Quality of Acute Care for Patients With Urinary Stones in the United States

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OBJECTIVE To describe guideline adherence for patients with suspected upper tract stones.

PATIENTS AND METHODS We performed a cross-sectional analysis of visits recorded by the National Hospital Ambulatory Medical Care Survey (emergency department [ED] component) in 2007-2010 (most recent data). We assessed adherence to clinical guidelines for diagnostic laboratory testing, imaging, and pharmacologic therapy. Multivariable regression models controlled for important covariates.

RESULTS An estimated 4,956,444 ED visits for patients with suspected kidney stones occurred during the study period. Guideline adherence was highest for diagnostic imaging, with 3,122,229 (63%) visits providing optimal imaging. Complete guideline-based laboratory testing occurred in only 2 of every 5 visits. Pharmacologic therapy to facilitate stone passage was prescribed during only 17% of eligible visits. In multivariable analysis of guideline adherence, we found little variation by patient, provider, or facility characteristics.

CONCLUSION Guideline-recommended care was absent from a substantial proportion of acute care visits for patients with suspected kidney stones. These failures of care delivery likely increase costs and temporary disability. Targeted interventions to improve guideline adherence should be designed and evaluated to improve care for patients with symptomatic kidney stones. UROLOGY 86: 914–921, 2015. Published by Elsevier Inc.

Kidney stones impose a large and rising burden of disease in the United States: their prevalence has nearly doubled over the past 15 years, and stone disease now affects 1 of every 11 persons.[1,2] Kidney stones occur primarily in a working-age population, and up to 50% of patients experience a recurrence.[3,4] Stones are among the most costly urologic conditions in terms of aggregate direct costs, in addition to the indirect costs of work loss and temporary disability from pain.[4,5]

Extreme pain often causes patients to seek care in the emergency department (ED). Coincident with the rising prevalence of stone disease, the rate of ED visits for kidney stones has increased by 91% over 1992-1994 baseline.[6] Initial acute care is provided primarily by nonurologists.[7] Given rising acute care visits by patients with symptomatic stones, and the gateway role for further intervention that the ED serves, understanding quality of this acute care is critical.

One potential measure of quality is adherence to published, evidence-based guidelines. Current guidelines suggest that patients should be assessed for signs of sepsis or renal failure, each of which is an indication for urgent intervention.[8] Patients with bacteriuria should be empirically treated with antibiotics to prevent urosepsis.[8]

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Charles D. Scales had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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The institutional review boards of the RAND Corporation determined that the study design was exempt from the requirement for review.

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The most sensitive initial imaging modality for most patients is noncontrast computerized tomography (CT), which serves to confirm the clinical diagnosis and determine prognosis for passage of the stone.[9,10] For appropriately selected patients, a trial of pharmacologic medical expulsive therapy (MET) is recommended; randomized controlled trials suggest that this will obviate 1 surgical intervention for every 4 patients treated.[11]

The few existing analyses of acute care for patients with suspected kidney stones focus primarily on broad utilization patterns, rather than guideline adherence.[6,12-14] Prior analyses of MET utilization examined data collected before guideline endorsement[15] or did not explore factors associated with utilization of MET.[6] Given this context, we sought to assess adherence to guidelines for acute care of patients with suspected kidney stones. Specifically, we sought to characterize guideline adherence in the areas of laboratory testing, imaging, and use of MET and to describe variation in guideline-adherent care delivery.

PATIENTS AND METHODS

Data Source

We used data from the ED component of the National Hospital Ambulatory Medical Care Survey (NHAMCS-ED). The NHAMCS is a multistage probability survey of outpatient and ED encounters at nonfederal hospitals located in all 50 states and the District of Columbia.[16] The survey is designed to produce nationally representative estimates of ED encounters in the United States; each observed (unweighted) visit (n = 1341) is weighted according to National Center for Health Statistics (NCHS) procedures to generate national estimates.[16] Deidentified data for each sampled visit include patient demographics, diagnoses, services, medications prescribed, and disposition. The institutional review board determined that this study was exempt from review.

Study Population

The study population consisted of all visits for patients with suspected kidney stones between 2007 and 2010 (most recent data available). We used established claims algorithms based on International Classification of Disease, Ninth Edition (ICD-9) diagnostic codes to identify patients with encounters for kidney stones.[15,17] Patients younger than 18 years of age were excluded.

Outcomes

To assess guideline adherence, we examined 3 discrete outcomes implicit in current guidelines (see eMethods). We defined adherence with laboratory testing guidelines as an encounter where a patient underwent a complete blood count (assessment for signs of sepsis[8]), measurement of serum creatinine (assessment for renal function[8]), and urinalysis (assessment for bacteriuria).[8] We measured adherence to imaging guidelines[9] by the performance of a CT scan during the visit. As a prespecified sensitivity analysis, we identified visits in which an ultrasound or plain X-ray was performed; guidelines suggest these may be appropriate in certain circumstances.[9] We identified MET utilization as prescription of an alpha-blocker or a calcium channel blocker, using established algorithms for this dataset.[6,15] We excluded ineligible patients using established algorithms.[6,15] As a prespecified sensitivity analysis, we repeated the analysis only among those with a highly specific ICD-9 code (592.1) for ureteral stones.[18] No patients in the MET cohort were admitted to hospital or underwent procedural intervention.

Covariates

A number of factors could potentially be associated with provision of guideline-adherent care. Patient-level covariates included age and sex. The prevalence of kidney stones varies importantly by race and ethnicity.[2] For this reason, and in accordance with NCHS analytic guidelines regarding sample size,[16] we classified race and ethnicity as reported by NHAMCS into 3 groups: white non-Hispanic, Hispanic, and other. Payer type was recoded as private, Medicare, Medicaid, and self/other. We included arrival by ambulance transport. Quartiles of household income, percent of population in poverty, and percent of adults with a bachelor's degree or higher in the patient's ZIP code served as a proxy for socioeconomic status.

We created an indicator variable for whether the patient was seen by a nonphysician provider (ie, nurse practitioner). Facility-level covariates included teaching status and ownership. Given the known geographic variation in stone prevalence,[1] we included region as a covariate. In addition, we used an indicator variable to identify hospitals located in metropolitan areas. To identify potential changes in guideline adherence over time, we included survey year as a covariate.

To examine potential associations between health information technology and care delivery, we included indicators for whether the ED had computerized systems to provide reminders about guideline-based interventions, as well as an indicator variable for a computerized lab ordering system. At the time of our analysis, these data elements for the 2010 survey were not yet publically available. Therefore, we limited this analysis to the 2007-2009 data and a priori designated this as a secondary analysis.

Statistical Analysis

Using NCHS-recommended design and weighting variables, we calculated nationally representative estimates of the percent of encounters that provided guideline-adherent care. All results are reported as nationally representative (weighted) estimates unless otherwise specified. We constructed logistic regression models for each of the 3 outcomes (laboratory testing, imaging, and MET use) to identify associations between provision of guideline-adherent care and patient, provider, hospital, and geographic area covariates, accounting for the complex survey sample design. Regression models for laboratory testing and imaging included age, sex, race, payer, arrival by ambulance, nonphysician provider, teaching status, hospital ownership, region, year, education level, household income, poverty level, and metropolitan status. Because of the smaller number of eligible subjects and NCHS analytic guidelines regarding cell size, only patient age, sex, region household income, and education were included in the MET guideline adherence regression model. We performed several sensitivity analyses to address potential selection bias from cohort identification (eMethods). In no case did the proportion of visits including guideline-adherent care differ substantively from the main analysis. We used SAS 9.2 (Cary, NC) for all analyses. Results were considered statistically significant with 2-sided $\alpha = 0.05$.

RESULTS

An estimated 4,956,444 ED visits nationally occurred between 2007 and 2010. Visits for patients eligible for