

The effect of hospital infection control policy on the prevalence of surgical site infection in a tertiary hospital in South-South Nigeria

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ABSTRACT

Background: Surgical site infections (SSIs) are a significant cause of morbidity, emotional stress and financial cost to the affected patients and health care institutions; and infection control policy has been shown to reduce the burden of SSIs in several health care institutions. This study assessed the effects of the implementation of the policy on the prevalence of SSI in the University of Port Harcourt Teaching Hospital, Nigeria. **Patients and Methods:** A review of the records of all Caesarean sections carried out in the hospital, before and 2 years after the implementation of the infection control policy was conducted. Data collected include the number and characteristics of the patients that had Caesarean section in the hospital during the period and those that developed SSI while on admission. **Results:** The proportion of patients with SSI decreased from 13.33% to 10.34%, 2 years after the implementation of the policy (P -value = 0.18). The implementation of the policy did not also result in any statistically significant change in the nature of the wound infection (P -value = 0.230), in the schedule of the operations (P -value = 0.93) and in the other predisposing factors of the infections (P -value = 0.72); except for the significant decrease in the infection rate among the un-booked patients (P -value = 0.032). **Conclusion:** The implementation of the policy led to a small decrease in SSI, due to the non-implementation of some important aspects of the WHO policy. The introduction of surveillance activities, continuous practice reinforcing communications and environmental sanitation are recommended to further decrease the prevalence of SSI in the hospital.

Key words: Hospital infection control policy, hospital infection control committee, Nigeria, Port Harcourt, surgical site infection, teaching hospital,

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INTRODUCTION

Surgical procedures are one of the most effective medical procedures, used in the management of a wide variety of diseases. Studies, however, indicate that several of the surgical procedures are complicated by infection, with 5% of all surgical operations carried out in hospitals in developed countries said to be affected.¹ The situation in the hospitals of developing countries is believed to be significantly worse, with the infection rate found in some

studies up to 20 times higher than the rates in developed countries.²

Although surgical site infections (SSIs) are not associated with a high mortality rate, they are, however, a significant source of morbidity, emotional stress and financial cost to the affected patients and health care institutions.³ Approximately five million episodes of SSIs occur in the United States every year, accounting for an average of 7.3 extra days in hospital, and more than 1.6 billion dollars of additional hospital charges.⁴ Studies carried out in several other developed countries show that SSIs result in an average of 10 extra days of hospital stay, and add an additional £1780 to the patient's hospital bill⁵; even as the infections are directly linked to the death of at least 5000 patients in the UK alone, in spite of an expenditure of up to a billion pounds. The situation in developing countries such as Nigeria is known to be significantly worse.^{2,3}

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Infection control policy has, however, been shown to reduce the burden of hospital-acquired infections in several health care institutions and has since become a constant feature in most health facilities in developed countries.⁶ Hospital infection control policy can be defined as the systematic measures taken by the management of a hospital to reduce the incidence, and improve the adverse effects of hospital-acquired infections on patients and health workers. Infection control policy has been introduced in some hospitals in Nigeria and other developing countries, but very few studies have been published on the effectiveness of the policy.⁷ This study is to assess the effects of the implementation of the policy on SSIs in a tertiary health facility in Port Harcourt, the capital of the oil-rich Rivers State, south-south Nigeria. It is hoped that the findings of this study would further demonstrate the effectiveness of the policy in Nigeria, and consequently encourage its widespread adoption in the prevention of post-operative wound infections.

PATIENTS AND METHODS

The study was conducted using a preintervention/post-intervention, comparative study design, with a concurrent control, to increase validity.⁸ The intervention was carried out in the University of Port Harcourt Teaching Hospital, Port Harcourt, while the Braithwaite Memorial Specialist Hospital, the other multi-specialist tertiary health care institution in Port Harcourt was used as the concurrent control. The data for the study were collected through a review of the records of the Caesarean section operations carried out in the hospitals, before and after the implementation of the policy.

The data extracted from the operation records include the total number of Caesarean sections carried out in the period, and the number and characteristics of the patients that developed SSI while on admission. The decision to restrict the study to only cases diagnosed while the patients were still on admission was because the study hospitals did not have a surveillance system.⁹⁻¹¹ The patients' characteristics extracted for the study include the nature of the SSI, the socio-demographic characteristics, the booking status, the presence or otherwise of predisposing health conditions and the indications for the surgery.

Data analysis

Data handling and analysis were carried out using Stata 10 and Microsoft Excel. For all statistical tests, *P*-value of 0.05 or less was considered statistically significant.

Ethical clearance

The approval to undertake the study was sought and obtained from the Ethical Review Committee of the University of Port Harcourt Teaching Hospital, Port Harcourt and the management of the study hospitals.

RESULTS

The number and characteristics of the Caesarean section operations carried out in UPTH, in the 4 months that preceded the implementation of the infection control policy, and the 4 months that preceded the 2 years of implementing the policy in UPTH are presented in Table 1. A similar data recorded in the comparable hospital (BMSH), at the time of the post-intervention assessment is also presented in Table 1.

The patients operated in the hospitals were of comparable age (*P*-value = 0.38) and booking status (*P*-value = 0.84), but the patients operated in UPTH were, however, better educated (*P*-value = 0.000).

The proportion of patients with SSI was 13.33% in UPTH, in the 4 months that preceded the implementation of the infection control policy. This is comparable to the 13.75% recorded in the BMSH, at the time of the post-implementation assessment. There was, however, a 22.43% decrease (*P*-value = 0.18), after the implementation of the policy in UPTH, as the proportion of patients with SSI fell to 10.34% in the assessed period.

The characteristics of the SSI are presented in Table 2. The implementation of the policy did not result in any statistically significant change in the nature of the wound infection (*P*-value = 0.230), in the schedule of the operations (*P*-value = 0.93) and in the other predisposing factors of the infections (*P*-value = 0.72); except for the significant decrease in the infection rate among un-booked patients (*P*-value = 0.032). The infection rate among the un-booked patients decreased 34.94%, from 31.2% before the policy to 20.3% after the policy.

Table 1: Characteristics of caesarean section operations carried out in the hospitals

Characteristic	UPTH 1 (%) (n = 410)	BMSH (%) (n = 301)	UPTH 2 (%) (n = 416)
Age			
16-20 years	91 (22.20)	69 (22.92)	88 (21.15)
21-25 years	147 (35.85)	113 (37.54)	129 (31.01)
26-30 years	106 (25.85)	62 (20.60)	141 (33.89)
Greater than 30 years	66 (16.10)	57 (18.94)	58 (13.94)
Educational status of patients			
No formal education	12 (2.93)	15 (4.98)	24 (5.77)
Primary	29 (7.07)	69 (22.92)	49 (11.78)
Secondary	184 (44.88)	114 (37.87)	196 (47.12)
Tertiary	185 (45.12)	103 (34.22)	147 (35.34)
Booking Status			
Booked patients	327 (79.76)	244 (81.06)	337 (81.01)
Un-booked patients	83 (20.24)	57 (18.94)	79 (22.84)
Surgical Site Infection (SSI)			
Patients without SSI	356 (86.83)	259 (86.05)	373 (89.66)
Patients with SSI	54 (13.17)	42 (13.95)	43 (10.34)

Table 2: Characteristics of the surgical site infections

Characteristic	UPTH 1 (%) (n = 54)	BMSH (%) (n = 42)	UPTH 2 (%) (n = 43)
Nature of Surgical Site Infection (SSI)			
Superficial	16 (29.63)	10 (23.81)	30 (69.77)
Deep	25 (46.30)	19 (45.24)	9 (20.93)
Organ/Space	13 (24.07)	13 (30.95)	4 (9.30)
Booking status			
Booked	28 (51.85)	21 (50.00)	27 (62.79)
Un-booked	26 (48.15)	21 (50.00)	16 (37.21)
Underlying health problem (more than one indications listed)			
Abnormal BMI	10 (18.52)	4 (9.52)	9 (20.93)
Anaemia	5 (9.26)	6 (14.29)	4 (9.30)
Ruptured uterus	18 (33.33)	14 (33.33)	13 (30.23)
Preclampsia	14 (25.93)	13 (30.95)	9 (20.93)
Other medical problems	16 (29.63)	13 (30.95)	11 (25.58)
Schedule of surgery			
Elective	15 (27.78)	9 (21.43)	14 (32.56)
Emergency	39 (72.22)	33 (78.57)	29 (67.44)

DISCUSSION

The implementation of the infection control policy in the University of Port Harcourt Teaching Hospital (UPTH) resulted in a 22.43% decrease in the prevalence of SSI in the hospital. This is lower than the 51.72% recorded in a hospital in Kano, Nigeria,¹² and significantly lower than the minimum of 60% achieved in several hospitals in developed countries.^{13,14} The small decrease in SSI achieved in the hospital can be attributed to the significant improvement in the supply of sterile medical consumables and antiseptics, especially as the other important infection control measures such as surveillance and continuous education of the health workers were not carried out.

The implementation of infection control policy has been shown to result in significant increase in the consumption of sterile medical consumables and antiseptics.^{15,16} This is probably not a problem to hospitals in developed countries, but is often a big hindrance to the proper implementation of the infection control policy, in the poorly resourced hospitals in developing countries. The real success of the implementation of the policy in UPTH is probably the written commitment of the management of the hospital to ensure the steady supply of the required medical consumables and antiseptics. This was carried out by contracting the supply of sterile linens and dressing packs to a private company, with adequate checks; and mandating the clinical departments to ensure the steady supply of antiseptics and similar consumables, through a revolving fund scheme.

The effects of the implementation of the policy in the hospital could have been further boosted if the

infection control committee of the hospital had carried out surveillance activities, and if their educational programme had not stopped a few months after the commencement of the policy. Surveillance activities comprising the continuing systematic collection, analysis, interpretation and dissemination of data related to SSIs has on its own been found to result in up to a 50% decrease in SSI, especially if the results of the surveillance activities are used to improve the infection control effort.¹⁷

Educational programme to improve practice, on its part has been found to “wash out” with time,^{15,18,19} and therefore needs to be continuous, to ensure the attainment of the desired change in practice. This study was carried out up to 2 years after the end of the educational programme of the infection control committee of the hospital. This time interval has been noted in other studies to be long enough to “wash out” what has been learnt. A study recorded no effect when a hand hygiene education programme was assessed 3 months after the conclusion of the programme.¹⁸

A glimmer of the effects of the educational programme carried out in UPTH can, however, be seen in the reduction in the prevalence of SSI achieved with un-booked patients. The percentage of un-booked patients with SSI fell from 48.15% before the implementation of the policy, to 37.21% 2 years after the policy. Briggs²⁰ had in 1988 noted that un-booked patients in the hospital commonly present as complicated emergency cases, and the management of these complicated patients have been shown to pressurise health workers into cutting corners.²¹ The fact that success was achieved with these cases is a pointer that at least some success was achieved with the practice change communication carried out in the hospital.

The SSI recorded in the study hospitals are significantly higher than those recorded in hospitals in developed countries,²² and even in smaller and rural hospitals in developing countries.²³ The prevalence rate of SSI can be as low as 2% in developed countries,²² while it was 10% in a rural hospital in Uganda,²³ compared to the minimum of 10.34% recorded in the study hospitals. This is in spite of the exclusion from the study of infections that occurred after the discharge of the patient from the hospital. This, according to some studies, albeit carried out in developed countries could have excluded up to 50% of the cases from the study.^{24,25}

The high incidence of SSI in the study hospitals, before and after the implementation of the policy could be indicative of the fact that some of the SSI might be from factors beyond the direct influence of the infection control policy. Environmental factors are known to cause SSI, especially as the surgical site can easily be

contaminated with air and water borne microbes.^{26,27} This explains why the WHO recommends that operation theatres and delivery rooms should have a positive air pressure control, and a total air change rate of 15 air changes/hr.²⁸ The WHO also sets a minimum water supply target of 40 – 60 l/ day for every in-patient and 100 l for every deliveries or surgical operation carried out in a hospital.^{5,29} These recommendations are much easier to follow in developed countries, but not always so in developing countries. A study carried out on the environmental condition of UPTH³⁰ found that the hospital has the low ceiling, small window design of hospitals in the temperate developed countries, but often did not have the electrical power needed to operate the mechanical ventilation systems installed to effect the recommended air changes needed to prevent airborne nosocomial infection.³¹ The study also found that though the hospital met the recommended water supply targets, the water supplied to wards and theatres of the hospital did not have any residual disinfectant, in spite of the labyrinth of water supply pipes in the hospital. Although the environmental condition in small hospitals in developing countries is more likely to be worse, they, however, represent a smaller concentration of patients and microbes, and therefore present a lower risk of infection.

CONCLUSIONS

The implementation of an infection control policy in a teaching hospital in Port Harcourt, Nigeria led to a small decrease in SSI, probably due to the non-implementation of some important aspects of the WHO policy. The introduction of surveillance activities, continuous practice reinforcing communications and environmental sanitation are recommended to further decrease the prevalence of SSI in the hospital.

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