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SHORT REPORT

# Active prospective surveillance study with post-discharge surveillance of surgical site infections in Cambodia



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## KEYWORDS

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**Summary** Barriers to the implementation of the Centers for Disease Control and Prevention (CDC) guidelines for surgical site infection (SSI) surveillance have been described in resource-limited settings. This study aimed to estimate the SSI incidence rate in a Cambodian hospital and to compare different modalities of SSI surveillance. We performed an active prospective study with post-discharge surveillance. During the hospital stay, trained surveyors collected the CDC criteria to identify SSI by direct examination of the surgical site. After discharge, a card was given to each included patient to be presented to all practitioners examining the surgical site. Among 167 patients, direct examination of the surgical site identified a cumulative incidence rate of 14 infections per 100 patients. An independent review of medical charts presented a sensitivity of 16%. The sensitivity of the purulent drainage criterion to detect SSIs was 83%. After hospital discharge, 87% of the patients provided follow-up data, and nine purulent drainages were reported by a practitioner (cumulative incidence rate: 20%). Overall, the incidence rate was dependent on the surveillance modalities. The review of medical charts to identify SSIs during hospitalization was not effective; the use of a follow-up card with phone calls for post-discharge surveillance was effective.

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## Introduction

The Centers for Disease Control and Prevention (CDC) guidelines [1] are currently the gold standard for surgical site infection (SSI) surveillance [2]. In resource-limited settings, there are barriers to correctly implementing the CDC guidelines [3,4]. In this study, we aimed to do the following: estimate the SSI incidence rate in a Cambodian hospital and compare different modalities of SSI surveillance in a resource-limited setting.

## Methodology

Using an active prospective study with post-discharge surveillance, we collected data on the occurrence of SSIs at the Preah Kossamak Hospital in Phnom Penh, Cambodia [5]. There were three inclusion criteria: be at least 17 years of age; undergo surgery; and remain hospitalized at least 48 h after surgery. Each patient gave his/her informed consent before enrolling in the study. The study was approved by the Cambodian National Ethics Committee for Health Research with the reference 36NECHR.

During the hospital stay, the CDC criteria to identify SSIs were independently collected twice:

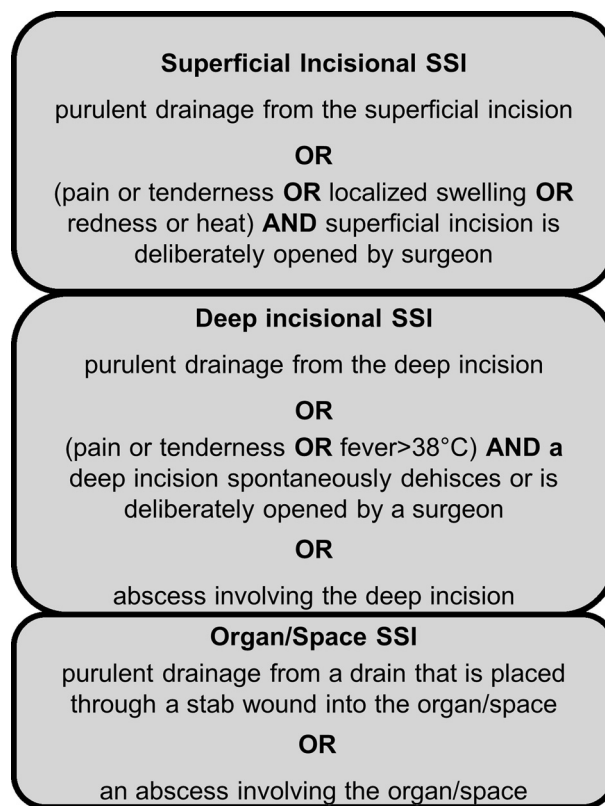
- by direct examination of the surgical site every two days by teams of trained surveyors;
- and by review of the medical charts after discharge by another single trained surveyor.

The criteria used to identify the occurrence of SSIs during the hospital stay are presented in Fig. 1.

After discharge from the hospital, we used a follow-up card to collect the occurrence of purulent drainage from the surgical wound. The card was given to the patient during the hospital stay. Then, patients were called by phone at the following times:

- the day after discharge to remind them to give the follow-up card to any practitioner examining the surgical site during the 30 days following surgery;
- and 15 and 30 days following surgery to collect the information from the card and to ask the patient if white liquid had discharged from the surgical wound.

For the included and not included surgical patients, we compared age, gender and province of residence, what type of surgery they underwent, the duration of their surgery, whether they underwent elective or emergency surgery, the American



**Figure 1** American Centers for Disease Control criteria and algorithm used to identify surgical site infections during hospital stay.

Society of Anesthesiologists' score [6] and the surgical wound classification [6] using two-tailed univariate analysis with an alpha risk of 5%.

The SSI cumulative incidence rate was the number of new SSIs identified during the 30 days after surgery divided by the number of patients included. We studied the effectiveness of reviewing medical charts and of the single use of the purulent drainage criterion to identify SSIs. Direct examination of the surgical site every two days using the CDC criteria was considered the gold standard.

## Results

From April, 17th to June, 11th 2011, 260 patients underwent surgery. Among them, 167 patients were included in the study. After discharge, 87% of the patients provided follow-up data, with a contact rate of 85.6% and 79.3% 15 and 30 days after surgery, respectively.

The male to female ratio of the included patients was 1.65:1. Their median age was 28 years ([10; 90] percentiles: [20.5; 63]), and only 24.2% lived in the

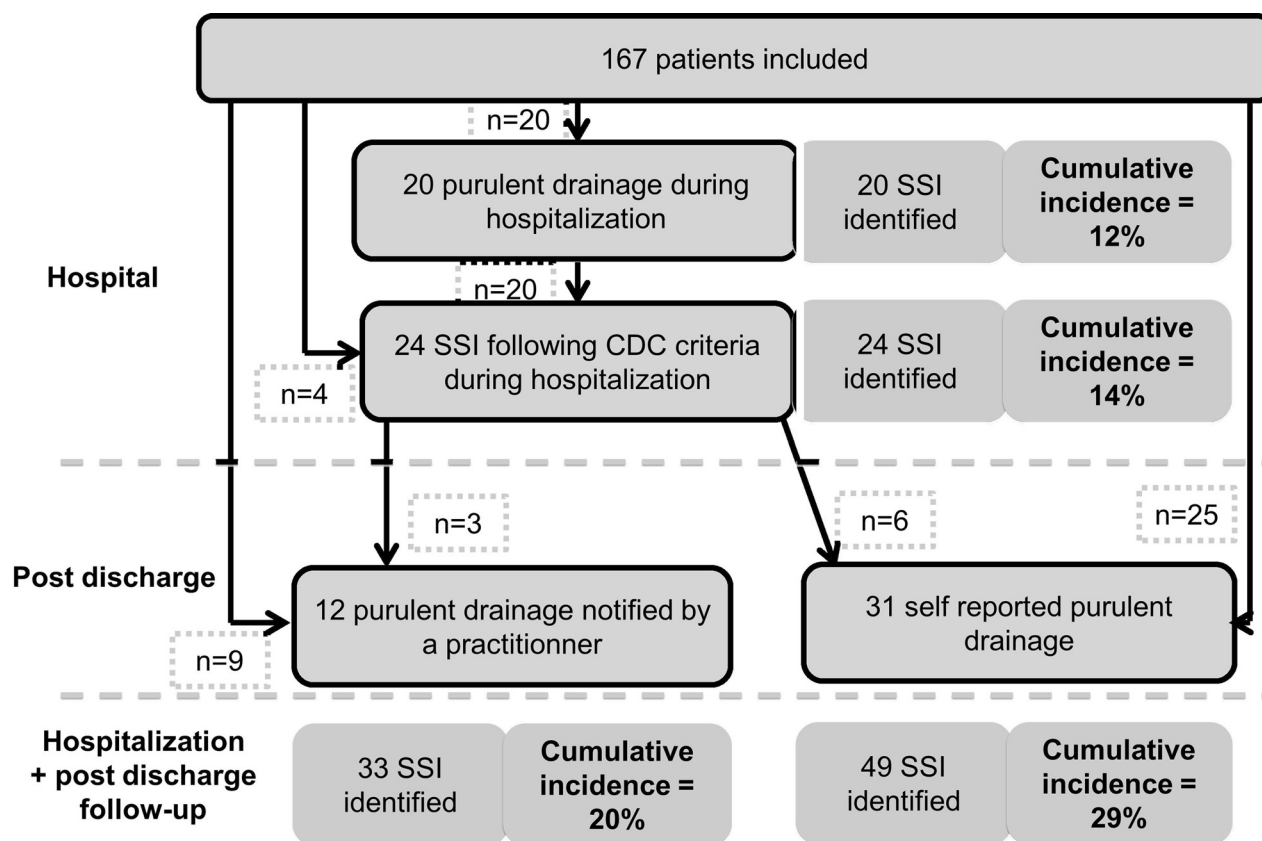


Figure 2 Surgical site infections identified using different criteria and modalities.

Phnom Penh province. Forty percent of the patients underwent orthopedic procedures. Half of the procedures were performed in emergency (55.5%) and half were due to an accident (52.1%). No significant differences were found between the included and non-included patients.

The included patients were hospitalized for a median of 7 days following surgery ([10; 90] percentiles: [3.6; 13.4]), and 96% were discharged before 30 days. During hospitalization, the cumulative incidence rate of SSIs identified using the CDC criteria was 14% (CI 95% [9; 21]). The sensitivity and specificity of the purulent drainage criterion to identify an SSI were 83% and 100%, respectively (positive predictive value: 100%, negative predictive value: 97%).

After discharge from the hospital, 31 patients reported by phone that "white liquid had discharged from the surgical wound"; among them, 12 purulent drainages were reported by a practitioner using the follow-up card. The cumulative incidence rates of SSIs using different criteria and modalities are presented in Fig. 2.

The independent review of medical charts identified 7 SSIs (incidence rate of 4.6%) with

a sensitivity and specificity of 16% and 97%, respectively (positive predictive value: 43%; negative predictive value: 89%).

## Discussion

To our knowledge, this is the first active prospective study of all types of SSIs with post-discharge surveillance performed in Cambodia.

Because of a high rate of discharge from the hospital at less than 48h after surgery, we were only able to include 65% of all surgical patients at PKH during the study period. This high proportion of very short hospital stays should be taken into account for further studies. Nevertheless, no significant differences were found between the included and non-included patients.

We feel confident that purulent drainage is an effective criterion to diagnose SSIs after discharge from the hospital. Indeed, this criterion was found to be highly effective at detecting SSIs during hospitalization, with a sensitivity of 83% and a specificity of 100%.

Comparing SSI rates between studies is a complex task and should be undertaken with care [7]. With this in mind, we found an overall rate of 20 SSIs per 100 surgical patients, which can be compared to the results of a recent meta-analysis that estimated a global rate of 11.8 SSIs per 100 surgical patients in resource-limited settings [3]. Considering the criteria used to detect an SSI (purulent drainage solely, or CDC criteria), and the length of the surveillance (only hospital based, or hospital and post-discharge surveillance), the SSI rate varied from 12% to 29% in our study.

We used gold standard methods during hospitalization to perform the surveillance of SSIs; this included direct examination of the surgical site [1,6], collection of the CDC criteria to diagnose a SSI [3] and collection of data by trained dedicated surveyors [8]. Such methods of surveillance require a great deal of resources, which constitutes an important hindrance in resource-limited settings [4]. To find a less resource-consuming method, we studied the effectiveness of medical charts review for SSI surveillance. Unfortunately, the sensitivity of the medical chart review was found to be very low (15%). In contrast, after discharge from the hospital, the use of a follow-up card with phone calls was found to be very effective, with an overall contact rate of 87%. Further studies are needed to define the most effective modalities of SSI surveillance in resource-limited settings.

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### Competing interests

None declared.

### Ethical approval

Not required.

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