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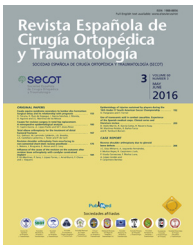

ORIGINAL ARTICLE

The cost of infection in hip arthroplasty: A matched case–control study☆

A.E. González-Vélez[a,*], M. Romero-Martín[b], R. Villanueva-Orbaiz[b], C. Díaz-Agero-Pérez[c], A. Robustillo-Rodela[c], V. Monge-Jodra[c]

[a] *Colsanitas, Bogotá, Colombia*
[b] *Departamento de Medicina Preventiva, Salud Pública e Historia de la Ciencia, Universidad Complutense de Madrid, Madrid, Spain*
[c] *Hospital Universitario Ramón y Cajal, Madrid, Spain*

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KEYWORDS
Hip arthroplasty;
Surgical wound infection;
Hospital costs;
Length of stay;
Methicillin-resistant *Staphylococcus aureus*

Abstract
Objective: Surgical site infection (SSI) represents 30% of all causes of health care-associated infection (HAI) and is one of the most dreaded complications in surgical patients. We estimated the excess direct costs of SSI using a matched nested case–control study in acute-term care at Ramon y Cajal University Hospital in Spain.
Material and method: Cases were patients who developed a first episode of SSI according to the criteria established by the CDC's National Healthcare Safety Network. Controls were matched to cases in 1:1 ratio taking into account the American Society of Anaesthesiologists score, age, sex, surgery date, and principal diagnosis.
Results: This study found that infection in hip replacement increased direct costs by 134%. Likewise, the excess cost due to the infections caused by methicillin resistant *Staphylococcus aureus* was 69% higher than the excess cost attributable to infections caused by other microorganisms.
Conclusions: SSI after hip replacement continues to be a costly complication from the hospital perspective. Costs due to SSI can be used to prioritise preventive interventions to monitor and control HAI.

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* Corresponding author.
E-mail address: aegonzalezv@gmail.com (A.E. González-Vélez).

PALABRAS CLAVE
Artroplastia de cadera;
Infección de localización quirúrgica;
Costes hospitalarios;
Estancia hospitalaria;
Staphylococcus aureus resistente a la meticilina

El coste de la infección en artroplastia de cadera: estudio de casos y controles emparejado

Resumen
Objetivo: La infección de localización quirúrgica (ILQ) representa el 30% de todas las causas de infecciones relacionadas con la atención sanitaria (IRAS), siendo una de las complicaciones más temidas en pacientes quirúrgicos. Se estimó el exceso de costes directos de la ILQ mediante un estudio de casos y controles emparejado y anidado en una cohorte, en un hospital de agudos en España (Hospital Universitario Ramón y Cajal).
Material y método: Los casos fueron pacientes que desarrollaron un primer episodio de ILQ según los criterios establecidos por el *National Healthcare Safety Network* de los CDC. Los controles fueron emparejados a los casos en una razón de 1:1, teniendo en cuenta la clasificación de la *American Society of Anesthesiologists*, la edad, el sexo, la fecha de la cirugía y el diagnóstico principal.
Resultados: Este estudio encontró que la infección en reemplazo de cadera incrementó los costes directos en un 134%. Asimismo, el exceso de costes debido a la infección causada por *Staphylococcus aureus* resistente a la meticilina fue 69% mayor que el exceso de costes debido a las infecciones causadas por otros microorganismos.
Conclusiones: La ILQ después de reemplazo de cadera sigue siendo una complicación costosa desde la perspectiva del hospital. Los costes debidos a la ILQ pueden ser utilizados para priorizar intervenciones preventivas de vigilancia y control de las infecciones relacionadas con la atención sanitaria.

Introduction

In Spain, hospital-acquired (HAI) or nosocomial infection is the second cause of adverse events attributable to hospitalisation, and surgical site infections (SSI) amount to 30% of all of the causes of HAI.[1] SSI is one of the most worrying complications in surgical patients. Rates of infection vary widely, depending on the type of procedure analysed,[2,3] and it affects 3.5% of hip arthroplasty patients in Spain.[4] According to a recent revision, and depending on the type of surgical procedure, the average cost attributable to SSI ranges from 2342 US$ to 38,554 US$ per admission, while hospitalisation time is prolonged by from 6 to 14 days, on average.[5] Alfonso et al.[6] estimated that the cost of SSI was 10,232 US$ per patient in a Spanish hospital, of which 37% was due to the prolongation of hospitalisation. This study aims to quantify the excess direct costs due to surgical wound infection in hip arthroplasty, using cases with matched controls.

Material and methods

Study context and design

This study was undertaken in Ramón y Cajal University Hospital, a public hospital in Madrid (Spain). It has 1090 working beds, receives approximately 34,000 admissions and performs 32,000 surgical operations per year. From 1 January 2005 to 31 December 2011 the patients admitted to the Traumatology and Orthopaedic Surgery Department for hip replacement, identified in the ninth revision of the International Disease Classification by codes: 00.70–00.73, 00.85–00.87, 81.51–81.53, were followed up prospectively by the nosocomial infection monitoring system *Continuous clinical quality improvement indicators*.

Sources of data and variables

The nosocomial infection monitoring system *Continuous clinical quality improvement indicators* is composed of a work team in the preventative medicine department of the hospital, with at least one epidemiologist doctor and one or more nurses specialising in this area. They visit trauma units at least once every 2 days to gather data, from the day surgery takes place until patients are discharged, including any re-admission during the first year after implantation. The system has its own data-gathering format for this, linked to a program created for processing and analysis. Clinical histories were used as the source of information, together with information supplied directly by the doctors and nursing staff, the surgical report and the results of cultures and microbiological laboratory analyses.

Data was gathered on each patient regarding their age, sex, main diagnosis at admission, type of surgery (emergency vs planned), type of arthroplasty, American Society of Anaesthesiologists (ASA) classification, duration of the procedure, degree of surgical contamination, the suitability of pre-surgical antibiotic prophylaxis, the etiological agent, depth of infection, days of hospitalisation, costs and mortality. Antibiotic prophylaxis was considered to be suitable if the antimicrobial agent used was recommended in the hospital guides (cephazolin, amoxycillin/clavulanic acid or