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Differential Cost of Wound Dressing per Wound Diagnosis: Evidence from South West Nigeria

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ABSTRACT

Background & Objective: Wound dressing forms an integral part of wound care protocol, and it is well established to consume significant healthcare resources in most countries. However, across the globe, there is a paucity of studies on the specific cost of dressing per wound diagnosis.

Materials & Methods: The study was based on a descriptive cross-sectional research design to determine the differential cost of dressing per wound diagnosis in three teaching hospitals in southwest Nigeria. The study population (n=190) was selected from the three hospitals' surgical, medical, neurological, and radiotherapy wards using convenience sampling. A self-structured questionnaire was used to collect data from the respondents. Data collection was for four weeks. Ethical approvals were received, and ethical principles of voluntariness, confidentiality, and non-maleficence were upheld.

Results: Findings show that tibiofibular fracture, femoral fracture, and avulsion injury are the common traumatic injuries sustained by the respondents. The cost of wound dressing significantly varies across wound diagnoses: On weekly estimation, avulsion injury ($4.92) and tibiofibular fracture ($4.21) dressings were twice the cost of dressing another wound diagnosis. Per acute care episodes, the cost of tibiofibular fracture wound dressing was the highest ($119.18). Patients with avulsion injuries and leg ulcers require more hospital stays.

Conclusion: Avulsion injury, tibiofibular fracture, and femoral fracture are the major drivers of the increasing cost of wound dressing among hospitalized patients. The cost of other dressing consumables besides dressing materials and lotion was considered high for all types of wound diagnosis.

Keywords: Cost, Wound Dressing, Wound Diagnosis, Acute Care Episode, Injury, Nigeria

1. Introduction

Wound dressing forms an integral part of wound care protocol, and it is well established that it consumes a significant amount of healthcare resources in most countries (1-6). However, across the globe, there is a paucity of studies on the specific cost of dressing across wound diagnoses. This is worse in low and middle-income countries, where wound dressing costs are poorly documented (2, 4, 7). Previous wound studies have primarily focused on the total cost of wound dressing and the variables influencing the price of dressing. There is no empirical data on the specific dressing cost for each wound diagnosis.

The economic value of the cost of dressing each wound is essential for healthcare planning, budgeting, and policy-making. Unfortunately, much attention has not been drawn to the economic burden attributed to wound care, especially caring for chronic nonhealing wounds (8). It is believed that much of the research funding goes to cancer research, whereas diabetic foot ulcers are life-threatening, with increasing indices of high mortality for decades. Furthermore, in the United Kingdom (UK) alone, more than two million cases of various wound diagnoses are managed annually, requiring a budget expenditure of over £5 billion (9, 10). In a Singapore study reported by Ogundeji et al (11) the cost of managing chronic wounds per annum was more than S$ 5 million, and the

differential cost of managing ischaemic ulcers, pressure injuries, and diabetic foot ulcers was S$0.43 million, S$0.63 million, and S$1.68 million, respectively. Also, according to Barnsbee et al (12) the direct cost of venous leg ulcers in Australia was estimated to be US$802.55 million annually. A cost-effective wound care economic analysis is essential to track wound diagnoses that contribute to the escalating cost of care.

Furthermore, there are no standardized wound care tariffs for wound dressing in most care settings across low and middle-income countries (4, 13). Often, patients pay unexpected estimated amounts for wound care. This development puts patients and families at risk of catastrophic healthcare expenditure (14-18). Adequate data reporting is needed on the cost of each wound diagnosis's wound dressing to support further studies' inference on the escalating cost of wound care. The author, therefore, investigates the differential cost of dressing for wound diagnoses per acute care episode in resource-constrained settings of southwest Nigeria.

2. Materials and Methods

2.1 Research Design

This study was based on a descriptive cross-sectional research design to determine the differential cost of dressing per wound diagnosis in three Teaching hospitals in southwest Nigeria.

2.2 Research Setting

This study used significant teaching hospitals in Nigeria's southwestern region. The hospitals were purposively selected: the University College Hospital (UCH), Ibadan, Obafemi Awolowo University Teaching Hospital Complex, Ife, and the National Orthopaedic Hospital, Igbobi, Lagos.

2.3 Study Population

The study population consisted of all patients with wounds in selected wards of the three hospitals, including surgical, medical, neurological, and radiotherapy wards.

2.4 Sample Size Calculation

The Kish and Leslie (1965) formula for calculating a single proportion was used to determine the sample size.

The formula is given as:

$$n = \frac{z^2pq}{d^2}$$ (Ilesanmi & Ogundeji, 2020)

n= desired sample size

z = level of significance at 95% confidence interval (=1.96)

p = 50% = 0.5

Where q = 1-p =1-0.5 = 0.5

d = Degree of precision (5% = 0.05)

$$n = \frac{1.96)^2 \times (0.5) \times (0.5)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.25}{0.0025}$$

$$n = 384.16 \approx 384$$

To calculate the attrition rate

$$n = \frac{1}{1 - f} \times \text{calculated sample size}$$

Where f= attrition =10%

$$n = \frac{1}{1 - 0.1} = 1.11 \times \text{calculated sample size}$$

Therefore, Sample Size n= $1.11 \times 384 = 426.24 \approx 426$

The estimated sample size after consideration of the attrition rate was 426.

2.5 Sampling Method

The non-probability sampling technique was used: Purposive sampling was utilized to select the study settings and sites. In contrast, convenience sampling was employed to select the respondents using the inclusion criteria. The inclusion criteria were patients with acute or chronic wounds and patients already discharged or on admission for at least four weeks.

2.6 Instrument for Data Collection

A self-structured questionnaire was used to collect data from the respondents via an interviewer-administered questionnaire. The questionnaire was constructed based on the purpose of the study. The face and content validity of the instrument was ensured by experts in the field of medical-surgical nursing and biostatisticians, and amendments were made before the data collection. Training on the questionnaire was conducted for the researchers, emphasizing thoroughness during data collection. The interviewers are qualified nurses and researchers. Also, defined eligibility criteria were established to ensure concordance among the interviewers. Only participants who met the inclusion criteria were included in the study. The instrument's reliability was also assessed through the test-retest method; Ten wound patients were interviewed using the constructed questionnaire at the Lagos State University Teaching Hospital. Another ten patients were again interviewed in the same hospital two weeks later. The two results were subjected to statistical analysis to determine each item's internal consistency. The coefficient of stability of the instrument was found to be 0.774.

2.7 Procedure for Data Collection

The data collection was done through an interviewer-administered questionnaire. The principal investigator, two other researchers, and three research assistants were involved in the data collection. The patients were interviewed in English or Yoruba, depending on their

preference. The research assistants, who are nurses, filled out the questionnaire during the interview. The data collection was for four weeks, covering the three selected hospitals.

On each ward, the nurse manager or the nurse on duty identified the patients who were discharged or had spent four weeks on the ward. The interview was usually conducted in the morning after nursing procedures and physician ward rounds. Areas of interest during the interview included wound diagnosis and the cost of wound dressing materials during the acute care episode, including the procurement receipts. Sometimes, the interview is rescheduled if the patient is to undergo a procedure or is resting. Consequently, the interview was conducted within 10-15 minutes to prevent boredom and the risk of infection transmission.

2.8 Method of Data Analysis

The collected data were cleaned, entered, and analyzed by the Statistical Package for Social Sciences (SPSS) version 23 via descriptive and inferential statistics. The results were presented in a bar chart and a table. A p-value less than 0.05 was considered significant.

2.9 Ethical Considerations

The ethical approval of the research was obtained from the Institutional Review Board (IRB) of each study setting. Ethical approval was obtained from the National Orthopaedic Hospital, Igbobi, Lagos, Nigeria, with reference number OH/90/C/IX. The approval was obtained from the University of Ibadan/University College Hospital Ethical Committee (UI/UCH Ethical Committee) with reference number NHREC/05/01/2008a (21/0047) and also from the Ethics and Research Committee (ERC) of the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) with the protocol number ERC/2021/04/07. Furthermore, ethical principles of voluntariness, confidentiality, and non-maleficence were upheld. The respondents were not coerced to participate in the study. The patient's name, hospital number, address, or identity were not obtained. No patient sustained any injury during the interview.

3. Result

Table 1 showed settings and Respondents' distribution.

The bar chart above shows that 48 respondents had other diagnoses, 35 had a tibiofibular fracture, 31 had a femoral fracture, and 24 had avulsion injuries (Figure 1).

Table 2 above shows the mean distribution of variables by direct wound dressing and diagnosis cost. The average price of wound dressing consumables for tibiofibular fracture and avulsion injury is estimated to be $4.21±0.83 and $4.92±1.48 per week, respectively. Furthermore, the cost of hospitalization per week for femoral fracture, tibiofibular fracture, and avulsion injury was $18.04±1.51, $17.55±0.92, and $17.50±3.54, respectively. The cost of hospitalization per week and acute care episodes for femoral fracture is significant ($p< 0.05$).

Table 1. Study settings and Respondents' distribution.

Hospital	Inpatients Sample N (%)
National Orthopaedic Hospital Igbobi, Lagos (NOHIL)	94 (49.5)
University College Hospital (UCH)	65(34.2)
Obafemi Awolowo University Teaching Hospital Complex (OAUTHC)	31(16.3)
Total	**190**

Table 2. Mean distribution of variables by direct cost of wound dressing and diagnosis.

Variables	Wound diagnosis (mean and standard deviation)- (in US dollars $)									P Value
	Tibiofibular fracture	Femoral fracture	Avulsion injury	Breast cancer	Cellulitis	Cervical cancer	Leg ulcer	Amputation	Others	
Cost of dressing consumables per week	4.21±0.83	2.32±0.44	4.92±1.48	2.93±1.79	3.05±1.03	1.51±0.075	2.77±1.14	1.16±0.19	3.07±0.89	0.209
Cost of lotion used per week	3.28±0.73	3.85±1.56	2.06±0.45	1.08±0.39	2.75±0.56	0.67±0.028	2.45±0.80	0.89±0.24	2.29±0.54	0.206
Total cost of dressing per week	12.06±3.08	7.70±1.87	9.69±1.63	6.40±1.34	9.66±1.27	6.71±0.047	7.78±2.10	5.56±1.15	8.94±1.50	0.253

Variables	Wound diagnosis (mean and standard deviation)- (in US dollars $)									P Value
	Tibiofibular fracture	Femoral fracture	Avulsion injury	Breast cancer	Cellulitis	Cervical cancer	Leg ulcer	Amputation	Others	
Total cost of dressing per acute care episode	119.18±49.87	64.45±26.62	45.08±8.13	38.67±14.30	57.53±12.75	56.54±23.11	53.48±17.56	22.23±4.61	66.11±20.69	0.539
Cost of hospitalization per week	17.55±0.92	18.04±1.51	17.50±3.54	5.20±0.23	15.50±2.02	4.14±0.52	12.54±3.80	14.84±4.18	14.11±2.08	<0.001
Total cost of hospitalization per acute care episode	118.21±12.91	119.76±17.24	87.21±16.70	29.85±8.14	80.92±13.39	28.99±3.64	86.84±29.60	59.34±16.72	96.50±19.35	0.005

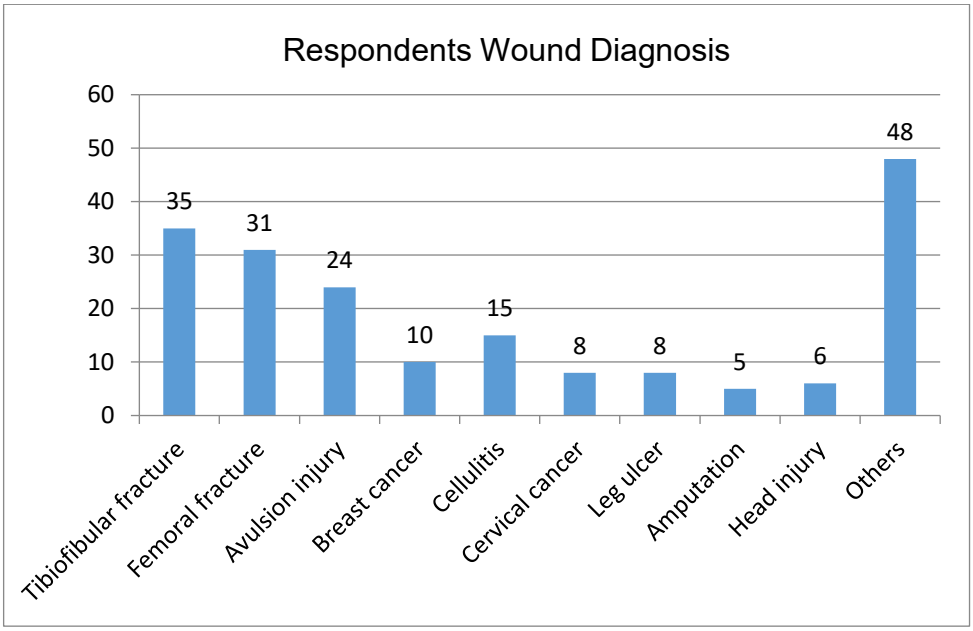

Figure 1. Bar chart showing types of respondents' wound diagnosis (**Designed by Authors, 2025**).

4. Discussions

4.1 Burden of Wound-related Diagnosis

Wound care researchers across the globe often report the high cost of wound dressing. However, studies on the differential cost of dressing expended per wound diagnosis are sparse. The author bridges the gap by reporting the cost of dressing for common wound diagnoses per acute care episode. From the findings, tibiofibular fracture, femoral fracture, and avulsion injury were the common traumatic injuries sustained by the study population in southwest Nigeria. This may be because the study was done in commercial cities. Also, commercial motorcyclists and highway hawkers form a significant workforce in Nigeria, and they are often prone to femoral or tibiofibular fractures from road traffic accidents (RTA).

To buttress this assertion, a Nigerian retrospective study by Onyemaechi et al **(19)** in Enugun reported that 91% of the patients with injuries seen in the hospital over a year had road traffic accidents (RTA) with an injury severity score (ISS) of greater than 15. In another retrospective study at the University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu, Nigeria, Onyemaechi **(20)** argued that road traffic accident is a significant cause of disability and traumatic injury death. In the study, the author reported that most injuries on the highway involved soft tissue injuries and fractures.

Furthermore, another study in southwest Nigeria reported an increase in mortality rate from traumatic injuries, where RTA alone constituted 76%, and motorcycle accidents ranked the highest **(21)**. Nigeria's current economic challenges and insurgencies could further aggravate the incidence of RTA, resulting in fractures. In Europe, a Netherlands study using secondary data from the National Trauma Registry compared the injury pattern and severity among deceased RTA patients and found that of the total fatalities analyzed, many were from bicycle accidents, with ISS more significant than 16 **(22)**.

4.2 Differential Cost of Wound Dressing Per Wound Diagnosis

The cost of wound dressing significantly varies across wound diagnoses. Firstly, considering the cost of wound dressing consumables per week, the cost of avulsion injury and tibiofibular fracture were twice the cost of other wound injuries such as femoral fracture, cervical cancer, and amputation. Although the sustained femoral fracture is high, the wound dressing cost is lower than that of an avulsion injury. This may be because avulsion injury is mostly an open injury, while femoral fracture may be a closed injury. Furthermore, stretching to acute care episodes, the cost of tibiofibular fracture wound dressing was USD119.18, which was relatively higher than the cost of the wound dressing for another wound diagnosis. A possible explanation could be that other types of wound diagnosis may not require dressing consumables and products compared to avulsion injury.

Studies and inferences continue to attribute the high cost of wound care to continual dressing changes, the use of imported materials, and hospitalization (7, 23). Every week, the cost of wound dressing in this study is similar to findings reported by Ogundeji et al (11). Surprisingly, the cost of dressing breast cancer wounds was lower per acute care episode. However, the authors inferred that the cost of wound dressing is proportional to the length of hospital stay. In other words, the cost of dressing breast cancer wounds is likely to increase during hospitalization. This is remarkably similar to the disparity between the leg ulcer dressing and the amputation dressing cost, as Olsson et al (23) where the long-term care cost of leg ulcers increases.

Furthermore, findings show that patients with avulsion injuries and leg ulcers require more hospital stays, and this has implications for the high cost of hospitalization as compared to other wound diagnoses. The cost of hospitalization usually contributes to the increased cost of wound dressing. Consequently, the cost of other dressing consumables, besides the dressing materials and lotion, was high for all types of wound diagnosis. This is primarily influenced by patient acuity, wound severity, and the professionals handling the wound care. Further study is required to explore the implications of wound practitioners' characteristics and nursing intensity on wound care costs.

The strength of this study lies in the fact that it was done in major teaching hospitals in southwest Nigeria, as well as the considerably large sample size and the length of data collection. However, the study is delimited to a single geopolitical area of Nigeria, and the results are not generalizable to all regions of Nigeria, which the authors considered a limitation. Also, there were recall biases where patients could not recall vividly the cost of specific dressing consumables and products. Nonetheless, the researchers were able to nip the challenges in the bud by asking the relatives for the receipt of procurements and the ward nurses for the cost of some materials. Also, the researchers visit the hospital pharmacy to confirm the unit price of commodities. It is also worth noting that there is a gross paucity of research data on the specific cost of each wound diagnosis. This study will, therefore, serve as a blueprint and a resource for other future studies investigating the differential cost of dressing various wound diagnoses.

5. Conclusion

This study uncovers the cost of dressing wound diagnosis in southwest Nigeria. Findings revealed that avulsion injury, tibiofibular fracture, and femoral fracture are the major drivers of the increasing cost of wound dressing every week. Considering the cost of dressing per acute care episode, the cost of dressing a tibiofibular fracture wound was significantly higher compared to the cost of dressing other wound diagnoses. In terms of length of hospital stay, avulsion injury, and leg ulcer, the cost of wound dressing was reportedly high. The author inferred that this is due to continual dressing changes and hospitalization. Consequently, the cost of other consumables used during dressing was high for all wound diagnoses. This development, therefore, has implications for wound care professionals, nursing intensity, and the choice of materials used.

6. Declarations

6.1 Acknowledgments

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6.2 Ethical Considerations

Ethical Clearance was granted by the Institutional Review Board (IRB) of the selected hospitals, which include the National Orthopaedic Hospital Igbobi Lagos (OH/90/C/IX), the University College Hospital Ibadan (NHREC/05/01/2008a- 21/0047) and the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife (ERC/2021/04/07) all in Nigeria. Verbal and written consent was received from each participant, while ethical principles of anonymity, voluntariness, and confidentiality were upheld.

6.3 Authors' Contributions

KDO, who is the author, is responsible for the conceptualization, literature review, study design, analysis, and writing of the report for intellectual content.

6.4 Conflict of Interest

The author declares no conflict of interest.

6.5 Fund or Financial Support

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

6.6 Using Artificial Intelligence Tools (AI Tools)

The authors did not utilise AI tools.

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