



A Survey of Wound Care in a Surgical Department in an Urban Clinical Setting in Northern Part of Nigeria

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Abstract: Objective: The purpose of this study was to identify, quantify the demographic, wound characteristics and treatment objectives of patients admitted in the surgical department of this tertiary hospital. Study design: A pre-prepared questionnaire was used for data collection. The questions were related to patient socio-demographic characteristics and their knowledge and attitude towards the wound management. The data collection took place from October 1st to December 31st 2016. Result: Data from 67 patients (59.7% male; 40.3% female) were collected. 29.9% were between 20-30 years of age, 19.4% were alcoholics and 28.4% were traders. Majority of the wounds were caused by automobile accident (46.3%), mostly located on the legs (31.3%), majorly close wounds (85.1%) with duration of 7 days. Almost all the patients experienced wound pain (95.5%) located on the wound area (52.2%), 23.9% found it difficult to sleep and 85.1% were prescribed drugs. 86.6% had dressing changes and this was done twice weekly (32.8%). Conclusion: There is need to improve outcomes, reduce the burden of wounds and improve health related quality of life.

Keywords: Patients, Wound Care, Clinical Setting, Characteristics, Surgical Department

1. Introduction

Wound care represents a major health burden in Africa and most parts of the world [1, 2]. With increasing recognition of wound care as a medical specialty and as a public health concern that consumes extensive resources, therefore attention to patient focused symptoms and quality of life measurement are necessary [3].

Survey of wound care among patients are statements made or actions taken by consumers that indicate their desirability of a range of health options such as health experiences, treatment options and health states. This reflects beliefs and attitudes of the patient and family, and are related to the process, probability, and severity of potential choices [4]. The concept occupies an increasingly prominent place at the center of healthcare reform, and involves all aspects of healthcare, including discovery, research, delivery, outcome, and payment [3].

Multidisciplinary approaches to wound care in the primary health care sector, as well as in hospitals, have demonstrated a reduction in home visits and the range of products used [4, 5]. Those primarily involved in wound care are patients, doctors and nurses [6]. Studies have shown that wound care appears to be delivered by individuals instead of health care professionals, and this may not be in the best interest of the patient [7].

Patients are important stakeholders in the research process. They are more than just subjects in clinical trials and adopters of research outputs, patients become active participants in the selection of a research agenda, design of technologies, and the development of patient-centered outcome measures [8].

Research on wound patients had identified significant factors such as wound recurrence, quality of treatment for wound care, maintenance of independent living, personal interactions with doctors and healthcare professionals, living

a normal life, and receiving appropriate skilled care for their non-healing wound [9].

Individual biochemical differences in the wound will eventually lead to the development of personalized wound management protocols. With personalized medicine, which will involve mapping out comparative effectiveness research in wound care, thereby understanding patient essential to improve the delivery of safe, quality, cost effective services [9].

The majority of patient wound research has focused on decisions about specific woundstates or screening methods, it has also been suggested that future research should focus on the context of care (site), provider competence, and patient preference and much more effort should be directed at including patient involvement in wound cared evlopment [3].

Due to lack of specialization wound care, including low levels of research, minimal time spent on wound prevention or management [3], therefore in this study, we investigated urban wound care in clinical setting in order to identify and quantify the age and gender of patients receiving wound treatment, treatment objectives, and the type, duration and characteristics of wounds as well as knowledge and attitude of the patients towards the wound management.

2. Method

2.1. Settings

All hospitalized patients admitted in the male and female surgical departments of Bingham University Teaching Hospital participated in the wound care survey. Bingham University teaching Hospital is a missionary hospital located at Zaria bye pass in Jos North Local Government Area of Plateau State. There were 10 beds in each of the surgical unit, and on average, at least ten wound patients were admitted per month. Four types of specialized surgeons (vascular, orthopaedic, gastrointestinal and plastic surgery related) are involved in surgery in this health facility. The nursing staffs with different levels of specialization and specialized medical doctors visit the wards daily and participate in a multidisciplinary round. An inclusion criterion for the study was patients admitted in surgical department at the time of the data collection. The survey was conducted for over a period of 3months.

2.2. Instrument

The data collection instrument designed for this study was based on information gathered from semi-structured interviews conducted with the patients on current practice with regard to wound care. The instrument included five categories of data collection

1. The characteristics of patients (sex, age, lifestyles and occupation).
2. The characteristics of the wounds (location, causes, nature, appearance and duration).
3. The treatment of the wounds (pain, pain location, sleep

disturbances, drugs)

4. The relationship between lifestyles and wound pain
5. The frequencyof dressing changes

2.3. Ethical Clearance

Approval for the study was received from the Bingham University Teaching Hospital Health Research Ethics Committee (No NHREC/ 21/05/2005/00237).

2.4. Data Analysis

The software package SPSS 20.0 version was used to analyze descriptive non-parametric statistical techniques. Percentages and frequency distributions were used to describe participant characteristics, wound characteristics, wound treatment and frequency of dressing changes. Data were also analyzed by 2-tailed test of significance, this was done by bivariate analysis using Pearson correlation coefficient.

2.5. Limitations

The following limitations were observed in this study. Firstly discharged patients could not be monitored for outcome of wound treatment; secondly inability to determine the anthropometric parameters of the patients and lastly the cost of patient wound treatment could not be determined.

3. Results

3.1. TheCharacteristics of the Patients

Table 1. Demographic characteristics of the patients.

GENDER	FREQUENCY(%)
Male	40(59.7)
Female	27(40.3)
AGE GROUPS (YEARS)	
0-20	6(9.00)
20-30	18 (26.9)
30-40	20 (29.9)
40-50	10 (14.9)
50-60	7(10.5)
60-70	3 (4.5)
>70	3 (4.5)
LIFESTYLES	
Smokers	9 (13.4)
Alcoholics	13(19.4)
Diabetics	5(7.5)
Exercise	34 (50.8)
OCCUPATION	
Trading	19 (28.4)
Driving	5(7.5)
Farming	3 (4.5)
Office	10(14.9)
Industrial	6(9.00)
Student	13(19.4)
Applicant	16(23.8)

A total of 67 patients responded to the questionnaires. Out of the total sample, 59.7% were males while 40.3% were females. Patient age groups ranged from < 20 to >70 years. Majority of the patients were in the age group of 30-40 years.

Half of the patients (50.8%) engaged in exercise, 13.4% were smokers, 19.4% were alcoholics while 7.5% were diabetics. Respondents had a range of occupations including trading (28.4%), office (14.9%), industrial (9.0%), driving (7.5%), farming (4.5%), 19.4% were students while 23.8% were unemployed as shown in Table 1.

3.2. The Characteristics of the Wounds

Table 2 indicates wound characteristics. A proportion of the wounds were located on the legs (31.3%), followed by hand or arm, trunk and buttock had the least location of wounds. The most common cause of wound was automobile accident (46.3%), followed by surgery (14.9%) and other causes such as fall, bites (14.9%). Majority of the participants had close wounds (85.1%), 14.9% of the respondent wounds were observed to have pus, 9.00% had odour, bleeding wounds and swelling wounds. 40.3% of the patient had short duration of wound (<7days) while 32.8% had long duration of wound (>30days).

Table 2. Characteristics of wounds among the hospitalized patients.

WOUND LOCATION	FREQUENCY (%)
Head/Face	13 (19.4)
Hand/Arm	14 (20.9)
Stomach	5(7.5)
Trunk	2 (3.0)
Buttock	2 (3.0)
Leg	21 (31.3)

WOUND LOCATION	FREQUENCY (%)
Others	10 (14.9)
CAUSES OF WOUND	
Automobile accident	31 (46.3)
Surgery	10 (14.9)
Assault	3 (4.5)
Domestic accident	4 (6.00)
Gunshot	8 (11.9)
Burns	1 (1.50)
Fall	10 (14.9)
NATURE OF WOUND	
Open	10 (14.9)
Close	57 (85.1)
WOUND APPEARANCE	
Pus	59 (88.1)
Odour	61 (91.5)
Bleed	61 (91.5)
Swollen	61 (91.5)
WOUND DURATION (DAYS)	
0-7	27 (40.3)
8-14	6 (7.5)
15-30	10 (14.9)
>30	22 (32.8)

3.3. The Treatment of the Wounds

Almost all the patients (95.5%) had pain associated with their wounds, 52.2% had their pains located on the wound areas, 23.9% were disturbed from sleeping by the wounds and 85.1% were on medications for wound treatment as illustrated in figure 1.

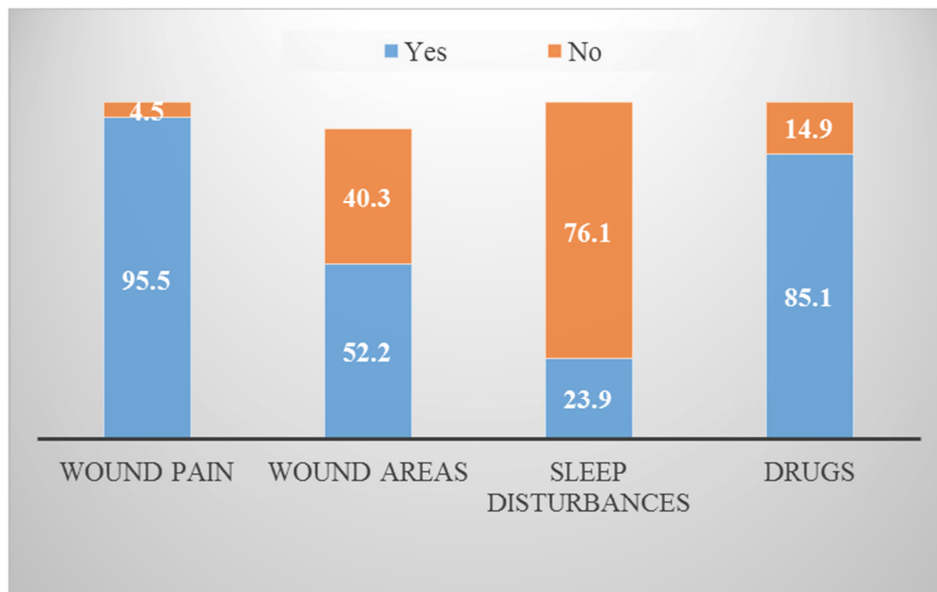


Figure 1. Wounds associated with pains, sleep and treatments.

3.4. The Relationship Between Lifestyles and Wound Pain

Figure 2 shows that majority of the respondent (60%) that were not engaged in physical fitness experiences had wound pains, 24% who were alcoholics complained of wound pain as well as 16 % of the smokers.

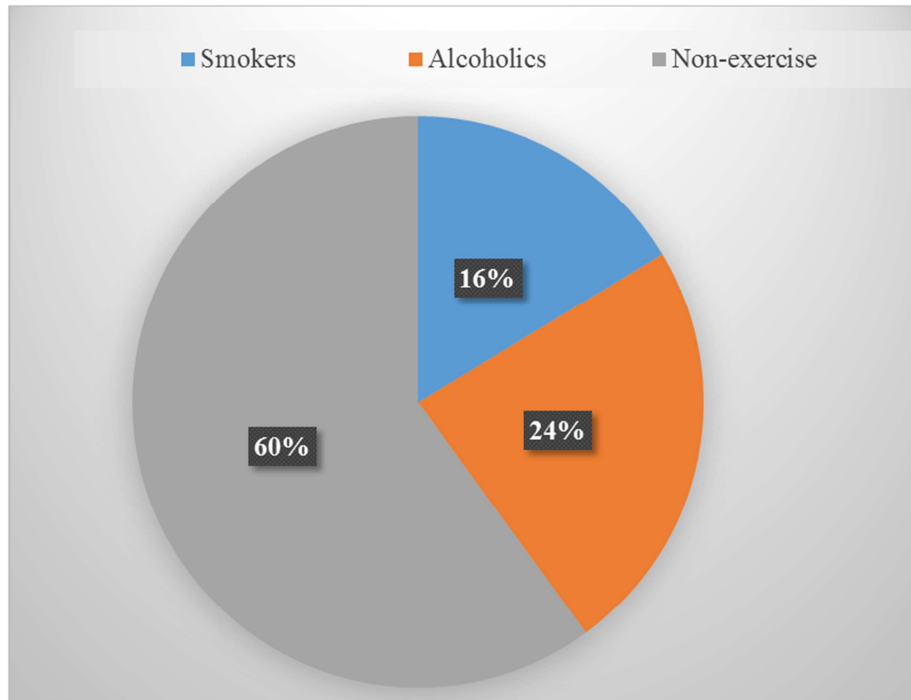


Figure 2. Effect of wound pain on lifestyles.

** There was a high significant association between smoking and wound pain at 0.01 levels.
 ** There was a high significant association between alcohol and wound pain at 0.01 levels.
 ** There was a high significant association between nonexercise and wound pain at 0.01 levels.

3.5. The Frequency of Dressing Changes

Figure 3 shows frequency of dressing changes. 86.6% of the patients had dressing changes, majority of the dressings were changed twice weekly (32.8%), followed by weekly (29.9%).

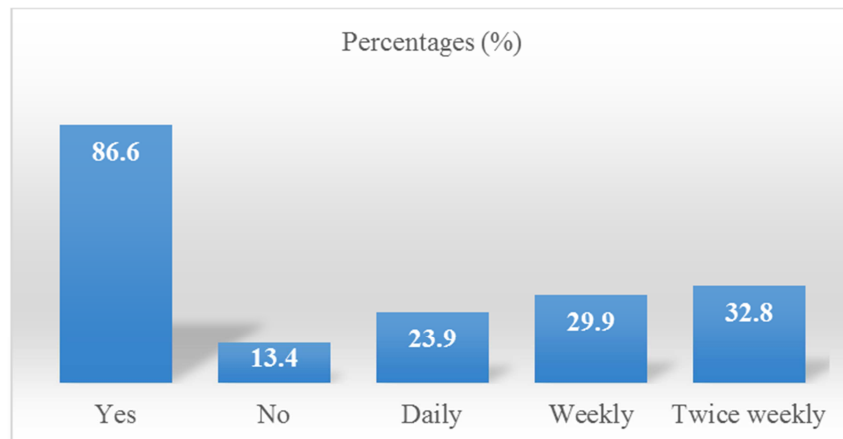


Figure 3. Frequency of dressing changes.

4. Discussion

In wound care, a complete patient history is needed to determine the outcome risks for all wounds, including risks for and type of potential contamination, activity at time of injury, functional changes, and any comorbid illnesses that may prevent or decrease normal healing [10]. Also in men and women the incidence of wounds vary markedly between age groups, environment, and occupation [2], therefore in

this study, wounds were more predominant in males similar to previous studies in different settings [1, 11]. One of the more commonly proposed explanations for differences in sex distribution in the wound care survey observed between men and women, is the characteristic sex difference in size and physical capacity which could be attributed to the more physically demanding jobs [1, 12].

For many years, studies have shown that the relationship between age and relative risk of wound did not change [13]. In

this survey, majority of the wounds belonged to the age groups (young- aged groups), followed by middle-age groups, these are the groups of people that are face with higher relative risk of open-wound injuries as well as a higher relative risk for both traumatic and non-traumatic musculoskeletal wounds similar to several other studies [1, 14].

Individual-level variables such as cigarette smoking, alcohol use, comorbidities or underlying medical problems (e.g., diabetes), or other factor (exercise) that have been shown as risk factors for wound healing [15]. Few of the participants reported to engage in smoking, the negative effects of smoking on wound-healing outcomes have been known for a long time according to some studies [15]. Post-operatively, patients who smoke show a delay in wound healing and an increase in a variety of complications such as infection, wound rupture, anastomotic leakage, wound and flap necrosis, epidermolysis, and a decrease in the tensile strength of wounds [15]. Therefore the high significant association between smokers and wound pain patients is highly justifiable.

Some of the patients reported to have been exposed to alcohol. Research had shown that most of the patients who had sustained wounds due road traffic accidents were under the influence of alcohol [16]. There was a high significant association between alcoholics and wound pain patients, this agrees with several studies which show that exposure to alcohol impairs wound healing and increases the incidence of infection [17]. Acute ethanol exposure can lead to impaired wound healing by impairing the early inflammatory response, inhibiting wound closure, angiogenesis, and collagen production, and altering the protease balance at the wound site [18]. Other common conditions like diabetes were reported by some of the respondents. Diabetes slows the healing of wounds as documented by some researchers [18]. This underlying medical condition can impair vascular flow, thus setting the stage for poor tissue oxygenation resulting in hypoxic wounds. Diabetic foot ulcers are a serious complication of diabetes and can lead to amputation of the affected limbs of diabetic patients' further lowering quality of life [18]. This, warrant closer follow-up care, patients with diabetes should be encouraged to keep their blood sugar well controlled as well as maintain adequate protein/vitamin intake vital for normal healing [18].

Half of these patients were involved in exercises. Exercises reduce obesity, wound tension, tissue pressure, leading to increase microperfusion and the availability of oxygen to the wound. Obesity impairs wound healing, obese individuals frequently face wound complications, including skin wound as well as wound pain [18, 19]. This corresponds with a high significant association between non-exercise and wound pain patients.

In typical African communities, people sustain different types of wounds with varying severity in their daily life activities [2]. Also work culture or workplace climate has been reported to influence sex disparity in injury risk [15]. Majority of the participants in this survey were involved in trading, office, industrial and driving, this similar range of

occupation was observed in the study in a similar clinical setting [20] in which the major respondents were traders.

Male workers also tend to have more autonomy and control at work, similar study was carried out by some researchers. These factors are likely more evident in industrial workforces traditionally dominated by men, therefore some of the sex differences in the wound care survey observed in this study population may be explained by these factors. Other factors, such as balancing the demands of work and family, may also contribute to the difference in wound rate observed between men and women [21]. Also wound survey conducted by Builders and Oseni-Momodu in 2017 indicated a significant association between gender and causes of wound [1].

The physical examination of a wound requires assessment of location, length, width, depth, type of tissue in the wound bed, neurovascular and functional status of surrounding structures, and associated contaminants. If neurovascular compromise is present or if deep structures such as tendons, muscles, or bones are involved, specialty consultation may be warranted [11]. The majority of the wounds were located on the legs, the result of this finding is in agreement with the survey conducted in another country [22], in which almost all the wounds were located on the legs. A number of these patients also sustained wounds on hand or arm followed by head or face. This conforms to study conducted in a similar teaching hospital where young adult males account for the majority of wounds located on the upper extremities, head and neck region [16]. Almost all the respondents were admitted to the surgical department of this hospital as a result of automobile accident similar to previous studies in low and middle income countries [1, 16, 20].

Wounds in which soil or dirt are embedded are considered contaminated at the time of injury and may need to be left open if adequate debridement is uncertain, or may require a more aggressive operative washout. A deeply contaminated wound that is not completely clean has an increased risk of developing an anaerobic infection if closed [23]. Therefore few of the patients had their wounds left open. Without proper cleansing and wound care, these acute wounds can lead to complications, such as poor healing and infection. Optimizing wound healing through proper acute wound management involves removal of harmful debris/ necrotic tissue, exploration for underlying injuries, control of bacterial burden and appropriate closure [24].

A complete patient wound appearance is needed to determine the outcome risks for all wounds, including risks for and type of potential contamination, activity at time of injury, functional changes, and any comorbid illnesses that may prevent or decrease normal healing [24]. In this study, some of the wounds appeared to contain pus and characterized by bleeding, swelling and odour. Wound irrigation and exploration in a well-lighted area may help identify the site of bleeding, allow for immediate intervention, and identify any emergency surgical concerns. In addition to volume loss from hemorrhage, wounds involving more than 10% of the body surface area are

associated with loss of excess extracellular fluid, may become life-threatening, and often need inpatient management [24]. For those delayed presentations, infection is expected in cases of secondary abscess, purulent drainage, or if the skin has a dimpled appearance >1 cm beyond the wound edge. Wounds that appear dry, gangrenous, or have demarcated gangrene are non-healable due to ischemia and other secondary factors [24].

One challenging aspect in wound care is nursing of fungating wounds as these wounds pose a challenge as it is difficult to manage the physical aspects of such a wound which is accompanied by pain, bleeding, exudates and odour [25]. The psychological impact of fungating wounds on patients, their families and caregivers can be quite strong and irreversible. Fungating wounds require sensitivity in nursing management and consideration of social and psychological issues. Dowsett (2005) emphasize on the need for nurses to work in partnership with patients to meet their clinical, quality of life and psychosocial needs (25). Therefore, the primary goals for wound care are to attain a functional closure, decrease potential risk for infection, and minimize scar formation [24].

Apart from a full range of motion, location of wound, wound duration is also an important factor for assessing all wounds [24]. Many of the respondents were admitted into the hospital, when the wounds were less 7 days. Wound depth is a factor that affects the rate of healing. Superficial wounds in otherwise healthy people, involving only the epidermis and papillary dermis, are expected to heal within 10 days with appropriate treatment and no complication thickness wounds, such as a skin graft donor site, normally take up to 21 days to heal [25]. Full thickness wounds undergo two stages of healing. Primary healing of the deep tissue within 7 days post-injury allows for secondary healing through re-epithelialization and contraction [24]. The result of this survey showed that a large number of the participants stayed in this clinical setting for more than 30 days. These are the patients that had chronic wounds, chronic wounds do not usually heal in an ordered, timely fashion and are characterized by delayed healing, cellular senescence, and recurrent infections [25]. Chronic wounds in particular are common across all health care settings and these problematic wounds frequently result in a loss of productivity; extended hospital stays of more than 30 days and increased expenditure [1].

Almost all the patients experienced wound pains. Pains due to wounds are usually localized, intense, and persistent, and may be exacerbated by physical and psychological factors, they are classified as nociceptive and neuropathic pain [2]. Since, the type and intensity of wound pain a patient experiences is influenced by many physical factors such as cause/site of the wound and lifestyles, therefore, many of the respondent reported that they experienced the pains in the wound areas such as legs, head, face, hand, arm and in many parts of the body [1]. This also explains the high significant association between patients' lifestyles and wound pains. Some of these patients also found it difficult to sleep at night

as a result of wound pain, because pain is an important feature of wounds and is an unpleasant sensation that is felt as a result of the brain's response to damage in the body [1].

Wound treatment is an integral part of wound care. Wound treatment involves all activities or procedures that will promote the healing wounds, preventing infections, and getting rid of an already existent infection [6], therefore almost all the participants were administered drugs. As the historical and clinical features surrounding the wound process differ, wounds must be evaluated and treated individually [1]. A number of measures including dressing and administration of painkillers, use of anti inflammatory agents, antimicrobial agents, and healing promoting drugs are involved in wound care and management [1]. According to research carried out by Builders and Oseni-Momodu, therapeutic drug classes such as antimicrobials, analgesics, corticosteroids, ascorbic acid, anaesthetics, tranquilizer, intravenous fluids and miscellaneous agents were administered to wound patients in a tertiary hospital in Northern part of Nigeria [1].

The frequency of changing of wound dressings vary from daily to twice weekly among the patients whose wounds required dressing, research has shown that wound care is very labour intensive and high percentage of nursing time is spent on the provision of wound care with patients receiving an average of 2.4 dressing changes per week [26]. The time it takes to change the dressing will depend on the extent of tissue damage, but dressings applied to the face and hands will take longer than those applied to other parts of the body [26].

Dressings of wounds such as surgical wounds are usually should left dry and untouched for a minimum of 48 hours post-operatively to allow for re-establishment of the natural bacteria-proof barrier, unless otherwise clinically indicated [27], heavily contaminated wounds may need delayed primary closure to minimize the risk of infection. These wounds are cleaned, debrided, and dressed with a moist dressing, then covered to prevent further contamination [18]. The moist dressing is typically changed daily and the wound reassessed after 3 to 4 days. If no signs of infection are present upon re-examination, secondary closure can be performed (18). Extremely dirty wounds may benefit from daily cleansing and dressing changes for the first 3 to 5 days prior to closure. In circumstances where secondary closure cannot be performed, healing by secondary intent is generally used. No attempt for aided wound closure is provided [18].

Modern techniques such as early excision and skin replacement therapy have reduced the number of dressing changes necessary to treat wounds such as burn wounds [28]. The preferred recommended management techniques are, daily cleansing of the wound, topical applications and occlusive dressings, especially for wounds where sufficient epidermal living cells remain to ensure a degree of satisfactory spontaneous healing. Because a burn wound can be heterogeneous, it may be necessary to wait eight to ten days before determining which tissues need to be excised and grafted, and which will heal by themselves [29].

Factors which include appropriate wound dressing, patient education related to wound care, appropriate environmental considerations, and clinical follow-up are very essential for successful patient wound dressing [18].

5. Conclusion

Wounds are common problems for people throughout the world, wound recurrence, quality of treatment for wound care, maintenance of independent living, personal interactions with doctors and healthcare professionals, living a normal life, and receiving appropriate skilled care for their non-healing wound are all significant important factors identified by patients and their health care providers in wound management because wound care varies based on the wound characteristic and location. Without proper treatment, significant disability can result. A good understanding of basic wound care principles will help your patients to heal as quickly as possible with the best outcome.

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References

- [1] M. I. Builders and E. Oseni –Momodu, “Pattern of wounds in Bingham University Teaching Hospital, Jos”. *J Med MedSci*, vol. 8, pp. 60-68, 2017.
- [2] P. F. Builders and M. I. Builders, *Wound Care: Traditional African Medicine Approach*. Chapter contributed to the book topics on *Worldwide Wound Healing – Innovation in natural and conventional methods*, Chapter 1, 126. DOI: 10.5772/62668, In tech, pp. 4-24, 2016.
- [3] Q. L. Corbett and W. J. Ennis, “What Do Patients Want? Patient Preference in Wound Care?”. *Advances in wound care*, vol. 3, pp. 537-543, 2013.
- [4] S. Sidani, D. Epstein and J. Miranda, “Eliciting patient treatment preferences: A strategy to integrate evidence-based and patient-centered care”. *Worldviews Evid Based Nurs*, vol. 3, pp. 116, 2006.
- [5] L. Davey, J. M. Solomon, S. F. Freeborn, “A multidisciplinary approach to wound care”. *J Wound Care*, vol. 3, pp. 249-252, 1994.
- [6] H. Vermeulen, D. T. Ubbink, M. D. Femke de Zwart, A. Goossens and R. Vos, “Preferences of patients, doctors, and nurses regarding wound dressing characteristics: A conjoint analysis”. *Wound Rep Reg*, vol. 15, pp. 302–307, 2007.
- [7] The National Pressure Ulcer Advisory Panel. *Pressure ulcers prevalence, cost and risk assessment: consensus development conference statement*. *Decubitus*, vol. 2, pp. 24-28, 1989.
- [8] F. Callard, D. Rose and T. Wykes, “Close to the bench as well as at the bedside: involving service users in all phases of translational research”. *Health Expect*, vol. 15, pp. 389, 2012.
- [9] R. M. Epstein and R. L. Street, “The values and value of patient-centered care”. *Ann Fam Med*, vol. 9, pp. 100, 2011.
- [10] F. Gottrup, “Multidisciplinary wound healing concepts”. *EWMA Journal*, vol. 3, pp. 5-18, 2003.
- [11] A. Yamuragiye, A. Ibambasi, A. Mutuyimana, O. Mutuyemariya and E. Nsereko. “Injury profile in an emergency department at a referral hospital in Kigali”. *Rwanda J Health Sci*, vol. 2, pp. 61–62, 2013.
- [12] C. Blue, “Women in nontraditional jobs: is there risk for musculoskeletal injury”. *AAOHN J*, vol. 41, pp. 235–240, 1993.
- [13] P. Smith, “The relationship between age and work injury in British Columbia: Examining differences across time and nature of injury”. *Journal of Occupational Health*, vol. 55, pp. 98-107, 2013.
- [14] M. Fitzharris, J. Yu, N. Hammond, C. Taylor, Y. Wu, S. Finfer and J. Mybur J. “Injury in China: a systematic review of injury surveillance studies conducted in Chinese hospital emergency departments”. *BMC Emergency Medicine*, vol. 11, pp. 18, 2011.
- [15] C. Ahn, P. Mulligan and R. S. Salcido, “Smoking—the bane of wound healing: biomedical interventions and social influences”. *Adv Skin Wound Care*, vol. 21, pp. 227-238, 2008.
- [16] P. V. Lakshmi, J. P. Tripathy, N. Tripathy, S. Singh, D. Bhatia, J. Jagnoor, R. Kumar, “A pilot study of a hospital based injury surveillance system in a secondary level district hospital in India: lessons learnt and way ahead”. *Injury Epidemiol*, vol. 3, pp. 24, 2016.
- [17] G. Szabo and P. Mandrekar, “A recent perspective on alcohol, immunity, and host defense”. *Alcohol ClinExp Res*, vol. 33, pp. 220-232, 2009.
- [18] S. Guo and L. A. Dipietro, “Factors Affecting Wound Healing”. *J Dent Res*, vol. 89, pp. 219-229, 2010.
- [19] D. A. Anaya and E. P. Dellinger, “The obese surgical patient: a susceptible host for infection”. *Surg Infect (Larchmt)*, vol. 7, pp. 473-480, 2006.
- [20] G. A. Rahman, A. Adigun, F. Yusuf, and C. K. P. Ofoegbu. “Wound dressing where there is limitation of choice”. *Nig J Surg Res*, vol 8, pp. 151- 154, 2006.
- [21] A. T. Oyeboode, L. F. Cantley, M. D. Slade, K. M. Pollack, S. Vegso, M. G. Fiellin, and M. R. Cullen. “Sex differences in injury patterns among workers in heavy manufacturing”. *Am J Epidemiol*, vol. 169, pp. 161–166, 2009.
- [22] K. Ousey, J. Stepsteson, S. Barrett, B. King, N. Morton, K. Fenwick and Caryn Carr. “Wound care in five English NHS Trusts: Results of a survey”. *Wounds*, Vol. 9, pp. 20-28, 2013.
- [23] N. J. Percival, “Classification of wounds and their management”. *Surgery*, vol. 20, pp. 114–117, 2002.
- [24] R. G. Sibbald, D. Williamson, H. L. Orsted, K. Campbell, D. Keast, D. Krasner and D. Sibbald. “Preparing the wound bed: debridement, bacterial balance and moisture balance”. *Ostomy/Wound Manage*, vol. 46, pp. 14–35, 2000.
- [25] G. S. Schultz, R. G. Sibbald, V. Falanga, E. A. Ayello, C. Dowsett, K. Harding, M. Romanelli M. C. Stacey, L. Teotand W. Vanscheidt. “Wound Bed Preparation: A Systematic Approach to Wound Management”. *Wound Repair and Regeneration*, vol. 11, pp. 1-28, 2003.

- [26] M. Clarke-Moloney, N. Keane and E. Kavanagh, "Changes in Leg Ulcer Management Practice following training in an Irish Community Setting". *Journal of Wound Care*, vol. 17, pp. 116-121, 2008.
- [27] HSE, National best practice and evidence based guidelines for wound management. Health Service Executive, Dublin, 2009.
- [28] Sheridan R. L and R. G. Tompkins, Skin substitutes in burns. *Burns*, vol. 25, pp. 97-103, 1999.
- [29] P. Latarjet, The management of pain associated with dressing changes in patients with burns, *EWMA Journal*, vol. 2, pp. 5-9, 2002.