

**THE EFFECT OF RECIPIENT SITE BACTERIAL PROFILE ON THE PERCENTAGE  
TAKE OF SPLIT THICKNESS SKIN GRAFT AT KENYATTA NATIONAL HOSPITAL**

**PRINCIPAL INVESTIGATOR**

**DR ANNE GAKENIA KIMANI**

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**2019**

**DECLARATION**

I declare that this dissertation is the result of my original work and that it has not been submitted either wholly or in part in any other institution for an academic award.

Name: Dr. Anne Gakenia Kimani

Sign: \_\_\_\_\_ Date: \_\_\_\_\_

**SUPERVISORS APPROVAL**

This dissertation has been submitted for examination with my approval as a university supervisor

Dr. Daniel Ojuka

MBChB (U.O.N), M.Med Surgery (U.O.N), PhD (UON) FACS

Consultant General Surgeon/ Senior Lecturer

Department of Surgery, University of Nairobi

Signature .....Date.....

DR. Ferdinand Nangole

MBChB (UON), M Med, General Surgery (UON), PRAS FELLOW EBOPRAS,

Consultant Plastic surgery/ Senior Lecturer

Department of Surgery, University of Nairobi.

Signature ..... Date .....

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## DEDICATION

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## LIST OF ABBREVIATIONS

CHS	College of Health Sciences
DM	Diabetes Mellitus
FTSG	Full Thickness Skin Graft
GNB	Gram Negative Bacilli
GNC	Gram Negative Cocci
GPC	Gram Positive Cocci
GPB	Gram Positive Bacilli
KNH	Kenyatta Nation Hospital
MCS	Microscopy Culture and Sensitivity
MRSA	Methicilline Resistant Staphylococcus Aureus
STSG	Split Thickness Skin Graft
UON	University of Nairobi

## ABSTRACT

### **Background**

Split thickness skin graft (STSG) is a common procedure but graft failure often occurs due to multiple factors. These factors includes infection, hematoma, poor surgical technique, and seroma formation among others. Recipient site microbiology prolife reflect the organism that eventually infect the graft causing failure. Studies on graft failure due to infection have not been done in Kenyatta National Hospital (KNH).

### **Objective**

The aim of the study was to assess the effect of the recipient site microbiological profile on the graft take for patients undergoing split thickness skin grafting in KNH.

### **Methods**

This was a descriptive study among patients undergoing skin grafting in KNH. A total of 69 patients who underwent STSG were recruited in the study, the recipient site was assessed on day 5 and 10 and percentage graft take rate recorded. The wounds were biopsied at the time of the skin grafting and sent for microscopy culture and sensitivity. Outcomes variables that were assessed were percentage skin graft take, bacterial profile of the recipient site and the effect the bacterial profile had on the skin graft take. Data was entered into SPSS and analyzed for proportions, rates and bivariate analysis was done for association using Chi-square. Statistically significant was taken at p-value <0.05.

### **Results**

The location of the wound was majorly in the lower limbs 45 (65%) with a wound size median value of 26.5% (IQR: 9 - 33) for percentage burn. The median percentage graft takes of the wound at day 5 and 10 was 60%. Majority 92% of the wounds biopsied cultured organisms, the majority were; *Pseudomonas Aeroginosa* 12 (17.39%). *Pseudomonas aeroginosa* affected graft survival with a percentage take of less than 20%.

## **Conclusion**

The median percentage take of skin graft wounds is 60% with majority of wounds grafted in KNH are post burn wounds. Graft take did occur in wounds that did culture organisms but presence of some specific organism were a negative predictor of graft take this include *pseudomas aeroginosa*, *proteus spp*s and *streprococcus pyogens*.

## 1.0 INTRODUCTION

### 1.1 Background of the study

STSG is a common procedure used by surgeons to achieve wound closure for large tissue defect. The first documented skin grafting was done 2500 – 3000 years ago by a Hindu tile maker for nasal reconstruction after trauma, the procedure was then popularized by Reverdins in the 19<sup>th</sup> century and Olliers in 1872 and 1886(1). In KNH approximately 250 STSGs are done per year.

Skin graft loss is due to a number of factors; loss due to infection is brought about by inadequate wound care and wound preparation. This leads to reoperation, reduction of skin harvesting sites, increased scar formation, among others(1,2,3). Unal et al(2) recorded the rate loss of skin graft secondary to infection at 23.5%. Bacchetta et al(3) noted that for skin grafts exposed to 10<sup>5</sup> or more organisms, only less than 20% of the graft remained viable and Hogsberg et al(4) found that of wounds containing *P. aeruginosa*, only 33.3% healed.

Studies done in KNH on STSG locally compared tumescent technique and non-tumescent technique of STSG and found the percentage takes at 96.3% and 94% respectively(5), and on wound beds microorganism, Ngugi et al in 2013 looked at burn wound infection and found the overall infection rate of burn wounds is 23.6%(6). Bhatt et al(7) in 2003 looked at early post-operative wound infections and noted the overall wound infection rate in KNH to be 17.1%. There is no study in KNH that assesses take rate of this skin grafts with respect to organisms' cultured and bacterial load in so doing looking at the wound bed readiness before skin grafting. The aim of the study was to assess the effect of the recipient site microbiological profile on the graft take for patients undergoing split thickness skin grafting in KNH

## 2.0 LITERATURE REVIEW

Skin graft is the transfer of devascularised skin containing epidermis and dermis, obtained from a donor site to a recipient site. For the skin graft to survive, it must undergo 3 phases. The first phase is plasmatic imbibition, this is when the graft absorbs nutrients and oxygen from the transudate this lasts up to 24 to 48 hours. The second phase is inosculation when the capillaries from the recipient and donor site align and finally the third phase revascularization occurs by day 5, where new blood vessels invade or anastomose to open dermal vascular channels. Full circulation is restored by day 4 to 7 and the graft undergoes epidermal growth and hyperplasia during this time period, and continues for several weeks (8) (9).

The different types of skin grafts depend on the depth of the dermis, this can be classified as split and full thickness skin graft. STSG can be further classified as thin 0.008 – 0.012, medium 0.012 – 0.018 and thick 0.018 – 0.030 depending on the depth of skin harvested.(8) A FTSG involves harvesting the epidermis and entire layer of the dermis but not including the subcutaneous tissue. The harvest of split thickness skin graft is done by a dermatome that is either manual (humby knife) that is commonly used in KNH, or powered by compressible air or electrical. Skin graft take rate is expressed as a percentage of the surface area of the wound being grafted. Bloeman et al(10) assessed the subjective clinical evaluation of skin graft take and comparable it to digital image analysis (objective measurement) and found that subjective clinical evaluation is as good as digital imaging analysis but with digital image analysis being more time consuming and technically challenging.

Indications for skin grafting include coverage of a wound defect that cannot be closed by approximation of wound edges in patients with trauma, post tumor excision and post contracture release(11). STSG are used in third degree burns where skin and skin appendages are damaged and therefore complete spontaneous healing isn't possible, they can also be used to facilitate a more rapid healing of leg ulcers after debridement if the wound bed is deemed well healed (12).

## **2.1 Post-operative complications of skin graft**

Post-operative complications of skin grafting can be divided into early and late complications. Early post-operative complication includes infections, hematoma, seroma accumulation, and shearing forces. Whereas late complications are grouped into functional and aesthetic complications (8), studies done indicate infection is the second most common complication following hematoma and seroma (2).

Flowers *et al* (13) noted that the second most common cause of graft failure is infection and attributed this to poor wound bed preparation, quilt suturing of the graft, and formation of hematomas and seromas. With the most common cause of graft failure being hematoma formation seen in large wounds and excessive suturing of the graft.

## **2.2 Skin graft failure due to infection**

Wound and skin infection refers to the presence of multiplying organisms within the skin or break in the skin that causes a host reaction, that includes inflammation or tissue damage(14).

Superficial surgical site infection involves skin and subcutaneous tissue of the incision site and at least one of the following:

1. Purulent drainage with or without laboratory confirmation, from the superficial incision
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative
4. Diagnosis of superficial incisional SSI made by a surgeon or attending physician

The consequence of bacteria on skin graft is dependent on 3 factors which include bacterial load, strain virulence and host immune response. Typically, all open wounds are contaminated by microorganisms. Grafts exposed to bacterial count of more than  $10^5$  per gram of tissue have a less than 20% graft survival, implying that only wounds with a bacterial count of less than  $10^5$  per gram of tissue are ready for grafting (3).

Specific strains of bacterial, including *Pseudomonas aeruginosa*, are a negative predictor for the survival of a graft.(2) (4). Other organisms implicated in affecting skin graft survival include *staphylococcus aerus* and *streptococcal pyogenes*, which induces injury even at a lower count of  $10^2$  per gram of tissue.(10), comorbidities like diabetes have an effect in skin graft take due to impaired immunity therefore the effect of bacteria is seen at a lower bacterial load or just with normal flora.(15)

A study by Unal et al concurred with the above findings. The study indicated that *Pseudomonas* infections tend to be more dramatic due to the following; toxin production, mechanisms that evade phagocytosis, antibiotic resistance and development of biofilms. Toxins produced by *pseudomonas* namely pyocyanin and exotoxin are responsible for skin graft lysis (2) (13).

Chronic wounds can also be closed by STSG. Hesberg et al (4) studied the success of STSG on venous leg ulcers and found that long standing wounds had a higher rate of *pseudomonas aeruginosa*. He also noted that wounds with *P.aeruginosus* had 33.3% success rate of grafts take as compared to 73.1% of those without *P.aeruginosa*, making *P. aeruginosa* a negative predictor of the success of graft take. Gjjobsbol et al(16) assessed the bacterial load or specific organisms of 50 chronic venous wounds and noted that all chronic wounds where colonized by more than one species and the most common organisms cultured include.

- *Staphylococcus aureus* (found in 93.5% of the ulcers),
- *Enterococcus faecalis* (71.7%),
- *Pseudomonas aeruginosa* (52.2%),
- coagulase-negative staphylococci (45.7%),
- *Proteus* species (41.3%) and anaerobic bacteria (39.1%).

As for chronic wounds seen in diabetic patients that are managed by STSG a study by Ramanujam et al(17) stated that diabetic wounds took longer to heal; about 1.99 weeks longer than non-diabetic patients and 41% of the wounds, organisms where cultured. Of this 15% had *staphylococcus* and *streptococcus* and 6% cultured *pseudomonas* species. Donegan et al(15) noted that diabetic patients have a higher risk of post-operative complications (5.15 times higher than non-diabetic) after STSG.

Mzezwa et al looked from Zimbabwe looked at the effect of HIV on skin graft found that graft survival in non-HIV patients was higher at 65% than those infected with HIV, with the exact mechanism of the cause of the greater failure remaining largely unknown but theories on increased rate of infection and immune dysregulation have been postulated.

### **2.3 Role of the skin and microbiology of infection**

The role of intact skin is the primary defense against bacterial colonization. Once the skin integrity is impaired, the underlying subcutaneous tissue is exposed, providing an ideal environment for bacterial colonization and growth(18).

Bowler *et al* (19) did a review of wound microbiology and stated that exposed subcutaneous tissue provides an ideal environment for bacterial contamination and colonization, other factors that contribute to this include the presence of dead and devascularised tissue and impaired host immune response. Origin of the wound contaminants include but are not limited to environment, surrounding skin and endogenous sources including the mucus membrane especially wounds of close proximity to the orifice. He noted that wound colonization is polymicrobial and there are various factors that contribute to the progressions from colonization to infection, this include wound factors like type, size, depth and site of the wound and extend of non-viable contamination, host factors like host immune response and microbiological factors like local microorganism, virulence of the type of organism involved.

Kinyua et al(20) studied the organism isolated from burn wound patients in KNH found 60% of organisms isolated were gram negative of which 44% was *Staphylococcus Aureus* and 32.1% being *Pseudomonas aeruginosus*, with majority of the organisms isolated where multidrug resistant.

### **2.4 Diagnosis of wound infection**

Types of wound infection range from contamination, colonization and infection. The effect of microorganisms on a wound depends on three host and bacterial factors; bacterial load, virulence of a particular strain and the host immune response.



The gold standard for assessing wound infection is by skin biopsy either by scalpel or punch, which is disadvantageous as it is traumatic, wound disrupting, costly and time consuming(21), (22). Swab culture is a more commonly used technique due to its ease of use, cost effectiveness and its noninvasive nature. However, the major concern with swab wound cultures is the fact that it does not provide adequate information on the invading organisms as compared to the skin biopsy. Basak *et al* (23) assessed the reliability of surface swabs in diagnosis of wound infection and compared to wound biopsy and found that surface swabs were reliable in about 72% of the cases when compared to cultures that were obtained from wound biopsies.

A number of swab techniques have been modified in an attempt to circumvent this, they include the Levin, z tract/10-point, zigzag technique. The Levine technique is a quantitative swab culture that involves turning the end of a cotton-tipped applicator swab on a 1cm<sup>3</sup> surface area of the wound. Gardner et al (24) looked at the validity of the 3 swab technique, he found that the Levin technique had a sensitivity and a specificity of 90% and 57% respectively in chronic wounds with a mean concordance between the swab and tissue specimen was 78%.

Copeland-Halpein et al(25) did a systemic review of the best sampling technique for cultures of infected wounds. They compared punch biopsy, Levin and z swab techniques and concluded that punch biopsy provides qualitative and quantitative information on bacterial profile with a specificity and sensitivity of 100% and 90% respectively. They noted that the Levin is superior to Z swab and the swabbing techniques have a limited role in the detection of colonization vs infection and assessment of antibiotic resistant wounds.

## 3.0 STUDY JUSTIFICATION

Skin grafting is a common procedure performed by all surgical departments. The impact of skin graft loss due to infection is not adequately appreciated in KNH. Data on the particular organisms and the bacterial load that predisposes one to skin graft loss is not available. This study seeks to describe the percentage skin graft loss that is due to infection and also state the particular organism cultured and bacterial load that causes graft loss. The information obtained from this study can be used to improve wound bed preparation and initiate adequate and prompt treatment of organisms involved. The study can also be used for policy formulation on soft tissue infection and antibacterial use.

### 3.1 Study Question

Does the recipient site bacteriology profile affect the graft take after skin grafting?

### 3.2 Study Objectives

#### 3.2.1 Broad objective

The purpose of the study is to assess the effect of recipient site microbiological profile on the graft take of patients undergoing skin grafting in Kenyatta National Hospital.

#### 3.2.2 Specific Objectives

1. To assess bacterial profile (specific organism and bacterial profile) of the wound at the time of skin grafting.
2. To assess the percentage graft take of the wound at day 5 and 10
3. To compare to the bacterial profile cultured and the percentage take
4. To assess the organism's antimicrobial sensitivity pattern of wounds cultured

### **3.3 Materials and Methods**

#### **3.3.1 Study design**

Descriptive cohort study

#### **3.3.2 Study Area**

The study was carried out at Kenyatta National Hospital, the largest tertiary referral hospital with a bed capacity of 2000. It serves as the teaching hospital for the University of Nairobi, College of Health Sciences. The wards included include 4A, 4C, 4D, 5A, 5B, 5D, 6A, 6B, 6C, 6D, Main theatre, Burns theatre and Surgical Outpatient clinic

#### **3.3.3 Study population**

All patient undergoing skin grafting at Kenyatta National Hospital, that gave consent for the study.

#### **3.3.4 Sampling**

Convenient sampling was used.

#### **3.3.5 Eligibility Criteria**

##### **3.3.5.1 Inclusion criteria**

Patients undergoing skin grafting in Kenyatta Nation hospital with wound beds that have adequate red granulation tissue for both acute and chronic wounds.

##### **3.3.5.2 Exclusion criteria**

- I. Patients with signs and symptoms of local or systemic infection including exudate from wound and presence of necrotic tissue.
- II. Patients on prophylactic or therapeutic antibiotics
- III. Patients with visible bone or tendon on wounds
- IV. Patients with albumin levels <30g/dl, Hemoglobin <10g/dl

### 3.3.6 Sampling size calculations

The formula used for calculating the sample size for a simple random sample without replacement is shown below:

$$n = \left( \frac{z}{m} \right)^2 p(1 - p)$$

where,

z is the z value (1.96 for 95% confidence level);

m is the margin of error (0.10 = + or – 10%); and

p is the estimated value for the proportion of the sample that develop wound infection (0.235 for 23.5% based on a previous study (2)).

We used the formula our sample size as:

$$n = \left( \frac{1.96}{0.10} \right)^2 0.235 (1 - 0.235) = 69$$

### 3.3.7 Sampling Procedure

Patients undergoing skin grafting in KNH who fit in the inclusion criteria participated in the study. The etiology of the wounds was classified into different categories that include: acute wounds – burns, trauma and chronic wounds – vascular, chronic burns, wounds of unknown origin.

Preoperative evaluation of the wounds was done to optimize the recipient site for grafting, the wounds with necrotic tissue, discharge, malodor, periwound erythema or edema were excluded

In theater the wounds were cleaned with soap and water. The surgical team performing the skin graft once sterile would clean the wound with 1% iodine solution and draped. Saline soaked gauzes were used to wipe off the iodine solution from the biopsy site. Using the punch biopsy needle in a sterile technique a specimen was obtained and labeled with unique numbers, date and time of procedure. The specimens were then delivered to the microbiology laboratory within two

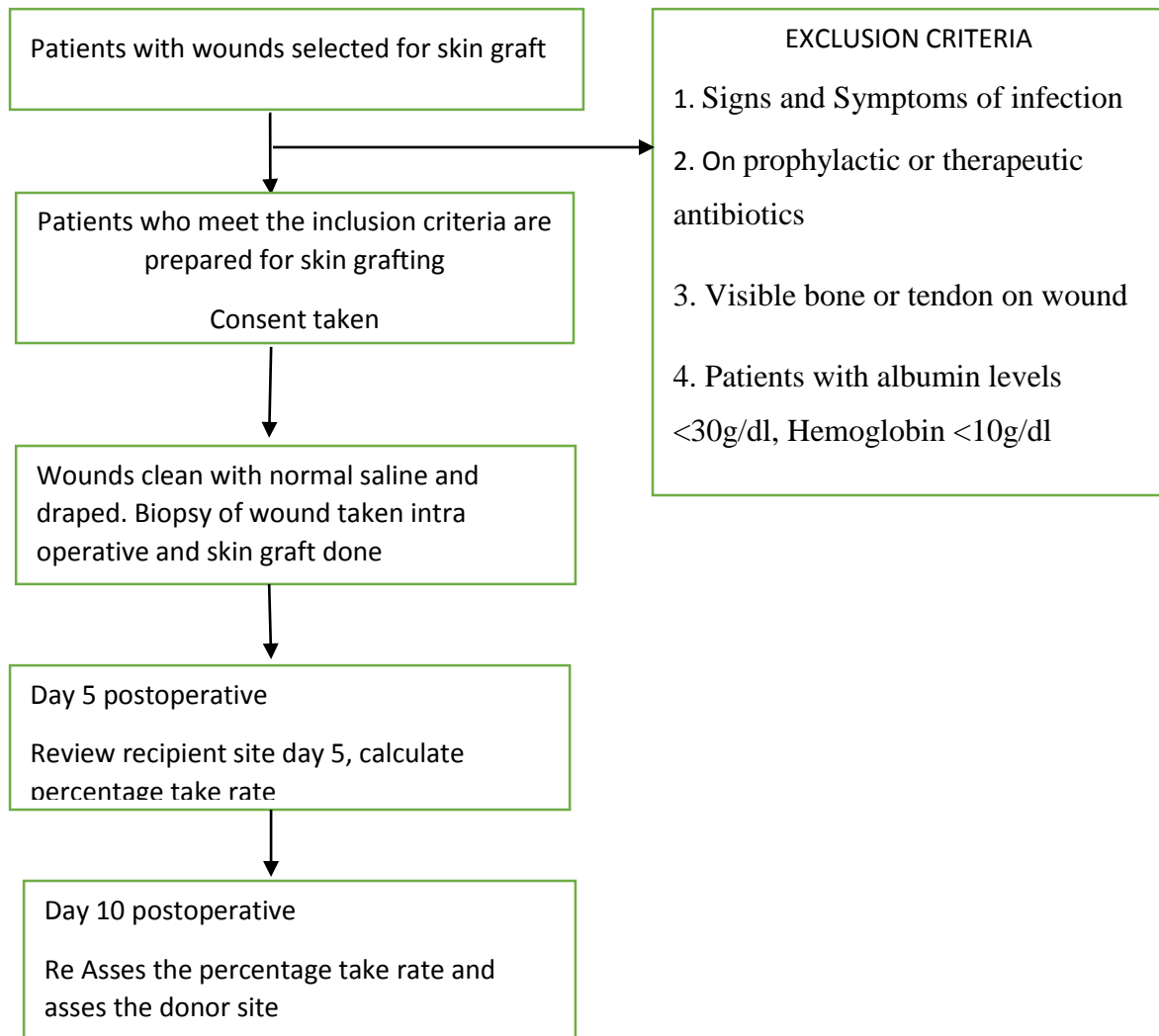
hours and processed within twenty-four hours of obtaining the specimen. After biopsy specimen is obtained, skin grafting and dressing of the wound done via standard departmental protocol with Vaseline soaked gauze, dry gauze and crepe bandage.

The recipient site was evaluated on the fifth and tenth post-operative day, percentage graft take will be determined by wound tracing paper technique which was placed on a metric grid paper and number of squares counted to establish the surface area in square centimeters. Surface area of the wound and area with graft take were obtained. The take was then compared with the wound microbiology results.

### **3.3.8 Laboratory**

In the laboratory the specimen were cultured in Kleb and Blood agar. Suspected colonies undergo antibiotics susceptibility testing with the standardized Kirby-Bauer disc diffusion method (recommended by Clinical Laboratory Standards International). The laboratory tests were carried out in the microbiology laboratory at KNH by a study dedicated technician. All the reagents were prepared in accordance with standard operating procedures used at UON/KNH. Equipment operation was done according to manufacturer's instructions. Find attached in appendices 3 the UON/KNH standard operating procedures for microscopy, culture and sensitivity.

**Figure 1: Patient Flow Chart**



### **3.3.9 Quality assurance and control measures**

Quality control was a continuous process throughout the study to maximize validity and reliability of the findings of the study.

The principal investigator carried out all the interviews and physical examinations. The data collection tools were cross checked for completeness and any missing entries corrected. The quantitative and qualitative data collected was cross checked for any inconsistencies and outliers rectified.

### **3.3.10 Data management and analysis**

Data was collected and entered into data collection sheets. The data was cross checked to ensure quality and accuracy. It was then entered into a Microsoft Excel spreadsheet screen, and thereafter imported into the statistical analysis software for data management and analysis.

Continuous data including but not limited to Age of patient, graft take and times since wound occurred was presented using means and respective standard deviations (SD) or medians and inter-quartile range (IQR) as deemed appropriate. Counts and corresponding percentages (%) were used for categorical variables such as sex of patient, wound classification, bacterial profile. Bivariate comparisons of percentage graft take at day 5 and 10 with the demographic and clinical characteristics was done using Wilcoxon rank sum tests and Kruskal Wallis tests for continuous variables as appropriate. A matched pairs comparison of the median skin graft takes at 5<sup>th</sup> and 10<sup>th</sup> day was done using Wilcoxon signed rank test. Bar, box and pie graphs were used to display some of the results as appropriate. Pictorial presentation of the grafted sites was also presented. All p values less than 0.05 was considered significant. Stata version 15.1 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC) was used for all statistical analyses.

### **3.3.11 Study Limitations**

Assessment of the bacterial count by the University of Nairobi laboratory was the major study limitations due to lack of the adequate equipment, a macerator of the biopsy specimen.

### **3.3.12 Ethical Consideration**

Permission was sought from the Kenyatta National hospital- University of Nairobi Ethics and Research Committee (KNH –UoN ERC) which is the institutional review board at the UoN. Consent was administered to the participants and data collected only after the form had been signed. For minors less than 18 years of age, assent was be obtained from the parents and signed before administration of the data collection tool. The biopsy collection procedure was performed aseptically and transported to the laboratory. The principal investigator and the two research assistants underwent a training in Good Clinical Practice before embarking on sample collection. The results of the MCS were shared with the study participants, the department of surgery before dissemination.



## 4.0 RESULTS

### 4.1 Demographics

Majority of the patients, 46 (66.7%), were male. The median age of the patients was 24 years (IQR: 11 - 34) and majority, 27 (39.1%) aged less than 20 years as shown in table 1.

*Table 1: Demographics*

Demographics	n (%)
Gender	
Female	23 (33.3)
Male	46 (66.7)
Age Median (IQR)	24 (11 - 34)
Age Category	
0-20 years	27 (39.1)
21-30 years	20 (29)
31+ years	22 (31.9)

### 4.2 Presentation

Most of the patients, 54 (78.3%) and 7 (10.1%), cause of wound was mostly burn wounds and post traumatic wound respectively. A majority of the patients wound duration is 22 (31.9%) and 25 (36.2%), was between 4 to 12 weeks and 12 to 72 weeks respectively. The rest of the patients with wound duration of 1 week 1 (1.4%), 2-4weeks had 5 (7.2%) and greater than 72 weeks had 16 (23.2%)

The overall median hospital stay was 10 weeks (IQR: 5 - 21) with a majority, 19 (27.5%), staying for between 6 to 10 weeks. Majority 94.2% of patients had no medical condition, of the 69 patients 4 had medical conditions 2 are diabetic and 2 are hypertensive. All were well controlled table 2.

*Table 2: Presentation*

Medical History	n (%)
<b>Cause of wound</b>	
Burn wounds	54 (78.3)
Diabetic wound	3 (4.3)
Melanoma	1 (1.4)
Post-surgical wound	3 (4.3)
Post traumatic wound	7 (10.1)
Venous ulcer	1 (1.4)
Duration of hospital stay in weeks Median (IQR)	10 (5 - 21)
<b>Duration of hospital stay in weeks</b>	
1-5 weeks	18 (26.1)
6-10 weeks	19 (27.5)
11-20 weeks	14 (20.3)
20+ weeks	18 (26.1)

### **Physical Examination**

On physical examination, the location of the wound was majorly in the lower limbs 45 (65%) and upper limbs 39 (56.52%). The percentage size of the wound had a median value of 26.5 percent (IQR: 9 - 33). Just under three quarters of the surgeons, 49 (72.1%), were third year residents.

*Table 3: Physical Examination*

Physical Examination	n (%)
Location of wound *	
anterior trunk	6 (8.7)
lower limbs	45 (65.22)
Trunk	35 (50.72)
upper limbs	39 (56.52)
Size of wound percent Median (IQR)	26.5 (9 - 33)
Size of wound percent	
1-15 percent	19 (27.9)
16-30 percent	27 (39.7)
31-45 percent	22 (32.4)

\* Multiple response, %s may add up to more than 100%

### **4.3 Experience of Surgeon**

The experience of surgeons performing the surgeries is as indicated in the table below. Of note majority of skin graft are performed 3<sup>rd</sup> year residence 49 (72.1%), with 4<sup>th</sup> years residence 15 (22.1%), with 2<sup>nd</sup> an 5<sup>th</sup> year residence did both 2 cases (2.9%). Figure 2

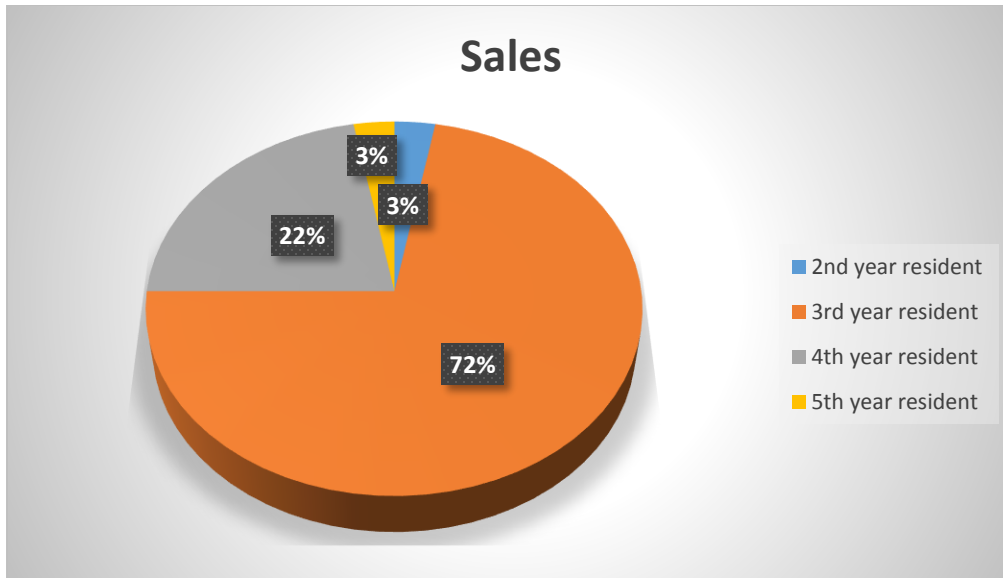


Figure 2: Proportion of residence performing skin grafts

#### 4.4 Post-Operative Skin Graft Assessment

Majority 68 (98.4%) of patients had no post-operative complications except one patient who had a surgical site infection 1(1.6%). The median percentage graft takes of the wound at day 5 was 60% (IQR: 20 - 80) and 60% (IQR: 10 - 80) at day 10.

#### 4.5 Biospy Results

The majority of the microscopy results had Gram Negative Rods (GNR) 44 (65.68%), Gram Negative Cocci (GNC) 4 (5.97%), Gram Positive Rods (GPR) 6 (8.96%) or Gram Positive Cocci (GPC) 31 (46.27%), 4(5.98%) have no organisms on gram staining (Figure 3).

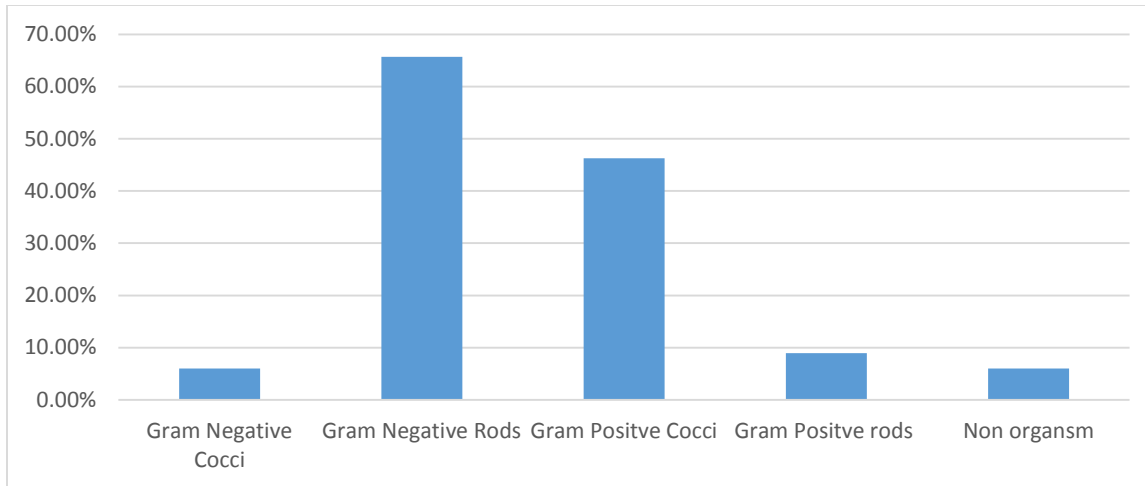


Figure 3: Gram staining results

With regard to organisms cultured, the majority were; *Pseudomonas Aeruginosa* 12 (17.39%), *Proteus mirabilis* 11 (15.94%), *Klebsiella Pneumonia* 9 (13.04%), *Acinetobactor baumannii* 8 (11.59%) and *Staphylococcus aureus* 7 (10.14%). (Table 4)

Table 4: Biopsy Results

Biopsy Results	n (%)
Organisms Cultured *	9 (13.04)
Acinetobacter species	1 (1.45)
Enterobacter aeruginosa	9 (13.04)
Klebsiella Pneumonia	1 (1.45)
Morganella morganii	11 (15.94)
Proteus mirabilis	5 (7.25)
Providencin Stuartii	12 (17.39)
Pseudomonas Aeruginosa	1 (1.45)
Pseudomonus species	3 (5.8)
Staphylococcus Species	7 (10.14)
Staphylococcus aureus	3 (4.35)
Streptococcus pyogens	2 (2.9)
Streptococus Pneumonia	4 (5.8)
Nil	

The drugs which the patients were sensitive to include; meropenem 31 (48.44%), amikacin 28 (43.75%), ciprofloxacin 27 (42.19%), piperacillin/tazobactam 25 (39.06%), gentamycin 15 (23.44%) and levofloxacin 13 (20.31%). Majority of the drugs with a high proportion of patients showing a resistance; gentamycin 34 (53.12%), cefepime a 4<sup>th</sup> generation cephalosporin 28 (43.75%), a 3<sup>rd</sup> generation cephalosporin ceftriaxone 27 (42.19%), septrin 25 (39.06%), ampicillin 23 (35.94%), ciprofloxacin 22 (34.38%) and piperacillin/tazobactam 21 (32.81%) as shown in Table 5.

*Table 5: Sensitivity and Resistance of Organism Cultured to antibiotics*

<b>ANTIBIOTICS</b>	<b>SENSITIVITY n(%)</b>	<b>RESISTANCE n(%)</b>
Amikacin	28 (43.75)	5(7.81)
Amoxicillin	9 (14.06)	13(12.5)
Ampicillin	1 (1.56)	42.18
Piperacillin/tazobactam	25 (39.06)	21(32.81)
1 <sup>st</sup> generation cephalosporin	2 (3.12)	
2 <sup>nd</sup> generation cephalosporin	4 (6.25)	12(18.74)
3 <sup>rd</sup> generation cephalosporin	25 (39.06)	65(95)
4 <sup>th</sup> generation cephalosporin	10 (15.62)	28(43.75)
Ciprofloxacin	27 (42.19)	22(34.38)
Macrolides	3 (4.68)	11(17.18)
Gentamycin	15 (23.44)	34(53.12)
Levofloxacin	13 (20.31)	2(3.12)
Linezolid	2 (3.12)	
Meropenem	31 (48.44)	9(14.06)
Imipenem	4 (6.25)	
Norfloxacin	3 (4.69)	
Septrin	7 (10.94)	25(39.06)
Teicoplanin	2 (3.12)	
Tetracyclin	3 (4.68)	11(17.19)
Vancomycin	5 (7.81)	4(6.25)
None	2 (3.12)	
*Multiple response, %s may add up to more than100%		

#### 4.5 Percentage Graft take and Bacterial Profile depending on Duration of wound.

The percentage skin graft take at 5 and 10 days post-operation was lower as the wound duration increased even through this was without statistical significance, all p value > 0.05. Overall, there was no clear pattern in the wound duration and organism cultured. As seen in Table 6 and Figure 4.

Table 6: Percentage graft take based on duration of wound

PERCENTAGE SKIN GRAFT TAKE	5th day post op		10th day post op	
	Median IQR	Test, P value	Median IQR	Test, P value
Wound duration		Wilcoxon rank-sum, 0.1334		Wilcoxon rank-sum, 0.1492
1-4 Weeks	90 (70-90)		90 (60-90)	
4-12 Weeks	72.5 (35-80)		60 (20-80)	
12-72 Weeks	60 (10-80)		50 (5-80)	
>72 Weeks	50 (0-77.5)		25 (0-77.5)	

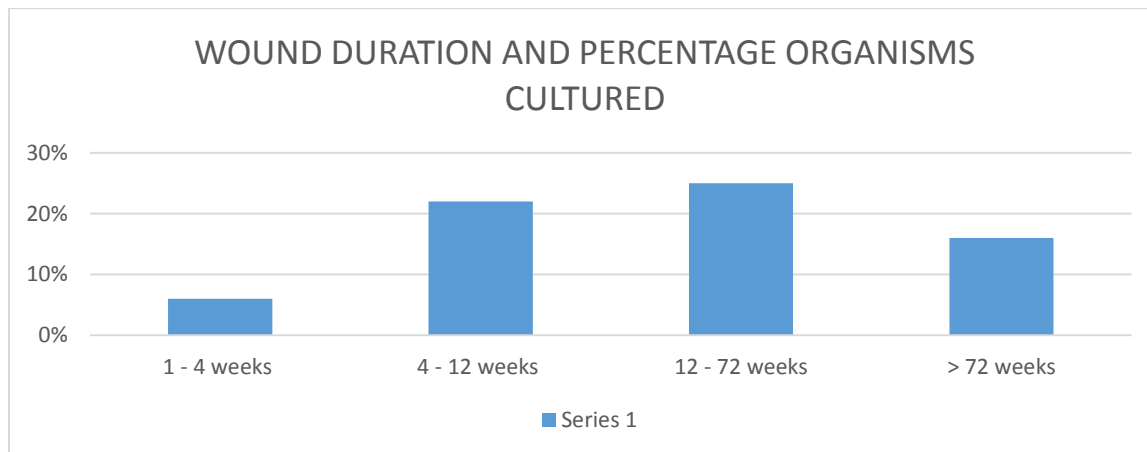


Figure 4: Wound duration and percentage organisms cultured

## **4.6 Bivariate Comparisons**

### **4.6.1 Percentage Graft Take by demographic and clinical characteristics**

There was no significant difference in the median percentage skin graft take on the 5th day post operation by gender, age category, duration of hospital stays and cause of wound.

Similarly, there was no significant differences in the median skin graft take on the 10th post operation by gender, age category and cause of wound, except for duration of hospital stay ( $p$  value = 0.038) (Table 7).



Table 7: Skin Graft Take by demographic and clinical characteristics

Percentage Skin graft Take	5th day post op		10th day post op	
	Median IQR	Test, P value	Median IQR	Test, P value
Characteristics				
Gender		Wilcoxon rank-sum, 0.493		Wilcoxon rank-sum, 0.738
Female	60 (0-85)		60 (0-85)	
Male	65 (20-80)		60 (20-80)	
Age category		Kruskall Wallis, 0.308		Kruskall Wallis, 0.377
0-20 years	75 (20-85)		60 (20-85)	
21-30 years	55 (15-77.5)		42.5 (7.5-72.5)	
31+ years	57.5 (0-90)		55 (0-90)	
Duration of hospital stay		Kruskall Wallis, 0.054		Kruskall Wallis, 0.038
1-5 weeks	80 (40-90)		77.5 (40-90)	
6-10 weeks	60 (0-80)		50 (0-70)	
11-15 weeks	75 (10-80)		75 (0-80)	
16-20 weeks	75 (60-80)		75 (60-80)	
20+ weeks	20 (0-85)		15 (0-85)	
Cause of wound		Kruskall Wallis, 0.062		Kruskall Wallis, 0.079
Burn wounds	62.5 (20-80)		60 (20-80)	
Diabetic wound	75 (20-85)		75 (20-85)	
Melanoma	90 (90-90)		90 (90-90)	
Post surgical wound	90 (20-100)		90 (20-100)	
Post traumatic wound	0 (0-75)		0 (0-75)	
Venous ulcer	0 (0-0)		0 (0-0)	

#### 4.6.2 Percentage take comparison at day 5 and 10 post operation

There was no significant difference in the matched median percentage take between the 5th and 10th day post operation,  $p = 0.431$  as shown in Figure 5.

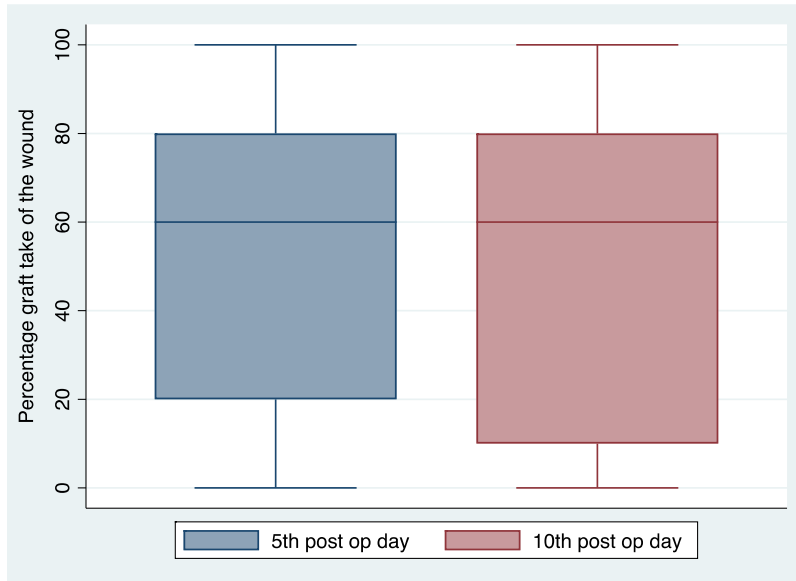


Figure 5: Comparison of graft take on 5th and 10th day

#### 4.7 Percentage graft take by organism cultured

There was a statistically significant difference in the median skin graft percentage take among the various organisms cultured at day 5 post operation,  $p$  value = 0.005. Similarly, there was a statistically significant median skin graft percentage take at 10<sup>th</sup> day post operation,  $P$  value = 0.006 as indicated in Table 8 and Figure 6.

Table 8: Percentage graft take by organism cultured

Organism Cultured	5th day post op Median (IQR)	10th day post op Median (IQR)
Acinetobacter deutrificans	75 (75-75)	75 (75-75)
Acinetobactor baumanii	85 (20-90)	85 (20-90)
Enterobacter aeruginosa	0 (0-0)	0 (0-0)
Klebsiella Pneumonia	65 (40-80)	50 (30-80)
Morganella morganii	75 (75-75)	75 (75-75)
Nil	90 (90-90)	90 (90-90)
Non cultured	90 (90-90)	90 (90-90)
Proteus mirabilis	35 (0-60)	35 (0-60)
Proteus spp isolated	50 (25-70)	15 (7.5-40)
Providencin Stuartii	78 (70-80)	75 (70-80)
Pseudomonas Aeroginosa	20 (0-50)	10 (0-40)
Pseudomonus spp	30 (30-30)	30 (30-30)
Sphingomucis paucimobillis	60 (60-60)	60 (60-60)
Staphylococcus Spps	70 (60-80)	70 (60-80)
Staphylococcus aureus	90 (80-90)	90 (60-90)
Staphylococcus scium	70 (70-70)	60 (60-60)
Staphylococcus sciuri	0 (0-0)	0 (0-0)
Streptococcus pyogens	20 (0-50)	20 (0-50)
Kruskall Wallis test , P value	0.005	0.006

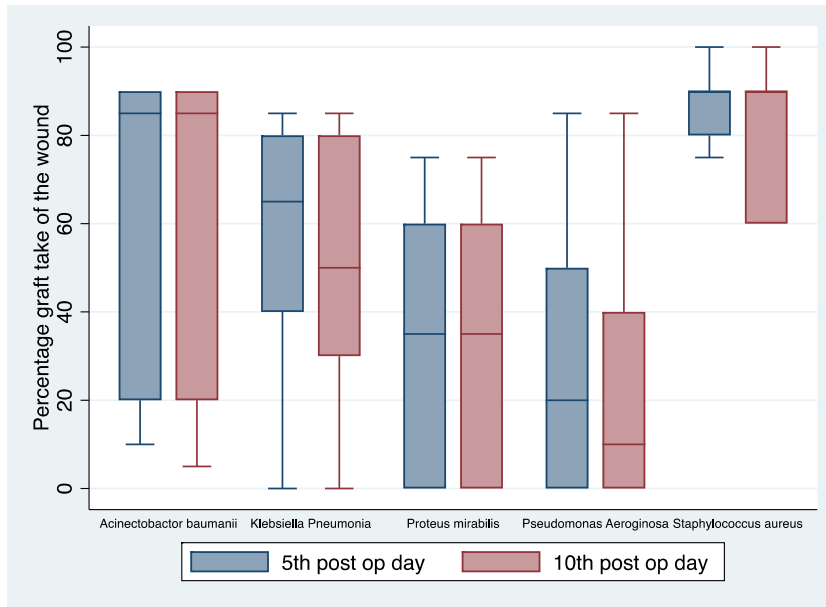


Figure 6: Percentage graft take by organism cultured

#### 4.8 Sensitivity to drug by Organism cultured

Meropenem had a very high sensitivity percentages against *Acinetobacter deutrificans* (57.14%), *Klebsiella Pneumonia* (66.67%), *Proteus mirabilis* (55.56%) and *Pseudomonas Aeruginosa* (58.33%). Amikacin was highly sensitive against *Acinetobacter deutrificans* (42.86%), *Klebsiella Pneumonia* (55.56%), *Proteus mirabilis* (55.56%) and *Pseudomonas Aeruginosa* (50%). Ciprofloxacin was only highly sensitive against *Klebsiella Pneumonia* (66.67%). Piperacillin/tazobactam was highly sensitive against *Proteus mirabilis* (44.44%) and *Pseudomonas Aeruginosa* (58.33%) (Table 9)

Table 9: Sensitivity to drug by Organism cultured

Sensitivity to Drug	Selected Organism Cultured				
	Acinetobacter deuffuricans*	Klebsiella Pneumonia *	Proteus mirabilis*	Pseudomonas Aeruginosa*	Staphylococcus aureus*
Amikacin	3 (42.86)	5 (55.56)	5 (55.56)	6 (50)	1 (16.67)
Amoxicillin	0 (0)	0 (0)	1 (11.11)	0 (0)	0 (0)
Amoxicillin/clavulin	0 (0)	1 (11.11)	2 (33.33)	0 (0)	1 (16.67)
Cefazolin	0 (0)	0 (0)	1 (11.11)	0 (0)	0 (0)
Cefepime	1 (14.29)	1 (11.11)	1 (11.11)	5 (41.67)	0 (0)
Ceftazidime	1 (14.29)	0 (0)	3 (33.33)	5 (41.67)	0 (0)
Ceftriaxone	0 (0)	1 (11.11)	4 (44.44)	0 (0)	0 (0)
Cefuroxime	0 (0)	1 (11.11)	3 (33.33)	0 (0)	0 (0)
Ciprofloxacin	1 (14.29)	3 (33.33)	6 (66.66)	4 (33.33)	1 (16.67)
Clindamycin	0 (0)	0 (0)	0 (0)	1 (8.33)	0 (0)
Gentamycin	2 (28.58)	1 (11.11)	4 (44.44)	1 (8.33)	2 (33.34)
Levofloxacin	0 (0)	1 (11.11)	0 (0)	1 (8.33)	4 (66.67)
Linezolid	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.33)
Meropenem	4 (57.14)	6 (66.67)	5 (55.56)	7 (58.33)	0 (0)
None	1 (14.29)	0 (0)	0 (0)	1 (8.33)	0 (0)
Norfloxacin	0 (0)	0 (0)	0 (0)	1 (8.33)	2 (33.33)
Piperacillin/tazobactam	1 (14.29)	2 (22.22)	4 (44.44)	7 (58.33)	0 (0)
Septrin	0 (0)	0 (0)	0 (0)	0 (0)	3 (50)
Tegercylin	0 (0)	0 (0)	0 (0)	1 (8.33)	0 (0)
Teicoplanin	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.33)
Tetracyclin	0 (0)	0 (0)	0 (0)	1 (8.33)	2 (33.33)
Vancomycin	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.33)
Number of Patients	7	9	9	12	6

\*Multiple response , percentages may add up to more than 100%

#### 4.9 Resistance to drug by Organism cultured

Ampicillin had the highest resistance from *Klebsiella Pneumonia* (77.78%) and *Proteus mirabilis* (66.67%). Benzyl penicillin had highest resistance from *Staphylococcus aureus* (66.67%) while cefazolin from *Acinetobacter deutrificans* 57.14%). Similarly, cefepime had a high resistance from *Acinetobacter deutrificans* (71.43%) and cefotaxime against *Staphylococcus aureus* (66.67%). Ceftriaxone had high resistance against *Acinetobacter deutrificans* (100%) and likewise for ciprofloxacin (85.71%). Ciprofloxacin had a high resistance from *Klebsiella Pneumonia* (66.67%). Piperacillin/tazobactam had a high resistance from *Acinetobacter deutrificans* (85.71%) and *Klebsiella Pneumonia* (77.78%) as shown in Table 10.

Table 10: Resistance to drug by Organism cultured

	Selected Organism Cultured				
	Acinetobacter deutrificans*	Klebsiella Pneumonia*	Proteus mirabilis*	Pseudomonas Aeroginosa*	Staphylococcus aureus*
Resistance to drug					
Amikacin	0 (0)	0 (0)	1 (11.11)	3 (25)	0 (0)
Amoxicillin/clavulin	2 (28.57)	4 (44.44)	4 (44.44)	1 (8.33)	0 (0)
Ampicillin	3 (42.86)	7 (77.78)	6 (66.67)	2 (16.67)	0 (0)
Ampicillin/sulbactam	0 (0)	2 (22.22)	1 (11.11)	1 (8.33)	0 (0)
Benzyl penicillin	0 (0)	0 (0)	0 (0)	1 (8.33)	4 (66.67)
Cefazolin	4 (57.14)	1 (11.11)	1 (11.11)	4 (33.33)	0 (0)
Cefepime	5 (71.43)	5 (55.56)	4 (44.44)	6 (50)	0 (0)
Cefotaxime	2 (28.57)	3 (33.33)	2 (22.22)	8 (66.67)	0 (0)

Ceftazidime	5 (71.43)	0 (0)	1 (11.11)	5 (41.67)	0 (0)
Ceftazoline	1 (14.29)	0 (0)	1 (11.11)	0 (0)	0 (0)
Ceftriaxone	7 (100)	5 (55.55)	3 (33.33)	2 (16.66)	0 (0)
Cefuroxime	0 (0)	3 (33.33)	2 (22.22)	1 (8.33)	0 (0)
Cephalosporins	0 (0)	2 (22.22)	0 (0)	0 (0)	0 (0)
Ciprofloxacin	6 (85.71)	6 (66.67)	3 (33.33)	6 (50)	0 (0)
Macrolides	0 (0)	0 (0)	0 (0)	1 (8.33)	8 (16.66)
Gentamycin	5 (71.43)	4 (44.44)	4(44.44)	8 (66.67)	4 (66.67)
Levofloxacin	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.33)
Meropenem	3 (42.86)	2 (22.22)	1 (11.11)	3 (25)	0 (0)
Piperacillin/tazobactam	6 (85.71)	7 (77.78)	4 (44.44)	2 (16.67)	0 (0)
Septrin	4 (57.14)	4 (44.44)	3 (33.33)	2 (16.67)	3 (50)
Tetracyclin	0 (0)	0 (0)	1 (11.11)	0 (0)	3 (50)
Tobramycin	0 (0)	0 (0)	0 (0)	0 (0)	1 (16.67)
Vancomycin	0 (0)	0 (0)	0 (0)	1 (8.33)	2 (33.33)
Number of Patients	7	9	9	12	6

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\* Multiple response, %s  
may add up to more than  
100%

## 5.0 DISCUSSION

Skin graft may be occasionally lost due to infection in the early post-operative period. Awareness of the specific organism that cause graft loss is the first step in minimizing graft loss. The choice of wound biopsy verses skin swab is highly debatable with papers published to support both sides(24,25). We choose biopsy as it shown to superiorly reflect mircoflora of deeper tissue, the biopsies in this study were done under anesthesia just before skin grafting so as to reduce complications associated with biopsy.

The median percentage of skin graft take in this study is 60%. In comparison to other studies reviewed, that had takes of 70 – 100%, (26–28) we have a significantly lower percentage graft. The lower graft take can be explained by the variation with the on table wound preparation by unutilization of hydro jets in their routine wound preparation for effective removal of wound contamination by blume et al (26). Other factors that could affect our percentage graft take include chronicity of the wounds and prolonged duration of hospital stay. A study by Petkar et al(27), the majority of the patients recruited in this study had acute wounds of less than 3 months, and average total length of hospital stay at  $9.74 \pm 6.3$  (range: 2–27) as compared to this study, the largest percentage of patients had wounds for more than 3 months and our average hospital stay of 10 weeks (IQR: 5 - 21).

Virtually all of the wounds (94%) cultured organisms, of note the 4 who had no organisms cultured had shorter hospital stay. The commonest organism culture in this study include *Pseudomonas Aeruginosa* 17.39%, *Proteus mirabilis* 15.94%, *Klebsiella Pneumonia* 13.04%, *Acinetobactor baumannii* 11.59% and *Staphylococcus aureus* 10.14%. In literature this pattern is consistent with the majority of the wounds cultured in majority of studies(2–4,6). There are some differences in the proportion of organism cultured in this study, majority of the studies had staphylococcus as the commnest organsims cultred both in the acute and chronic setting, with *Pseudomonas* species having a lower percentage (2,28,29). This variation can be brought about by the generally longer hospital stay in congested wards therefore prolonged exposure to nosocomial infection.

Diabetic and venous ulcers cultured *klebsiella pneumonia*, *streptococcus pyogenes*, *morganella morgani*. This findings are in keeping with similar studies done on chronic wounds but with one



exception, majority of the studies on chronic wound cultured a higher percentage of pseudomonas species than my study (15) (17). This could be explained by the low percentage of chronic wounds due to diabetes mellitus and venous ulcers 5.7%, therefore we don't have an adequate representation of chronic wounds caused by diabetes or venous ulcers.

The negative predictor of skin graft survival from this study is *pseudomonas aeruginosa*, *proteus mirabilis* and *streptococcus pyogenes* with a skin graft survival of less than 35%. Unal et al(2) found that skin graft loss due to pseudomonas infection is dramatic and causes increase rate of reoperation, he also acknowledged the presence of *streptococcus pyogenes* as a negative predictor of graft take but they cultured less *streptococcus pyogenes*. In this study the 13 out of the 69 wounds cultured contained *pseudomonas species* the risk factors that can be postulated for this study includes long term hospital stay, chronic burn wounds with a high percentage burn surface area, this is in keeping with the above study that described the higher tendency of pseudomonas infection with larger wounds usually related to burn.

Is there a need for routine preoperative recipient site biopsy? From this overall study there is a need. This is due to our overall low percentage skin graft take and the higher percentage of virulent organism cultured in the wounds. In other ideal centers they are moving away from routine wound biopsy because this delays skin grafting and increase cost of care but ours is a less than ideal setting therefore we should consider the need for routine skin grafting.

## 6.0 CONCLUSION

The purpose of this study is to identify determinants of split thickness skin graft infection. The median percentage skin graft take wounds is 60% with Majority of wounds grafted in KNH are burn wounds. Graft take did occur in wounds that did culture organisms but presence of some specific organism are a negative predictor of graft take this include pseudomas aeroginosa, proteus spps and streprococcus pyogens.

## 7.0 RECOMMENDATION

From this study it is clear we need further evaluation for the organism cultured in wounds. I recommend a further study on wound specific organism. A study that assesses the different aetologies of wounds for example diabetic wounds, venous or arterial ulcers and look at the organisms cultured and the skin graft takes.

From the study we recommend the routine use of recipient site wound microscopy culture especially for patients with long duration of hospital stay. We also recommend Decreased duration of hospital stay by minimizing delays in surgery.

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## APPENDICIES

### **Appendix I – CONSENT FORM 8 (ENGLISH VERSION)**

#### **Part I: Information sheet**

##### **TITLE OF STUDY**

Assesment of the relationship between recipient site bacterial profile with the percentage take of a split thickness skin graft

##### **Introduction**

My name is Dr. Anne Gakenia Kimani, a post graduate student at the University of Nairobi's School of Medicine. I am carrying out a study to assess the effect of bacteria profile on split thickness skin graft at Kenyatta National Hospital. This will be determined by data collection through filling a questionnaire and patient examination.

##### **Purpose of the research**

Information obtained from this study will be used to assess the recipient site bacterial profile and its effect on split thickness skin graft. This study is also a requirement for any doctor who aspires to graduate from our college as a general surgeon.

##### **Voluntary Participation/Right to Decline or Withdraw**

An invitation to participate in this study is hereby extended to you. You will have the opportunity to ask questions before you decide on your or your childs enrollment into the study. You may seek clarification regarding any bit of the study from my assistant(s) or I should any part be unclear. The decision to participate in this study will be entirely voluntary after you have comprehensively understood the details herein. By refusing to participate in the study, you (or your kin) will not be denied medical care. Furthermore, you may stop participating at any time with no consequences whatsoever.

##### **Confidentiality**

If you agree to participate, you will be asked to provide personal information and other details related to your or your childs condition. All the information which you provide will be kept

confidential and no one but the researchers will access it. Your name or your child's will not appear in any document. The information about the participant will be identified by a number and only the researchers can relate the identification number to the said participant. The information will not be shared with anyone else unless authorized by the Kenyatta National Hospital/University of Nairobi – Ethics and Research Committee (KNH/UoN-ERC).

### **Risks**

Your or your child involvement in this research will be through an interview and clinical evaluation and they will not expose themselves to any risks if you consent on their behalf, to participate.

### **Cost and Compensation**

There will be no extra cost incurred by you (or your kin) from participation in this study, and there is also no compensation.

### **Sharing of information**

Following authorization by the Kenyatta National Hospital/University of Nairobi – Ethics and Research Committee (KNH/UoN-ERC), which is a committee whose work is to make sure research participants are protected from harm, relevant medical information yielded from this study may be shared with fellow doctors through scientific seminars, workshops and publications. Personal information will not be disclosed whatsoever.

### **Who to contact**

This proposal has been reviewed and approved by the KNH/UoN-ERC, for the duration of one year, the responsibility of this committee is to make sure research participants are protected from harm. It was submitted to them through the Chairman of the Department of Surgery at the School of Medicine of the University of Nairobi with the approval of university supervisors. The contact information of these people is given below if you wish to contact any of them for whatever reason;



The Secretary, KNH/UoN-ERC  
P.O. Box 20723 KNH,  
Nairobi 00202  
Tel 726300-9  
Email: KNHplan@Ken.Healthnet.org

Principal researcher:

Dr. Anne Gakenia Kimani, Resident, Department of Surgery, School of Medicine, University of Nairobi. P.O. Box 19676 KNH, Nairobi 00202. Mobile No. 0708 355 500

University of Nairobi research supervisors

1. Dr. Daniel Ojuka. Department of Surgery, School of Medicine, University of Nairobi, P.O. Box 19676 KNH, Nairobi 00202, Tel: 0202726300.

2. Dr. Ferdinand Nangole, Department of Surgery, School of Medicine, University of Nairobi, P.O. Box 19676 KNH, Nairobi 00202, Tel: 0202726300.

## **Part ii: Consent certificate by patient**

I hereby give my written and informed consent to allow myself or my.....  
participate in this study on burn severity and bourn wound infection among burns patients in  
burns unit at Kenyatta national hospital.

I have been adequately explained to about the study by Dr. Anne Gakenia Kimani. I do this with  
the full understanding of the purpose of the study and procedures which include a pus swab for  
culture and sensitivity and answering to a proforma which have been explained to me.

I understand that my rights will be respected, and confidentiality maintained at all times.

I also understand that the consent is voluntary, and I am at liberty to withdraw from the study  
without my care being affected.

Patient's signature.....Patient's Name.....

Signature/left thumb print (Parent/Guardian)

Date.....Day/Month/Year

**Statement by the witness if participant is illiterate**

I have witnessed the accurate reading of the consent form to the participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness.....

Signature of witness.....

Date.....

**Part iii: Statement by the researcher**

I have accurately read out the information sheet to the participant, and to the best of my ability and made sure of the following;

- That the participant consent has been given voluntarily and free of duress.
- That all information given will be treated with confidentiality.
- That refusal to participate or withdrawal from the study will not in any way compromise the quality of care and treatment given to the patient.
- That the results of this study might be published to enhance the knowledge of the subject of research.
- That I have answered all the questions asked by the participant to the best of my ability and knowledge.
- That a copy of this Informed Consent Form has been provided to the participant.

Name of researcher taking consent .....

Signature of researcher taking the consent .....

Date .....Day/Month/Year

## **Appendix II – CONSENT FORM (SWAHILI VERSION)**

### **Sehemu ya I: Maelezo ya habari**

Uhakikisho wa uhusiano kati ya profile ya wapokeaji wa bakteria na asilimia huchukuliwa na upepo wa ngozi ya mgawanyiko

### **Utangulizi**

Jina langu ni Dk. Anne Gakenia Kimani, mwanafunzi wa mwisho wa Chuo Kikuu cha Nairobi cha Chuo Kikuu cha Nairobi. Ninafanya utafiti ili kuchunguza athari za wasifu wa bakteria juu ya ugawanyiko wa ngozi ya udongo katika Hospitali ya Taifa ya Kenyatta. Hii itatambulishwa na kukusanya data kupitia kujaza dodoso na uchunguzi wa mgonjwa.

### **Kusudi la utafiti**

Taarifa zilizopatikana kutoka kwenye utafiti huu zitatumika kuchunguza maelezo ya bakteria ya wapokeaji wa tovuti na athari zake kwenye ugawanyiko wa ngozi ya upepo. Utafiti huu pia ni mahitaji kwa daktari yeyote anayependa kuhitimu kutoka chuo kikuu kama upasuaji mkuu.

Kushiriki kwa hiari / Haki ya Kupungua au Kuondolewa

Mwaliko wa kushiriki katika utafiti huu unapanuliwa kwako. Utakuwa na nafasi ya kuuliza maswali kabla ya kuamua juu ya usajili wako au watoto wako katika utafiti. Unaweza kutafuta ufafanuzi kuhusu sehemu yoyote ya utafiti kutoka kwa msaidizi wangu au ni lazima sehemu yoyote isiwe wazi. Uamuzi wa kushiriki katika utafiti huu utakuwa kikamilifu kwa hiari baada ya kuelewa kikamilifu maelezo hapa. Kwa kukataa kushiriki katika utafiti huo, wewe (au jamaa yako) hautakataa huduma za matibabu. Aidha, unaweza kuacha kushiriki wakati wowote bila matokeo yoyote.

### **Usiri**

Ikiwa unakubali kushiriki, utaulizwa kutoa maelezo ya kibinafsi na maelezo mengine kuhusiana na hali yako au mtoto wako. Taarifa zote unazozotoa zitashika siri na hakuna mtu lakini watafiti watazipata. Jina lako au mtoto wako haitaonekana katika hati yoyote. Taarifa kuhusu mshiriki huyo itajulikana kwa nambari na watafiti tu wanaweza kuhusisha nambari ya kitambulisho kwa mshiriki huyo. Taarifa haitashirikiwa na mtu mwingine isipokuwa idhini ya Kenyatta National Hospital / Chuo Kikuu cha Nairobi - Kamati ya Maadili na Utafiti (KNH / UoN-ERC).

## **Hatari**

Ushiriki wako au mtoto wako katika utafiti huu utakuwa kupitia mahojiano na tathmini ya kliniki na hawatakuwa na hatari yoyote kama ukikubali kwa niaba yao, kushiriki.

## **Gharama na Malipo**

Hutakuwa na gharama ya ziada iliyopatikana na wewe (au jamaa yako) kutoka kushiriki katika somo hili, na pia hakuna fidia.

## **Ugawanaji wa habari**

Kufuatilia idhini ya Kenyatta National Hospital / Chuo Kikuu cha Nairobi - Kamati ya Maadili na Utafiti (KNH / UoN-ERC), ambayo ni kamati ambayo kazi yake ni kuhakikisha washiriki wa utafiti wanalindwa dhidi ya madhara, taarifa za afya zinazofaa kutoka kwa utafiti huu inaweza kuwa kushirikiana na madaktari wenzake kupitia semina za kisayansi, warsha na machapisho. Maelezo ya kibinafsi hayatafunuliwa chochote.

## **Nani wa kuwasiliana**

Pendekezo hili limepitiwa na kupitishwa na KNH / UoN-ERC, kwa muda wa mwaka mmoja, jukumu la kamati hii ni kuhakikisha washiriki wa utafiti wanalindwa dhidi ya madhara.

Iliwasilishwa kupitia Mwenyekiti wa Idara ya Upasuaji katika Chuo Kikuu cha Matibabu cha Chuo Kikuu cha Nairobi na idhini ya wasimamizi wa chuo kikuu. Maelezo ya mawasiliano ya watu hawa yanapewa hapa chini ikiwa unataka kuwasiliana na yeyote kati yao kwa sababu yoyote;

Katibu, KNH / UoN-ERC

P.O. Sanduku 20723 KNH,

Nairobi 00202

Simu 726300-9

Barua pepe: KNHplan@Ken.Healthnet.org

Mtafiti mkuu:

Dk Anne Gakenia Kimani, Mkazi, Idara ya Upasuaji, Shule ya Matibabu, Chuo Kikuu cha Nairobi. P.O. Sanduku 19676 KNH, Nairobi 00202. Simu No. 0708 355 500

Wasimamizi wa utafiti wa Chuo Kikuu cha Nairobi

1. Dk Daniel Ojuka. Idara ya Upasuaji, Shule ya Matibabu, Chuo Kikuu cha Nairobi, P.O. Sanduku la 19676 KNH, Nairobi 00202, Tani: 0202726300.
2. Dr Ferdinand Nangole, Idara ya Upasuaji, Shule ya Matibabu, Chuo Kikuu cha Nairobi, P.O. Sanduku la 19676 KNH, Nairobi 00202, Tani: 0202726300.

**Sehemu ya ii: Hati ya kibali kwa mgonjwa**

Mimi hapa kutoa idhini yangu iliyoandikwa na taarifa kuruhusu mwenyewe au yangu ..... kushiriki katika utafiti huu juu ya ukali mkali na maambukizi ya jeraha kubwa kati ya wagonjwa wa kuchoma katika kitengo cha kuchoma katika hospitali ya taifa ya Kenyatta.

Nimeelezwa kwa kutosha juu ya utafiti na Dk Anne Gakenia Kimani. Ninafanya hivyo kwa ufahamu kamili wa madhumuni ya utafiti na taratibu ambazo zinajumuisha swab ya pus ya utamaduni na uelewa na kujibu kwa proforma ambayo yameelezewa kwangu. Ninaelewa kuwa haki zangu zitaheshimiwa, na usiri umehifadhiwa wakati wote.

Pia ninaelewa kwamba ridhaa ni ya hiari, na nina uhuru wa kujiondoa kwenye utafiti bila kujali kuathiriwa.

Sahihi ya mgonjwa ..... Jina la Mgonjwa .....

Ishara.....

Tarehe ..... Siku / Mwezi / Mwaka

Taarifa ya shahidi ikiwa mshiriki hayujui

Nimeona usomaji sahihi wa fomu ya kibali kwa mshiriki, na mtu huyo amepata fursa ya kuuliza maswali. Ninathibitisha kwamba mtu huyo ametoa ridhaa kwa uhuru.

Jina la shahidi .....

Saini ya shahidi .....

Tarehe.....

### **Sehemu ya iii: Taarifa ya mtafiti**

Nimesoma kwa usahihi karatasi ya habari kwa mshiriki, na kwa uwezo wangu wote na ninahakikisha kuwa zifuatazo;

- Kuwa ridhaa ya mshiriki amepewa kwa hiari na bila ya kufadhaika.
- Kwamba habari zote zitapewa zitashughulikiwa kwa siri.
- Kukataa kushiriki au kuondokana na utafiti hakutapoteza ubora wa huduma na matibabu ya mgonjwa.
- Kwamba matokeo ya utafiti huu yanaweza kuchapishwa ili kuongeza ujuzi wa somo la utafiti.
- Kwamba nimejibu maswali yote aliyoulizwa na mshiriki kwa uwezo wangu wote na ujuzi wangu.
- Kuwa nakala ya Fomu hii ya Ruhusa ya Ruhusa imetolewa kwa mshiriki.

Jina la mtafiti alichukua ridhaa .....

Sahihi ya mtafiti anaidhinisha .....

Tarehe ..... Siku / Mwezi / Mwaka

### **Appendix III - ASSENT FORM FOR CHILDREN 7 YEARS TO 12 YEARS**

My name is Dr Anne Gakenia Kimani, I am carrying out a study to determine the effect of bacterial profile on skin graft take on surgical patients at Kenyatta National Hospital.

This may help us understand the effect of bacteria on skin grafts survival. If you would like, you can participate in this study.

If you decide you want to participate in my study, your mother will be asked some questions, and be required to go through a questionnaire with me or my research assistant. You will also undergo a physical examination and a skin biopsy while your undergoing your skin graft in theatre

There are no risks involved in this study; you will not incur any extra costs for participating in this study.

Other people will not know if you are participating in this study. Your answers and your progress will be kept private. When I tell other people about my research, I will not use your name, so no one can tell who I am talking about.

Your parents or guardian have to say it is okay for you to be in the study. After they decide, you get to choose if you want to do it too. If you don't want to be in the study, you will not get into any trouble. You can stop being in the study at any time.

My telephone number is 07208 355 500. You can call me if you have questions about the study or if you decide you do not want to be in the study any more.

I will give you a copy of this form in case you want to ask questions later.

Sign this form only if you:

- Have understood what you will be doing for this study,
- Have had all your questions answered,
- Have talked to your parent(s)/legal guardian about this project, and
- Agree to take part in this research



---

Your Signature

Name

Date

---

Name of Parent(s) or Legal Guardian(s)

Researcher explaining study

---

Signature

Name

Date

## **Appendix IV - ASSENT FORM (SWAHILI)**

### **FOMU YA IDHINI YA WATOTO WALIO NA UMRI WA MIAKA KATI YA SABA NA KUMI NA MBILI.**

Jina langu ni Dkt. Anne Gakneia Kimani. Mimi ni daktari ninayesomea upasuaji katika Chuo Kikuu cha Nairobi. Ninafanya utafiti kwa anwani ya, **Determine the effect of bacterial profile on skin graft take on surgical patients at Kenyatta National Hospital**

Ujumbe utakaodhihirika kutokana na utafiti huu utasaidia madaktari kuelewa athari za bakteria juu ya uhai wa ngozi

Kushiriki katika utafiti huu ni kwa hiari na hamna masharti yeyote ya lazima. Unapo kubali kushiriki katika utafiti huu, utaulizwa maswali ya kukuhusu kupitia dodoso hili, aidha nami au mtafiti msaidizi wangu.

Hakuna hatari wala gharama ya ziada yeyote itakayo kukumba kutokana na kushiriki katika utafiti huu.

Una haki ya kujiondoa kutoka ushiriki wa huu utafiti wakati wowote upendapo na uamuzi huo hauwezi dhuru matibabu yako kwa vyovyote vile.

Hakuna yeyote mwingine atakayejuzwa ushiriki wako katika utafiti huu. Majibu yako na mwelekeo wa matibabu yako yatakuwa ni siri na hifadhi yako. Ninapojua watu kuhusu utafiti wangu, hakuna popote nitataja jina lako, hivyo basi hamna atakaye tambua kwa majina walioshiriki.

Itawabidi pia wazazi au wadhamini wako kukubali ushiriki wako katika utafiti huu.

Watakopo amua, utakuwa nawe huru kukubali kwa kushiriki pia. Ijapo hautakubali, hakuna madhara yoyote utapata. Una uhuru wa kujiondoa katika utafiti.

Nambari yangu ya rununu ni 0708 355 500. Waweza kunipigia simu wakati wowote kuulizia zaidi kuhusu utafiti huu au ikiwa ungependa kujiondoa.

Nitakupa nakala ya fomu hii ikiwa ungependa kuuliza maswali zaidi baadaye.

Tia sahihi iwapo;

- Umeelewa ushiriki wako katika utafiti huu
- Maswali yako yote yamejibiwa vilivyo
- Umejadili na wazazi au wadhamini wako kuihusu
- Umekubali kushiriki katika utafiti

Jina lako..... Sahihi yako.....

Tarehe.....

Jina la mzazi au mdhamini.....

Mtafiti aliyekupa maelezo ya utafiti

Jina..... Sahihi.....

Tarehe.....

## Appendix V - DATA COLLECTION TOOL

### BASIC INFORMATION

1. Study code number .....
2. Telephone Contact .....
3. Age .....
4. Gender                      male  female

### HISTORY

1. Date of admission .....
2. Diagnosis/ cause of wound (tick appropriate option)

- Burn Wounds
- Diabetic Wound
- Venous ulcers
- Post Traumatic Wound
- Post Surgical wound
- Melanoma
- Pyoderma Gangrenosum

3. Wound duration (wks).....

- < 1 week
- 2 – 4 weeks
- 4 – 12 weeks
- 12 – 72 weeks
- >72 weeks (6 months)

4. Duration of Hospital stay (weeks) .....

5. Do you consume alcohol? YES  N NO

6. Do you smoke cigarettes? YES  NO

IF YES for how long ..... and number of pack years .....

7. Do you have any of the following medical conditions?

- Diabetes mellitus    YES     NO
- HIV                    YES     NO
- Hypertension        YES     NO
- Anemia                YES     NO
- Sterioids             YES     NO
- Chemotherapy       YES     NO
- Radiotherapy        YES     NO

If YES to any of the above is the medical condition well controlled?    YES     NO

**PHYSICAL EXAMINATION**

1. Location of wound (tick appropriate box(s))

- Upper Limb
- Lower Limb
- Anterior Trunk
- Posterior Trunk

2. Size of wound (length X width in cm<sup>2</sup>).....

3. Skin Graft performed by (tick appropriate box)

- Resident – 2<sup>nd</sup>  3<sup>rd</sup>  4<sup>th</sup>  5<sup>th</sup>
- Consultant

**POST OPERATIVE SKIN GRAFT ASSESMENT**

5th post-operative day percentage graft take .....

Features of post-operative complications (tick appropriate box)

- Hematoma
- Seroma
- Graft shearing

- Purulent infection


- Non

10 the post-operative day percentage graft take .....


**BIOPSY RESULTS**

- Microscopy\_\_\_\_\_
- Organisms  
Cultured\_\_\_\_\_
- Sensitivity\_\_\_\_\_
- Bacterial  
Count\_\_\_\_\_


## Appendix 4: RESEARCH APPROVAL LETTER



UNIVERSITY OF NAIROBI  
COLLEGE OF HEALTH SCIENCES  
P O BOX 19676 Code 00202  
Telegrams: varsity  
Tel: (254-020) 2726300 Ext 44355



KNH-UON ERC  
Email: [uonknh\\_erc@uonbi.ac.ke](mailto:uonknh_erc@uonbi.ac.ke)  
Website: <http://www.erc.uonbi.ac.ke>  
Facebook: <https://www.facebook.com/uonknh.erc>  
Twitter: [@UONKNH\\_ERC](https://twitter.com/UONKNH_ERC) [https://twitter.com/UONKNH\\_ERC](https://twitter.com/UONKNH_ERC)



KENYATTA NATIONAL HOSPITAL  
P O BOX 20723 Code 00202  
Tel: 726300-9  
Fax: 725272  
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/149

24<sup>th</sup> April, 2019

Dr. Anne Gakenia Kimani  
Reg. NO.H58/74790/2014  
Dept. of Surgery  
School of Medicine  
College of Health Sciences  
University of Nairobi

Dear Dr. Kimani

**RESEARCH PROPOSAL: THE EFFECT OF RECIPIENT SITE BACTERIAL PROFILE ON THE PERCENTAGE TAKE OF SPLIT THICKNESS SKIN GRAFT AT KENYATTA NATIONAL HOSPITAL (P895/12/2018)**

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 24<sup>th</sup> April 2019 – 23<sup>rd</sup> April 2020.

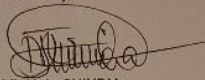
This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
- Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal.*)
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,



**PROF. M. L. CHINDIA**  
**SECRETARY, KNH-UoN ERC**

c.c. The Principal, College of Health Sciences, UoN  
The Director, CS, KNH  
The Chairperson, KNH- UoN ERC  
The Assistant Director, Health Information, KNH  
The Dean, School of Medicine, UoN  
The Chair, Dept. of Surgery, UoN  
Supervisors: Dr. Daniel Ojuka, Dr. Ferdinand Nangole

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