THERAPEUTIC PAIN MANAGEMENT

Nursing Care for Patients Suffering from Burns

A Literature Review

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Abstract:
Burn patients' care phase stretches from the time when the injury has been incurred to the time when the burn wound has healed completely. Most burn wounds are painful as a result of damage caused to the epidermis and dermis. Pain management and pain alleviation is a critical element for burn patients. Pain from the injuries caused by the burns calls for therapeutic treatment or intervention to reduce patients suffering. This study sought to establish therapeutic techniques that nurses uses in the management of pain in burn patients and it was guided by the following research question:(1)What types of pain do burn patients' experience? (2)What approaches do nurses apply in the management of pain of burn patients? The method used in this study is litterature review. The results of the study was outlined in 3 heading namely, types of pain experienced by burn patients, approaches nurses apply in management of burn pain and therapeutic approaches to pain management. The study found out that pain experienced by burn patients majorly revolve around traetment procedures like dressing and wound debridement, the findings also indicated that the application of non-pharmacologic methods had less positive effect to pain management compared to pharmacologic methods.

Keywords:	Therapy, Pain Management, Burns, wound care, treatment, pharmacologic
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FOREWORD

This work will not have been successful without dedication. Foremost, I thank God for the gift of health throughout the process of writing this thesis. The process has further been a learning experience in which I have been able to gain from the educational journey. Special appreciation goes to my friends whose support and encouragement have enabled me to complete this work within due time.

1 INTRODUCTION

According to oxford living dictionary, therapy is defined as treatment intended to treat or relieve a disorder; the same dictionary also defines therapeutic as having good effect on the body or mind and contributing to a sense of well-being. This thesis will therefore seek to address the interventions that nurses' use to relieve pain in patients suffering from burns. Yates (2011) categorizes burns as one among the distressing injuries to be sustained by an individual. They define burns as occurring from skin contact with hot water, hot surfaces or objects, chemicals, radiation or electricity, as well as skin injuries resulting from cold and friction.

The American Burns Association indicates that burns are majorly dependable on depth, location and extent of the injury. The American Burns Association further places into consideration; superficial-thickness burns, partial-thickness burns less than 15% total body surface area in individuals between 10-50 years of age, partial thickness burns less than 10% total body surface area in children younger than 10 years of age and adults older than 50 years of age, and full thickness burns less than 2% total body surface area to be minor burns (Hermans, 2005; Parasca et al 2018).

Burn depth is factored by temperature and the duration of contact with the heat agent as well as skin thickness and blood supplied to the injured site (ABLS, 2005). The description of burn depth follows a grading going from most superficial to the deepest. In superficial burns, the epidermis is injured and it sloughs within a period of a few days, heals within a period of one week and is known to leave no scarring after healing. Superficial partial-thickness burns are known to involve all of the epidermis as well as the superficial dermis. This depth of burn injury heals within a period of 10 to 14 days and causes blister formation. For deep partial-thickness burns, all of the epidermis and part of the dermis is involved. Partial-thickness burns heal within 2 to 4 weeks and are known to leave major scarring. Considerably, full-thickness burns involve all of the epidermis and the dermis, and extend beyond the skin into subcutaneous fat, bone, muscle or tendon and for healing, may require significant reconstruction or amputation of the

injured limb (Grunwald & Garner, 2008; Sheridan 2005; Choi et al 2015; Dunpath et al 2016; Bittner et al 2015, Greenwood et al 2017).

Burn extent is a percentile measurement of the total body surface area burned which uses two modes; the Rule of Nines and the Lund and Bowder Methods to make estimation of burn extent of the injured site. The Rule of Nines method anatomically divides the adult body into sections of 9% or multiples of 9%. Since infants notably have larger heads and smaller legs than adults, the Rule of Nines is modified in their case by doubling the head percentile from 9% to 18% and decreasing each leg's percentile from 18% to 14%. Small scattered burns such as splash burns as a result of spilled hot liquids are represented by a 1% percentile of the patient's palms and fingers. However, the Lund and Bowder Method divides the human body into smaller segments with respect to change in surface area that is subject to age (Gomez & Cancio, 2007; ABLS, 2005; Hermans, 2005; Parasca 2018).

Burn location considerably develops problems for the injured patient during healing which may include edema. Facial edema may hinder the patient's eyes from opening and hindering them from sight recovery. If the burnt location is the perineum, obstruction to the urethra may be consequential which may require that the patient be fixed with a urinary catheter. For burns that occur over patient's joints, these hinder motion of the patient's limb, (Greenwood et al 2017; Timothy et al 2018; Tang et al 2014).

Burn injuries of the superficial and deep tissue nature create various pain mechanisms. Breslau et al (2002). They further note that pain management is of core concern for burn patients due to distress the pain causes. Pain In burn injury is caused by inflammation to the pathophysiological processes due to tissue and nerve injury caused by the burn Woolf and Thompson (1991). The patients thus feel pain at the area where the burn injury has occurred; in the form of allodynia and hyperalgelsia in surrounding tissues which are rather uninjured from the burn (S. Lo Vecchio et al 2015; Richardson & Mustard, 2009; Malefant and Pappilon 1996). Summer, Puntillo and Miaskowski (2007) further point out that the generation of persistent pain is due to pain sensory impulses undergoing amplification to painful stimuli such as wound debridements, inflammatory processes and infection.

2 BACKGROUND

Burn patients' care phase stretches from the time when the injury has been incurred to the time when the burn wound has healed completely. Most burn wounds are painful as a result of damage caused to the epidermis and dermis. However, the most painful burns are the superficial partial-thickness type due to the exposure of the sensory nerve endings caused by epidermal exposure. Pain arising from burn injury is usually intense at the moment when the injury has occurred, as well as during dressing change and debridement. Burn pain subsides when the nerve endings are protected from further exposure through the application of dressing, but spikes once again when the patient carries out physical activity such as during pain therapy.

Majority of burn patients require the administration of analgesics throughout the duration of burn care for the wound, for sleep and for therapeutic purposes. Burn patients are habitually pre-medicated for pain before manipulation of the injured site through the use of anesthesia to reduce burn pain (Moss 2004; Sheridan 2005; Grunwald & Garner, 2008; Ewings & Pollack, 2008, Gomez & Cancio, 2007; Hartford & Kealey, 2007).

The resultant pain of a burn injury is caused by direct stimulation and nociceptor injury which are located in the epidermis and dermis. Influences from the brain and peripheral stimuli are responsible for modulation of the impulse magnitude (Richardson & Mustard, 2009). Inflammatory responses preceding the burn leads to chemical irritations that sensitizes the nociceptors at the location of the burn injury. The location of the burn injury therefore remains sensitive and painful to stimuli, with primary hyperalgesia. Secondary hyperalgesia is defined as the change in sensitivity to the adjacent tissues at the site of the burn injury. Pain quality changes, as inflammatory response subsides, and the intensity of pain is variable, but is maximal in areas where skin loss has occurred. Insensitivity to pain is characteristic of severe burn injuries, which is resultant of nerve damage from the burn injury.

Pain management and pain alleviation is a critical element for burn patients. Gandhi (2010) asserts that different burn injuries are associated with different kinds of pain;

therefore, effective pain management is crucial for the overall outcome of treatment for a burn patient. Burn injuries cause pain for patients which call for therapeutic treatments to reduce the patient's suffering. However according to Raymond, Nielsen and Lavigne (2001), rehabilitation and re-epithalization processes only serve to worsen burn patients' pain.

Pain from muscular and skeletal injuries tends to recede as patients recover. Summer, Puntillo and Miaskowski (2007) remark that insufficient pain treatment for burn patients leads to lack of or poor compliance with physical and occupational rehabilitation therapy, pain progression and paresthesia. Yuxiang, Lingjun and Lu (2012) further opine that pain management associated with burn injuries is the first step of the treatment stage and it should be done dynamically.

According to Weddell (2004), Burn pains are characteristically unpredictable and their management is multifaceted. Researchers argues that in order for health care practitioners to be able to reduce the discomfort patients go through as a result of burn pain, there is need for them to comprehend the principles around analgesia and the significance of administering the right kind of treatment at the right time to counter the pain and further claims that when acute pain is inadequately addressed, problems such as pulmonary embolism may follow which in turn may compound the patient's recovery, further distressing and inconveniencing the patient. (Weddell 2004, Megnistu et al 2018)

Burn patients' pain relief has often been an intricate theme and the provision of analgesia has often been a hard sell unless given in post operative cases, this indecisive step is attributable to the complex nature of burn pain, Edward A. (2016). Notably, pain experiences depend both on the stimulus of the pain, as well as how the brain deciphers the messages sent to it. Such pain related elements vary from person to person and are dependable on a variety of situations. Jinshu Tang (2014). The British Media Association and the Royal Pharmaceutical Society of Great Britain (2004) states that, strong opioids such as morphine should therefore be used hand in hand with analgesia to relieve patients' burn related pain.

3 THEORETICAL FRAMEWORK

The effect of relaxation techniques during burn therapy on patients is explained by the Albert Bandura's theory self-regulation (Howard et al 2007; Mann et al 2013), which outlines that behavior plays a great role in the maintenance of one's health. I picked this theory because one of the key aspects of therapy is self awareness and from this model when one regulates their behavior through knowledge, they not only influence the outcome but also provide a concrete basis for desired action. This model enroutes how the reactions to pain can be influenced by cognitive structuring, therefore patients can be made to influence the experiences associated with the burn pain. Pivotal to the self-regulation theory is information, whereby, firstly, patients are divulged with information concerning the procedures applicable to wound treatment, secondly, the resultant pain that the patient is expected to feel from the treatment procedure and thirdly, the mechanism the patient can apply in order to cope with the painful experience. Information on coping mechanisms teaches the patient on how to deal with pain brought about by the burn wound as well as pain from procedures applied for treatment. Through the application of coping mechanisms, the patient is enabled to take charge of the process and in essence, the treatment runs its course smoothly. In administering the relaxation technique, the patient is able to deal with cases of anxiety attributed to treatment procedures. The more a patient is relaxed, the less anxious they will be, and therefore, the experience is considerably, less painful. (Bandura, A. 1991; Bandura A. 1988)

4 AIM AND RESEARCH QUESTIONS

The main aim of the study is to evaluate the pain faced by burn patients and to address the therapeutic pain management strategies applied by nurses in the alleviation of burn pain. The study is guided by two research questions:

1. What types of pain do burn patients' experience?
2. What approaches do nurses apply in the management of pain of burn patients?

5 METHODOLOGY

The method applied by the research is literature review. Hart (1998) defines literature review as a “thorough summary and critical analysis of the relevant available research and non-research literature on the topic under study”. The purpose of literature review as an applied method for the study is to provide the reader with relevant and current literature touching on the topic under study, and also provide a platform for justifying future research in the study scope. Good literature review consists of information gathered from various sources, is aptly written, and contains few to no inclinations of personal bias, it is also pivotal for flow of information and content readability. Furthermore, terminology is considerably significant, jargon should be minimal and citations are to be accurate throughout the review.

Two types of literature review in research include traditional or narrative literature review and systematic literature review. Traditional or narrative literature review involves summarizing and critiquing a body of literature to draw conclusions about a research theme. Traditional or narrative literature review is considerably selective in the literature material it uses for research, but the selection criterion for the materials is not presented exhaustively to the reader. Traditional or narrative literature reviews provides the reader with extensive background on a subject area and provide existent gaps in the presented knowledge, thus laying implication for new research, Cronin et al (2008).

Systematic literature review on the other hand, is more rigorous, compared to traditional or narrative literature review. Parahoo (2006), remarks that systematic literature review details the time frame within which the literature was sources as well as the methods of synthesis and evaluation.

5.1 Data Collection

Articles and journals used in the research were searched from Google scholar and other search engines like Academic Search Elite (EBSCO), Cinahl (EBSCOhost), PubMed, Sage, and other relevant online sources as well. It was imperative that the literature materials addressed the nature of the research theme, thus, therapeutic pain management and nursing care for patients suffering from burns. It was also significant that the articles and journals were medical in nature. Furthermore, the search for relevant literature utilized keywords respective to the research such as nursing care, burns, burn pain, pain management, burn pain therapy, Therapy, Pain Management, and Burns, wound care, treatment, pharmacologic. It is worth saying that some search engines upon loading the key words did not give desired results and thus was not included. In the inclusion criteria only articles with full access were considered and they should not be dated earlier than the year (2000)

DATABASE	KEY WORDS	FILTERS	HITS	SELECTED
Google Scholar	Therapy, Pain Management,Burns, wound care,treatment, pharmacologic	200-2018	17700	2
Cinahl EBSCOhost	Therapy, Pain Management, Burns, wound care, treatment, pharmacologic	2000-2018	8106	3
PubMed	Therapy, Pain Management, Burns, wound care, treatment, pharmacologic	2000-2018 (Free full Text)	50 (14)	2
Academic search	Therapy, Pain Man-	200-2018	10250	1

Elite (EBSCO)	agement, Burns, wound care, treatment, pharmacologic	(Full text)	(1718)	
SAGE	Therapy, Pain Management, Burns, wound care, treatment, pharmacologic	200-2018	560	1

Table 1.Database searches

Article 1	Bennet, M., Yuan, C. (2008) Clinical pain management. *Cancer Pain* 2nd Edition Pg. 104-22
Article 2	Dahl, O. (2013). *Memories of Pain, Adaptation to Life and Early Identification of Stressors in Patients with Burns*. Karolinska Institutet. Stockholm.
Article 3	De Jong, A., Middelkoop, E., Faber, A. and Van, L. (2007). Non-pharmacological nursing interventions for procedural pain relief in adults with burns: A systematic literature review. *Burns*. Vol 33(7).811-827.
Article 4	Griggs, C. *et al.* (2017) 'Sedation and Pain Management in Burn Patients', *Clinics In Plastic Surgery*, 44(3), pp. 535–540. Doi: 10.1016/j.cps.2017.02.026.
Article 5	Kiplagat, M. (2013). *Pain management practices during wound care in patients with moderate to major burn injuries*, Kenyatta national hospital, Kenya. University of Nairobi.
Article 6	Lekule, J.A. (2013). A burned child's pain during treatment as assessed by the child, caregiver and the nurse. Muhimbili University of Health and Allied Sciences.
Article 7	Lin, L. A., Bohnert, A., Jannausch, M., Goesling, J., & Ilgen, M. A. (2017). Use of non-pharmacological strategies for pain relief in addiction treatment patients with chronic pain. *The American journal on addic-*

	tions, *26*(6), 564–567. doi:10.1111/ajad.12600
Article 8	Richardson, P., and Mustard, L. (2009). The management of pain in the burns unit. *Burns*; 35:921 - 36.
Article 9	Senarath-Yapa, K, & Enock, S. (2009). Management of burns in the community. *Journal of wounds United Kingdom*, *5*(2), 38-48.

Table 2.List of selected articles

Article 1: It shaded more light to patients' pain inadequacies before wound procedures with regard to pharmacologic treatment. It established that for weak analgesic to have significant effect it has to be administered together with an opioid

Article 2: This article described the type of pain burn patients go through, the pain intensity and how pain can affect ones activity of daily living.

Article 3: This article tailored nurses' intervention techniques used in te management of pain and specifically recommended non-pharmacological methods.

Article 4: It encouraged the adaptation of multy modal treatment approach to burn pain management as it indicated that relying only on some treatment plans may incur more harm than good to the patient. It also recommended that a constant pain assessment should be carried out across all the burn injury phase and try to understand its pathophysiological and pharmacological effects.

Article 5: outlined the clinical pain management practices in wound care and recommended the innovation of combining pharmacologic and non-pharmacologic techniques.

Article 6: Assessed pain management in children with burn injuries and suggested the best pain relief strategy.

Article 7: Its aim was to find the need to better understanding of pain treatment decision making among patients struggling with addiction without getting the situation out of

control. It concluded that it is best to use non-medication in such cases but still gave opioids.

Article 8: The article ascertained that good pain control strategy depends on assessment, issuance of analgesic and regular evaluation

Article 9: the aim of was to understand the mechanism of burn injuries and and their aetiology

5.2 Data Analysis

Data analysis for the current study was carried out using literature and theory backed inductive content analysis, which is the derivation of data from various sources such as articles and journals and interpreting them understandably. According to Mayring (2007), the initial step in content analysis is the explicit definition of source materials. Findings from sources addressing the theme were categorically assessed in order to present the information in a meaningful and understandable way.

Interpretation in content analysis involves three modes which involve summary - data reduction, explication - finding further source materials and
, Mayring (2007). In this study, data structuring and filtering was significant to provide thematic analysis in line with the research question as well as objective categorization; thus types, of pain experienced by burn patients, and the pain management approaches applied by nurses when caring for patients suffering from burns. Mayring (2007) remarks that data structuring makes possible, the reconstruction of the analysis procedure and affirms the reliability and comparability of the findings, furthermore, categorization can also be revised subject to the source material.

The use of inductive content analysis in the study first involved breaking down the data so as to explain the research. Data was prepared by collecting relevant information from specific sources that included published medical journals. The data was then grouped

and organized into categories that addressed the concepts in the research. Finally, the findings were reported categorically with regard to therapeutic pain management and nursing care for patients suffering from burns. The findings were grouped and presented objectively into two sets; thus pain experienced by burn patients and pain management methods. Following Mayring (2007), the categories developed in analysis were further explained to guarantee constancy and reasonability.

5.3 Ethical Concerns

The current study adhered to ethical considerations, more specifically the acknowledgement of work that was not the author' own (Kour, 2014). Ethical principles that involved beneficence, justice and respect were utmost in carrying out the research. When doing this work, the author tried his best to treat the literatures reviewed accurately and fairly not to be bias or criticize them. Though some materials were not answering my research question, I chose to use data that was out in the public domain to mean I would look more in to other materials other than contacting the researchers for consent or for more information since this may breach the ethical code. I also did not question or doubt the skills of the researchers. All these ethical considerations were prioritized when carrying out the study. It was paramount that blatant plagiarism, fabrication and falsification of material from the selected literature sources be avoided (Kour, 2014). Furthermore, the author ensured that there were no instances of partisan views in carrying out the study.

6 RESULTS

This segment presents the findings from the literature of articles reviewed. The findings are presented categorically as per the research objectives in the overview of the research question.

6.1 Types of Pain Experienced by Burn Patients

According to Dahl (2013) (Article 2), burn patients experience pain in different ways. He indicated that pain experienced by burn patients tends to aggravate with healing of injured tissues. He categorize the types of pain into (1) breakthrough pain, (2) rest pain, (3) psychogenic pain and (4) procedural pain which are considered intense and are triggered by activity to injured area such as wound cleaning and dressing. In his research, he found out that pain from burns was directly as a result of the burn wound and the pain was consistent all through the treatment period. Patients in Dahl's study also recorded immobility during bed rest whereby the burn pain was discomforting to a large extent. Pain from burns presented a wide range of variation in relation to intensity and it gradually reduces during healing process.

Background pain can be defined as an underlying pain from a previous injury and is ongoing with or without procedural activities; this type of pain can be managed by giving long-acting analgesic agents with the aim of limiting breakthrough pain episodes. Procedural pain is experienced during dressing of the burn wounds and was considered to be the most intense during the treatment period. Patients in the remarked dressing pain to be caused by adherence of bandages to wounds that freshly exposed wound surfaces when they were removed as well as bleeding and festering sores and blisters which occurred as a result of the burn Dahl (2013) (Article 2). Breakthrough pain is a more intense occasional pain associated with activities of daily living, the best example being pain experiences faced by burn patients as a result of wound hypersensitivity during bathing and showering at varying water temperatures. The other types of pain are noci-

ceptive and neuropathic pains which are attributed to trauma at the nerve endings, chronic pain that lasts for more than six months and persists even after the wound has healed. Cornelia Griggs (2017) (Article 4), Richardson and Mustard (2009) (Article 8) Rest pain which is continuous and dull and finally psychogenic pain which the patient anticipates in the absence of mechanical stimulation.

Predominantly, the cause of burn pain is tissue damage. Lekule (2013) (Article 6) argues that dressing change is painful, albeit necessary for the treatment of burn wounds. Senarath-Yapa & Enock (2009) (Article 9) remark that wound dressing procedures are a regular occurrence in burn care; hence painful experiences are similarly commonplace. The frequency of dressing-related pain experiences therefore calls for nurses to have adequate knowledge and information on pain assessment and management in order to mitigate the intensity of pain during dressing procedures.

Similarly, Kiplgat (2013) (Article 5) study arrived at a conclusion that patients with moderate burns were administered with procedures that included dressings, physiotherapy, and debridement. Consequently, according to the study, Kiplagat (2013) (Article 5) indicated that in manner of hierarchy, burn wound dressing was the mostly administered procedure, followed by physiotherapy and finally debridement. Majority of patients further reported an increase in pain experiences during treatment procedures. Additionally, the intensity of pain between patients varied in such manner that patients with major burn wounds experienced more pain compared to patients with minor burn wounds (Kiplagat, 2013) (Article 5).
However, the study by Lekule (2013) (Article 6) indicated that there has been an inconsistency with pain management which is mostly attributed to inexperience among nurses and anxieties with regard to analgesic administration.

6.2 Approaches Nurses Apply in Management of Burn Pain

A study done by Kiplagat (2013) (Article5) on pain management practices during wound care in patients addressed procedural pain management through the application

on pharmacologic treatment and revealed that patients who were on Paracetamol monotherapy reported an increased intensity of pain during burn wound care compared to those on morphine. Similarly, the study also revealed that patients who were on Paracetamol administration only experienced more pain during burn wound procedures than patients who were on a combination of Paracetamol and morphine. However, the study reported that the difference between the groups did not contain any statistical significance.

The study by Kiplagat (2013) (Article 5) also indicated that burn patients who were administered with pharmacologic treatment reported less pain than patients who were administered with non-pharmacologic treatment. Further indicated by the Kiplagat study was that there was no statistically significant difference between patients who were administered with both pharmacologic and non-pharmacologic treatment and those patients who were administered with either of the two modes of treatment. The study also showed that the administration of non-pharmacologic methods to pain mitigation is effective in the management of burn pain and that distraction as a burn pain management technique was regularly applied followed by reassurance and counseling. The findings concurred with a study carried out on select hospitals in Netherlands by De Jong et al. (2007) (Article 3) which surmised that non-pharmacologic techniques were appropriate in the management of burn patient's procedural pain.

The study attributed the increase of patient pain to inadequacies with regard to pain management before wound procedures on burn patients. With regard to pharmacologic treatment, the study established that a weak analgesic administered in combination with an opioid has a synergistic effect; a finding that augured with Benet and Yuan (2008) (Article 1) recommendation of increasing opioid doses until burn patients are relieved of pain albeit without presenting the patients with unbearable side effects or equally, by combining a weak analgesic with an opioid.

6.3 Therapeutic approaches to pain management

According to oxford living dictionary, therapy is a treatment intended to relieve or heal a disorder. It also defines therapeutic as having a good effect on the body or mind and contributing to a sense of well-being.
Lin et al (2017) (Article7) indicates that therapy may involve a procedure, medication or both as long as the desired goal is achieved.

7 DISCUSSION

Pain can either be physical or non-physical. Physical pain is associated with damage to body tissues and hurts; it can be categorized into (1) neuropathic, (2) nociceptive. The physical pain can further be sub divided into (1) breakthrough pain which is short term, undulating and can sometimes be severe, (2) rest pain which is considered as continuously dull background pain, (3) psychogenic pain which the patient anticipates in the absence of mechanical stimulation, and (4) procedural pain which is considered intense and is triggered by activity to injured area such as wound cleaning and dressing. Schneider et al. (2006)

7.1 Pharmacological Pain Management

Burn injuries are majorly treated pharmacologically by using agents such as anesthetics, opioids, nonsteroidal anti-inflammatory drugs, sedatives and anxiolytics. During painful procedures to treat severe burn injuries, anesthesia is the first choice of pain management for the patient's wounds Wiechman (2016). Tobias and Deshpande (2005) propose that there are a number of factors that should be considered when contemplating the administration of pharmacological treatment to a burn patient. These factors include duration of the treatment procedure, the scale of pain that is attributed to the treatment procedure, the age of the patient, accessibility of pharmacological agents and tech-

niques, and the skill of personnel responsible with administering and monitoring the pharmacological effects of agents used (Tobias & Deshpande, 2005). In relation to that, Zor et al. (2010) indicates that combining pharmacological agents such as dexmedetomicline, ketamine and tramadol is appropriate for pain management in adults.

7.2 Non-Pharmacological Pain Management

According to Topku and Findik (2012), background or procedural burn pain can be treated through non-pharmacological strategies among which they include, foremost, understanding the condition that causes the pain, cutaneous stimulation, relaxation, distraction, bio-feedback, acupuncture, and hypnosis. Topku and Findik (2012) further assert that non-pharmacological techniques aim at reducing the burn patient's perception of pain. For burn patients, the control system that engages the transmission of painful stimuli to the brain is through the administration of non-pharmacological treatment, suppressed.

Wrights and Drummondt (2000) are of the view rapid induction analgesia as a non-pharmacological treatment method positively impacts patient's pain perception, relaxation and anticipatory anxiety during the duration of burn injury treatment and care. Non-pharmacological techniques provide the patient with a means of active participation in the treatment process by reducing the anxiety that predisposes the patient's painful experience. However, despite the many studies carried out on pain management on burn patients, results indicate that these studies have mainly addressed the pharmacological strategies and besides virtual reality, music therapy and relaxation techniques, there is still a deficiency of studies centered further on non-pharmacological techniques. Wiechman et al. (2009) remarks that for burn treatment to be considered effective especially non-pharmacologic treatment, the approach should be administered hand in hand with pharmacological treatment.

7.3 Forms of Non-Pharmacologic Pain Management

The variety of coping mechanisms to burn pain has been categorized into two groups which largely include avoidance and approach. Avoidance is generally a technique that focuses on distracting the patient from pain experienced by the burn injury, while approach centralizes on the patient's desire to seek out information on treatment procedures for the burn wound, Kipping B. et al. (2012). The primary difference between the two categories is a matter of relinquishment of control with regard to treatment procedures. In avoidance, the health care professional carries out the treatment procedure without the patient's participation while in approach, the patient participates by looking into the nature and/or severity of their burn injury. Martin-Herz et al. (2000)

Avoidance therapy interventions are psychological distractions from the pain experienced by a patient. As outlined by Multiple Resource in relation to the Theory of Attention, the severity of pain may be reduced when the care professional focuses the patient towards stimuli that are not associated with their pain. Avoidance therapy applies four basic techniques which include distraction, virtual reality, hypnotic analgesia and lastly, imagery. However, no one technique has been noted as the primary mode of therapeutic pain management in so far as burn injuries are concerned hence the necessity to administer pharmacological in combination with non-pharmacological treatment (Wiechman A.S et al. 2009; Wiechman .S. et al 2016;Wickens et al. 2002)

Distraction as a pain intervention technique is commonly applied when the patient is a child. However, adults can similarly apply distraction as a pain management technique, though the types of distractions between the two will differ, subject to age. In the case of children, games such as counting, songs and story-telling are more appropriate for their age group. However, with relation to adults, distraction techniques require that the care professional digs deeper into his/her creative side, though sometimes, listening to music or communication between the patients and care professional would suffice. Kipping et al. (2015), Lee faucher et al. (2006).

Hypnotic analgesia alters the patient's state of conscience and makes them receptive to suggestions made by the care professional, altering their perceptions and increases their capacity for pain dissociation. It is espoused that hypnosis is effective in patients with burn injuries since it enables them to change their acuity to painful experiences, hypnotic analgesia is an appropriate therapeutic technique for pain management in burn patients because through deep breathing exercises, posthypnotic suggestions, and narrowed attentions, firstly, the intense nature of burn pain will tend to motivate them to participate in the exercise, secondly, the behavioral regression after burn injury pushes patients to be willing to be cared for, thirdly, patients experience dissociative responses which may moderate hypnotizability, and lastly, to counter pain anxieties, hypnosis can be scheduled to be performed before the patient undergoes a treatment procedure that stimulates pain. (Wiechman 2016; Lee faucher et al 2006)

According to the Agency of Health Care Policy and Research, imagery can be used to counter patient pain in that the patient is engaged in imagery scenes with the aim of taking their concentration away from the pain. The integrative nature of imagery renders the patient to be consumed in the visual stimulations, preferred sounds and pleasant sensations, all towards the therapeutic goal of taking their focus away from the pain. During wound care, which can sometimes be painful for the patient, the indulgence in these pleasantries might present them with a less intense painful experience. However, there exist uncertainties on whether imagery can explicitly reduce pain through affecting the sensory element of pain, Lee faucher et al (2006), Karen Arane et al (2017). Similarly, virtual reality in essence involves immersing the patient into a computer generated atmosphere. Patients can engage with the computer generated environment and as such, take their attention away from pain they experience during wound care (Wiechman et al., 2009); Pattereson et al,.2004)

Cognitive Behavioral Therapy (CBT) is another therapeutic technique applied for pain management through changing patient's thinking and behavior. Cognitive Behavioral Therapy applies the use of diversion, coping skills and mechanisms, relaxation and provision of information in order to change the patient's perception with regard to the painful experience. Through the administration of Cognitive Behavioral Therapy, the patient's pain anxieties can be managed by making the recognition that care procedures

for the wounds will cause pain, stopping the anticipation of pain by the application of active efforts to ensure the anticipatory thought process is blocked, and by distracting the patient's attention to pain through diversion to another thought (Borza L. 2017). Similarly to CBT, mindful meditation is another non-pharmacologic technique that amalgamates cognitive restructuring, attention and relaxation whereby the patient is urged to pay attention to the present. However, mindful meditation has not yet been introduced in the therapeutic pain management of burn patients (Williams et al., 2015).

7.4 Physiological and Psychological Effects of Pain

According to Woo (2010), increased stress level and heightening of anxiety have been posited to have an effect on thresholds of pain by lowering it. This, he postulate, is because the person becomes keen on pain inducing situations and pain inducing stimulants. Woo (2010) asserts that the result of this is normally a never ending cycle of stress and increased pain, much to the detriment of the patient with the pain resultant injury.

Aaron et al (2001) indicates that for patients with pain injuries such as burn patients, there is an association between pain and instances when the burn wound is dressed and further stresses that such instances of pain can be predicted by the patient's anxiousness during wound dressing. This assertion is supported by Woo (2010) who carried a study of 96 patients to measure the correlation between pain and anxiety. Woo (2010) concluded that anxiety and pain of wounds by burn patients had a positive correlation and patients who experienced high levels of anxiety similarly experienced high levels of pain during burn injury dressing than patients whose anxiety levels were significantly low.

It is suggested that the impact of pain on the burn patient is the development of sleep loss, lack of appetite, dependence, depression and immobility (Vuolo, 2009). Solowiej et al. (2009) observes that there is considerable growth of literature that addresses the relationship between anxiety and stress and delay in healing of patient wounds. Rich-

ardson and Davies (2011) additionally indicate that increased stress levels initiate an increase of cortisol levels, which is detrimental to the patient's immunity and inflammatory responses. Woo (2010) attributes the release of vasopressin and glucocorticoid to psychological stressors which are a result of wound pain. The release of these two agents hinders oxygen and nutrient delivery. Vasopressin is characteristically, a vasoconstrictor, while glucocorticoid detriments cell regeneration, immune responses and growth factors (Woo, 2010).

The inadequacy of pain management when administering treatment to burn wounds can have lasting effects on burn patients, Bittner (2016). The patient may subsequently keep distance from further dressing changes to the burn wound as well as lose confidence in the ability of the care team to provide painless dressing due to the anxiety that may be harbored by the patient. Similarly, ineffective management of pain in the short and long term renders patients to develop non-adherence to hospital treatment. Woo, (2010) Choiniere (2001)

According to Fletcher (2010), ineffectiveness in pain management renders patients to develop anticipatory pain, whereby they tend to remember procedural pain during treatment of injuries and thus they develop coping strategies which are aimed at preventing further painful experiences during wound dressing. Patients who have experienced pain during previous injuries and have developed pain anticipation have a tendency of experiencing intensified pain during latter wound treatment especially during instances when the wound requires dressing. The heightened state of anxiety experienced by patients therefore serves to elevate the intensity of pain

7.5 Nurses Role in Pain Management

Nurses are frequently faced with the aspect of pain when dealing with burn patients. Nurses are however, faced with the probability of causing pain whenever they care for burn patients, especially when they perform dressing change, cleaning and debriding the burn wound, while at the same time being tasked with provision of pain relief (Lee Fau-

cher 2006). Pain management research is highly prioritized, and for nurses working in burn treatment, pain management is considered to be quite unsatisfactory. Nurses are centrally placed in pain management considering they are in constant interaction with burn patients and are therefore pivotal in pain alleviation (Brychta & Magnette, 2011). Nurses are consistent contributors to pain management as they measure and evaluate burn patients' pain and further treating the pain through pharmacologic and non-pharmacologic methods (Brown N, J. et al, 2014). It is however important to mention that patients are prone to pain experiences despite the administration of pharmacologic treatments. Furthermore, combination of pharmacologic and non-pharmacologic treatment modes exhibit positive pain mitigation. Additionally, despite the effective nature of pain management through the combination of both methods, it is argued that nurses can independently administer non-pharmacologic methods to mitigate patients' pain (Lin et al 2017)

There are myriad non-pharmacologic methods to counter pain in burn patients and various factors needs to be considered when nurses uses non-pharmacological methods to relieve pain in a patient. These criteria include, among others, simplicity, easy to learn, immediate applicability and minimal expenditure of time and effort during administration. Simple relaxation technique to burn pain mitigation is touted to meet the stated criteria since simple relaxation benefits the burn patients through ease of application compared to the time need to apply the more intricate non-pharmacologic techniques (Lee Faucher et al 2006), (Cornelia Griggs et al 2017).

Nurses are notably, the coordinators of care for burn patients. However, care for burn patients calls for multidisciplinary team alliance in order to result to optimal healing outcome. Greenfield (2010) remark that burn care requires vast knowledge on the physical effects of burn wounds as well as considerable rehabilitative and psychosocial skills. Burn patients begin their rehabilitative process from the moment that they are brought in for care and lasts long after they have been discharged from hospital premises with the singular goal of restoration to the state they were in before they were inflicted with the burn wounds. Williams (2009) note that patients' psychosocial and social care is achieved through constant nurse's input together with both patient and family where the common denominator is inarguably, communication.

8 CONCLUSION

According to the findings of the present study, burn patients' experiences with pain majorly revolve around treatment procedures. The intensity of pain experienced during dressing and debridement however, varied with the degree of patient's wound whereby the level of tissue damage varied. However, the findings also indicated that nurses fell short with pain management techniques more so, beyond the dependent and standardized application of analgesic methods. Equally, the findings indicated that the application of non-pharmacologic methods had less positive effect to pain management compared to pharmacologic methods. The ineffectiveness of non-pharmacologic techniques was also pegged on inadequacies of nurses with regard to the administration of non-pharmacologic techniques. Relaxation and distraction techniques were frequently applied as non-pharmacologic methods to manage patients' pain, which were considered effective as their administration relieved the patient of anxieties during pain related treatment procedures.

9 LIMITATION OF THE STUDY

The study was limited on two fronts. Foremost, the study was not financially supported therefore the extent of study was held within personal budgetary demarcation and where it demanded for further financial input, such as requiring payment in order to have access to a literature resource, the resource was discounted.

Secondly, the present study is a relatively limited study, which is composed only of literature review and data for the study is limited to secondary sources. For a comprehensive study, it would have required that the study further sought the interaction of nurses practicing in burn units in order to gain opinions on the research question and to address the objectives of the study thus, pain experienced by burn patients and the strategies

employed by nurses in order to manage patients' pain. If I was to do this study again I would rather not do a review and also I would also do more about the non-physical pain. Finally, it was a challenge to do the work and remain focused on pain since one could easily be swayed into wound care and procedures as there is a very slim line between the two.

10 RECOMMENDATIONS

The study in addressing the pain management strategies applied with regard to burn patients noted a lack of capacity for nurses to appropriately administer pain management due to skill and experience inadequacies. In light of this, the study recommends that studies be carried out to determine the factors hindering nurses' inadequacies in burn units. Furthermore, the study's findings noted that the non-pharmacologic methods applied by nurses majorly revolved around only two techniques, thus relaxation and distraction, but since the study was limited in comprehensiveness, it falls short of generalizability, therefore it makes the recommendation for more studies be carried out in order to determine the dependence of these two techniques, and if so, explore the variables surrounding the select application of non-pharmacologic pain management techniques.

REFERENCES

D'Asta, F. *et al.* (2014) 'Introducing the Advanced Burn Life Support (ABLS) course in Italy', *Burns (03054179)*, 40(3), pp. 475–479, doi: 10.1016/j.burns.2013.08.004.

Aaron, L.A., Patterson, D.R., Finch, C.P., Carrougher, G.J., and Heimbach, D.M. (2001), the utility of a burn specific measure of pain anxiety to prospectively predict pain and function: a comparative analysis. *Burns 27(4):* 329 - 34.

ABLS (2005). Advisory Committee Advanced Burn Life Support Providers Manual. Chicago, IL: *American Burn Association*: 14 - 22, 42 - 5, 70 - 6.

Bandura, A. (1991). Social cognitive theory of self-regulation Organizational Behavior and Human Decision Processes, 50, 248-287

Bandura, A. (1991). Self-regulation of motivation through anticipatory and self-reactive mechanisms In R. A. Dienstbier (Ed.), Perspectives on motivation: Nebraska symposium on motivation (Vol. 38, pp. 69-164). Lincoln: University of Nebraska Press.

Bandura, A. (1988).Self-regulation of motivation and action through goal systems In V. Hamilton, G. H. Bower, & N. H. Frijda (Eds.), *Cognitive perspectives on emotion and motivation* (pp. 37-61). Dordrecht: Kluwer Academic Publishers.

Barber, J. (1996). A brief introduction to hypnotic analgesia. In: Hypnosis and Suggestion in the Treatment of Pain, *Barber J (Ed)*, WW Norton & Company; New York. p.3.

Bennet, M., Yuan, C. (2008) Clinical pain management. *Cancer Pain* 2nd Edition Pg. 104-22

Borza L. (2017). Cognitive-behavioral therapy for generalized anxiety. Dialogues in clinical neuroscience, 19(2), 203-208.

British Medical Association and the Royal Pharmaceutical Society of Great Britain (2004). *British National Formulary 47*. London: BMA/RPSGB.

Brychta, P., Magnette, A. (2011). European practice guidelines for burn care. The Hague: *European Burns Association*. http://www.euroburn.org/userfiles/users/36/pdf/guidelines/EBAGuidelinesBurnCareVersion1.pdf.

Carnwell, R., Daly, W. (2001). Strategies for the construction of a critical review of the literature. *Nurse Educ Pract* 1: 57 - 63.

Carr, E.C.J., and Mann, E.M. (2000). *Pain: Creative Approaches to Effective Management.* London: Macmillan.

Choinière, M., Melzack, R., Girard, N., Rondeau, J., and Paquin, M.J. (1990). Comparisons between patients' and nurses' assessment of pain and medication efficacy in severe burn injuries. *Pain*; 40: 143 - 52.

Choiniere, M. (2001). Burn pain: a unique challenge. *Pain clinical updates* 9: 1 - 4.

Colling, J. (2003). Demystifying the clinical nursing research process: the literature review. *Urol Nurs* 23(4): 297 - 9.

Cronin, P., Ryan, F., and Coughlan M. (2008). Undertaking a literature review: a step-by-step approach. *British Journal of Nursing*, Vol 17, No 1.

Dahl, O. (2013). *Memories of Pain, Adaptation to Life and Early Identification of Stressors in Patients with Burns*. Karolinska Institutet. Stockholm.

Dauber, A., Osgood, P.F., and Breslau, A.J. (2002). Chronic persistent pain after severe burns: A survey of 358 burns survivors. *Pain Med*; 3:6 - 17.

De Jong, A., Middelkoop, E., Faber, A. and Van, L. (2007). Non-pharmacological nursing interventions for procedural pain relief in adults with burns: A systematic literature review. *Burns*. Vol 33(7).811-827.

Eller, L.S. (1999). Guided imagery interventions for symptom management. *Annu Rev Nurs Res*; 17:57.

Ewings, E.L., and Pollack, J. (2008). Pediatric upper extremity burns: outcomes of emergency department triage and outpatient management. *J Burn Care Res*; 29(1):77 - 81.

Fletcher, J. (2010). Managing wound pain during application and removal of dressings. *Br J Nursing 19(20):* S4 - S6.

Gandhi, M. (2010). Management of pain in children with burns. *International Journal of Pediatrics*. doi: 10.1155/2010/825657.

Gomez, R., and Cancio, L.C. (2007). Management of burn wounds in the emergency department. *Emerg Med Clin North Am*; 25(1):135 - 46.

Greenfield, E. (2010). The pivotal role of nursing personnel in burn care. *Indian Journal of Plastic Surgery Supplement*. 43, 94 - 100.

Grunwald, T.B., and Garner, W.L. (2008). Acute burns. *Plast Reconstr Surg*; 121:311e-9e.

Hart, C. (1998). *Doing a Literature Review*. Sage Publications, London.

Hartford, C.E., and Kealey, G.P. (2007). Care of outpatient burns. In: Herndon DN, Jones JH, eds. *Total Burn Care*. Philadelphia, PA: WB Saunders; 67 - 80.

Haythronthwaite, J.A., Lawrence, J.W., and Fauerbach, J.A. (2001). Brief cognitive interventions for burn pain. *Ann Behav Med* 23(1): 42 - 49.

Hermans, M.H. (2005). A general overview of burn care. *Int Wound J*; 2:206 - 20.

Judkins, K. (1998). Pain management in the burned patient. *Pain Reviews;* 5: 133 - 146.

Kiplagat, M. (2013). *Pain management practices during wound care in patients with moderate to major burn injuries*, Kenyatta national hospital, Kenya. University of Nairobi.

Kour S. (2014). Ethical and Legal issues in Educational research. *Indian Journal of Applied Research*, 4(6).

Landolt, M.A., Marti, D., Widmer, J., and Meuli, M. (2002). Does cartoon movie distraction decrease burned children's pain behavior? *J Burn Care Rehabil*; 23:61.

Latarjet, J., and Choinere, M. (1995). Pain in burn patients. *Burns;* 21: 5, 344 - 348.
Latarjet, J. (2002). The management of pain associated with dressing changes in patients with burns. *EWMA J 2(2):* 5 - 9.

Lekule, J.A. (2013). A burned child's pain during treatment as assessed by the child, caregiver and the nurse. Muhimbili University of Health and Allied Sciences.

Leventhal, H., Johnson, J.E. (1983). Laboratory and field experimentation, development of a theory of self-regulation. In: Woolridge, P.J. (ed.), *Behavioral science and nursing theory*, St. Louis: Mosby: p.189 - 262.

Madjar, I. (1998). *Giving comfort and inflicting pain*. Edmonton: Qual Institute Press; p. 119 - 50.

Malefant, A., Forget, R., and Pappilon, J. (1996). Prevalence and characteristics of chronic sensory problems in burns patients. *Pain*; 67:493 - 500

Mann, T., de Ridder, D., & Fujita, K. (2013), Self-regulation of health behaviour: Social psychological approaches to goal setting and goal striving. *Health Psychology*, *32*(5), 487-498.
http://dx.doi.org/10.1037/a0028533

Martin-Herz, S.P., Thurber, C.A., and Patterson, D.R. (2000). Psychological principles of burn wound pain in children. II: Treatment applications. *J Burn Care Rehabil*; 21:458.

Marvin, J.A., Carrougher, G., Bayley, E., Knighton, J., Rutan, R., and Weber, B. (1992). Burn nursing Delphi study: Pain management. *J Burn Care Rehabil*; 13(6): 685 - 94.

Mayring, P. (2003). Qualitative Content Analysis – Backgrounds and Techniques. Weinheim: Beltz Verlag / Deutscher Studien Verlag.

Mayring, P. (2007). Qualitative Content Analysis: In Flick, Uwe; Kardorff, Ernst von; Steinke, Ines (eds.), Qualitative Forschung – Ein Handbuch. Reinbek: Rowohlt Taschenbuch Verlag GmbH, pp.468 - 475.

Melzack, R. (1996). *The Challenge of Pain.* Penguin, London.

Meyer, R.P. and Campbell, J.N. (1981). Myelinated nociceptive afferent account for hyperalgesia that follows a burn to the hand. *Science*; 213:1527 - 9.

Moss, L.S. (2004). Outpatient management of the burn patient. *Crit Care Nurs Clin North Am*; 16(1): 109 - 17.

Nowlin, A. (2006). The delicate business of burn care. *RN*; 69 (1):52 - 4, 56 - 7.

Parahoo, K. (2006). *Nursing Research - principles, process and issues*. 2nd edn. Palgrave, Houndsmill.

Patterson, D.R. (1996). Burn Pain. In: Hypnosis and Suggestion in the Treatment of Pain, *Barber J (Ed)*, WW Norton & Company. New York. p.267.

Patterson, D.R. (1992). Practical applications of psychosocial techniques in controlling burn pain. *J Burn Care Rehabil*; 13(1): 13 - 8.

Patterson, D., Hoflund, H., Espey, K., & Sharar, M. (2000). Pain management. Philadelphia, PA: Lippincot, Williams & Wilkins.

Patterson, D.R., Tininenko, J.R., Schmidt, A.E., and Sharar, S.R. (2004). Virtual reality hypnosis: a case report. *Int J Clin Exp Hypn*; 52:27.

Raymond, I., Nielsen, T.A., and Lavigne, G. (2001). Quality of sleep and its daily relationship to pain intensity in hospitalized adult burn patients. *Pain*; 92:381 - 8.

Richardson, C., and Davies, S. (2011). Psychological mechanisms of pain in acute and chronic wounds. In: Upton D ed. *Psychological Impact of Pain in Patients with Wounds*. Wounds UK London: 1 - 18.

Richardson, P., and Mustard, L. (2009). The management of pain in the burns unit. *Burns*; 35:921 - 36.

Schneider, J.C., Harris, N.L., El Shami, A., Sheridan, R.L., Schulz, J.T., Bilodeau, M.L., and Ryan, C.M. (2006). A descriptive review of neuropathic-like pain after burn injury. *J Burn Care Res* 27(4): 524 - 528.

Senarath-Yapa, K, & Enock, S. (2009). Management of burns in the community. *Journal of wounds United Kingdom*, *5*(2), 38-48.

Sheridan, R.L. (2005). Outpatient burn care in the emergency department. *Pediatr Emerg Care*; 21:n449 - 56.

Solowiej, K., Mason, V., and Upton, D. (2009). Review of the relationship between stress and wound healing: part 1. *J Wound Care 18(9):* 357 - 66.

Summer, G.J., Puntillo, K.A., and Miaskowski, C. (2007). Burn injury pain: the continuing challenge. *J Pain*; 8:533 - 48.

Thurber, C.A., Martin-Herz, S.P., and Patterson, D.R. (2000) Psychological principles of burn wound pain in children. I: theoretical framework. *J Burn Care Rehabil*; 21:376.
Tobias, J., and Deshpande, J. (2005), *Paediatric pain management for primary care*, 2nd Edition 183 - 228

Topcu, R., and Findik, W. (2012). Pain relief connections. *Journal of Pain Management Nursing*, *13*(1), 1 - 63.

Vuolo, J.C. (2009). Wound-related pain: key sources and triggers. *Br J Nursing 18(15):* S20 - S25.

Weddell, R. (2004). Improving pain management for patients in a hospital burns unit. *Nursing Times*; 100: 11, 38 - 40.

Wickens, C.D., Helleberg, J., and Xu, X.(2002).Pilot maneuver choice and workload in free flight. *Hum Factors*; 44:171.

Wiechman, A.S., Patterson, D.R., and Sharar, S.R. (2009). Pain management in patients with burn injuries. *Int Rev Psychiatry*; 21:522.

Williams, H., Simmons L.A., Tanabe P. (2015). Mindfulness-Based Stress Reduction in Advanced Nursing Practice: A Non-pharmacologic Approach to Health Promotion, Chronic Disease Management, and Symptom Control. *J Holist Nurs*; 33:247.

Williams, C. (2009). Successful assessment and management of burn injuries. *Nursing Standard*. 23(32), 53 - 62.

Woo, K.Y. (2010). Wound-related pain: anxiety, stress and healing. *Wounds UK 6(4):* 92 - 8.

Woolf, C.J., and Thompson, S.W. (1991). The induction and maintenance of central sensitization is dependent on N-methyl-D-aspartate acid receptor activation: Implication for the treatment of post injury pain hypersensitivity states. *Pain*; 44:293 - 9.

Wrights, B. and Drummont, P. (2000). Rapid Induction Analgesia in alleviating procedural pain in burn care: *Burns* (26-3) 275 - 282.

Yates, J. (2011). Patterns of scald injuries in children: has anything changed? *Irish Medical Journal*. 104, 9, 263 - 265.

Yuxiang, L, Lingjun, Z, and Lu, T. (2012). Burn patients' experience of pain management: a qualitative study. *Burn*; 38:180 - 6.

Zor F *et al.* (2010) 'Pain relief during dressing changes of major adult burns: ideal analgesic combination with ketamine', *Burns (03054179)*, 36(4), pp. 501–505. doi: 10.1016/j.burns.2009.08.007.