Longitudinal trends in discharge patterns of orthognathic surgeries: is there a regionalization of procedures in teaching hospitals?

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Objective. The aim of this study was to determine if there is regionalization of orthognathic surgeries to teaching hospitals during the study period.

Study Design. The Nationwide Inpatient Sample for years 2000-2008 was used. Every hospitalization that had an orthognathic surgery was selected. Patient and hospital level variables were examined. The odds of an orthognathic surgery procedure being performed in a teaching hospital over the study period was computed with the use of a multivariable logistic regression model.

Results. During the study period, a total of 108,264 hospitalizations underwent orthognathic surgeries in the United States. The average age ranged from 27 years during the years 2006-2008 to 28.2 years during the years 2000-2002. After adjusting for multiple patient and hospital level factors, the year of procedure was not a significant predictor of increasing odds of an orthognathic surgery being performed in a teaching hospital.

Conclusions. There is no evidence of concentration of orthognathic surgical procedures in teaching hospitals. (Oral Surg Oral Med Oral Pathol Oral Radiol 2013;115:583-588)

Each year almost 39.8 million hospitalizations occur in the United States, ~$364.8 billion is being spent annually on these hospitalizations, and ~800,000 people die in hospitals.[1] Several earlier studies have examined predictors of improved outcomes in hospitalized patients undergoing a wide range of surgical procedures,[2-7] and those studies have identified high-volume and teaching hospitals to provide better quality of care in terms of reduced mortality rates, lower hospital readmission rates, fewer complications/adverse events, better management of complications/adverse events when they occur, better economics in terms of lower hospitalizations charges/costs, and shorter duration of stay in hospitals. These hospitals are purported to have structural attributes (e.g., better nursing care, well established care delivery patterns, and better facilities) allowing better processes of care delivered and resulting in better hospitalization outcomes.[8] It has been postulated that the number of procedures performed (higher volumes of similar procedures) by a hospital positively correlates with the success of its outcomes.[9,10] Consequently, over the past decade, there have been attempts to regionalize surgical procedures to select centers of excellence, which include high-volume and teaching hospitals.[11-13] To date, there is no empiric evidence documenting the effect of this on the delivery of orthognathic surgical procedures in the United States.

The objective of the present study was twofold. First, we examined representative trends nationally in hospitalization patterns for patients undergoing orthognathic surgeries in the United States. Second, we determined if there is regionalization of the orthognathic surgeries to teaching hospitals during the study period (years 2000-

Statement of Clinical Relevance

The study provides nationally representative estimates of orthognathic surgeries in the United States from 2000 to 2008 and examines if there was any regionalization/concentration of procedures to teaching hospitals. The results suggest that there was no regionalization to teaching hospitals.

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2008) and to examine the factors (at both patient and hospital levels) associated with regionalizing the surgical procedures to teaching hospitals. We hypothesized that over the study period, a greater proportion of orthognathic surgeries were performed in teaching hospitals and that patients with a higher comorbid disease burden are more likely to undergo orthognatic surgeries at teaching hospitals as opposed to nonteaching hospitals.

MATERIALS AND METHODS

Description of database

The Nationwide Inpatient Sample (NIS) the largest all-payer hospital discharge database in the United States, sponsored by the Agency for Healthcare Research and Quality (AHRQ), a division of the Department of Health and Human Services of the United States Government, was used for the current study.[14] The study examined the NIS data for a 9-year study period from the years 2000 through 2008. The sampling frame for the NIS closely represents all hospitalizations in the United States occurring each year.

Institutional review board approval

An Institutional Review Board exemption for the conduct of this study was granted from the Harvard University Faculty of Medicine Committee on Human Studies.

Data user agreement

The present study was a retrospective analysis of the NIS data, which is publicly available for purchase from the Healthcare Cost and Utilization Project of the AHRQ. Before obtaining the data from AHRQ, the first author completed a data user agreement. As per the data user agreement with AHRQ, individual cell counts of $\leq$10 can not be reported, to preserve patient confidentiality. In accordance with the agreement, these low estimates are not presented in the present study.

Orthognathic surgery case selection

Every hospitalization that underwent an orthognathic surgery procedures (identified by ICD-9-CM procedure codes) was selected for analysis. Procedures examined included: closed osteoplasty [osteotomy] of mandibular ramus (76.61), osteoplasty [osteotomy] of body of mandible (76.63), open osteoplasty [osteotomy] of mandibular ramus (76.62), other orthognathic surgery on mandible (76.64), including mandibular osteoplasty not otherwise specified and segmental or subapical osteotomy, segmental osteoplasty [osteotomy] of maxilla (76.65), total osteoplasty [osteotomy] of maxilla (76.66), augmentation genioplasty (76.68), reduction genioplasty (76.67), and other facial bone repair (76.69), including osteoplasty of facial bone not otherwise specified.

Variables examined

The NIS dataset provides information on several variables, including age at time of admission, race, sex, admission type (emergency/urgent vs. elective), insurance payer type (Medicare, Medicaid, private insurance, uninsured, or other insurance plans), procedures performed during hospitalization, various hospital characteristics (teaching status, hospital bed size, hospital location, and hospital region), comorbid conditions present (identified from secondary diagnosis fields), hospital charges and length of stay, and disposition information following orthognathic surgery (home health care, transfer to long-term facilities, transfer to another short-term hospital/facility, and routine discharge). The Charlson comorbid severity index method was used to estimate the comorbid burden.[15] Patients without any comorbid condition were given a score of "0" and those with comorbid conditions were given a score ranging from 1 to 18 based on the type and severity of comorbid condition(s).

Statistical approach

Descriptive statistics were used to summarize the data. The NIS database is a ~20% stratified probability sample of all acute care hospitals in the United States. Each hospitalization (discharge) in the database has a specific weight assigned to it. These weights are used to provide an estimate of close to 100% of all hospitalizations occurring in the United States each year.[14] The sampling frame of the NIS dataset is based on geographic region, teaching status, urban/rural location, ownership, and bed size of the hospitals. This complex sampling frame was taken into consideration while conducting the data analysis. The hospital stratum was used as the stratification unit, and each individual hospitalization was the unit of analysis. All estimates were projected to national levels with the use of the discharge weight variable of each hospitalization unit.

The outcome variable of interest in the study was the performance of orthognathic surgery in a teaching hospital versus a nonteaching hospital. The independent variables included age, sex, insurance status, Charlson comorbid burden severity, geographic region, and year of procedure. The simultaneous association between all independent variables and the odds of the orthognathic surgery being performed in a teaching hospital was examined by a multivariable logistic regression model. In that model, age was used as continuous variable and all other independent variables were used as categoric variables. In the multivariable logistic regression model, the Taylor linearization method with replace-