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Review

Impact of surgical site infection on healthcare costs and patient outcomes: a systematic review in six European countries

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SUMMARY

Background: Surgical site infections (SSIs) are associated with increased morbidity and mortality. Furthermore, SSIs constitute a financial burden and negatively impact on patient quality of life (QoL).
Aim: To assess, and evaluate the evidence for, the cost and health-related QoL (HRQoL) burden of SSIs across various surgical specialties in six European countries.
Methods: Electronic databases and conference proceedings were systematically searched to identify studies reporting the cost and HRQoL burden of SSIs. Studies published post 2005 in France, Germany, the Netherlands, Italy, Spain, and the UK were eligible for data extraction. Studies were categorized by surgical specialty, and the primary outcomes were the cost of infection, economic evaluations, and HRQoL.
Findings: Twenty-six studies met the eligibility criteria and were included for analysis. There was a paucity of evidence in the countries of interest; however, SSIs were consistently associated with elevated costs, relative to uninfected patients. Several studies reported that SSI patients required prolonged hospitalization, reoperation, readmission, and that SSIs increased mortality rates. Only one study reported QoL evidence, the results of which demonstrated that SSIs reduced HRQoL scores (EQ-5D). Hospitalization reportedly constituted a substantial cost burden, with additional costs arising from medical staff, investigation, and treatment costs.
Conclusion: Disparate reporting of SSIs makes direct cost comparisons difficult, but this review indicated that SSIs are extremely costly. Thus, rigorous procedures must be

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implemented to minimize SSIs. More economic and QoL studies are required to make accurate cost estimates and to understand the true burden of SSIs.

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Introduction

Surgical site infection (SSI) is one of the most frequently reported types of hospital-acquired infection (HAI), constituting up to 19.6% of all HAIs in Europe in 2011—2012 [1]. The Centre for Disease Control and Prevention (CDC) [and the European Centre for Disease Prevention and Control (ECDC)] defines SSI as postoperative infection occurring within 30 days of a surgical procedure (or within one year for permanent implants) [2—4].

The development of an SSI causes a substantial increase in the clinical and economic burden of surgery. The financial burden of surgery is increased due to the direct costs incurred by prolonged hospitalization of the patient, diagnostic tests, and treatment. Certain patients may also require reoperation after the contraction of an SSI, which is associated with considerable additional costs [5]. Indeed, Broex *et al.* demonstrated that in European hospitals patients who develop an SSI constitute a financial burden approximately double that of patients who do not develop an SSI [6]. The same review also reported that the length of hospitalization was more than twice as long for patients with an SSI relative to uninfected patients [6]. SSIs may therefore represent an opportunity cost to hospitals by displacing hospital resources that would otherwise be spent elsewhere, as well as delaying subsequent patients' surgery. Following discharge from hospital, SSI patients may also rely on healthcare from other community care services, which will further contribute to the economic burden of infection.

SSIs negatively impact on patient physical and mental health. Increased patient morbidity, mortality, and loss of earnings during recovery are some of the indirect costs associated with infection. Intangible costs may also be incurred by the patient, such as pain and anxiety. In addition, patients may experience delayed wound healing and be more susceptible to secondary complications, such as bacteraemia [7,8]. Distress may also be caused to the patient and family members if the patient is absent from home and work for a prolonged period. Accordingly, prolonged hospitalization and increased morbidity as a result of developing an SSI have been shown to negatively impact on patient health-related quality of life (HRQoL) [9].

There is limited evidence reporting the costs incurred following the development of an SSI, and few recent data comparing overall costs across surgical specialties. Thus, the aim of this systematic review was to assess, and evaluate the evidence for, the cost and HRQoL burden of SSI across various surgical specialties in Europe. The six countries included in the review were the 'big five' European nations (France, Germany, Italy, Spain, the UK), as well as the Netherlands.

Methods

The following electronic databases were interrogated on September 12th, 2015, to identify relevant studies: Embase, Medline, and the Cochrane Library. Supplementary data sources included reference lists of included publications and the following conference proceedings over the last three years' availability: the International Society for Pharmacoeconomics and Outcomes Research (ISPOR), the European Society of Clinical Microbiology and Infectious Diseases (ESCMID), the International Conference on Prevention and Infection Control (ICPIC), and the Healthcare Infection Society (HIS).

National studies reporting SSI economic and/or quality of life (QoL) evidence in patients who underwent surgery in a hospital setting met the inclusion criteria. The review included studies published in English post 2005 that reported data for France, Germany, the Netherlands, Italy, Spain, and the UK. The population, interventions, comparators, outcomes, study design (PICOS) statement is summarized in Supplementary Appendix A. Titles and abstracts of publications yielded by the electronic searches were screened according to the eligibility criteria, and non-relevant studies were excluded. Full publications of potentially relevant publications were assessed by a single reviewer, and verified by a second reviewer. Eligible studies were represented multiple times if they reported on more than one European country or operation type. See the PRISMA flow diagram (Figure 1), which illustrates the number of eligible papers identified by the systematic review.

Included studies were stratified by surgical specialty into the following groups: cardiothoracic surgery, general surgery, neurosurgery, orthopaedic and trauma surgery, otolaryngology, urology, and multiple or unspecified surgery.

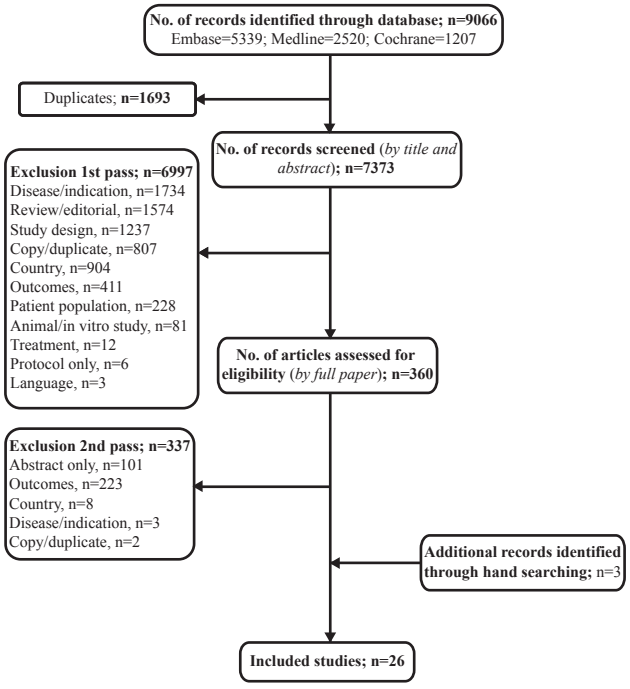

Figure 1. Systematic review PRISMA flow diagram.

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