

# Implementation Strategies to Reduce Gynecological Surgical Site Infections

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## ABSTRACT

Surgical site infection (SSI) is a widespread issue that raises expenditures, duration of hospital visits, readmissions, but also death. This original study objective was to compare the SSI incidence prior to and after the introduction of the BIs as well as to assess the intervention's effectiveness in decreasing the relative SSI incidence. Method. This study was carried out at Department of Gynecology in Hayatabad Medical Complex, Peshawar, Pakistan from January 2021 to October 2021. Following 30 days following surgery, the prevalence of SSIs was studied. Of the 850 participants with GM who were diagnosed, 630 had laparotomies prior to (PRE) and 220 following (POST) the installation of BI. Result The most frequent suggestion was OC. There was a substantial decrease in the SSI frequency between OC laparotomies, including those without BR (PRE 11% (45/395) vs. POST 4.3% (7/162); RRR 81.7%; OR 0.14, 95% CI 0.06-0.52; p value less than 0.002) also those through BR (Pre 67.3% (31/46) against Post 14.2% (2/14); RRR 86.7%; OR 0.06, 95% CI 0.02–0.57; p = 0.003). the total SSI incidence within UC decreased from 25.8% (47/182) to 15.3% (6/39; RRR 48%; OR 0.46, 95% CI 0.17-1.34; p = 0.133). Overall SSI rates among CC decreased from 17.6% (6/34) to 0 (0/15).

**Conclusion** Most commonly, conventional bundles of implementation interventions are used in SSI prevention. The rate of SSI in GM significantly decreased once BI was implemented.

**Keywords:** Surgical site infection, laparotomies, gynecological cancers, gynecology oncologist.

## INTRODUCTION

Surgical site infection (SSI) is a widespread issue that raises expenditures, duration of hospital visits, readmissions, but also death [1,2]. In 2005, SSIs contributed more than one million patient days and \$1.6 billion in expenses in the United States [3]. SSIs ranged from 0.6% to 9.5% per 100 surgical operations in Europe during 2013 and 2014 [4]. A recent research from Pakistan revealed that among elderly patients, 4 out of 9 experienced SSIs, while those who received urgent surgery being the most severely impacted [5]. SSIs seem to be the most common healthcare related with infections in low and middle nations. The World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) have released guidelines defining one of most effective prevention approaches, and convincing data indicates that multiple treatments seek to stop SSIs. But evidence-based suggestions are frequently not given to patients at the clinic [6,7].

Surgery is crucial for such treatment of gynecological cancers. The chemoradiotherapy ovarian cancer (OC) operations frequently call for extensive multi-organ resections in the pelvis and upper abdomen. Extremely complicated OC operations come with a considerable risk of SSIs, a significant intraoperative mortality rate, and low overall health outcomes [8,9]. When contrast to a less invasive procedure, staging operation for uterine cancer (UC) is linked with a 15-fold higher incidence of SSI [10]. Consequently, there seems to be a surge of interest in using novel facts "bundled interventions" (BIs) within the postoperative timespan to get rid of SSIs [11]. Studies in various specialized fields have revealed a considerable decline in SSI incidence following the use of BIs [12]. Furthermore, considering the estimated SSI prevalence of 3 to 6 percent for significant GM surgeries as well as an estimated 40% healthcare center readmission incidence owing to postoperative SSIs, the specialty of gynaecology oncologist (GO) [13] There are few research on using BI to lower SSI [14]. An infection type connected with healthcare that has the potential to seriously affect patients is surgical site infections (SSIs). An SSI's postoperative complications might result in extended hospital stays, time away from work, and the requirement for additional surgery. Data from 2009 reveal that hospital stays were extended an average of 9.7 days because of SSIs, with an average cost of \$20,842 per hospital stay

This original study objective was to compare the SSI incidence prior to and after the introduction of the BIs as well as to

assess the intervention's effectiveness in decreasing the relative SSI incidence.

## MATERIAL AND METHODS

From January 2021 to October 2021, this study was conducted at the Department of Gynecology in Peshawar, Pakistan's Hayatabad Medical Complex. The restrictions were as follows: identification of a benign gynaecological issue; minimally invasive GM surgery; GM was performed outside of the body and SSI was observed. Since patients with recurring diseases frequently require many procedures during the duration of their illness, individual patient admissions were employed. The historical data of individuals before the adoption of BIs was contrasted with the planned records of patients admitted who had laparotomy subsequent to the deployment of BIs (Pre and Post). In order to analyze the patients, they were split into four sub-cohorts 1) OC lacking BR, 2) OC needing BR 3) staging laparotomy designed for UC, and 4) Radical hysterectomy intended for CC.

Fourteen components made up the BIs all across the surgery hospitalization. Health education, a completely separate closing tray for the closure of the fascia and the skin, staff glove changes prior to the closure of the fascia, gown changes if soiled, dressing withdrawal within 24-two days, rejection by means of 4.0% chlorhexidine-gluconate, and follow-up telephone since the research center were important elements of BIs. Through a mix of hospital evaluations and schedule telephone calls made through medical attendant, 1-month SSI data were acquired retrospectively. Following 30 days following surgery, the prevalence of SSIs was studied.

For dependent variable, variations in the central tendency were compared using the Wilcoxon rank sum analysis. Use of the Pearson Chi-square test was used to analyze categorical variables or proportional variances. A probability value smaller than 0.05 was used to determine the statistical significance. Version 20.0 of IBM SPSS for Windows was used for all analyses.

## RESULTS

Of the 850 participants with GM who were diagnosed, 630 had laparotomies prior to (PRE) and 220 following (POST) the installation of BI. Table 1 lists the demographic information and surgical features of the participants. The epidemiological and medical features of the two groups were comparable (P values were greater than 0.05). The most frequent indication including

both groups was OC, and a disproportionately greater proportion of patients underwent surgery for OC during the Pre-intervention period. In the months following the surgery, a significantly lower number of UC patients required laparotomies. The total compliance by means of the different BIs components was 94.89%. Cefuroxime redose after 2–3 hours of incision (88.9%), wash through 4 percent chlorhexidine–gluconate following bandage withdrawal (91.2%), plus patients departure with a 4-oz bottle of 4 percent chlorhexidine–gluconate (92.8%) were the compliance components with the lowest levels displayed in table 2.

Table 1: Demographic and operational traits

Unique features	Pre Intervention (n = 630) N (%)	Post Intervention (n = 220) N (%)	P value
Age (in years), Average Range	54 (15 - 84)	55 (12–86)	0.078
Body Mass Index	23.8 ± 5.0	24.7 ± 4.5	0.336
ASA			0.832
1-2	462 (73.3)	178 (80.9)	
≥ 3	102 (16.1)	42 (19.0)	
unidentified	66 (10.4)	0	
H/O Diabetes	144 (22.8)	47 (21.3)	0.757
Previous Abdominal Operations			0.879
0	339 (53.8)	115 (52.2)	
1	201 (31.9)	69 (31.2)	
2	58 (9.2)	25 (11.3%)	
greater than or equal to 3	32 (5.0)	11 (5.0%)	
operating period (min)	210 (100 – 800)	200 (75 – 750)	0.042
Estimated loss of blood (ml)	290 (100 – 3000)	310 (100 – 3500)	0.171
Method			0.031
OC	392 (62.2)	159 (72.2)	
OC + BR	37 (5.8)	13 (5.9)	
UC	173 (27.3)	39 (17.7)	
CC	28 (4.4)	9 (4.5)	
Wound class			0.687
hygienic	113 (17.9)	44 (20.1)	
Clean contaminated	405 (64.2)	134 (60.9)	
impure	112 (17.7)	42 (19.09)	

Table 2: Reliability with the care bundle procedure in the POST intervention group

Elements	Percentage
Preoperative	
Health educational brochure on avoiding SSI	96.7
Wash with 4 percent chlorhexidine-gluconate the previous day and the evening before operation.	99.8
Intraoperative	
antibiotic dosing in accordance with SCIP	99.3
application of 2 percent chlorhexidine-gluconate and 70 percent isopropyl alcohol to the region of the wound	99.5

Table 3: Incidence of SSI in the groups before and after the therapy

Kind of surgical procedure	Pre-intervention	Post-intervention	P <sup>a</sup>	Reduction in relative risk (RRR) (%)	odds ratio (95% CI)
Total	18.2 (115/630)	8.18 (18/220)	< 0.001	76.0	0.18 (0.08 – 0.38)
OC	11.39 (45/395)	4.3 (7/162)	<0.002	81.7	0.14 (0.06 – 0.52)
OC + BR	67.3 (31/46)	14.2 (2/14)	0.003	86.7	0.06 (0.02 – 0.57)
UC	25.8 (47/182)	15.3 (6/39)	0.133	48	0.46 (0.17 – 1.34)
CC	17.6 (6/34)	0 (0/15)	- <sup>c</sup>	- <sup>c</sup>	- <sup>c</sup>

<sup>a</sup> Fischer test.  
<sup>c</sup> Considering the need of an occurrence within the Post-intervention phase, the p - values and OR were not estimated

Table 4: Pre and post intervention group SSI incidence underwent subset evaluation.

Features	Pre intervention	Post intervention	P value
Age greater than or equal to 55 years SSI rate	49/225 (21.7)	3/69 (4.34)	0.003
ASA score 2 or 4 SSI rate	23/109 (21.1)	5/45 (11.1)	0.043
operating period greater than or equal 230 min SSI rate	61/299 (20.4)	7/89 (7.86)	0.002
Clean contaminated surgeries SSI rate	65/408 (16.27)	7/136 (5.14)	< 0.002
Contaminated surgeries SSI rate	24/106 (22.64)	3/42 (7.1)	0.006
LOHS > 6 days <sup>a</sup> SSI	61/267 (22.84)	5/41 (12.1)	0.04

<sup>a</sup> The Average LOHS for the PRE-intervention phase was 6 days, as well as the same value was used for the POST-intervention period also to remove any potential for bias.

Cefuroxime should be given again within 2–3 hours following the incision.	88.9
sterilized sealing tray for skin and fascia closure	94.3
Prior to fascia closure, staff members should change their gloves and, if necessary, their gowns too	93.6
Postoperative	
Maintain good personal hygiene.	91.6
Hand sanitizer is easily accessible.	92.5
Focus on removing the bandage after 24 to 48 hours.	94.3
After removing the dressing, the patient takes a 4% chlorhexidine-gluconate wash.	91.2
patients' knowledge of disease signs and wound management	96.8
Post discharge	
Give the patient a 4-oz bottle of 4 percent chlorhexidine-gluconate upon discharging	92.8
During 24-72 hours, a follow-up telephone conversation from the institute	97.2
Overall compliance	94.89

Mostly in PRE intervention group, the total SSI rate was 18.2% (115/630), but in the post intervention cohort, it was 8.18% (18/220; RRR 76%; OR 0.18, 95% CI 0.08- 0.38; p value less than 0.001). There was a substantial decrease in the SSI frequency between OC laparotomies, including those without BR (PRE 11% (45/395) vs. POST 4.3% (7/162); RRR 81.7%; OR 0.14, 95% CI 0.06-0.52; p value less than 0.002) also those through BR (Pre 67.3% (31/46) against Post 14.2% (2/14; RRR 86.7%; OR 0.06, 95% CI 0.02–0.57; p = 0.003). Although the participants become more likely to have poor function and operational levels, a greater number of diseases and ASA score, as well as a greater risk of having sarcoma in the POST intervention group, the total SSI incidence within UC decreased from 25.8% (47/182) to 15.3% (6/39; RRR 48%; OR 0.46, 95% CI 0.17-1.34; p = 0.133). Overall SSI rates among CC decreased from 17.6% (6/34) to 0 (0/15) (Table 3).

Using a variety of medical and treatment regimen characteristics, subset assessment of the before and post-intervention group of SSI incidences was carried out (Table 4). Age 55 years, ASA score 2, operative time 230 minutes, clean and contaminated treatments, participants through sustained span of linger in hospital greater than the median LOHS, and patients with clean contaminated and contaminated therapies were threatened demographic and therapeutic factors that significantly reduced the risk of SSI in post intervention group. Patients who had had repeat surgery saw a reduction in the SSI rate [PRE 24.63% (17/69) vs POST 6.8% (2/29); p = 0.216] although it was not statistically significant.

**DISCUSSION**

The use of BIs was found to significantly lower the 1-month SSI incidence and the SSI incidence in at-risk GM procedures in the present prospective, single-institution analysis. This represents the first systematically researched assessment of scientific proof SSI reduction strategies (BIs) in Pakistan, to the best of our understanding. The Surgical Care improvement project was

launched in 2006 through the goal of lowering the incidence of medical hurdle like SSI [15]. Organizing the time, kind, and period of medicines; glycemic management and normo-thermia were the main goals of the SCIP effort. Regardless of the high level of adherence with the SCIP recommendations, these treatments have not consistently been shown to decrease the incidence of SSIs, suggesting the requirement for additional treatments [16,17].

According to the research that has been reported, the SSI incidence for main gynecological cancers surgeries varied between 4 to 39% [18]. The background SSI incidence in the present investigation is 18.2%, which is consistent with the previous published studies. 11.39%, 25.8%, and 17.6% of CC laparotomies had SSI rates. The SSI prevalence among OC who underwent BR laparotomies was 67.3%, which was surprisingly higher than that noted in the research.

Rarely has the effectiveness of BIs in gynaecological cancer been assessed [19]. Jhonson et al. [20] conducted the initial research. The following therapies were also used: preoperative chlorhexidine washing, a separate fascial closure tray, glove replacement, and postoperative everyday chlorhexidine solution bathing. The studies report a substantial relative risk reduction (RRR) of 81.5% and a drop in the SSI frequency from 7% to 2%. With an RRR of 74.6% and an SSI rate decrease of 3.4%, this cohort had the highest rate reduction. We showed a substantial decrease in the entire SSI rate ( $p < 0.001$ ) with an RRR of 76% using the same reduction bundle. Additionally, we observed a substantial decrease in the incidence of superficial SSI ( $p < 0.001$ ). The OC with BR sub-cohort (RRR 86.7%) showed the highest decrease in comparison to the prior research.

Several research has found risk variables that raise the chance of SSI [21]. To determine the effectiveness of BIs in lowering the rate of SSI among at-risk demographic and surgical variables, we performed the subgroup evaluation. Patients under  $\geq 55$  years old had significantly lower rates of SSI, greater ASA scores, greater operations ( $\geq 230$  minutes), clean impure and unhygienic procedures, and extended LOHS. The current research examined specifically at the drop in the SSI incidence in individuals who had had repeated surgery and discovered a drop of 6.8% from 24.63%. Unfortunately, statistical significance could not be achieved, possibly due to a decline in the number of those who had had repeated therapy. In highly risky categories such as patients with stomas or those who had hysterectomies, Schiavone et al. showed a substantial decline in SSI incidence in these age ranges of  $\geq 60$  years,  $\geq 340$  minutes of operation, and  $\geq 450$  ml of blood loss [19]. By demonstrating an adverse relationship between the quantity of bundle interventions elements deployed along with the threat SSI cases, Waits et al. enhanced the bundling notion [20]. The present research is the primary account of GM in the research, and it reports a response rate of 94.89% overall as well as accordance with particular BIs aspects.

## CONCLUSION

Most commonly, conventional bundles of implementation interventions are used in SSI prevention. The rate of SSI in GM significantly decreased once BI was implemented. The treatment continued to be helpful in at-risk patients with immutable clinical and pathological and operational health conditions. Additional investigation should identify the approaches, or combinations thereof, that are most successful in encouraging GM compliance with SSI-preventive procedures.

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