Early Intervention during Acute Stone Admissions: Revealing "The Weekend Effect" in Urological Practice

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Purpose: Obstructing nephrolithiasis is a common condition that can require urgent intervention. In this study we analyze patient factors that contribute to delayed intervention during acute stone admission.

Materials and Methods: We retrospectively reviewed the HCUP SID (Healthcare Cost and Utilization Project State Inpatient Database) for Florida and California from 2007 to 2011. Patients who were admitted urgently with nephrolithiasis and an indication for decompression (urinary tract infection, acute renal insufficiency and/or sepsis) were included in the study. Intervention was timely or delayed, defined as a procedure that occurred within or after 48 hours, respectively. Adjusted multivariate models were fit to assess factors that predicted a delayed procedure as well as mortality.

Results: Overall 10,301 patients were admitted urgently for nephrolithiasis with indications for decompression. Early intervention occurred in 6,689 patients (65%) and was associated with a decrease in mortality (11, 0.16%), compared to delayed intervention (17 of 3,612, 0.47%, p=0.002). On multivariate analysis timely intervention significantly decreased the odds of inpatient mortality (OR 0.43, p=0.044). Weekend day admission significantly influenced time to intervention, decreasing patient odds of timely intervention by 26% ($p < 0.001$). Other factors decreasing patient odds of timely intervention included non-Caucasian race and nonprivate insurance. Presenting medical diagnoses of urinary tract infection, sepsis and acute renal failure did not appear to influence time to intervention.

Conclusions: Delayed operative intervention for acute nephrolithiasis admissions with indications for decompression results in increased patient mortality. Nonmedical factors such as the "weekend effect," race and insurance provider exerted the greatest influence on the timing of intervention.

Key Words: urinary calculi, outcome assessment (health care), urologic surgical procedures, socioeconomic factors

The prevalence of nephrolithiasis is rapidly increasing in the United States, and has been estimated to have doubled in the last 15 years, with approximately 10% of the population experiencing an episode of nephrolithiasis in their lifetime.[1] While it is well accepted that not all acute stone disease must be treated operatively and/or in a timely manner,[2]

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patients with obstructing stones in the setting of infection and/or sepsis should receive decompressive intervention urgently.[3] Failure of timely operative intervention in this setting has been shown to contribute to serious complications, including an increase in patient mortality.[4]

At present there is a paucity of data examining whether patients with indications for urgent decompressive intervention undergo procedures in a timely fashion. Borofsky et al suggest that there is a significant number of such patients who fail to receive timely intervention in whom worse outcomes are the result.[4] To date no study has examined the patient factors that contribute to this disparity, and we hypothesize that socioeconomic factors and timing of patient presentation contribute to delays in intervention.

In this context our study is designed to examine patients who were urgently or emergently hospitalized and underwent operative decompressive intervention during their inpatient stay. We characterized the medical sequelae of a delay in treatment and determined the presenting patient factors associated with a delay in time to intervention.

PATIENTS AND METHODS

A cross-sectional, retrospective review of patients admitted urgently or emergently with a primary diagnosis of nephrolithiasis was conducted using the HCUP SID for Florida and California between 2007 and 2011. The HCUP provides inpatient hospitalization records for all payers in a de-identified, publicly available database.[5] Patient demographic information as well as acute and chronic medical diagnoses are provided based on administrative discharge records. Diagnoses may be designated as present on hospital admission,[6] allowing for the differentiation of conditions developing during the course of a patient's hospitalization. In addition, the date of procedures relative to hospital admission is recorded, allowing researchers to determine the time from admission to procedure. This study was deemed exempt from institutional review board approval.

To identify patients for inclusion in this study ICD-9-CM codes were used to identify patients admitted with renal (592.0) or ureteral (592.1) calculi as 1 of their first 2 diagnoses. Of these patients only those with an indication for decompression present on admission including urinary tract infection (599.0), acute renal insufficiency (584.5–584.9) and/or sepsis (995.9x) were included in the final cohort. Furthermore, patients were excluded from analysis if they were not admitted in an urgent or emergent fashion. Additional demographic variables included age at presentation, race (Caucasian, African-American, Hispanic, Asian, other/unknown) and primary insurance provider (public insurance [Medicare or Medicaid], private insurance or uninsured/self-pay).

Procedures and the day performed relative to the date of admission were noted, and the admission date was indicated as a weekday or weekend day. Decompressive procedures included in the study were ureteral stent placement (59.8), percutaneous renal aspiration (55.92) and percutaneous nephrostomy tube placement (55.02). Only patients who underwent procedural decompressive intervention were included in the study to exclude those who were treated with a nonoperative technique (eg symptomatic management with a planned outpatient procedure, medical expulsive therapy etc) or those who may have spontaneously passed their stone. Patients were excluded from study if they underwent definitive management of a stone during their admission, including ureteroscopy (56.31), percutaneous nephrolithotomy (55.03, 55.04) or extracorporeal shock wave lithotripsy (98.51).

To define a cutoff for early vs delayed intervention the median length of stay for patients admitted urgently or emergently for a stone and ultimately discharged without procedural intervention was determined to be 2 days (IQR 1–3). As such, procedures performed within the first 48 hours of hospital admission were considered timely and those performed after that point were considered delayed.

Several statistical analytic steps were performed. Charlson comorbidity indices were calculated for each patient based on medical diagnoses as a baseline measure of general health.[7] Descriptive statistics were performed on the baseline patient cohort. Continuous variables are reported as means (SD). Univariate analysis was performed comparing patients undergoing intervention within 48 hours and after. Student's independent t-test and Pearson's chi-squared test were used for continuous and categorical variables, respectively. To assess mortality a multivariate logistic regression model was fit, adjusted for patient age, gender, race, primary insurance provider, medical comorbidities and Charlson comorbidity index. We then fit a predictive multivariate logistic regression model to assess covariates associated with procedural intervention within 48 hours of admission, adjusted for patient medical comorbidities and Charlson comorbidity index. All significance tests were 2-sided with an α of 0.05 considered statistically significant. All statistical analyses were performed using STATA® version 13.

RESULTS

Between 2007 and 2011, 10,301 patients were admitted urgently or emergently for a primary diagnosis of nephrolithiasis, an indication for decompression, and underwent a decompressive intervention for their stone. Mean patient age was 55.9 years (SD 17.6) and 47% were male. Patient race was 66% Caucasian, 7% African-American, 20% Hispanic, 3% Asian and 4% other/unknown. Primary insurance provider was public (50%) or private (35%), with 15% classified as uninsured or self-pay. Weekend hospital admission occurred in 2,810 (27%) cases (table 1).

Overall 6,689 of 10,301 (65%) patients underwent decompressive intervention within 48 hours of admission. On univariate analysis patients who