# CLINICAL AUDIT ON SURGICAL MANAGEMENT OF PRESSURE ULCER IN THE PLASTIC SURGERY UNIT AT MUHIMBILI NATIONAL HOSPITAL

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**MSc (Plastic and Reconstructive Surgery) Clinical Audit**

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**School of Clinical Medicine**

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# CLINICAL AUDIT ON SURGICAL MANAGEMENT OF PRESSURE ULCER IN THE PLASTIC SURGERY UNIT AT MUHIMBILI NATIONAL HOSPITAL

**By**

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**A Clinical Audit Submitted in (partial) Fulfillment of the Requirement for the Degree of Master of Science (Plastic and Reconstructive Surgery) at**

**Muhimbili University of Health and Allied sciences**

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## CERTIFICATIONS

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a clinical audit entitled, **"Clinical Audit on Surgical Management of Pressure Ulcer in the Plastic Surgery Unit at Muhimbili National Hospital"**, in (partial) fulfillment of the requirements for the Master of Science (Plastic and Reconstructive Surgery) of Muhimbili University of Health and Allied Sciences.

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**Dr. Laurean Rwanyuma (MD, MMed)**

**(Supervisor)**

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**Date**

## DECLARATION AND COPYRIGHT

I, **Phillip Raphael Makoye**, I declare that this **clinical audit** is my original work and that it has not been presented and will not be presented to any other university for a similar of other degree award.

Signature: ……. Date: ……

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## DEDICATION

To my children, I love you so much. I have taken much of your time that I was supposed to spend with you. I do this for you, for us, for the sick people and for serving the purpose of our Almighty God. May God bless you Glory, Michael, Gabriel, Mitchell and any other young brother or sister who shall be born after you. May all the God's favors and blessings be with you forever. To you Esther, I love you so much.

## ABSTRACT

**Background:** Pressure ulcers, caused by prolonged pressure or shear in immobile or critically ill patients, pose a major healthcare challenge, leading to complications and higher costs. Surgical management is crucial for advanced cases, yet data on techniques and outcomes, particularly in Sub-Saharan Africa, is limited. This audit evaluates surgical interventions for pressure ulcers at Muhimbili National Hospital (MNH), aiming to improve care strategies and address a critical knowledge gap.

**Objective:** To assess the surgical management of pressure ulcers in the Plastic Surgery Unit at Muhimbili National Hospital, with the aim of improving patient outcomes and optimizing care practices.

**Methodology:** This clinical audit was conducted at the Plastic and Reconstructive Surgery Unit, Muhimbili National Hospital, from November 2022 to August 2024. It retrospectively reviewed surgical management of pressure ulcers in adult patients. Data was collected via patient records, analyzed using SPSS after obtaining ethical clearance obtained from MUHAS and MNH.

**Results:** This audit of 17 pressure ulcer patients at Muhimbili National Hospital revealed a median age of 62 years, predominantly affecting older males (58.8%), with 52.9% having Grade III ulcers mainly in the sacral region (41.2%). Most patients were non-ambulant (70.6%), indicating a need for targeted care. Seven surgical techniques were employed, with the gluteal myocutaneous V-Y flap being the most common (29.4%). Significant associations were found between ulcer location and severity in surgical technique selection ($p=0.047$ and $p=0.045$), while age, gender, and mobility status did not significantly impact choices. Postoperative complications occurred in 29.4% of patients, particularly high in those treated with the reverse sural flap (100% complication rate), and the median hospital stay was 9 days, underscoring the necessity for effective postoperative care.

**Conclusion:** This audit reveals a significant prevalence of pressure ulcers among older male patients, primarily affecting those who are non-ambulant. The findings highlight the need for tailored surgical interventions, particularly the gluteal myocutaneous V-Y flap, while emphasizing the importance of postoperative care to reduce complications. Targeted strategies are essential for managing pressure ulcers in high-risk populations to improve patient outcomes.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| HAPI | Hospital-acquired Pressure Injuries |
| MNH | Muhimbili National Hospital |
| MUHAS | Muhimbili University of Health and Allied Sciences |
| NPIAP | National Pressure Injury Advisory Panel |
| SCI | Spinal Cord Injury |

## DEFINITION OF KEY TERMS

**Pressure Ulcer:** A pressure ulcer, also known as a bedsore or decubitus ulcer, is a localized injury to the skin and underlying tissue that occurs due to prolonged pressure, typically over bony prominences. This condition often arises in individuals with limited mobility, leading to reduced blood flow and tissue ischemia. Pressure ulcers are classified into stages based on the depth and severity of tissue damage, ranging from non-blanchable erythema (Stage I) to full-thickness skin and tissue loss (Stage IV).

**Optimized Wound:** An optimized wound refers to a wound that is managed using evidence-based practices to promote effective healing. This involves the appropriate selection of wound dressings, management of exudate, prevention of infection, and addressing any underlying factors that could impede healing, such as nutritional status or comorbidities. The goal of optimizing wound care is to create a conducive environment for tissue regeneration and minimize complications.

**Postoperative Outcome:** Postoperative outcome refers to the results or consequences experienced by a patient following a surgical procedure. These outcomes can be measured in terms of healing success, complications (such as infections or hematomas), functional improvement, patient satisfaction, and overall quality of life. Evaluating postoperative outcomes is essential for assessing the effectiveness of surgical interventions and guiding future clinical practices.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

Pressure ulcers, also referred to as pressure injuries, are localized areas of ischemic damage to the skin and underlying tissues, primarily caused by prolonged mechanical forces such as pressure or shear [1,2]. These forces, when exerted over bony prominences like the sacrum, ischium, and trochanter, lead to tissue damage and ulceration [3]. According to recent studies, 70% of pressure ulcers occur over these regions mentioned earlier, although other areas such as the occiput, scapula, heel, and lateral malleolus are also at risk [4]. Individuals most vulnerable to pressure ulcers include elderly patients, those with limited mobility, particularly patients with spinal cord injuries, those undergoing prolonged surgical procedures, and people in ntensive care [5]. Conditions such as diabetes, incontinence, and poor nutritional status further exacerbate the risk [1,6].

Sustained pressure on tissues can lead to occlusion of the capillary beds, resulting in reduced oxygen supply to the affected area. As the ischemia persists, toxic byproducts begin to accumulate in the tissue, eventually leading to ulceration and necrosis. In a bedridden patient or during surgery, immobility for as little as two hours is enough to initiate the development of a pressure ulcer [7]. Additionally, impaired nervous regulation of local blood flow also plays a role in the formation of these ulcers [8]. As mentioned, older individuals are more susceptible, with two-thirds of pressure ulcers occurring in patients over 70 years old. Some studies show that 83% of hospitalized patients developed pressure ulcers within the first five days of their hospital stay [7].

Pressure ulcers represent a major healthcare issue globally, affecting thousands of individuals each year [7]. The proportion of decubitus ulcer in Tanzania is currently unknown. The management of pressure injuries imposes a significant economic burden. A 2019 study by Padula and Delarmente estimated that hospital-acquired pressure injuries (HAPI) could cost over $26.8 billion [9]. In Africa, the precise cost of pressure ulcer treatment remains unclear;

however, one report indicated that it constitutes 25% of the total expenses associated with spinal cord injury (SCI) care [10].

Pressure ulcers are classified by their severity into stages, with the National Pressure Injury Advisory Panel (NPIAP) offering the most widely accepted classification system. Stages range from Stage I, characterized by non-blanchable erythema of intact skin, to Stage IV, where full-thickness tissue loss exposes deeper structures such as muscle or bone [11]. Surgical intervention is often reserved for advanced-stage ulcers (Stage III and IV), where conservative treatments like dressings and pressure relief fail to achieve healing [12]. Here's a list of the pressure ulcer stages:

- **Grade/Stage I**: Intact skin with localized non-blanchable erythema. May appear differently on darkly pigmented skin. Color changes do not include purple or maroon, which may indicate deeper tissue damage.
- **Grade /Stage II**: Partial-thickness skin loss with exposed dermis. The wound bed is viable, pink or red, and moist. Adipose tissue and deeper structures are not exposed. No slough or eschar is present.
- **Grade /Stage III**: Full-thickness skin loss with visible adipose tissue. Granulation tissue and epibole (rolled edges) may be present, with possible slough or eschar. Fascia, muscle, and bone are not exposed.
- **Grade /Stage IV**: Full-thickness tissue loss with exposed fascia, muscle, tendon, ligament, cartilage, or bone. Slough or eschar may be present, with possible undermining and tunneling.
- **Unstageable**: The extent of tissue damage is obscured by slough or eschar. Full-thickness loss is suspected but cannot be confirmed until removal of necrotic tissue.

Surgical management of pressure ulcers typically involves debridement of necrotic tissue, with reconstruction through soft tissue flaps, either myocutaneous or fasciocutaneous. The choice of flap depends on the location, size of the ulcer, and the patient's medical history. While surgical

closure of pressure ulcers accelerates recovery and reduces recurrence rates, success depends heavily on the quality of local tissues, patient comorbidities, and the availability of post-operative care, including home-based nursing and the use of pressure-relieving devices like ripple mattresses [12,13]. However, in resource-limited settings, the cost of such devices often puts them out of reach for many families.

Although surgical intervention has been shown to facilitate faster recovery, early discharge, and reduced ulcer recurrence, there is a paucity of recent data from Sub-Saharan Africa.

## 1.2 Literature Review

### 1.2.1 Management of Pressure Ulcer

In reviewing the management of pressure ulcers, several key strategies have been emphasized in the literature. Boyko and colleagues highlighted that, once a pressure ulcer forms, healthcare workers must prioritize offloading the affected area, ensuring proper drainage if infection is present, debriding devitalized tissue, and providing optimal wound care. Redistributing pressure is crucial and can be achieved through patient repositioning, the use of immersive beds, special dressings, and adjustments to prosthetics approaches similar to those used for prevention [14]. Furthermore, Wong et al, in their study on pressure ulcer complications, stressed the importance of draining abscesses when present. Temporary application of agents like iodine, silver sulfadiazine, hydrogen peroxide, or Dakin's solution may be helpful if infection is suspected; however, these agents should be used with caution as they can impede long-term wound healing. Antibiotics should be reserved for cases of significant cellulitis or systemic infection. Interestingly, despite exposed bone in sacral pressure ulcers, studies show a relatively low incidence of osteomyelitis [15].

Boyko et al also emphasized the importance of mechanical debridement to remove devitalized tissue and biofilms that hinder wound healing, although this is not recommended for dry eschar without signs of infection. The type of dressing used should be tailored to the ulcer's stage, the presence of infection, and the level of exudate [14]. The NPIAP recommends foam silicone dressings, with specific support for Allevyn Life silicone adhesive dressings in patients with a Braden score of 14 or less, as demonstrated in a comprehensive pressure ulcer prevention program by Swafford and colleagues [16]. This approach significantly reduced the incidence of hospital-acquired pressure ulcers.

In a review of the effects of honey on pressure ulcers, Ariani et al. found that honey has the potential to significantly enhance the healing of chronic pressure ulcers. The study demonstrated its safety and effectiveness in treating various chronic wounds, including pressure ulcers. Due to honey's numerous beneficial properties, it is particularly suitable for use in hospital settings

with limited resources [17]. Although this practice is utilized in Tanzanian healthcare, no supporting studies have been conducted locally.

### 1.2.2 Algorithm for Dressings of Pressure Injury Management

According to the wound management algorithm outlined by Boyko and colleagues [14], if a wound is infected, the treatment approach depends on the amount of exudate present:

- **No exudate**: Use silver, honey, or foam dressings.
- **Some exudate**: Apply alginate, negative pressure wound therapy, silver, gauze, or foam.
- **Copious exudate**: Use alginate, negative pressure wound therapy, gauze, or foam.

For non-infected wounds, the management also varies based on exudate levels:

- **No exudate**: Use hydrogel or transparent film.
- **Some exudate**: Apply alginate, hydrocolloid, negative pressure wound therapy, gauze, or foam.
- **Copious exudate**: Use alginate, hydrocolloid, negative pressure wound therapy, gauze, or foam.

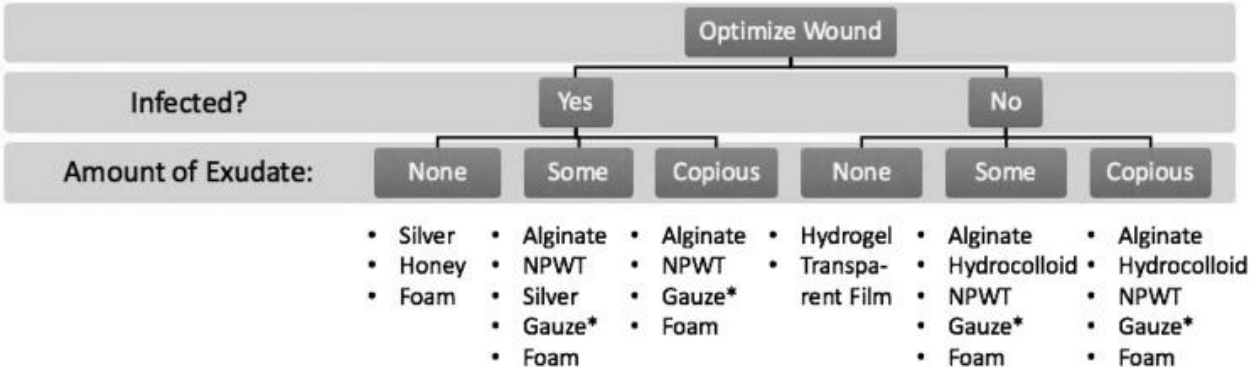



**Figure 1:** An algorithm to assist in selecting the appropriate type of dressing for pressure ulcer management. *Gauze dressings may be used when options are limited, though they require more frequent changes. Source: Boyko et al [14].

In certain situations, urinary or fecal diversion might be required when the ulcer is at risk of contamination from waste. The need for surgical intervention is determined by the ulcer's depth and severity. Proper cleaning and drainage are essential to eliminate dead tissue and debris. Additionally, vacuum-assisted closure or negative pressure wound therapy can be utilized preoperatively to optimize the wound environment for surgical closure [18].

### 1.2.3 Surgical Techniques in Managing Pressure Ulcer

The surgical management of pressure ulcers focuses on filling dead space and providing durable skin coverage through flap reconstruction. Ideal candidates for surgery typically have stage 1 or 2 ulcers with a well-granulated wound base, minimal risk of infection, and a region that is protected from potential contamination [14]. Before proceeding with surgery, it is essential to assess the patient's nutritional status, including prealbumin levels, ensure proper diabetes management through blood sugar monitoring, and confirm the absence of acute medical conditions.

Surgical intervention generally involves the debridement of devitalized or infected tissue, including necrotic bone, to create a healthier wound environment. In some cases, skin grafting may be attempted, but this approach has a high failure rate in more advanced stages of pressure ulcers due to limited long-term durability [19]. For more robust and lasting coverage, flap reconstruction is often employed. The choice of flap, whether pedicle muscle, myocutaneous, fasciocutaneous, or free flaps, depends on several factors, including the anatomical location of the ulcer, the patient's mobility requirements, and the presence of comorbid conditions [19].

The surgical management of pressure ulcers in various anatomical regions requires selecting appropriate flap techniques to ensure effective coverage and healing. For sacral pressure ulcers, common reconstructive options include the gluteal myocutaneous flap, gluteal fasciocutaneous rotation-advancement flap, gluteal fasciocutaneous V-Y advancement flap, and the superior gluteal artery perforator flap. These techniques aim to provide durable coverage while minimizing the risk of recurrence, particularly in areas prone to pressure and contamination [12,13]. Drains should be placed to avoid the development of hematomas.

Ischial ulcers, which present unique challenges due to their location, can be managed with several flap options. Common choices include the inferior gluteal myocutaneous flap, gracilis myocutaneous flap, and biceps femoris myocutaneous flap. Fasciocutaneous options such as the lateral thigh fasciocutaneous flap, anterolateral thigh fasciocutaneous flap, and rectus abdominis myocutaneous flap are also considered. Additionally, perforator flaps like the inferior gluteal artery perforator flap and profunda femoris artery perforator flap can provide reliable coverage and promote wound healing. For trochanteric ulcers, the tensor fascia latae myocutaneous flap and vastus lateralis myocutaneous flap are often employed. These flaps offer robust soft tissue coverage and support wound closure in areas subjected to significant pressure. In some cases, the anterolateral thigh perforator flap or an expansive gluteal myocutaneous flap may be selected depending on the ulcer's size and complexity [1,3,20].

Foot and ankle ulcers require different strategies due to the delicate nature of the region. Surgical options include the reverse sural artery flap, medial plantar flap, and extensor digitorum brevis flap, all of which provide durable coverage. For more complex cases, propeller flaps or free tissue transfers may be necessary to achieve optimal healing [21]. In addition to these flap techniques, evidence suggests that hyperbaric oxygen therapy can significantly enhance wound healing. By improving oxygenation in and around the wound area, this therapy promotes tissue regeneration and supports the overall healing process, making it a valuable adjunct in the management of advanced pressure ulcers [22].

### 1.2.4 Postoperative Outcome Following Pressure Ulcer Surgical Treatment

Postoperative outcomes for reconstructive surgery in pressure ulcer management can be either positive or negative. A positive outcome is indicated by full graft or flap take, while complications such as hematoma, seroma, wound dehiscence, and infection can lead to negative outcomes. These complications may hinder the healing process and increase the risk of recurrence if underlying risk factors are not addressed. Thus, comprehensive postoperative care, including patient repositioning and pressure offloading strategies, is essential to enhance recovery and minimize the chances of complications or recurrence.

Postoperative complications following reconstructive surgery for pressure ulcers can significantly impact patient outcomes and recovery. One common issue is the failure of the graft or flap to take, which can occur due to inadequate blood supply, infection, or technical errors during the procedure. This complication may necessitate further surgical intervention and can lead to prolonged healing times [13,23].

Another concern is pigmentation changes at the surgical site. Patients may experience either hyperpigmentation or hypopigmentation as the skin heals, which can affect the aesthetic outcome and may take time to normalize. Blister formation is also a notable complication that can arise postoperatively. Blisters may develop due to friction, shearing forces, or inadequate wound care, potentially delaying recovery and increasing the risk of infection [23].

Hematomas, or localized collections of blood, can also occur, leading to swelling, pain, and additional pressure on the surgical site. If not managed promptly, hematomas can compromise the blood supply to the area, further contributing to graft failure. Consequently, these complications often result in a prolonged hospital stay, as patients require additional monitoring and interventions to address the issues that arise [12]. While studying outcomes remains challenging, there is consensus that patients often require lifelong treatment and preventive measures to manage pressure ulcers effectively [24].

### 1.2.5 Factor Influencing Selection of Patient for Surgical Management

Various factors, including anatomical location, stage of injury, and the specific treatment regimen employed may influence the outcome and prognosis of patients with pressure sore. Many studies focus on the efficacy of treatments by assessing the reduction in pressure ulcer incidence within healthcare facilities as a preventive measure rather than analyzing the healing rates post-treatment initiation.

Evidence indicates that after six months of treatment, healing rates for stage 2 pressure injuries reach approximately 70%, while stage 3 injuries heal about 50%, and stage 4 injuries approximately 30% [25]. In another study that did not differentiate healing rates by stage, 41.7% of patients achieved resolution of their pressure ulcers during an average follow-up of 1.8 years [26]. Recurrence rates also varied by anatomical location, with sacral ulcers exhibiting a 57%

recurrence, followed by ischial (14%), trochanteric (7%), calcaneal (7%), and other locations (14%) [26].

Several key factors dictate patient selection for surgical intervention in pressure ulcer management. Advancing age, the size and stage of the pressure injury, nutritional status, mobility and chronic comorbidities significantly affect prognosis [27]. Additionally, individuals with a higher mean body mass index, normal hemoglobin levels, and a greater likelihood of undergoing reconstructive plastic surgical procedures demonstrate improved healing rates [26].

## 1.3 Statement of the Problem

Pressure ulcers, also known as decubitus ulcer or bedsores, are a significant public health concern, particularly among vulnerable populations such as the elderly and those with limited mobility. These injuries can lead to severe complications, prolonged hospitalization, increased healthcare costs, and diminished quality of life. Despite advances in prevention and management strategies, the incidence of pressure ulcers remains high, particularly in surgical and critical care settings. At Muhimbili National Hospital, the Plastic Surgery Unit is tasked with addressing these challenging wounds through surgical intervention. However, there is a notable lack of comprehensive data regarding the efficacy of different surgical techniques employed in the management of pressure ulcers, as well as the associated postoperative outcomes. Furthermore, the criteria guiding the selection of surgical approaches remain inadequately defined, raising questions about the factors influencing surgical decision-making.

Without a clear understanding of these elements, there is a risk of suboptimal patient outcomes and inefficient use of healthcare resources. This assessment aims to systematically evaluate the surgical management of pressure ulcers in the Plastic Surgery Unit, examining various surgical techniques, their outcomes, and the patient characteristics that influence treatment decisions.

## 1.4 Rationale

The rationale for conducting this study arises from the need to improve the management and outcomes of pressure ulcers, which pose significant challenges to healthcare systems globally. Pressure ulcers not only contribute to patient morbidity and mortality but also lead to increased healthcare costs and prolonged hospital stays. As healthcare providers strive to deliver effective interventions, understanding the effectiveness of surgical management in specific clinical settings is essential.

Muhimbili National Hospital serves a diverse patient population with varying needs, and the Plastic Surgery Unit is at the forefront of managing complex pressure ulcers. However, the lack of comprehensive data on surgical techniques, postoperative outcomes, and the factors influencing surgical decisions creates a knowledge gap that can hinder optimal patient care.

By evaluating the different surgical techniques employed in the management of pressure ulcers, this study will provide valuable insights into their effectiveness and inform clinical practice. Understanding postoperative outcomes will also enable healthcare providers to identify best practices and potential areas for improvement in surgical interventions.

This study is crucial for informing evidence-based practices within the Plastic Surgery Unit and beyond, ensuring that healthcare providers are equipped with the necessary knowledge to make informed decisions regarding the management of pressure ulcers. Furthermore, it has the potential to contribute to the broader field of plastic and reconstructive surgery by providing insights that can be generalized to other healthcare settings facing similar challenges.

## 1.5 Audit Objectives

### 1.5.1 Broad Objective

To assess the surgical management of pressure ulcers in the Plastic Surgery Unit at Muhimbili National Hospital, with the aim of improving patient outcomes and optimizing care practices.

### 1.5.2 Specific Audit Objectives

1. To evaluate the different surgical techniques used in the management of pressure ulcers at the Plastic Surgery Unit.
2. To determine the postoperative outcomes associated with the surgical management of pressure ulcers in the unit.
3. To assess the factors influencing the selection of surgical management approaches for pressure ulcers, including patient characteristics and ulcer severity.

# CHAPTER TWO

# METHODOLOGY

## 2.1 Audit Site

The Plastic and Reconstructive Surgery Unit at Muhimbili National Hospital is a premier facility in Tanzania, staffed by highly specialized plastic surgeons. Equipped with a state-of-the-art operating theater, the unit handles a wide range of procedures, from simple surgeries to complex reconstructive interventions. As a teaching hospital, Muhimbili provides comprehensive training for general and plastic surgery residents, fostering a learning environment that enhances surgical skills and patient care. The unit focuses on various surgical areas, including reconstructive surgery for congenital anomalies and trauma, aesthetic enhancements, wound management for complex cases like pressure ulcers, and comprehensive burn care. By integrating surgical expertise with education and patient-centered practices, the unit plays a crucial role in advancing plastic surgery in Tanzania and improving overall patient outcomes.

## 2.2 Audit Type

**Clinical Audit:** Retrospective review of surgical cases involving pressure ulcers managed at the Plastic and Reconstructive Surgery Unit.

## 2.3 Audit Duration

From November 2022 to August 2024.

## 2.4 Audit Population

Patients undergoing surgical management for pressure ulcers in the Plastic Surgery Unit at Muhimbili National Hospital within a specified time frame.

## 2.5 Inclusion Criteria

The audit included adults aged 18 years and older of both genders diagnosed with pressure ulcers requiring surgical intervention across all stages (I to IV). Patients who undergone surgical

management within a specified timeframe and received various surgical techniques, such as flap reconstruction, or skin grafting.

### 2.6 Exclusion Criteria

Patients with pressure ulcers that were managed conservatively were excluded from the audit. Individuals with acute infections or comorbidities that contraindicate surgical intervention were omitted.

### 2.7 Sampling Technique

Convenience sampling.

### 2.8 Audit Standards

Comparison against established guidelines for surgical management of pressure ulcers, including healing rates and acceptable complication rates.

### 2.9 Data Collection

Data collection for the audit was conducted through a systematic review of patient records within the Plastic and Reconstructive Surgery Unit at Muhimbili National Hospital. Relevant demographic information, pressure ulcer characteristics, surgical techniques employed, and postoperative outcomes were extracted from electronic medical records. Additionally, a standardized data collection form was utilized to ensure consistency and accuracy in capturing data related to healing rates, complications, and recurrence. Clinical staff assisted in identifying eligible patients based on the inclusion and exclusion criteria established for the audit. Data were compiled and analyzed to assess the effectiveness of surgical management practices for pressure ulcers in the unit.

### 2.10 Data entry and Analysis

The entry and analysis of audit data were done using statistical package for social sciences (SPSS) version 27.

## 2.11 Ethical Consideration

Ethical clearance was obtained from MUHAS department of Surgery and MNH.

## 2.12 Feedback

Clinical audit findings will be disseminated to MUHAS and MNH authorities.

# CHAPTER THREE

# RESULTS

## 3.1 Demographic and characteristics of the clinical audit

The study included 17 patients with pressure ulcers. The median age of the patients was 62 years, with a range from 22 to 88 years. The age distribution revealed that the majority (52.9%) of patients were aged 60 and above. The population comprised 58.8% males and 41.2% females, indicating a higher prevalence of pressure ulcers in males. Additionally, the median hemoglobin level among the patients was 10.6 g/dl, with a range of 8.4 to 13.3 g/dl. In terms of ulcer location, the sacral area was the most affected, comprising 41.2% of cases, followed by trochanteric ulcers (23.5%), calcaneal (11.8%), scalp (11.8%), malleolar (5.9%), and ischial ulcers (5.9%). The severity of ulcers predominantly fell within Grade III (52.9%), followed by Grade IV (29.4%), few with grade II and none with grade I. Furthermore, a majority of the patients were non-ambulant (70.6%), while only 29.4% were ambulant. See **Table *1*** below.

## 3.2 Surgical techniques used in the management of pressure ulcers

Based on results from this audit, 7 surgical techniques were used with the gluteal myocutaneous V-Y flap being the most commonly used surgical technique (29.4%). For scalp ulcers, a Grade III ulcer was treated with a cutaneous local flap, while a Grade IV ulcer received a cutaneous graft. In the sacral region, Grade III ulcers were managed with the gluteal myocutaneous V-Y flap (3 cases) and a gluteal fasciocutaneous V-Y flap (1 case), whereas Grade IV ulcers were addressed with the gluteal myocutaneous V-Y flap (3 cases) and debridement (1 case). For trochanteric ulcers, a Grade II ulcer was treated with a cutaneous graft (1 case) and a Grade III ulcer with a cutaneous graft (1 case) as well as debridement (1 case). Calcaneal ulcers classified as Grade III were treated using the reverse sural flap (2 cases), while the ischial Grade IV ulcer was managed with a gluteus maximus myocutaneous flap. A cutaneous graft was used for the Grade III malleolar ulcer, reflecting a tailored approach based on ulcer grade and location (See **Table *2***).

**Table 1: Characteristics of Patients with Pressure Sore, N = 17**

| Variable | Value | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Median in years (Range)** | 62 (22 – 88) | | |
| **Age group (years)** | | | |
| 20 – 39 | | 3 | 17.6 |
| 40 – 59 | | 5 | 29.4 |
| 60 and above | | 9 | 52.9 |
| **Sex** | | | |
| Male | | 10 | 58.8 |
| Female | | 7 | 41.2 |
| **Median Hemoglobin (g/dl)** | 10.6 (8.4 – 13.3) | | |
| **Ulcer location** | | | |
| Calcaneal | | 2 | 11.8 |
| Ischial | | 1 | 5.9 |
| Malleolar | | 1 | 5.9 |
| Sacral | | 7 | 41.2 |
| Scalp | | 2 | 11.8 |
| Trochanteric | | 4 | 23.5 |
| **Ulcer grade** | | | |
| Grade II | | 3 | 17.6 |
| Grade III | | 9 | 52.9 |
| Grade IV | | 5 | 29.4 |
| **Mobility** | | | |
| Ambulant | | 5 | 29.4 |
| Non-ambulant | | 12 | 70.6 |

*g/dl is gram per deciliter*

**Table 2: Surgery for management of pressure ulcers at the Plastic Surgery Unit**

| Surgical technique | Number of cases (n) | Percentage (%) |
|---|---|---|
| Cutaneous graft | 4 | 23.5 |
| Cutaneous local flap | 1 | 5.9 |
| Gluteal maximus myocutaneous flap | 1 | 5.9 |
| Gluteal myocutaneous V-Y flap | 5 | 29.4 |
| Gluteal fasciocutaneous V-Y flap | 1 | 5.9 |
| Reverse sural flap | 2 | 11.8 |
| Surgical debridement | 3 | 17.6 |
| **Total** | **17** | **100%** |

### 3.3 Postoperative outcomes associated with the surgical management of pressure ulcers

Among the 17 patients, a total of five (29.4%) experienced complications (see **Figure *2***), with the highest complication rate seen in those treated with the reverse sural flap, where 100% of these patients encountered postoperative issues. In contrast, techniques such as cutaneous grafts and cutaneous local flaps reported no complications. The gluteal myocutaneous V-Y flap had a complication rate of 20%, with one patient experiencing issues, while the debridement technique had a similar complication rate of 33.3%, affecting one of the three patients treated. Additionally, the gluteal fasciocutaneous V-Y flap resulted in one case of complication, representing 100% of that subgroup. The study noted that only one patient died during their hospital stay; however, this patient was only undergoing surgical debridement, suggesting that this technique may not have been the direct cause of the adverse outcome. The median length of hospital stay for patients was 9 days, with a range from 5 to 22 days. Complications included necrosis in two patients, sepsis in another two, and a hematoma in one patient.

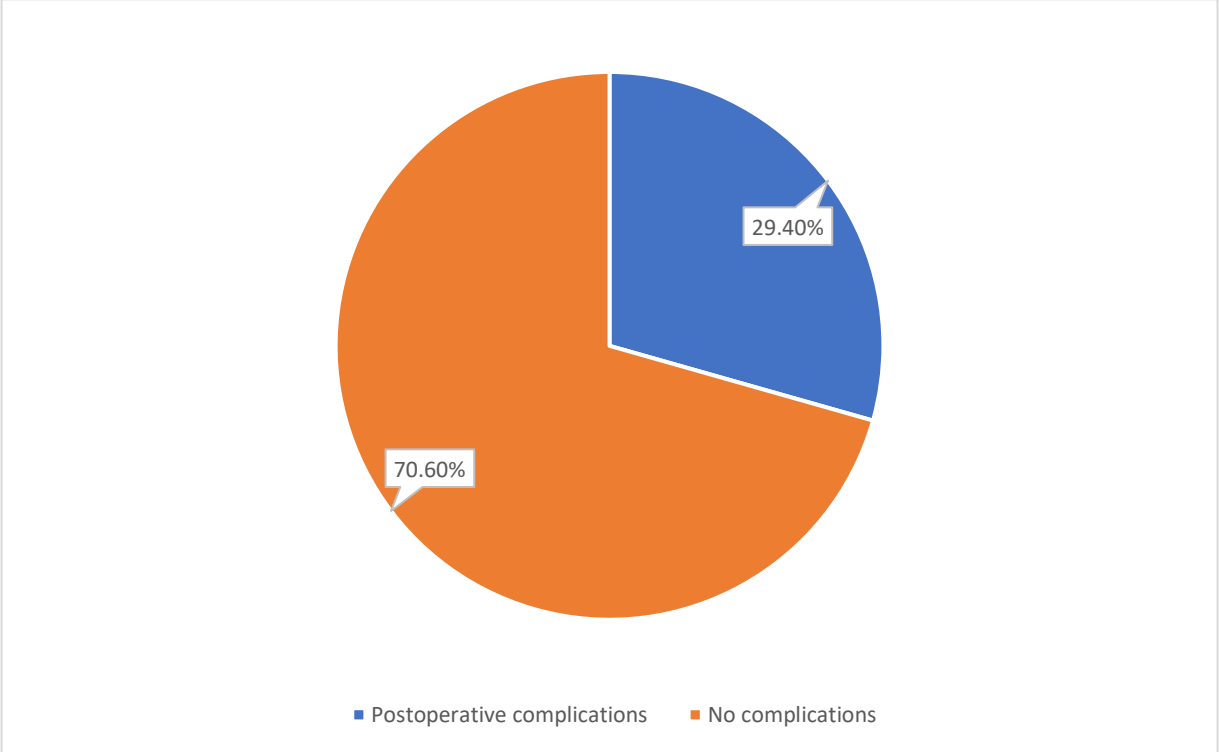



**Figure 2: Pie chart illustrating postoperative complication rate**

### 3.4 Factors influencing the selection of surgical approaches for pressure ulcers

The chi-square analysis evaluated factors influencing the selection of flap, graft, and debridement techniques for pressure ulcer treatment. Age and gender were not statistically significant in influencing surgical approach selection ($p=0.294$ and $p=0.588$, respectively), indicating no strong association between these demographics and the chosen techniques. However, ulcer location ($p=0.047$) and ulcer grade ($p=0.045$) showed significant associations. Flap techniques were predominantly used for calcaneal, ischial, and sacral ulcers, while trochanteric ulcers saw a greater use of grafts and debridement. Grade III ulcers were more commonly treated with flap techniques, while Grade II ulcers leaned toward debridement. Mobility status was not significantly associated with the choice of technique ($p=0.267$), suggesting that the level of patient mobility had limited influence on surgical selection in this cohort. (See **Table *3***)

**Table 3: Factors Influencing the Selection of Surgical Approaches for Pressure Ulcers**

| Variable | Flap, n (%) | Graft, n (%) | Debridement, n (%) | p-value |
|---|---|---|---|---|
| **Age** | | | | 0.294 |
| 20 – 39 | 3 (100) | 0 (0.0) | 0 (0.0) | |
| 40 – 59 | 3 (60.0) | 2 (40.0) | 0 (0.0) | |
| 60 and above | 4 (44.4) | 2 (22.2) | 3 (33.3) | |
| **Gender** | | | | 0.588 |
| Male | 7 (70.0) | 2 (20.0) | 1 (10.0) | |
| Female | 3 (42.9) | 2 (28.6) | 2 (28.6) | |
| **Ulcer location** | | | | **0.047** |
| Calcaneal | 2 (100) | 0 (0.0) | 0 (0.0) | |
| Ischial | 1 (100) | 0 (0.0) | 0 (0.0) | |
| Malleolar | 0 (0.0) | 1 (100) | 0 (0.0) | |
| Sacral | 6 (85.7) | 0 (0.0) | 1 (14.3) | |
| Scalp | 1 (50.0) | 1 (50.0) | 0 (0.0) | |
| Trochanteric | 0 (0.0) | 2 (50.0) | 2 (50.0) | |
| **Ulcer grade** | | | | **0.045** |
| Grade II | 0 (0.0) | 1 (33.3) | 2 (66.7) | |
| Grade III | 7 (77.8) | 2 (22.2) | 0 (0.0) | |
| Grade IV | 3 (60.0) | 1 (20.0) | 1 (20.0) | |
| **Mobility** | | | | 0.267 |
| Ambulant | 4 (80.0) | 1 (20.0) | 0 (0.0) | |
| Non-ambulant | 6 (50.0) | 3 (25.0) | 3 (25.0) | |

*Bolded p-values indicate statistical significance at $p < 0.05$.*

# CHAPTER FOUR

## DISCUSSION

The clinical audit included 17 patients with pressure ulcers, the majority of whom were older. Older adults aged 60 and above represented over half of the patients, supporting findings that age is a significant risk factor for pressure ulcers [2,25]. Male patients were slightly more prevalent in this audit (58.8%), consistent with studies such as Boyko et al [14]., which also identified a higher incidence in males due to factors like reduced mobility and chronic illnesses. Most ulcers were located in the sacral area, aligning with prior research that points to the sacral region as a common pressure ulcer site due to prolonged bed rest and immobility [4,8,25]. The severity of ulcers was predominantly Grade III and Grade IV, with only a few Grade II ulcers. This distribution is comparable to findings from Boyko et al [14]., who reported higher-grade ulcers as common among non-ambulant patients, which constituted 70.6% of this cohort.

Seven surgical techniques were employed, with the gluteal myocutaneous V-Y flap being the most frequently used (29.4%). The choice of flap and graft technique was adapted to ulcer grade and anatomical site. For instance, scalp ulcers were managed with either a local cutaneous flap or cutaneous grafts based on ulcer severity, similar to the customized approach recommended in studies by Wong et al [1]., which stress the importance of adapting treatment to ulcer depth and infection presence. Comparing these techniques with the literature, Boyko et al [14]. noted the success of flap techniques like the gluteal myocutaneous flap for sacral and ischial ulcers, given its durability and pressure resistance. Similarly, for calcaneal ulcers, the reverse sural flap was applied, although with a high complication rate, consistent with the challenges noted in surgical literature regarding foot ulcer management.

Postoperative complications affected nearly 30% of patients, with issues such as necrosis, sepsis, and hematoma. The highest complication rate was observed in reverse sural flap procedures, where all patients experienced postoperative issues. Techniques like the cutaneous graft and local flap reported no complications, aligning with Boyko's guidance that these simpler methods may reduce risk in less severe cases [14]. The median hospital stay was 9 days. One patient,

who received debridement, died, although no direct link between the surgical approach and outcome could be established. Literature also indicates mixed outcomes, with Boyko et al [14]. noting that while flaps offer greater durability, their complexity can lead to higher complication rates, particularly in challenging locations like the sacral or ischial regions.

Chi-square analysis indicated that ulcer location and grade were significantly associated with the selection of surgical techniques ($p=0.047$ and $p=0.045$, respectively). This aligns with findings by Ariani et al [17]., who emphasized that ulcer severity should guide flap versus graft decisions. In this audit ulcers in weight-bearing areas like the sacrum and ischium were often managed with flaps, while less severe or trochanteric ulcers were addressed with grafts or debridement. Furthermore, patient demographics such as age, gender, and mobility did not significantly influence technique choice, contrasting with findings by Swafford et al [16]., who suggested a role for patient mobility in pressure ulcer prognosis.

# CHAPTER FIVE

# CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

The clinical audit at Muhimbili National Hospital showed that pressure ulcers predominantly affected older, non-ambulant male patients, with over half presenting moderate to severe Grade III ulcers. Most ulcers were in high-pressure areas like the sacral region, highlighting the importance of focused preventive care in high-risk, immobile patients. A range of surgical techniques was used based on ulcer location and severity, with the gluteal myocutaneous V-Y flap being the most common and effective, especially for higher-grade ulcers. The audit found that flap techniques generally had better outcomes, though some, such as the reverse sural flap, carried higher complication rates. Postoperative challenges like necrosis, sepsis, and hematoma underscored the need for thorough postoperative care, including infection control and effective pressure offloading. The audit highlighted the importance of tailoring surgical techniques to the ulcer's characteristics, as location and grade, rather than demographic factors, determined the optimal approach. This finding supports a personalized strategy in managing pressure ulcers, focusing on wound characteristics to enhance recovery and minimize complications.

## 5.2 Recommendations

Given the high prevalence of pressure ulcers among older, non-ambulant patients, prevention efforts should focus on implementing early identification and risk assessment protocols. Regular repositioning, use of pressure-relieving devices, and optimal nutritional support could reduce the incidence of pressure ulcers, particularly among high-risk, non-ambulant patients.

To improve outcomes, it is recommended that flap techniques, particularly the gluteal myocutaneous V-Y flap, be prioritized for Grade III and IV ulcers in high-pressure regions. Standardizing protocols for choosing surgical techniques based on ulcer characteristics can streamline management and reduce variation in outcomes. Enhanced postoperative care, including vigilant monitoring for complications, regular wound inspection, and infection

control, is crucial. Implementing standardized post-surgical protocols, such as the use of prophylactic antibiotics and optimal dressing types based on ulcer exudate levels, may reduce the incidence of complications and improve healing.

Future management should focus on a structured algorithm that considers ulcer grade and location as primary factors for surgical approach selection. Training healthcare providers on this approach, along with postoperative care tailored to specific ulcer types, will enhance patient outcomes and reduce recurrence rates.

## REFERENCES


1. Norman G, Wong JK, Amin K, Dumville JC, Pramod S. Reconstructive surgery for treating pressure ulcers. Cochrane database Syst Rev. 2022 Oct;10(10):CD012032.
2. Chou R, Dana T, Bougatsos C, Blazina I, Starmer AJ, Reitel K, et al. Pressure ulcer risk assessment and prevention: a systematic comparative effectiveness review. Ann Intern Med. 2013 Jul;159(1):28–38.
3. Vanderwee K, Clark M, Dealey C, Gunningberg L, Defloor T. Pressure ulcer prevalence in Europe: a pilot study. J Eval Clin Pract. 2007 Apr;13(2):227–35.
4. Mervis JS, Phillips TJ. Pressure ulcers: Pathophysiology, epidemiology, risk factors, and presentation. J Am Acad Dermatol. 2019 Oct;81(4):881–90.
5. Gaspar S, Peralta M, Marques A, Budri A, Gaspar de Matos M. Effectiveness on hospital-acquired pressure ulcers prevention: a systematic review. Int Wound J. 2019 Oct;16(5):1087–102.
6. Brem H, Jacobs T, Vileikyte L, Weinberger S, Gibber M, Gill K, et al. Wound-healing protocols for diabetic foot and pressure ulcers. Surg Technol Int. 2003;11:85–92.
7. Bansal C, Scott R, Stewart D, Cockerell CJ. Decubitus ulcers: a review of the literature. Int J Dermatol. 2005 Oct;44(10):805–10.
8. van Marum RJ, Meijer JH, Ribbe MW. The relationship between pressure ulcers and skin blood flow response after a local cold provocation. Arch Phys Med Rehabil. 2002 Jan;83(1):40–3.
9. Padula W V, Delarmente BA. The national cost of hospital-acquired pressure injuries in the United States. Int Wound J. 2019 Jun;16(3):634–40.
10. Lessing NL, Mwesige S, Lazaro A, Cheserem BJ, Zuckerman SL, Leidinger A, et al. Pressure ulcers after traumatic spinal injury in East Africa: risk factors, illustrative case, and low-cost protocol for prevention and treatment. Spinal cord Ser cases. 2020 Jun;6(1):48.
11. Kottner J, Cuddigan J, Carville K, Balzer K, Berlowitz D, Law S, et al. Pressure ulcer/injury classification today: An international perspective. J Tissue Viability. 2020 Aug;29(3):197–203.
12. Nangole F, Khainga S, Otieno S, Tanga A. An Audit of Surgical Management of Pressure Sores in a Resource Constrained Hospital in Kenya. ISRN Plast Surg. 2013;2013.
13. Duci SB, Arifi HM, Selmani ME, Mekaj AY, Gashi MM, Buja ZA, et al. Surgical Treatment of 55 Patients with Pressure Ulcers at the Department of Plastic and Reconstructive Surgery Kosovo during the Period 2000–2010: A Retrospective Study. Plast Surg Int. 2013;2013:1–6.

14. Boyko T V, Longaker MT, Yang GP. Review of the Current Management of Pressure Ulcers. Adv wound care. 2018 Feb;7(2):57–67.

15. Wong D, Holtom P, Spellberg B. Osteomyelitis Complicating Sacral Pressure Ulcers: Whether or Not to Treat With Antibiotic Therapy. Clin Infect Dis an Off Publ Infect Dis Soc Am. 2019 Jan;68(2):338–42.

16. Swafford K, Culpepper R, Dunn C. Use of a Comprehensive Program to Reduce the Incidence of Hospital-Acquired Pressure Ulcers in an Intensive Care Unit. Am J Crit care an Off Publ Am Assoc Crit Nurses. 2016 Mar;25(2):152–5.

17. Ariani Y, Aliyatur T, Wicaksono B. literature review: The effect of honey in pressure ulcer wound healing acceleration. J Rekonstruksi dan Estet. 2022;7(2):37–42.

18. Batra RK, Aseeja V. VAC Therapy in Large Infected Sacral Pressure Ulcer Grade IV-Can Be an Alternative to Flap Reconstruction? Indian J Surg. 2014 Apr;76(2):162–4.

19. Ricci JA, Bayer LR, Orgill DP. Evidence-Based Medicine: The Evaluation and Treatment of Pressure Injuries. Plast Reconstr Surg. 2017 Jan;139(1):275e-286e.

20. Kim YH, Kim SW, Kim JT, Kim CY. Tensor fascia lata flap versus tensor fascia lata perforator-based island flap for the coverage of extensive trochanteric pressure sores. Ann Plast Surg. 2013 Jun;70(6):684–90.

21. Feng B, Dai GM, Wang YJ, Zhang L, Niu KC. The Treatment Experience of Different Types of Flaps for Repairing Soft Tissue Defects of the Heel. Int J Gen Med. 2021;14:8445–53.

22. Kranke P, Bennett MH, Martyn-St James M, Schnabel A, Debus SE, Weibel S. Hyperbaric oxygen therapy for chronic wounds. Cochrane database Syst Rev. 2015 Jun;2015(6):CD004123.

23. Liu X, Lu W, Zhang Y, Liu Y, Yang X, Liao S, et al. Application of gluteus maximus fasciocutaneous V-Y advancement flap combined with resection in sacrococcygeal pressure ulcers: A CONSORT-compliant article. Medicine (Baltimore). 2017 Nov;96(47):e8829.

24. Qaseem A, Humphrey LL, Forciea MA, Starkey M, Denberg TD. Treatment of pressure ulcers: a clinical practice guideline from the American College of Physicians. Ann Intern Med. 2015 Mar;162(5):370–9.

25. Bluestein D, Javaheri A. Pressure ulcers: prevention, evaluation, and management. Am Fam Physician. 2008 Nov;78(10):1186–94.

26. Walter GP, Seidel W, Giustina R Della, Bins-Ely J, Maurici R, Narciso-Schiavon JL. PROGNOSTIC FACTORS IN PATIENTS WITH PRESSURE SORES IN A UNIVERSITY HOSPITAL IN SOUTHERN BRAZIL. Acta Ortop Bras. 2017;25(6):243–7.

27. Takahashi PY. Pressure ulcers and prognosis: candid conversations about healing and death. Geriatrics. 2008 Nov;63(11):6–9.

# APPEDINCES

## Appendix I: Questionnaire

### Questionnaire on Surgical Management of Pressure Ulcers

### Section 1: Patient Demographics

1. Patient ID: _____
2. Age: _____
3. Gender:
    a. Male
    b. Female
    c. Other
4. Body Mass Index (BMI): _____

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### Section 2: Pressure Ulcer Characteristics

5. Location of Pressure Ulcer:
    a. Sacral
    b. Ischial
    c. Trochanteric
    d. Other: _____
6. Stage of Pressure Ulcer (select one):
    a. Stage I
    b. Stage II

c. Stage III

d. Stage IV

7. Duration of Pressure Ulcer prior to surgery: _____ (days/weeks)

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**Section 3: Surgical Management**

8. Surgical technique used:

a. Surgical debridement

b. Skin graft

c. Flap reconstruction

d. Other: _____

9. Was any preoperative intervention performed?

a. Yes

b. No

10. If yes, please specify: _____

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**Section 4: Postoperative Outcomes**

11. Date of surgery: _____

12. Duration of hospital stay post-surgery: _____ (days)

13. Was the pressure ulcer healed at the time of discharge?

a. Yes

b. No

14. If no, please indicate the reasons (check all that apply):

a. Infection

b. Hematoma

c. Blister formation

d. Other: _____

15. Any complications observed post-surgery?

a. Yes

b. No

16. If yes, please specify: _____

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**Section 5: Additional Comments**

17. Please provide any additional comments or observations regarding the surgical management of pressure ulcers:

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**Thank you for your participation!**