Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Costs of hepato-pancreato-biliary surgery and readmissions in privately insured US patients

Afif N. Kulaylat, MD,[a,b,1] *Jane R. Schubart, PhD,*[a,b,1] *Eric W. Schaefer, MS,*[b] *Christopher S. Hollenbeak, PhD,*[a,b] *Amanda B. Cooper, MD,*[a] *and Niraj J. Gusani, MD, MS*[a,b,*]

[a] *Department of Surgery, The Pennsylvania State University, College of Medicine, Hershey, Pennsylvania*
[b] *Department of Public Health Sciences, The Pennsylvania State University, College of Medicine, Hershey, Pennsylvania*

ARTICLE INFO

Article history:
Received 13 January 2015
Received in revised form
19 March 2015
Accepted 1 May 2015
Available online 7 May 2015

Keywords:
Pancreatectomy
Hepatectomy
Readmission
Costs
Economic
MarketScan

ABSTRACT

Background: Surgical costs are influenced by perioperative care, readmissions, and further therapies. We aimed to characterize costs in hepato-pancreato-biliary surgery in the United States.

Methods: The MarketScan database (2008–2010) was used to identify privately insured patients undergoing pancreatectomy ($n = 2254$) or hepatectomy ($n = 1702$). Costs associated with the index surgery, readmissions, and total short-term costs were assessed from a third party payer perspective using generalized linear regression models.

Results: Mean total costs of pancreatectomy and hepatectomy were $107,600 (95% confidence interval [CI], 101,200–114,000) and $81,300 (95% CI, 77,600–85,000), respectively, with corresponding surgical costs of 69.2% and 60.9%. Ninety-day readmission costs were $36,200 (95% CI, 32,000–40,400) and $34,100 (95% CI, 28,100–40,100), respectively. In multivariate analysis, readmissions were associated with an almost two-fold increase in total costs in both pancreatectomy (cost ratio = 1.98; $P < 0.001$) and hepatectomy (cost ratio = 1.92; $P < 0.001$).

Conclusions: Hepato-pancreato-biliary surgery is associated with significant economic burden in the privately insured population. Substantial costs are incurred beyond the index surgical admission, with readmissions representing a major source of potentially preventable health care spending. Sustained efforts in defining high-risk populations and decreasing the burden of postoperative complications through a combination of prevention and improved outpatient management offer promising strategies to reduce readmissions and control costs.

Oral Presentation at the 2014 Americas Hepato-Pancreato-Biliary Association (AHPBA) Annual Meeting, February 19–23, 2014, Miami, Florida. Abstract title: *Surgical and Total Costs of Hepato-Pancreato-Biliary (HPB) Surgery for US Patients Enrolled in Private Insurance (LO-F.05).*

* *Corresponding author.* Department of Surgery, The Pennsylvania State University, College of Medicine, 500 University Drive, H070, Hershey, PA 17033 0850. Tel.: +1 717 531 5965; fax: +1 717 531 3649.
E-mail address: ngusani@psu.edu (N.J. Gusani).

[1] Both authors contributed equally to this work.

0022-4804/$ – see front matter
http://dx.doi.org/10.1016/j.jss.2015.05.002

1. Introduction

The staggering costs of health care in the United States have been the target of increasing scrutiny [1]. Current reform is aimed at controlling these escalating costs and improving the quality and delivery of health care. Previous studies have characterized costs and outcomes among the Medicare, Medicaid, and uninsured populations [2–8]. However, less is known about the costs and outcomes associated with the operative care of privately insured patients.

Hepato-pancreato-biliary (HPB) surgery addresses patients with complex diseases and requires advanced and multidisciplinary care, substantially contributing to health care spending [8,9]. To date, no dedicated study has reported the costs of surgical treatment and overall care, in a sample of non-Medicare patients undergoing pancreatectomy or hepatectomy. The aims of our study were (1) to characterize the costs associated with two categories of HPB operations using an extensive sample of hospitals and surgeons in a privately insured population and (2) examine the effect of readmissions on total costs. We hypothesized that substantial costs would be incurred beyond the index admission and that readmissions would represent a major source of potentially preventable health care spending.

2. Methods

2.1. Data

Data were extracted from the MarketScan Commercial Claims and Encounters (MarketScan, Truven Health Analytics Inc, Ann Arbor, MI) database and included claims made during 2008–2010. This database contains reimbursed claims from more than 130 payers for over 56 million employees, dependents, and retirees covered annually under private insurance plans. No Medicaid or Medicare data are included. The database is divided into subsections, including reimbursed inpatient claims, outpatient claims, outpatient prescription drug claims, and enrollment information. The data include information on dates of services, the diagnoses associated with the claim, the procedures performed, costs associated with the claim, health plan reimbursement, and patient out-of-pocket expenses (copayments and deductibles). The outpatient services subsection includes information for all services performed in a doctor's office, hospital outpatient clinic, emergency room, or other outpatient facility. Outpatient services do not include postoperative home health services or discharges to a facility other than home (e.g., skilled nursing facility). The pharmacy claims contain information on the medication dispensed (including the strength), the number of pills, the number of days of medication supplied, and the cost of the prescription. The database is unique in that it reports the payments reimbursed by the insurance companies to the providers for services rendered, allowing true characterization of costs as opposed to charges.

2.2. Study population

We included patients aged ≥18 y in the MarketScan database who underwent pancreatectomy or hepatectomy between 2008 and 2010. Current procedural terminology codes were used to identify pancreatectomy (distal: 48140, 48145, and 48146; Whipple: 48150, 48152, 48153, and 48154; total: 48155 and 48160; other: 48105, 48120, 48148, and 48180) and hepatectomy (partial: 47120; lobectomy: 47125 and 47130; extended lobectomy: 47122). To capture claims associated with comorbidities or preoperative management, such as neoadjuvant chemotherapy or radiation therapy, only patients enrolled in a health plan ≥120 d before the date of surgery were included in the primary analysis.

Diagnoses were established using International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis codes associated with claims during the index hospitalization. Comorbidities were collected using the adult comorbidity evaluation-27 developed by Piccirillo *et al*. [10,11]. This measure was chosen because it reflects a wide range of coexisting conditions and disease severity relevant to cancer therapy choice and outcome. Only comorbidities that were listed on an inpatient or outpatient claim within 120 d before surgery were included. We excluded pancreatic and hepatic comorbidities. We ignored the level of decompensation (low, moderate, or high) and instead created indicators (present or not present) for all categories. The receipt of chemotherapy or radiation was identified from inpatient and outpatient claims using the following current procedural terminology codes for the administration of chemotherapy or radiation within 120 d before surgery (chemotherapy: 36260, 36640, 36823, 49418, 61517, 96401, 96402, 96405, 96406, 96409, 96411, 96413, 96415–96417, 96420, 96422, 96423, 96425, 96440, and 96912; radiation: 77263, 77280, 77300, 77301, 77336, 77338, 77417, 77418, 77421, and 77427).

Additionally, we further restricted our cohort to patients who were continually enrolled in a health plan ≥120 d after discharge, to capture claims associated with readmission or the initiation of adjuvant chemotherapy or radiation. Thus, our data set for analysis of costs is the set of adult patients who were continually enrolled in a private health plan from at least 120 d before surgery through 120 d after discharge from surgery. Using these criteria, 2254 major pancreatectomy patients and 1702 hepatectomy patients with complete information were identified.

2.3. Outcomes

The primary objective of the study was to characterize costs associated with pancreatectomy and hepatectomy in a privately insured population, from a third party payer perspective. In particular, we sought to describe the costs associated with readmission in this population. To capture costs, all inpatient, outpatient, and pharmaceutical claims that occurred from the date of surgery to 120 d after the date of discharge were collected. On each claim, a gross payment paid to the provider for the service was reported. MarketScan defines payment as the amount eligible for payment under the medical plan terms after applying rules such as discounts, but