

Prevalence of 24-Hour Urine Collection in High Risk Stone Formers

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Abbreviations and Acronyms

ED = emergency department

EPO = exclusive provider
organization

HMO = health maintenance
organization

POS = point of service

PPO = preferred provider
organization

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Purpose: Secondary prevention has an important role in urinary stone disease. The core of secondary prevention is the identification of modifiable risk factors by a 24-hour urine collection, which then directs selective medical therapy. While this decreases the recurrence rate, little is known about the frequency with which 24-hour urine collections are obtained.

Materials and Methods: Using medical claims from 2002 to 2006 we identified adults with incident urinary stone episodes. With appropriate diagnosis codes we determined those at high risk for recurrence. Of these patients we determined the proportion in whom a 24-hour urine collection was done within 6 months of diagnosis. Finally, we fitted regression models to measure associations between patient and provider level factors, and obtaining a 24-hour urine collection.

Results: We identified 28,836 patients at high risk for recurrence. The prevalence of 24-hour urine testing increased from 7.0% in 2003 to 7.9% in 2006 ($p = 0.011$), although the overall prevalence was exceedingly low at 7.4%. Multivariable regression revealed that region of residence and level of comorbid illness were independently associated with 24-hour urine collection, as was the type of physician who performed the followup. For instance, the odds of metabolic evaluation were 2.9 times higher when a patient was seen by a nephrologist (OR 2.92, 95% CI 2.32–3.67), and more than threefold higher when seen by a urologist (OR 3.87, 95% CI 3.48–4.30).

Conclusions: Obtaining 24-hour urine collections in stone formers at high risk is uncommon, raising a quality of care concern.

Key Words: kidney, nephrolithiasis, quality of health care,
urine specimen collection, secondary prevention

ALMOST 1/7 Americans experience acute renal colic secondary to urinary stone disease at some point in their lifetime.¹ Of these patients 50% experience a second stone episode within 5 years of the first and at least 10% have 3 or more recurrences.^{2–5} As such, urinary stone disease is most appropriately viewed as a chronic condition for which secondary prevention has an important role. In

stone formers this entails identifying and optimizing modifiable risk factors. The primary means of identifying patient specific modifiable risk factors is by a 24-hour urine collection assayed for various promoters and inhibitors of urinary stone formation.

However, despite evidence suggesting that selective medical therapy based on 24-hour urine collection results decreases the stone recurrence

rate,^{6–10} there are reasons to believe that the 24-hour collection is underused. 1) Although the test is noninvasive and easy to order, its results can be difficult to interpret if the ordering physician does not commonly perform metabolic evaluations. 2) While European guidelines indicate that stone formers at high risk are obliged to undergo a 24-hour collection,¹¹ no such recommendation has been released by professional organizations here in the United States.

Because prior empirical work characterizing the frequency of metabolic evaluation in stone formers is lacking, we measured the prevalence and determinants of 24-hour collection using medical claims data. Findings from our study have implications for patients at high risk for stone recurrence and the providers who care for them.

METHODS

Data and Study Population

In this study we used the 2002 to 2006 MarketScan® Commercial Claims and Encounters Database. This database is one of the largest of its kind in the health care industry with records on more than 180 million insured, working age adults and their dependents since 1995.¹² In these records are medical claims that capture patient level data on all inpatient and outpatient care and laboratory services provided. Using a previously described algorithm¹³ we identified patients 18 to 64 years old with incident acute stone episodes. Those with inpatient or outpatient claims for urinary stone disease in the 12 months before the index ED visit were excluded from study.

Our analytical focus was on patients at high risk for stone recurrence¹⁴ since metabolic evaluation is most warranted in this subset. To risk stratify patients we used ICD-9 diagnosis and CPT codes (supplementary Appendix 1, <http://jurology.com/>).

Primary Outcome

We determined the proportion of patients at high risk who provided a 24-hour collection within 6 months of the index ED visit. Unlike a comprehensive metabolic panel, there is no approved panel of CPT codes that can be billed for a 24-hour collection. Under the assumptions that most providers evaluating a stone former would measure urine calcium and most urine calcium measurements are done for urinary stone disease, we defined a 24-hour collection as having been performed if a claim was filed for a patient for timed urine calcium (CPT 82340).

Characterizing Patients

We constructed variables that we posited could affect ordering a 24-hour collection. We categorized patients by age, gender, employee classification (salaried vs hourly), employment status (full vs part time), benefit plan type (comprehensive, EPO/PPO, HMO or POS vs other

noncapitated), urban/rural status, geographic region of residence (Northeast, Midwest, South or West) and comorbidity level as assessed by the Charlson score).¹⁵ We hypothesized that some providers were more comfortable interpreting metabolic evaluations than others. Therefore, we also constructed 2 binary variables to indicate patients at high risk who were seen by a nephrologist and/or a urologist within 6 months of the index ED visit.

Statistical Analysis

With the patient as our unit of analysis, we first estimated 24-hour collection in those at high risk. We used logistic regression to examine for changes with time in the test frequency. We then determined whether patients who provided a 24-hour urine collection differed from those who did not. We made bivariable comparisons across the patient level variables described using the t-test for continuous variables and the chi-square test for categorical variables.

To understand the importance of physician type we fit multivariable regression models to allow us to estimate the odds of a patient undergoing testing when seen by a nephrologist and/or urologist. We accounted for measured differences between patients by including the described patient level covariates. Given the potential correlation of observations, ie patients diagnosed at the same facility may have similar odds of 24-hour urine testing, we adjusted the SE using the Huber-White sandwich estimator.¹⁶

To test the robustness of our findings we repeated our frequency estimates using 2 alternate definitions of a 24-hour urine collection (supplementary Appendix 2, <http://jurology.com/>). We also reran our analysis while excluding certain patients from the denominator of our prevalence calculations. Such patients included those with chronic urinary tract infections since only upper tract involvement warrants metabolic evaluation and we could not reliably distinguish between recurrent upper and lower urinary tract infections in medical claims, those with cystinuria since only a single 24-hour urine collection is needed to establish cystine excretion, which may have been collected years before the index ED visit, and those with uric acid urolithiasis since in most patients this is not associated with excess uric acid production. Because the results of this analysis were consistent with those of our primary analysis, only the latter is presented.

Finally, we performed secondary analysis to assess the collection rate in the patient subset with recurrence after the incident stone. We defined recurrence as a second ED visit for urolithiasis and/or stone directed surgery more than 6 months after the index claim.

All analysis was done using SAS®, version 9.3. We performed 2-sided significance testing and set a type I error rate at 0.05. This study had institutional review board approval.

RESULTS

During the study interval we identified 28,836 patients with an incident stone episode who were

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