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National trends in inpatient parotidectomy: A fourteen-year retrospective analysis

Rosh K.V. Sethi*, Daniel G. Deschler

Department of Otolaryngology, Harvard Medical School, Boston, MA, United States
Department of Otolaryngology, Massachusetts Eye and Ear, Boston, MA, United States

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ABSTRACT

Purpose: Operating room (OR) procedures represent one quarter of hospitalizations, yet OR-related stays account for nearly 50% of hospital costs. Understanding trends in inpatient parotidectomy, associated charges, and key outcomes including length of stay is imperative in the era of evolving health reform.

Materials and methods: The Nationwide Inpatient Sample (NIS) was queried for patients who underwent inpatient parotidectomy (ICD9-CM procedure code 26.31 and 26.32) between 2001 and 2014. Patient demographics, co-morbidities, hospital characteristics and outcomes including length of stay (LOS) and hospital charges were assessed.

Results: A total of 66,914 parotidectomies were performed in the inpatient setting between 2001 and 2014. The volume of inpatient parotidectomy decreased steadily by 48% over the study period (7375 procedures in 2001 to 3530 procedures in 2014). Average LOS increased from 1.8 days in 2001 to 2.5 days in 2014. Total charges increased from $17,072 in 2001 to $55,929 in 2014. In 2014, the majority of inpatient parotidectomies were performed in a teaching hospital (87%) and among patients who were older than 65 years (48.1%). In 2001, only 35.4% of patients who underwent parotidectomy were older than age 65, and relatively fewer surgeries were performed at teaching hospitals (63.1%).

Conclusions: Inpatient parotidectomy in the United States has evolved over the past fourteen years. Notable trends include a nearly 50% reduction of inpatient surgery, doubling in LOS, tripling of hospital charges and predominance of elderly patients with malignant disease. These results provide insight into inpatient parotid lesion management.

1. Introduction

Operating room (OR) procedures have long been established as one of the most costly drivers of healthcare spending in the United States by the Centers for Medicare and Medicaid Services. Prior studies demonstrate that OR procedures represent only 26.4% of hospitalizations, yet OR-related stays account for nearly 50% of hospital costs, amounting to $161 billion in 2007 alone [1]. Understanding trends in inpatient OR procedural frequency, associated charges and costs, and key outcomes including length of stay is a growing area of interest for leading economists and policy experts. In otolaryngology, however, there is a lack of epidemiological data on inpatient OR procedural trends.

Inpatient parotidectomy represents an interesting case study given evolving indications for treatment, novel surgical techniques, and changing disease prevalence over the past decade. Parotidectomy is now commonly considered in the management and prognostication of patients with metastatic cutaneous head and neck malignancies [2, 3]. There has been a recent popularization of conservative surgical techniques such as extracapsular dissection that spare facial nerve dissection, although there continues to be ongoing debate about clinical outcomes and recurrence rates among patients with benign disease [4–6]. As healthcare costs continue to rise there have been efforts to migrate routine parotidectomies from the inpatient setting to ambulatory surgery centers [7]. Additionally, imaging has become more commonplace for head and neck complaints and as a consequence a greater number of parotid masses are being detected incidentally [8].

As otolaryngologists, understanding the trajectory of common inpatient procedures is necessary to guide future health policy discussions and engage in data-driven discussion about future cost-management and resource allocation. In this study, national data is queried to quantify annual inpatient parotidectomy volume over a fourteen-year time span and key changes in patient outcomes including length of stay and hospital charges are assessed.

* Corresponding author at: Massachusetts Eye and Ear Infirmary, 243 Charles Street, Boston, MA 02114, United States.
E-mail address: Rosh_sethi@meei.harvard.edu (R.K.V. Sethi).

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2. Methods

2.1. Data sources

The 2001–2014 Nationwide Inpatient Sample (NIS), published by the Healthcare Cost and Utilization Project (HCUP) and Agency for Healthcare Research and Quality, was utilized to characterize national trends in inpatient parotidectomy. NIS is the nation's largest all-payer inpatient database that provides a 20% stratified sample of hospital admissions. Individual discharge abstracts can be weighted to calculate national estimates.

2.2. Study design

The NIS was queried for patients who underwent inpatient parotidectomy as the primary procedure (International Classification of Disease, Ninth Revision, Clinical Modification [ICD9CM] codes 26.31 and 26.32) between 2001 and 2014. Inpatient was defined as all procedures performed in a non-ambulatory setting with a subsequent inpatient stay > 24 h, as recorded in the NIS. Patients with length of stay less than one day were characterized as twenty-four hour observation status. Indication for parotidectomy was defined as benign salivary gland tumor (ICD9CM 210.2), malignant primary tumor of the parotid gland (ICD9CM 142.0) or other. Other primary diagnoses representing > 1% of all patients were tabulated.

2.3. Statistical analysis

Annual inpatient parotidectomy frequency was plotted between 2001 and 2014 to assess trends in inpatient volume over time. Mean length of stay and mean hospital charges per patient were also quantified and graphically plotted by year. Hospital charges, defined by HCUP and inclusive of procedural and inpatient charges, were adjusted for inflation to 2014 United States dollar value using the Consumer Price Index inflation calculator published by the United States Bureau of Labor Statistics. HCUP trend weights were employed to provide accurate national estimates over time.

Descriptive analysis was performed to characterize patient demographics (age, gender, and race, and primary insurance payer), hospital characteristics (bed size – as defined by HCUP, teaching status, and location), indication for surgery (benign, malignant or other) and patient disposition. Patient co-morbidities were assessed using the Elixhauser method [9].

Bivariable analysis was performed to compare patient demographics, hospital characteristics, surgical indication and patient disposition between years 2002 and 2014. The year 2002 was chosen for comparison given complete data availability and variable comparability to the year 2014. Comparisons in proportions were performed using survey-adjusted Chi Square testing. Statistical significance was defined by a type I error threshold of 0.05, All data linkages and statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

3. Results

3.1. Parotidectomy trends

A total of 66,914 inpatient parotidectomies were performed between 2001 and 2014. The annual volume of inpatient parotidectomy decreased by 48% from 7375 procedures in 2001 to 3530 in 2014 (Fig. 1). There was an increase in hospital charges from $17,072 in 2001 to $55,929 in 2014 (Fig. 1). Length of stay increased from a mean of 1.8 days in 2001 to 2.5 days in 2014 (Fig. 2). The proportion of patients who stayed > 24 h increased steadily from 2011 onwards, from 33% in 2011 to 53% in 2014 (Fig. 3). Twenty-four hour observation in the inpatient setting was infrequent and represented 2.3% of all cases.

3.2. Indications, patient demographics, and co-morbidities

The indication for parotidectomy changed over the study period. In 2002, the vast majority of procedures were performed for benign salivary gland disease (60.2%) and smaller proportion for primary malignant parotid tumors (14.5%). An additional 5.6% of patients had sialolithiasis, 3.1% had secondary malignant neoplasm of unspecified site, and the remainder of diagnoses each represented < 1% of all patients. In 2014, there was an equal case mix of benign disease (32.7%) and primary malignant parotid tumors (33.0%) (Fig. 4). An additional 7.9% patients had secondary malignant neoplasm from another site, 4.8% had unspecified disease of the parotid, 3.4% had secondary malignant lymph nodes of unspecified primary site within the parotid, and 1.7% had neoplasm of uncertain behavior within the parotid gland. The remainder of diagnoses represented < 1% of all diagnoses. Of note, in 2014 a greater percentage of patients carried diagnoses of metastatic cancer as defined by the Elixhauser co-morbidity classification scheme (18.1% in 2014 vs 4.7% in 2002, $p < 0.0001$), however it was not possible to determine if this was related to the parotid tumor or another primary site.

There were significant differences in patient demographics, co-morbidities and indications for procedures when comparing cases from 2002 to those performed in 2014 (Table 1). Notable demographic differences included an older population (38.7% of patients older than age 65 in 2002 compared to 49.3% in 2014, $p < 0.0001$) and greater proportion of males (49.4% in 2002 vs 59.9% in 2014, $p < 0.0001$).

Consistent with an older population, a greater proportion of patients who underwent parotidectomy in 2014 were insured by Medicare (47.7% vs. 37.7% in 2002, $p = 0.0002$). Additionally, a significantly greater proportion of patients had medical co-morbidities in 2014 including anemia, congestive heart failure, chronic pulmonary disease, depression, diabetes, hypertension, hypothyroidism, neurological disorders, obesity, peripheral vascular disease and renal failure (Supplement eTable 1).

3.3. Hospital characteristics

In 2014 the majority of inpatient parotidectomies were performed in an urban teaching hospital (87%), a significantly higher proportion than in 2002 (58.9%) ($p < 0.0001$). The geographic South and Midwest had the highest volume of parotidectomy compared to the geographic Northeast and West (Table 1). The majority of procedures are performed in large bedsize hospitals and this has remained consistent over time.

4. Discussion

Identifying trends in operating room procedures that frequently require hospital stay and may contribute significant expense to the healthcare system are imperative in the era of growing financial constraints and ongoing health reform efforts. Inpatient parotidectomy has not previously been characterized from an epidemiological perspective, however descriptive analyses such as this may provide valuable insight into disease management trends and practice patterns in the context of evolving indications, surgical techniques and disease prevalence.

This study includes over 66,000 cases and demonstrates a nearly 50% reduction in the volume of inpatient parotidectomy over a fourteen-year period associated with a tripling of mean hospital charges and increase in mean length of stay. Contemporary patients who undergo inpatient parotidectomy are significantly older, a greater proportion has malignant disease and history of metastatic cancer, and greater proportion has medical comorbidities as compared to over a decade ago.

Trends observed in this study may reflect a shift of parotidectomy procedures for benign disease to the ambulatory setting. Proponents of ambulatory parotidectomy cite feasibility, similar risk profile to

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