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Special article

Economic Cost Analysis Related to Complications in General and Digestive Surgery^{☆,☆☆}

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A B S T R A C T

Introduction: The aim was to assess the impact on economic costs and length of stay (LOS) of postoperative complications.

Methods: 5822 records from BMDS (2014–2015) are included. A descriptive, univariate and multivariate study evaluated the correlation between complications, Clavien-Dindo grade and vacation periods with LOS and economic costs, based on a full-cost model, aggregated by DRG.

Results and conclusions: Mean cost per stay was €676.71, and €4309.02 per episode. Complications appeared in 639 patients (11%). Admission to ICU was required in 203 patients, re-operation in 134 and re-admission in 243, while 66 patients died (1.1%). Complications caused significantly longer LOS (20.08 vs 5.48 days) and higher economic cost (€11 670.31 vs €3354.12); infectious complications were the most frequent and respiratory the most expensive (€20 428.53), together with ICU admission (€20 242.66). Clavien-Dindo grade correlated with greater LOS and costs (except grade V). During vacation periods, complications and LOS are increased, but costs of these complications and LOS did not differ significantly from complications detected in non-vacation periods.

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Análisis de los costes económicos asociados a las complicaciones en cirugía general y digestiva

RESUMEN

Palabras clave:

Complicaciones postoperatorias
Cirugía general
Costos y análisis de costo
Hospitales públicos

Introducción: El objetivo es analizar el impacto en costes económicos y estancias de las complicaciones quirúrgicas.

Métodos: Incluimos 5.822 registros del CMBD (2014-2015). Realizamos análisis descriptivo, univariante y multivariante, evaluando asociación entre complicaciones, grado Clavien-Dindo y vacaciones con estancias y costes económicos (modelo de costes totales agregados por GRD).

Resultados y conclusiones: El coste medio por estancia es de 676,71€, y de 4.309,02€ por episodio. Presentaron complicación 639 (11%). 203 ingresos en UCI, 134 reintervenciones, 243 reingresos y 66 fallecimientos (1,1%). Las complicaciones generan mayor estancia (20,08 vs 5,48 días) y coste (11.670,31€ vs 3.354,12€), siendo las infecciosas las más frecuentes y las respiratorias las más costosas (20.428,53€), conjuntamente con ingreso en UCI. El grado de Clavien-Dindo se correlaciona con el incremento de estancias y costes (excepto grado v). En vacaciones aumentan complicaciones y estancias, pero sus costes no varían respecto a no vacaciones.

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Introduction

Despite better patient selection, better preoperative preparation and advanced recovery programs, which have all become more routine, surgical complications can appear in up to 40% of patients undergoing general surgery, causing increased hospital stays,¹ risk of mortality, need for higher-level care at discharge and unplanned readmissions.^{1,2} In addition, some studies have estimated that the presence of complications can increase costs by 1.89³ and entail total additional costs of up to \$37 917 per patient.⁴ This estimation will lead to the development of strategies to make our healthcare system more sustainable.^{1,5-8}

Multiple factors can determine a greater number of complications, and their costs.^{2,9-11} Some are inherent to the type of patient,¹²⁻¹⁴ surgery,¹⁵ surgeon^{16,17} or specific complication,^{18,19} in addition to population aging and the chronification of disease.²⁰ Likewise, it is important to consider that the growing specialization and technification in healthcare, despite providing a clear improvement in health outcomes, can achieve the opposite effect, turning a complication into a source of expenses, sometimes never-ending, with a duration over time that is difficult to withstand from an economic viewpoint.²¹

Recently, an editorial of *The JAMA Network* stated that “effective methods have been identified to reduce surgical complications, but hospitals have been very slow to implement them.”²² Is it possible that hospitals benefit from complications, depending on how they are codified? In fact, depending on who is paying at hospitals where there are different “payers”, the profit or loss margin for financing the same complication may be dissimilar.⁴

We intend to analyze the economic impact of the presence of complications and their types in the context of a Surgical Unit at a Regional Hospital, with the idea of being able to

optimize resources or, at least, develop budget forecast initiatives according to these expected complications.

The general objective of this analysis is to calculate the cost caused by postoperative complications. The specific objectives are to determine the distribution of complications, cost of the main types of complications, correlation between costs and the Clavien-Dindo grade and differences in the distribution of complications at different times (vacation periods versus non-vacation periods) and their impact on hospital stays and costs.

Methods

Using a case-control study, we retrospectively analyzed the 2014–2015 general surgery records. The sample was divided into two groups, according to the presence of complications (cases) or absence (controls). The economic data have been extracted from the analytical accounting application COAN-HyD²³ associated with the records by means of a database prepared for this purpose, which included some variables of interest for the study and routines for the detection and classification of complications. The Ethics Committee authorized the study, and every precaution was taken for data protection, in accordance with current legislation.^{24,25}

“Complications” were defined as any deviation from the normal postoperative course, symptomatic or asymptomatic; “sequelae” were, to an extent, inherent to the surgery itself, appearing after the operation; lastly, “failure” was when the ultimate purpose of the surgery was not achieved.²⁶ Therefore, only complications, not sequelae or failures, have been considered objects of this study.

We included all the episodes with admission to/discharge from the surgery unit, admission to other units and discharge from the surgery unit, and discharge from the ICU after a surgical procedure. The only exclusion criterion was the impossibility of assigning *DRG (Diagnosis-Related Group)

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