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INSTITUTIONAL FACTORS AFFECTING NURSING PRACTICE IN PREVENTION OF SURGICAL SITE INFECTIONS AT MBAGATHI AND MAMA LUCY HOSPITALS IN NAIROBI, KENYA

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A. Chege, B. Mbithi, S. Oluchina and J. Kimondo

ABSTRACT

**Background:** Institutional factors have been attributed to the existing burden of nosocomial infections including Surgical Site Infections (SSIs) especially within public hospitals. Effective planning and availability of surgical resources improve care and reduce the risk of developing SSIs. Lack of standard guidelines has been associated with missed nursing care affecting SSI prevention practice. Mbagathi and Mama Lucy hospitals encounter a high burden of SSIs whose incidence is estimated at 20%. Understanding the effect of institutional factors on nursing practice is essential in improving surgical care and treatment outcomes.

**Objective:** To determine the institutional factors affecting SSI prevention practice among nurses working in surgical departments at Mbagathi and Mama Lucy hospitals in Nairobi Kenya.

**Methods:** This was a cross-sectional analytical study that involved a total of 126 nurses with a sample size of 63 participants from each of the two hospitals. Ethical approval was sought and informed consent from all the participants ensured before data collection. Simple random sampling technique was used and data collected through paired questionnaires and observation checklists. Data analysis was conducted using R version 4.1.2; chi-square, fisher's test and binary logistic regression.

**Results:** There was a significant role of SSI surveillance towards improving nursing practice in prevention of SSIs within surgical departments at Mbagathi hospital ( $p=0.023$ ) and Mama Lucy hospital ( $p=0.035$ ).

**Conclusion:** Existence of SSI surveillance processes within the surgical departments led to improved nursing care in prevention of SSIs.

**Recommendation:** There is need for enhanced SSI surveillance within surgical departments to improve prevention practice, patient safety and surgical treatment outcomes.

## INTRODUCTION

The nurse work environment is defined in the context of organizational and institutional factors that facilitate or restrict professional nursing practice [1]. The standards of care in prevention of surgical site infections (SSIs) vary across health care settings globally affecting surgical treatment and patient safety. There is need to address the existing burden of SSIs by enhancing preventive care through mitigation of existing institutional gaps that affect health service delivery.

A review of institutional factors that affected preventive care for SSIs in Asia indicated inadequate human resource for health as compromising the standards of nursing care [2]. Nurses therefore considered SSI preventive care as a secondary responsibility. Further, lack of standard guidelines and procedures significantly affected care especially within health care institutions that lacked infection prevention policies [2]. Nursing care in prevention of SSIs was among the commonly missed interventions within health care settings often leading to undesirable surgical outcomes [3]. Limited funding and unavailability of surgical supplies was associated with poor preventive care since nurses lacked the

appropriate resources for prevention of SSIs [2].

In Kenya, few studies have been conducted on factors affecting nursing care in prevention of SSIs. According to a study conducted in Nyeri County Hospital, lack of hospital based training, unavailability of wound dressing materials, inadequate surgical instruments and inadequate hand hygiene facilities compromised nursing care in prevention of SSIs [4]. Similarly, lack of hospital based policies and guidelines on prevention of SSIs limited provision of the appropriate nursing care [5].

According to a study that implemented a surveillance and prevention program for post caesarean section mothers within Thika and Kitale counties in Kenya, there were varying institutional standards of practice hence the need for standardized preventive care based on the existing SSI guidelines [6]. Health care institutions require to implement feasible post-surgical follow up and surveillance programs for SSIs to monitor and mitigate emerging surgical complications [6].

Despite the existing burden of SSIs, few studies are addressing the institutional factors that affect nursing practice in prevention of SSIs. The study was aimed at

assessing the institutional factors affecting nursing practice in prevention of SSIs at Mbagathi and Mama Lucy hospitals in Nairobi, Kenya.

## METHODS

### Study design

This was an analytical cross sectional study that was conducted over a duration of three months aimed at assessing the institutional factors affecting nursing practice in prevention SSIs at Mbagathi and Mama Lucy hospitals in Nairobi Kenya.

### Study setting

The study was conducted within surgical departments at Mbagathi and Mama Lucy hospitals in Nairobi county. The hospitals serve as major referral institutions within the southern and eastern parts of Nairobi county.

### Inclusion Criteria

The study included all the qualified nurses with over 6 months of clinical experience working within surgical departments at Mbagathi and Mama Lucy hospitals.

### Satisfactory nursing practice in prevention of SSIs

Assessment for satisfactory nursing practice in prevention of SSIs in the study was determined by evaluating the level of adherence to the World Health Organisation (WHO) SSI prevention guidelines in provision of nursing care pre-operatively, intra-operatively, and post-operatively using an observation checklist.

### Data collection

Data collection was conducted through the use of structured researcher administered questionnaires and participant observation check lists. The tools collected primary data on nursing practice in prevention of SSIs based on the WHO guidelines and the institutional factors affecting nursing practice in prevention of SSIs within the hospitals' surgical departments.

### Sample size and sampling technique

The sample size for the study was calculated using two independent means sample size formula:

$$N = \frac{2 (Z_{1 - \alpha / 2} + Z_{\pi})^2 \sigma^2}{\Delta^2}$$

Whereby:

$Z_{1 - \alpha / 2}$  = Percentile of the normal distribution used as the critical value in a two tailed test (1.96).

$Z_{\pi}$  = Percentile of the normal distribution where  $\pi$  is the power of the test (0.84 for 80th percentile)

$\sigma^2$  = Variance within group for a normal distribution (1)

$\Delta^2$  = Expected mean difference between the intervention and the control group

This provided a sample size of 63 participants from each of the two hospitals. Simple random sampling technique was used to obtain the study participants until the required sample size was achieved.

### **Ethical approval**

Ethical approval for the study was sought from The Nairobi Hospital Bioethics and Research Committee; authorization reference number

TNH/DCS/DMSR/ERC/SERC/26/04/24). A study permit was obtained from National Commission for Science, Technology and Innovation (NACOSTI); authorization reference number NACOSTI/P/24/35347. Authorization to conduct the study was sought from Nairobi county government as a pre-requisite to accessing the hospitals. Further, authorization was sought for data collection individually from Mbagathi and Mama Lucy hospitals. All the research participants were requested to provide a written informed consent individually before data collection. Confidentiality was maintained by observing anonymity of all the study participants from data collection, archiving and during analysis.

### **Validity and reliability**

Validity and reliability was ensured by pre-testing the data collection tools at Kiambu County Hospital in Kenya. A default sample size of 30 participants was used to pre-test and ensure validity of the data collection tools [7]. A test retest reliability coefficient was calculated that provided a Cronbach's Alpha of 0.995.

### **Data analysis**

Data analysis was done using R version 4.1.2; univariate data analysis was used to calculate the descriptive statistics while binary logistic regression was used to assess the institutional factors affecting nursing practice in prevention of SSIs. The results

were interpreted using p-values, with values  $<0.05$  considered to be significant.

## **RESULTS**

The findings indicated inconsistent use of standard guidelines for prevention of SSIs within the hospitals' surgical departments. Awareness of SSI prevention guidelines significantly varied across the two hospitals; 40 (63.5%) and 20 (31.7%) nurses at Mbagathi and Mama Lucy hospitals were unaware of SSI prevention guidelines ( $p < 0.001$ ).

Surveillance for SSIs was inconsistent within the hospitals' surgical departments whereby 10 (15.9%) and 35 (55.6%) at Mbagathi and Mama Lucy hospitals respectively conducted SSI surveillance ( $p < 0.001$ ).

Existence of multidisciplinary surgical team coordination in prevention of SSIs was reported by 48 (76.2%) and 57 (90.5%) at Mbagathi and Mama Lucy hospitals respectively ( $p = 0.056$ ). Lack of multidisciplinary surgical team coordination in prevention of SSIs was mainly attributed to; poor team work (33.3%, 66.6%), varying knowledge and practice standards among the surgical team members (20%, 16.7%), lack of interdisciplinary meetings to discuss SSI preventive care (6.7%, 16.7%) and poor dissemination of standard guidelines to support delivery of care (6.7%, 0%) at Mbagathi and Mama Lucy hospitals respectively. Factors attributed to poor of multidisciplinary surgical team coordination were homogeneous across both hospitals ( $p = 1.0$ ).

High surgical workload and theatre traffic compromised nursing care in prevention of SSIs; 28 (63.6%) and 16 (53.3%) nurses at Mbagathi and Mama Lucy hospitals respectively reported that they lacked adequate time to plan and implement SSI preventive care due to high patient numbers and workload within the surgical departments.

Inadequate resources for provision of SSI preventive care within the hospitals' surgical departments was homogeneously reported by 39.7% nurses each at Mbagathi and Mama Lucy hospitals ( $p = 1.0$ ). Among the resources, surgical supplies posed the major gap in SSI preventive care as indicated by 24 (96%) and 23 (92%) of participants at Mbagathi and Mama Lucy hospitals respectively ( $p = 1.0$ ). The rest of the information is shown in table 1.

**Table 1: Institutional factors affecting practice in prevention of SSIs at Mbagathi and Mama Lucy hospitals.**

|                                                                     |                                       | Mbagathi Hospital | Mama Lucy Hospital | P-value |
|---------------------------------------------------------------------|---------------------------------------|-------------------|--------------------|---------|
| Variable                                                            | Description                           | n (%)             | n (%)              |         |
| Existence of surgical site infection (SSI) prevention guidelines?   | Yes                                   | 0                 | 33 (55%)           | <0.001  |
|                                                                     | No                                    | 23 (36.5%)        | 10 (15.9%)         |         |
|                                                                     | Do not know                           | 40 (63.5%)        | 20 (31.7%)         |         |
| Surveillance for SSIs within the surgical departments?              | Yes                                   | 10 (15.9%)        | 35 (55.6%)         | <0.001  |
|                                                                     | No                                    | 53 (84.1%)        | 28 (44.4%)         |         |
| Multidisciplinary surgical team coordination in prevention of SSIs? | Yes                                   | 48 (76.2%)        | 57 (90.5%)         | 0.056   |
|                                                                     | No                                    | 15 (23.8%)        | 6 (9.5%)           |         |
| If no above, please specify                                         | Lack of teamwork                      | 5 (33.3%)         | 4 (66.6%)          | 0.928   |
|                                                                     | Lack of meetings                      | 1 (6.7%)          | 1 (16.7%)          |         |
|                                                                     | Unclear guidelines                    | 1 (6.7%)          | 0                  |         |
|                                                                     | Varying knowledge and practice levels | 3 (20%)           | 1 (16.7%)          |         |
|                                                                     | Not indicated                         | 5 (33.3%)         | 0                  |         |
| Adequacy of resources for SSI preventive care?                      | Yes                                   | 38 (60.3%)        | 38 (60.3%)         | 1.000   |
|                                                                     | No                                    | 25 (39.7%)        | 25 (39.7%)         |         |
| If no, please specify Mbagathi (n = 25) Mama Lucy (n = 25)          | Inadequate surgical supplies          | 24 (96%)          | 23 (92%)           | 1.000   |
|                                                                     | Not indicated                         | 1 (4%)            | 2 (8%)             |         |
| High surgical workload/Theatre traffic                              | Yes                                   | 44 (69.8%)        | 30 (47.6%)         | 0.019   |
|                                                                     | No                                    | 19 (30.2%)        | 33 (52.4%)         |         |
| Adequate of infrastructure and surgical space?                      | Yes                                   | 21 (33.3%)        | 16 (25.4%)         | 0.434   |
|                                                                     | No                                    | 42 (66.7%)        | 47 (74.6%)         |         |

### Effect of institutional factors on nursing practice in prevention of SSIs at Mbagathi hospital

The institutional factors affecting SSI prevention practice were assessed separately in the two hospitals. Due to the need for maintaining high standards of practice in prevention of SSIs, the outcome on SSI prevention practice was categorized as good

(satisfactory) or fair/poor (unsatisfactory) derived from the Bloom cut-off point (8).

Existence of SSI surveillance within the hospital's surgical departments was significantly associated with satisfactory nursing practice in prevention of SSIs OR 0.13, 95% CI (0.02 - 0.65;  $p = 0.023$ ). The rest of the information is shown in table 2.

**Table 2: Effect of institutional factors on nursing practice in prevention of SSIs at Mbagathi hospital**

| Factors                                      | Nursing practice in prevention of surgical site infections (SSI) |                        |                      |         |                   |         |
|----------------------------------------------|------------------------------------------------------------------|------------------------|----------------------|---------|-------------------|---------|
| SSI surveillance                             | Unsatisfactory<br>n = 36                                         | Satisfactory<br>n = 27 | Crude OR<br>(95% CI) | P value | Adjusted OR ()    | p-value |
| Yes                                          | 2                                                                | 8                      | 0.14 (0.02, 0.63)    | 0.019   | 0.13 (0.02, 0.65) | 0.023   |
| No                                           | 34                                                               | 19                     | Reference            |         |                   |         |
| Multidisciplinary surgical team coordination |                                                                  |                        |                      |         |                   |         |
| Yes                                          | 25                                                               | 23                     | 0.40 (0.10, 1.34)    | 0.154   |                   |         |
| No                                           | 11                                                               | 4                      | Reference            |         |                   |         |
| Adequate resources                           |                                                                  |                        |                      |         |                   |         |
| Yes                                          | 21                                                               | 17                     | 0.82 (0.29, 2.29)    | 0.710   |                   |         |
| No                                           | 15                                                               | 10                     | Reference            |         |                   |         |
| Inadequate infrastructure                    |                                                                  |                        |                      |         |                   |         |
| Yes                                          | 24                                                               | 18                     | 1.00 (0.34, 2.38)    | 1.000   |                   |         |
| No                                           | 12                                                               | 9                      | Reference            |         |                   |         |
| High surgical workload                       |                                                                  |                        |                      |         |                   |         |
| Yes                                          | 26                                                               | 18                     | 1.30 (0.44, 3.87)    | 0.635   |                   |         |
| No                                           | 10                                                               | 9                      | Reference            |         |                   |         |

### Effect of institutional factors on nursing practice in prevention of SSIs at Mama Lucy hospital

Surveillance for SSIs in some surgical departments at Mama Lucy hospital was

significantly associated with satisfactory nursing practice in prevention of SSIs OR 0.28, 95% CI (0.10 - 0.89;  $p = 0.035$ ). The rest of the information is shown in table 3.

**Table 3: Effect of institutional factors on nursing practice in prevention of SSIs at Mama Lucy hospital**

| Factors                                      | Nursing practice in prevention of surgical site infections (SSI) |                        |                   |         |                         |         |
|----------------------------------------------|------------------------------------------------------------------|------------------------|-------------------|---------|-------------------------|---------|
|                                              | Unsatisfactory<br>n = 31                                         | Satisfactory<br>n = 32 | Crude OR (95% CI) | P value | Adjusted OR<br>(95% CI) | P value |
| SSI surveillance                             |                                                                  |                        |                   |         |                         |         |
| Yes                                          | 12                                                               | 23                     | 0.25 (0.08, 0.69) | 0.010   | 0.28 (0.10, 0.89)       | 0.035   |
| No                                           | 19                                                               | 9                      | Reference         |         |                         |         |
| Multidisciplinary surgical team coordination |                                                                  |                        |                   |         |                         |         |
| Yes                                          | 25                                                               | 32                     | NA                | 0.991   |                         |         |
| No                                           | 6                                                                | 0                      | Reference         |         |                         |         |
| Adequate resources                           |                                                                  |                        |                   |         |                         |         |
| Yes                                          | 16                                                               | 22                     | 0.48 (0.17, 1.34) | 0.167   |                         |         |
| No                                           | 15                                                               | 10                     | Reference         |         |                         |         |
| Inadequate infrastructure                    |                                                                  |                        |                   |         |                         |         |
| Yes                                          | 23                                                               | 24                     | 0.96 (0.30, 3.02) | 0.941   |                         |         |
| No                                           | 8                                                                | 8                      | Reference         |         |                         |         |
| High surgical workload                       |                                                                  |                        |                   |         |                         |         |
| Yes                                          | 16                                                               | 14                     | 1.37 (0.51, 3.74) | 0.533   |                         |         |
| No                                           | 15                                                               | 18                     | Reference         |         |                         |         |

## DISCUSSION

Nosocomial infections pose a major setback to the safety and quality of health care especially within public hospitals. To address the existing burden of SSIs, the WHO provided prevention guidelines for implementation across all health care settings globally [10]. Nursing care in prevention of SSIs requires a suitable work environment through provision of appropriate resources, adequate staffing, nurses' involvement in the day to day running of surgical departments as well as ensuring a good staff working relationship [1].

Despite the progress made by Kenya on Universal Health Coverage (UHC), there are existing institutional gaps affecting health service delivery [9]. The gaps may be addressed through provision of feasible evidence based interventions that impact on the quality of health care. The WHO SSI prevention guidelines recommend post-operative surveillance for SSIs as a way of enhancing SSI preventive care and surgical safety [10]. The study indicated the significant role of SSI surveillance towards improving nursing practice in prevention of SSIs at Mbagathi and Mama Lucy hospitals. In a similar study, implementation of a

surveillance programme among post caesarean section mothers within Kitale and Thika counties in Kenya demonstrated the role in strengthening SSI prevention activities [6]. The finding was also replicated in a different study that indicated the effect of poor SSI surveillance in negatively affecting nursing care in prevention of SSIs [11]. Surveillance for SSIs within surgical departments enhances responsiveness among nurses and other health care workers on emerging infections and mitigation measures that include preventive care.

Lack of multidisciplinary surgical team coordination in prevention of SSIs was associated with unsatisfactory nursing practice. A similar study demonstrated the role of multidisciplinary teamwork towards improving SSI prevention practice by reducing the incidence from 11.11% in December 2018 to 1.89% in August 2019 [12]. Multidisciplinary surgical teamwork creates a common understanding on SSI prevention guidelines and improves adherence leading to improved standards of surgical care. In a different study, implementation of SSI prevention activities by the multidisciplinary surgical team reduced the incidence among elective caesarean section cases from 4.4% to 2.7%, similarly, there was reduction in the incidence among emergency caesarean

section cases from 9.1% to 4.1%. Likewise, multidisciplinary surgical team approach was associated with improved adherence to SSI care bundle elements [13]. There is need to utilize a multidisciplinary surgical team approach in implementation of SSI prevention guidelines to optimize the standards of surgical safety.

Inadequate resources affected nursing practice in prevention of SSIs compromising the standards of care in both hospitals. This was replicated in a survey conducted within public hospitals in Ethiopia whereby nurses lacked adequate resources compromising implementation of the SSI prevention guidelines and negatively affecting patient care [11]. Similarly, a study in Rwanda indicated that 30.1% of the hospitals lacked essential supplies to support SSI preventive care including lack of adequate hospital linen [14]. Despite the WHO recommendation on the use of triclosan coated sutures in the SSI prevention care bundle, there was absolute lack of awareness and availability of antimicrobial coated sutures within the two hospitals. Inadequate surgical resources affect UHC and commonly lead to procedural shortcuts in that compromise nursing care in prevention of SSIs.

Surgical planning and resource allocation was not aligned to the standard guidelines in prevention of SSIs. Health care institutions in Kenya therefore require to provide a suitable environment for implementation of the WHO SSI prevention guidelines in order to mitigate the existing burden and improve the standards of surgical care.

## CONCLUSION

Surveillance for SSIs within surgical departments led to satisfactory nursing practice in preventive care ( $P = 0.019$ ) and ( $P=0.010$ ) at Mbagathi and Mama Lucy hospitals respectively. Similarly, existence of multidisciplinary surgical team coordination was associated with 60% lower odds of unsatisfactory practice at Mbagathi hospital while inadequate surgical resources affected SSI prevention practice among 39.7% of nurses in both hospitals.

## RECOMMENDATIONS

There is need for SSI surveillance, multidisciplinary surgical team coordination and provision of adequate surgical resources to enhance SSI prevention practice and improve patient safety standards.

## STUDY LIMITATION

The risk of Hawthorne effect during data collection by observations was mitigated through participant observation.

#### **DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES**

The authors declare that no artificial intelligence or assisted technologies were used in the writing process.

#### **CONFLICT OF INTEREST**

The authors declare that they have no conflicting interests.

#### **FUNDING**

The study did not receive any external funding.

#### **ACCESS TO DATA**

The data to support the findings in the study are available from the corresponding author upon request.

#### **CREDIT STATEMENT**

Anthony.Chege conceptualized the study, conducted administration, data collection and wrote the original draft. Benard.Mbithi performed data analysis and interpretation. Sherry.Oluchina and Julia.Kimondo conceived the study and supervised the whole process.

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