



Major article

Direct health care costs and length of hospital stay related to health care-acquired infections in adult patients based on point prevalence measurements



Mikael Rahmqvist PhD ^{a,*}, Annika Samuelsson MD, PhD ^b, Salumeh Bastami PhD ^c, Hans Rutberg MD, PhD ^a

^a Department of Medical and Health Sciences, Division of Health Care Analysis, Linköping University, Linköping, Sweden

^b Unit for Infection Control, Department of Clinical and Experimental Medicine, Linköping University, Linköping, Sweden

^c Unit for Development and Patient Safety, Department of Medical and Health Sciences, Linköping University, Linköping, Sweden

Key Words:

Point prevalence survey
Readmission
Mortality rate

Background: The incidence of health care-acquired infection (HAI) and the consequence for patients with HAI tend to vary from study to study. By including all patients, all medical specialties, and performing a follow-up analysis, this study contributes to previous findings in this research field.

Methods: Data from the Swedish National Point Prevalence Surveys of HAI 2010-2012 was merged with cost per patient data from the county Health Care Register (N = 6,823). Extended length of stay (LOS) and costs related to an HAI were adjusted for sex, age, intensive care unit use, and surgery.

Results: Patients with HAI (n = 732) had a larger proportion of readmissions compared with patients with no HAI (29.0% vs 16.5%). Of the total bed days, 9.3% was considered to be excess days attributed to the group of patients with an HAI. The excess LOS comprised 11.4% of the total costs (95% CI, 10.2-12.7). The 1-year overall mortality rate for patients with HAI in comparison to all other patients was 1.75 (95% CI, 1.45-2.11), all 5 of these differences were statistically significant ($P < .001$).

Conclusions: Even if not all outcomes for patients with an HAI can be explained by the HAI itself, the increase in inpatient days, readmissions, associated costs, and higher mortality rates are quite notable.

© 2016 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

A health care-acquired infection (HAI) is defined as an infection occurring during the process of care in a hospital or other health care facility, neither present nor incubating at the time of admission nor at the time of a visit to a health care facility.¹ HAIs are known to comprise the largest part of adverse events in health care and cause prolonged hospital length of stay (LOS) and deaths.¹⁻⁴

In earlier studies, point prevalence surveys have been used to provide information on the presence of HAIs, and costs have been estimated indirectly from the extension of LOS and the mean cost of hospital days in different specialties.⁴⁻⁶

Depending on the type of HAI and the mix of patients included, previous studies have shown different results regarding LOS resulting from HAI. Plowman et al⁷ found that HAIs in general extended the LOS by 14 days, which was almost 3 times longer than the average LOS for patients without an HAI. There was a large variation in extended stay depending on the site of single infection (2-13 days) and admission specialty (1-23 days).

Sheng et al⁸ found that the additional LOS was around 20 days for patients affected by an HAI. They also addressed a difficulty regarding estimating costs for HAIs among inpatients by pointing out a higher mortality rate among patients with an HAI than among uninfected patients. Death reduces the direct medical costs but represents for each patient a unique loss of potential life years.

Klevens et al⁹ estimated a US case fatality rate of HAI in hospitalized patients to 5.7% during 1999-2002, with the highest mortality rate in ventilator-associated pneumonia (14.4%) and catheter-associated bloodstream infections (12.3%). In Europe the 30-day mortality rate for *Clostridium difficile* infection (CDI) is estimated to be from 3%-30% in different countries.¹⁰ Kaye et al¹¹ showed that the 90-day mortality rate in hospitalized older adults rises from

* Address correspondence to Mikael Rahmqvist, PhD, Department of Medical and Health Sciences, Division of Health Care Analysis, Linköping University, SE-58183 Linköping, Sweden.

E-mail address: mikael.rahmqvist@liu.se (M. Rahmqvist).

This work was funded by Region Östergötland, Sweden (LiÖ 2014-580). The study sponsor had no involvement in the study other than to provide data.

Conflicts of Interest: None to report.

SB is currently with Unit for Preparedness and Crisis Management, The Public Health Agency, Solna, Sweden.

33.2%–49.4% (odds ratio, 2.1; $P < .001$) in patients with a health care-associated bloodstream infection.

One challenge in estimating the effect of the additional LOS for patients with an HAI is to extract the effect of the infection from that of any other complications or disease progression. Regression analysis with adjustment for patient characteristics has therefore been a way to clear the effects of an HAI.^{4,7}

Readmissions are more common for patients with an HAI. Chopra et al¹² found that it was about twice as common that patients with CDI had a readmission within 30 days compared with all other patients (30.1% vs 14.4%).

Aim

The aim of this study was to examine the effects of HAI by calculating the difference in LOS and actual direct health care costs for patients with an HAI compared with patients without HAI. Additional LOS and costs resulting from any first hospital readmission within 30 days from discharge were also included in the analysis, as was the survival rate (as mortality ratio) between the 2 groups 1 year after the primary discharge.

MATERIALS AND METHODS

Setting

The County of Östergötland has the fourth largest population in Sweden, with 434,000 residents and the Region Östergötland (formerly the County Council) both provides and is responsible for all public health care in the county. All patient encounters, including primary care, are registered in the Health Care Register (HCR). The county has 3 hospitals, 1 of which is a university hospital.

The Point Prevalence Surveys of HAI

Directed by the Swedish Association of Local Authorities and Regions (SALAR) and using the Swedish National Board of Health and Welfare's definition of HAI, the Point Prevalence Surveys of HAI (PPS-HAI) have been conducted in the majority of public somatic hospitals in Sweden every spring and fall since 2008 and around 20,000 patients are included each semester. The PPS-HAI was conducted with national standard protocols and instructions by SALAR and was performed by nurses and attending physicians on each ward during all somatic clinics. The team that makes the registrations during the days the PPS is administered has to read and understand the instructions (from SALAR) detailing how to perform the survey.

All inpatients on a somatic ward on a given day were included. Demographic data (age, identity, and sex) were recorded, as was information on medical specialty. HAI was defined as an intention-to-treat diagnosis or final diagnosis of postoperative infection within 30 days from surgery or within 1 year if implantation surgery; device-related infections due to central venous catheters, urinary tract catheters, ventilator treatment, or endotracheal tubes or indwelling cerebral ventricular drainage; drug-related infections defined as *C difficile* enteritis, infections related to chemotherapy for cancer, or infections due to other immune-modulating drugs or corticosteroids; and other infections occurring > 48 hours after admission. The HAI was categorized according to the suspected anatomic site of the infection origin.

The Point Prevalence Register

The Point Prevalence Register (PPR) used includes local data from the County of Östergötland recorded in the national surveys for 2010–

2012, together with data from 4 extra surveys conducted in the same way during 2012. The data encompass 10 separate prevalence measurements with an average of 800 patients per registration (range, 729–829). Of all unique patients in this study, 58% were inpatients at the university hospital. The registrations included nonresidents in the county.

The validation of the national PPS for HAI in hospital care during autumn 2012

On commission of SALAR, the first author (MR) conducted a national validation study in 2013. The validation study design was to let an independent team consisting of specialists in infectious diseases do the same survey as the ordinary team on the same day. The primary aim was to see how well the results correlated. The study involved 1,216 patients across 20 hospitals in Sweden, the specialties chosen for the study were general surgery and internal medicine. In total, the independent teams found more patients with an HAI than the ordinary teams did (8.3% in the ordinary survey, whereas the validation teams found a prevalence of 13.1%) (95% confidence interval [CI], 11.2–15.0) (Table B in the Supplementary material). All registered cases of HAI became 15.3% when the figures from the 2 independent registrations were added together (Table A in the Supplementary material).

On the local level the validating teams found a higher prevalence at 17 hospitals, the same prevalence at 2 hospitals, and a lower level at 1 hospital. The conclusion from the validation study was that the ordinary teams in most cases underestimated the true prevalence. Details of the validation study are provided as supplementary material.

The HCR

Record data on medical specialty, main diagnosis, LOS, costs, and other factors for each inpatient in somatic care were retrieved from the HCR. All visit or hospitalization records include a personal identification number (PID), date of visit or hospitalization, day of discharge, and diagnosis according to ICD-10,¹³ with main diagnosis and secondary diagnosis. The patient-specific medical costs for visits and inpatient care in the HCR were priced with the additional module of cost per patient containing the diagnosis-related group costs per patient, as described in other studies.¹⁴ The detailed cost figures in the cost per patient module (ie, pricing) are administered by SALAR.

There were 8,104 registrations with a valid PID in the PPR, but 59 of them were double registrations on the same PPS for patients with >1 HAI, thus leaving 8,045 unique registrations. However, 27 of these cases were doubled for patients who had been registered on >1 PPS during the same admission, leaving 8,018 unique patients to be matched with the HCR. When we merged PPR data with HCR data, 37 patients from the PPR were impossible to find in the HCR. For these cases, we suspect that an incorrect PID had been entered in the PPR, and we found no systematic selection bias for the 23 patients for whom we could find no information. These 23 (of 37) patients were completely random across surveys and medical departments.

The complete and valid records resulted in 7,981 patients, of whom 316 died during admission (Table 1). In the 30-day follow-up of readmissions and in the calculation of 1-year survival after the discharge of the PPS admission the study population was reduced to 7,062 patients, of whom 6,823 were adults. Only residents of the county who were registered in the HCR could be part of the follow-up, and only patients who survived the original admission and the 30-day follow-up could be included in the final analysis.

Download English Version:

<https://daneshyari.com/en/article/5866436>

Download Persian Version:

<https://daneshyari.com/article/5866436>

[Daneshyari.com](https://daneshyari.com)