of the NFPA for pre-schoolers)[202].

Justification

1. Most of the burns which occur are preventable. The common cause of burns is open fire and scalds since most of the patients with burns are from the urban area/slum areas which lack electricity.
2. Physiotherapists should be part of the health promotion/education team as they perform community-based rehabilitation/outreaches
3. Ward rounds/meetings, posters and peer survivor's testimonies have been shown to be a cost-effective way for a multidisciplinary approach to educating the patients on their condition

Infection Control

- Physiotherapists need to familiarise with the infection control policy of hospitals and Burns' Unit.
- Physiotherapists are more hands-on therefore are the greatest source of spreading infection, and to enhance infection control, there is a need to complement all health personnel in combating infection.
- Physiotherapists need to reinforce that every Burns' Unit has a poster on infection control, prevention of nosocomial infections and hand washing.

Justification

1. Lack of physiotherapists on committees for infection control policies

Pain management

- Physiotherapists need to know the dosage, effects and side effects of drugs used on patients with burns Pain management
- Opioids are the common management for patients with burns, physiotherapists need to know the half-life of the drugs and side effects (vomiting, nausea, drowsiness, and dizziness).
- Physiotherapists should liaise with the nursing staff to know the timetable for administering and perform treatment when pain is minimal.
- The following are the most common drugs used by adults and paediatrics in Zimbabwe for patients with burns.

Paediatrics	Adults
Large surface area burns • Ringers Lactate 8mls/kg/hr for 12hours	Large surface area burns • Ringers lactate iv 10mls/kg for the first 12 hours and reduce to 8 mls/kg/hr when necessary
Pain • Morphine 0.05mg/kg hourly prn • Paracetamol 10mg/kg tds	Pain • Morphine iv 2.5 – 5 mg every 4 hours as necessary • Pethidine IM 1 mg /kg every 4 hours
Antibiotics • Erythromycin 12.5mg/kg/tds	Antibiotics • Eryhtromycin oral 500mg qid
Tetanus vaccine 0.5ml single dose	Tetanus booster stat dose 0.5mls

Justification

1. There is a need in continuous education in pharmacology for physiotherapists dealing with patients with burns, specifically for burns as the medication is continuously changing.

2. Knowing the time for pain management and dressing will limit the discomfort and pain on the patient if therapy is administered at the same time.

Non – pharmacological management

- Pain is the main cause for non-compliance for rehabilitation hence the need to minimise it using non-pharmacological techniques

- Pain should be managed using hands-on therapy (1) massage, (2) mobilisations and (3) exercises

Justification

1. Although there are several other non-pharmacological treatments which include but are not limited to Transcutaneous Electrical Nerve Stimulation (TENS), hot and cold therapy, music therapy, acupuncture and virtual reality these cannot be used due to erratic power supply even affecting the hospitals[205] and lack of equipment.

2. The use of hands-on therapy requires limited resources, and every physiotherapist has knowledge of massage, mobilisations and exercises. In addition, petroleum jelly is cheap and readily available.

Assessments

- Physiotherapists need to be well versed in assessment tools

  1. Depth of burns
  2. Degree of burns
  3. Lund and Browder Chart
  4. Rules of Nines

The Lund and Browder chart and rules of nines are summarised below

- *Wallace rule of nines*—this is a good, quick way of estimating medium to large burns in adults. The body is divided into areas of 9%, and the total burn area can be calculated. It is not accurate in children[17] (**Error! Reference source not found.**).

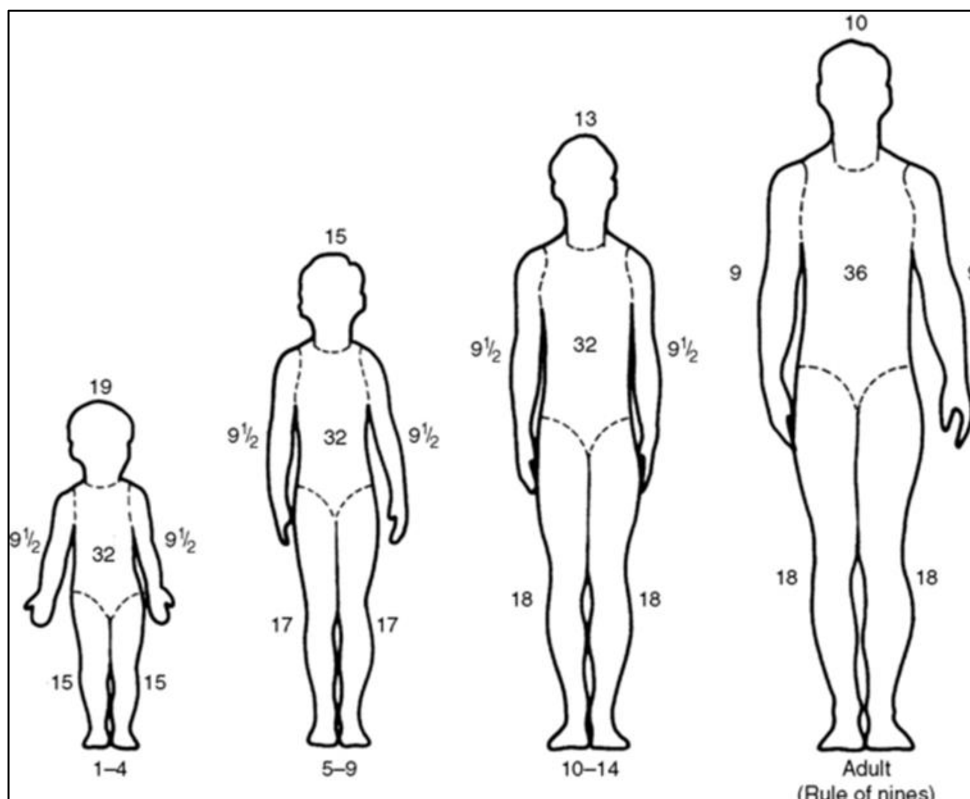
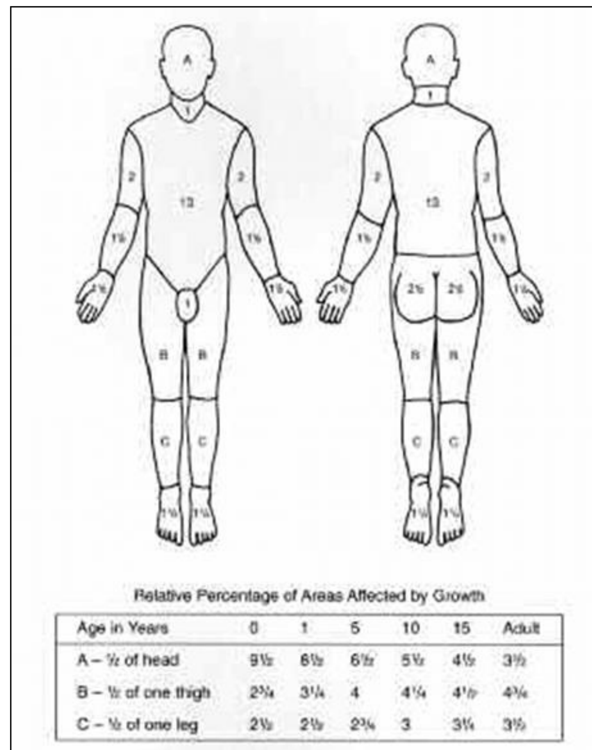


Figure: Wallace rules of nine for paediatrics and adults

- *Lund and Browder chart*—this chart, if used correctly, is the most accurate method. It compensates for the variation in body shape with age and therefore can give an accurate assessment of burns area in children[17](**Error! Reference source not found.**).



Relative Percentage of Areas Affected by Growth

Age in Years	0	1	5	10	15	Adult
A – ½ of head	9½	6½	6½	5½	4½	3½
B – ½ of one thigh	2¾	3¼	4	4¼	4½	4¾
C – ½ of one leg	2½	2½	2¾	3	3¼	3½

Figure: Lund and Browder chart[17]

For long term outcomes, the physiotherapist needs to have knowledge on;

1. Burn specific health scale
2. Burns outcomes follow up for questionnaire for infants and children
3. Functional Mobility Scale
4. Clinical Mobility Scale
5. English and Shona EQ – 5D[97]

Justification

1. Physiotherapists need to have adequate knowledge on the long-term management outcome measures. Long term outcome materials should be available at each institution

Section 2: Treatment

This section of the guidelines will focus mainly on treatment, and the subheadings are listed below. It is essential for physiotherapists to be able to manage burns from the acute stage to the rehabilitation stage. Treatment will be managed under the following headlines;

1. Range of Motion

2. Mobility and ambulation

3. Functional retraining
4. Strengthening
5. Aerobic exercises
6. Splinting/positioning
7. Massage
8. Compression
9. Reconstructive surgery

Range of Motion

- AROM and PROM should be done every day, and stretches need to be incorporated in every treatment session
- Range of movement (ROM) to end of the range is essential. Active ROM is encouraged as soon as possible. Active-assisted ROM and passive ROM are useful adjuncts to obtain the end of range, particularly if the patient is unable to participate actively. Stretches need to be low repetitions but long in duration to provide a sustained stretch.
- The location of the burn is essential to consider in terms of predicting potential scarring and contracture of joints. Areas of the body to be particularly aware of are;
- o Face
- o Neck
- o Axillae
- o Elbows
- o Hands and wrists
- o Knees – flexor surfaces
- o Ankles and feet

Justification

- Scheduled limb and joint movements should be done every day to decrease oedema, prevent skin/scar contractures and decrease pain
- Stretches were not incorporated in most burn treatment observed
- No machines are needed for AROM and PROM exercises hence it is a cost-effective way to manage contractures

Mobility/ambulation

- Mobility to commence as soon as possible to prevent secondary complications and restoration of function and independence.
- Use of cheap post skin graft applications rather than Biobrane and Integra.
- Contraindications/precautions should be noted for patients with burns and for patients with burns post skin graft when mobilising them out of bed
- The healing process for post-skin graft application should be known by every physiotherapist and is dependent on TBSA% and depth of the burn.
- The use of crutches and wheelchairs should only be used when the patient with burns is unable to walk without aid

Justification

- There is no ideal substitute in the market that provides an effective and scar- free wound healing.

Functional Re-training

- Need for follow-up of patients after being discharged.
- Incorporate "easy" exercises into the patient's daily routine which does not involve expensive materials/equipment.

*easy defined as basic/simple exercises that use less resources for example and can be done at home with minimal supervision

1. walking/running for endurance
2. Squats
3. Push-ups
4. Lunges
5. Stair climbing

- Activities of Daily Living to be incorporated as part of the exercise program as soon as possible and should be part of the patient's daily routine.
- Follow-up and work-related assessment are needed.
- Work assessment in collaboration with National Social Security Association, is needed for back to work assessments and compensation.

Justification

- There was no follow-up of patients with burns after discharge.
- Simple exercises like walking and running help in maintaining RoM and muscle strength and are inexpensive.
- Though work-related burns were few, there is a need to incorporate work-related burns

Muscle strengthening

- There is a need to do strengthening exercises for patients with burns, for both adults and paediatrics and the principles of strengthening exercises are no different from other musculoskeletal injuries
- Progressive resistance exercises should be incorporated at all stages of burn healing process with anti-gravity exercises being done as soon as possible.
- Bed exercises can be done when the patient is unable to perform strengthening exercises.

Justification

- No strength training exercises were done post-discharge of patients with burns but are vital in restoring the patient muscle strength and muscle mass.
- Sandbags can be used for muscle strengthening and are relatively cheap.

Aerobic exercises

- Walking and Running should be incorporated in all stages of the burn healing process especially after discharge.

Justification

- This is a cheap alternative to hydrotherapy, cycling and swimming.

Splinting and positioning

- Adequate knowledge of anatomy, biomechanics and wound healing. A clear scheduled and routine which is individual to each patient.
- Splints to be done in a position to maximise the range of motion in collaboration with multi-disciplinary team using Plaster of Paris.
- Patient's and family carers to ensure compliance with the regime set.
- Careful consideration should be taken post skin grafts
- Special considerations for difficult joints such as the axilla, hips, neck (collar, pillow), palms, hands, knees, wrist and toes.

Section 3: Paediatric considerations

A different splinting regimen and schedule should be adopted for the paediatric population with the use of PoP and frequent monitoring and changes.

Justification

- POP is a cheap alternative to splinting, unlike thermoplastics and topical negative pressure dressing.

Massage

- Use of petroleum jelly as an alternative for moisturiser and encourage the patient's participation on his/her own if they can reach the area
- Massage to be done at list two times a day as the skin will quickly dry.

Justification

- Petroleum jelly is a cheap alternative to expensive massage oils.

Compression

- Pressure bandaging should be applied for 12 weeks over joints, particularly in adults and children with TBSA ≥ and depth of partial-deep or deep burns.

Justification

- Bandaging is not as effective as pressure garments but does have an effect
- Pressure garments are not available, are expensive, and the ISBI practice guidelines report that pressure garments may not be effective in reducing global scar scores significantly
- Most of the young children had less severe burns
- Keloid formation is a long-term impairment
- Bandages can be used but are not practical for the whole body and will not be readily available in rural areas
- If possible, pressure garments should be sourced for those with facial burns.

Reconstructive surgery

- Early intervention is needed to minimise surgery

Justification

- Surgical intervention is expensive; hence the need for early intervention to prevent contractures, and deformity.
- Bandages can be used but are not practical for the whole body and will not be readily available in rural areas