Postoperative hospital-acquired infection in Hungvuong Obstetric and Gynaecological Hospital, Vietnam

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Summary: A prospective study was conducted following 1364 major operations at the 450-bed Hungvuong Obstetric and Gynaecological Hospital in HoChi Minh City, Vietnam, from 1 May to 30 September 1997 to characterize postoperative hospital-acquired infections. These infections were identified by ward rounds, review of laboratory results and patient follow-up until 30 days after discharge. During the study period, 194 infections were identified, yielding a rate of 14.2 infections per 100 operations. The most common sites were surgical wound and urinary tract, contributing together 95.9% of all hospital-acquired infections. The four most common pathogens were Staphylococcus aureus (29.6%), Escherichia coli (20.4%), Enterococci (16.7%) and Staphylococcus epidermidis (14.8%).

Keywords: Postoperative hospital-acquired infection; obstetric; gynaecology; surgical site infection; urinary tract infection; Vietnam.

Introduction

Hospital-acquired infections (HAI) are a serious problem throughout the world, especially when a patient undergoes a surgical procedure. They increase postoperative hospital stay, cost and related complications. The steadily increasing number of major operations, particularly Caesarean section, highlights the significance of infections in obstetric and gynaecological (Ob/Gyn) patients. Reported rates of HAI vary dramatically from country to country. In Canada, 44.1 infections were identified for every 100 Caesarean sections.1 In contrast, the rates in the United States were only 6.0% after abdominal hysterectomy and 6.5% after obstetric operations.2 HAI should have a greater impact in the developing world where there are limited resources, budget and personnel.

Although it was well demonstrated by the SENIC project that the establishment of effective infection control programmes could prevent 32% nosocomial infections and save more than $1.3 billion annually in United States,3 HAI data have not been systematically or effectively collected from the majority of hospitals in...
Vietnam. Therefore, we conducted this prospective study to determine the magnitude of postoperative infections in Hungvuong Ob/Gyn Hospital in HoChiMinh City, Vietnam. To our knowledge, this is the first report regarding HAI in Vietnam. The findings of the study will help to establish effective infection control programmes in Vietnam.

**Methods**

The Hungvuong Hospital is a 450-bed Ob/Gyn hospital with an average of 2500 admissions and 350 major operations per month. It is one of two Ob/Gyn centres responsible for South Vietnam, particularly HoChiMinh City and its suburbs. It not only serves a population of 2.5 million women in HoChiMinh City but acts as an Ob/Gyn tertiary-level supervisory centre for 18 district hospitals and other hospitals in HoChiMinh City as well.

From May to August 1997, all patients who experienced major Ob/Gyn operations were recruited into the study. A principal investigator visited each postoperative ward twice weekly and collected information regarding operative procedure, signs of infection, microbiology and other laboratory results. The data were recorded on pre-printed data collection forms. An American Society of Anaesthesiologists preoperative assessment (ASA) score, wound class and patient risk index were assessed mainly by reviewing medical records and discussing with an anaesthetist if necessary. Leucocyte count was routinely performed when the patient’s temperature exceeded 38.5°C. Further tests such as urine analysis, chest X-ray or wound culture were not performed routinely unless infection was suspected. The patient was followed up for one month after operation by research assistants at the outpatient clinic after discharge. Postoperative HAI were diagnosed using the Center for Disease Control (CDC) definition of HAIs. The infection rates were reported according to operative procedures, pathogens and patient risk index. Patient risk index was defined as the number of risk factors present among the following: (1) a patient with ASA score of 3, 4 or 5, (2) an operation classified as contaminated or dirty-infected and (3) an operation lasting over 1 h for Caesarean section of 2 h for hysterectomy. We modified a wound classification system to code salpingectomy and oophorectomy without inflammation or infection as clean instead of clean-contaminated. A Caesarean section was classified as class I if there was no rupture of membrane or labour; class II if there was less than two hours of rupture of membrane without labour or labour of any length with no rupture of membrane; class III for rupture of membrane greater than two hours and class IV for purulent amniotic fluid.

Data management and analysis were performed using the statistical software Epi Info version 6.04b and STATA version 5.0. Infection rate was reported in terms of number of infectious episodes per 100 operations. A non-parametric test for trend (Cuzick) was used to demonstrate a possible trend across ordered groups.

**Results**

During the four-month study period, 1361 patients underwent 1364 obstetric or gynaecological major operations. Caesarean section was the most common procedure, accounting for 70.1% of the operations performed at Hungvuong Hospital. Three patients who had experienced salpingectomy, later underwent radical hysterectomy because of malignancy. We identified 132 surgical site infections (SSI), 54 urinary tract infections (UTI), three pneumonias and five cases of gastroenteritis in 183 postoperative patients (Table I), yielding an overall rate of 14.2 infections per 100 operations.

A high rate of postoperative infections was found after hysterectomy. Approximately one-quarter of these procedures, vaginal hysterectomy (31%), abdominal hysterectomy (28.2%) and radical hysterectomy (25.1%) subsequently developed some kind of infectious complications, of which 60 and 36.5% were SSI and UTI, respectively. In contrast, postoperative infections were identified in approximately one-eighth of the Caesarean section
population in which SSI and UTI accounted for 79.5 and 16.2% of infections, respectively. The lowest rate of infection (4.7%) was found among patients undergoing salpingectomy, classified as a relatively clean operation. Ten patients developed more than one infected site following Caesarean section and in one of them, infection was identified in three sites—UTI, superficial SSI and endometritis. These were diagnosed on the second, seventh and ninth postoperative day, respectively.

Three patients contracted pneumonia on the fourth postoperative day with clinical and radiological evidence and five patients developed acute diarrhoea on the fifth and sixth postoperative days; causative pathogens could not be identified in these cases.

We isolated 54 pathogens from 125 specimens (Table II). The most common pathogen was *Staphylococcus aureus*, identified from 10 superficial SSI, one vaginal cuff infection and five cases of endometritis. *Escherichia coli* was detected in three cases of UTI and eight SSI.

Apart from those reported above, the SSI rate was also described according to intrinsic risk of patients (Table III). We observed an increasing trend of infection across increasing levels of ASA score, wound contamination and patient risk index. A test for trend, however, was not statistically significant for the latter criterion. When intrinsic patient risks of obstetric patients were categorized by patient risk index, 34, 59 and two SSIs were diagnosed among 442, 516 and 11 Caesarean section for categories 0, 1 and 2, respectively. There were 28, eight and one wounds that became infected among 337, 5.5 and 2 gynaecological patients in the same categories of patient risk index.

In addition, 99.2% of Ob/Gyn wounds were classified as clean-contaminated, according to the unmodified wound classification system. The rest, including eight Caesarean sections with amniotitis, one vaginal hysterectomy with...
rectal perforation and two abdominal hysterectomies (one with ovarian abscess and one with colectomy), were assessed as contaminated. Among these, we determined five SSIs after obstetric operations and one SSI after gynecological operations.

Discussion

The study included 1364 major Ob/Gyn operations. The prospective nature of the study accompanied by a follow-up component enabled us to address precisely the magnitude of HAI. Furthermore, the application of CDC criteria for HAIs proven to be highly accurate, made our study comparable with others around the world.

The overall infection rate of 14.2% in our study may be an underestimation since we could not confirm HAI in 62 suspected cases (4.5% of study sample). These patients, though with fever over 38.5°C on two consecutive days after the second postoperative day and a left-shifted neutrophilia, could not fulfil the CDC criteria for HAI. Our infection rate was similar to that of Horan (12.2%) who used similar diagnostic criteria and reported for only Caesarean section and abdominal hysterectomy. In contrast, Gedebou, using slightly different diagnostic criteria, documented 88 infections among 254 similar major Ob/Gyn operations in Ethiopia, yielding an overall rate of 34.6%.

With Caesarean section, the overall infection rate in our study was 12.2%, which is consistent with the rate of 13.9% reported from a prospective study of 1319 Caesarean sections in Denmark. Our rate was nearly twofold that of Horan in United States, but lower than the rate reported by Rehu in Finland and Henderson (44.1%) in Canada. Nevertheless, approximately 41% infections in Henderson's study were either deep SSI, asymptomatic bacteriuria or bacteremia. These types of infection comprised only 0-5% of all infections in our study. Furthermore, 16 cases of chorioamnionitis, which accounted for 2.7% infections in Henderson's study, were not classified as postoperative infections in our study.

There were 39 infections following abdominal hysterectomy, yielding an overall infection rate of 27.9%. Likewise, Persson documented a rate of 23.4% from a large-scale prospective study in Sweden.

We found a preponderance of SSI contributing 68.4% of all infections, which was similar to the rates reported elsewhere. The SSI rate after Caesarean section was 9.7%, falling between the extremes reported by other studies also applying CDC criteria for nosocomial infection. Neither Yacin's rate (0.3%) nor Elhataway's rate (18.3%) were detected from a large-scale study, and so may be distorted to either side. Comparable rates to that found in our study have been documented from Brazil (11.6%), Canada (8.8%) and Denmark (8.8%), although the last study used slightly more strict criteria.

In addition, 13.7% abdominal hysterectomies subsequently developed some kind of SSI, close to the rate reported from United States (12.6%) and Saudi Arabia (10.4%). Similarly, 18.8% of our patients, compared with 20.2% patients in Orr's study, suffered from SSI after radical hysterectomy. In contrast, our high SSI rate (26.2%) after vaginal hysterectomy differs markedly from those reported by Shapiro (7.8%) and Anderson (13.2%). Neither of them, however, examined the vaginal cuff after patients had been discharged from hospital, while 54.5% of vaginal cuff infections in our study were identified after discharge.

We isolated 54 common pathogens in this study (Table II). Apart from these, 23 cases with documented negative cultures gave a positive Gram-stain, of which 60-9% were Gram-positive cocci. Moreover, 49 (39.2%) of all cultures gave a negative result together with negative Gram stain. It is possible that some of these infections were due to anaerobic bacteria. An infection control unit has not yet been established in Hungvuong Hospital; as a result, the facilities for bacterial cultures are not yet sufficiently equipped or managed. We identified S. aureus as the most common pathogen causing SSI, which is consistent with the findings of Leigh, Eltahawy, and Twum-Danso. In contrast, Scott pointed out genital mycoplasmas
Table III  Patient risk-specific rate of surgical site infections (SSI)

<table>
<thead>
<tr>
<th>Risk classification</th>
<th>Obstetric operation†</th>
<th>Gynaecological operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of operations</td>
<td>Rate of SSI‡</td>
</tr>
<tr>
<td>ASA‡</td>
<td>1</td>
<td>877 8.3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>84 23.8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>7 28.6</td>
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<td>Modified wound class‡</td>
<td>1</td>
<td>295 6.8</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>168 10.7</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>506 11.3</td>
</tr>
<tr>
<td>Unmodified wound class‡</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>961 9.4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>8 62.5</td>
</tr>
<tr>
<td>Patient risk index</td>
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<td>442 7.7</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>516 11.4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11 18.2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>969 9.8</td>
<td>395 9.4</td>
</tr>
</tbody>
</table>

* Included 14 cases of Caesarean section accompanying gynaecological operations.
† Calculated as number of infections per 100 operations.
‡ P-value of non-parametric test for trend is less than 0.05.

(Ureaplasma urealyticum and Mycoplasma hominis) as the most common cause of post-Caesarean wound infection.26 These pathogens, though being associated with many conditions, have been shown to be causative in very few.26

The fact that the unmodified wound classification system is impractical in Ob/Gyn since almost Ob/Gyn wounds are classified clean contaminated was again illustrated in our study. Furthermore, the modified wound classification system made our SSI rates in the different levels of Ob/Gyn wound contamination comparable with those in general operations. Our overall wound class-specific infection rates after obstetric operations were reasonably similar to the findings of NAS-NRC (5.1, 10.8 and 16.3%),8 Twum-Danso (5.9, 10.7 and 24.3%)25 and Jamulratra (3.6, 8.4 and 11.8%).27 The rate after gynaecological operations was similar to Cruse's rate (1.8, 8.9 and 21.5%)28 and Hulton's rate (4.5 and 15.8% for clean and clean-contaminated wounds only).29 The infection rate after 'clean' gynaecological operations in our study was very close to those rates among 'clean' general wounds reported by Culver (2.1%),7 Cruse (1.8%)28 and Olson (1.8%).30 The unexpectedly high rate of infection among gynaecological wounds classified as contaminated in our study may be simply a result of small number of operations.

Although patient risk index has been demonstrated as an objective criterion allowing a valid comparison of infection rate among hospitals or across time,7 it has not been widely applied in Ob/Gyn. Our SSI rates by patient risk index after Caesarean section were nearly twice as high as those documented by Culver (4.2, 5.9 and 11.4%).7 Similarly, the rates after hysterectomy were approximately sixfold his rate (1.2, 2.6 and 2.6%).7 Differences in population studied and setting may bring about the different infection rates between our and Culver's findings.
In conclusion, the magnitude of HAI in Vietnam is considerable despite widespread use of antibiotics and improvements in operative techniques. Risk factors for SSI as well as antibiotic practices in Ob/Gyn operations will be the subject of subsequent reports. An infection control programme should be instituted in Vietnam, especially in a tertiary hospital like Hungvuong Hospital.

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References


