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Followup Care after Emergency Department Visits for Kidney Stones: A Missed Opportunity

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Abstract

Introduction and Objective—Follow-up care after an ED visit for kidney stones may help reduce ED revisits and increase use of stone prevention strategies. To test these hypotheses, we analyzed medical claims from working-age adults with kidney stones.

Methods—Using data from MarketScan (2003 to 2006), we first identified patients with an ED visit for kidney stones. We then determined which patients had an outpatient visit within 90 days of ED discharge. Finally, we used multivariable logistic regression to evaluate the association between receipt of follow-up care and ED revisit, as well as use of stone prevention strategies (24-hour urine testing and PPT prescription).

Results—Only 48.0% ($n=33,741$) of patients seen in the ED for kidney stones received follow-up care, 68.3% of which was with a urologist. While follow-up care was not associated with fewer ED revisits, patients who received it were more likely to undergo 24-hour urine testing (predicted probability, 2.2% vs. 0.9%; $P<0.001$) and be prescribed PPT (predicted probability, 10.6% vs. 8.9%; $P<0.001$), when compared to those who did not. Among patients who received follow-up care, use of stone prevention strategies was higher when the care was delivered by a urologist (predicted probability, 13.7% vs. 12.3%; $P=0.001$).

Conclusions—Over half of patients seen acutely in the ED for kidney stones do not receive follow-up care. Given that follow-up care is associated with greater use of stone prevention strategies, efforts to enhance linkages across healthcare settings are needed to provide patients with urinary stone disease higher quality care.

Keywords

renal stone; preventative therapy; emergency service

Introduction

The ED serves as the initial entry point into the healthcare system for many patients with kidney stones. In fact, over one million ED visits are made each year for the management of

renal colic.¹ After pain relief is achieved and any associated complications necessitating surgical intervention are ruled out, most of these patients are discharged home with recommendations on primary care or urologic follow-up. The purpose of such follow-up is two-fold: 1) to hasten short-term recovery and 2) to prevent long-term recurrence.

Despite the importance of timely follow-up, there are reasons to believe that compliance with it may be low. To begin, a large proportion of patients will pass their stones spontaneously.^{2,3} Even among those that do not, their stone-related symptoms may be self-limited. Indeed, less than half of patients with other chronic medical conditions, who suffer an acute exacerbation requiring ED visit, attend follow-up appointments.⁴⁻⁷ Noncompliance in the stone population could have downstream consequences, including ED revisit and lower use of secondary prevention.

In this context, we examined medical claims data from working-age adults with ED visits for kidney stones. We then measured the frequency with which these patients had outpatient follow-up care for their stone disease. Finally, we examined associations between the receipt of follow-up care and ED revisit, as well as use of stone prevention strategies. Findings from our study serve to inform the design of strategies for patient follow-up after an episode of renal colic that may improve clinical outcomes and decrease recurrence rates.

Methods

Data source and study population

For our study, we used Truven Health Analytics' MarketScan Commercial Claims and Encounters database (2003 to 2006). This database contains complete medical claims information regarding inpatient, outpatient, and pharmacy services use from more than 17 million workers and their dependents with employer-sponsored health insurance.

To begin, we used an established ICD-9 diagnosis code-based algorithm to identify adults between the ages 18 and 64 years with an initial ED visit for kidney stones. To measure subsequent ED revisits and the receipt of secondary prevention for kidney stones, we required continuous enrollment in a health benefit plan for 180 days after their index visit. For purposes of risk adjustment, subjects also had to have coverage for a minimum of 365 days preceding their index ED visit. We made no exclusions based on a patient's prior prescription fill history.

Exposure assessment

Next, we distinguished between subjects who had outpatient follow-up care and those who did not. We defined follow-up care based on submitted claims for outpatient evaluation and management services (based on *Current Procedural Terminology* codes 99201, 99202, 99203, 99204, 99205, 99206, 99207, 99208, 99209, 99210, 99211, 99212, 99213, 99214, 99215, 99241, 99242, 99243, 99244, and 99245) with an associated diagnosis of kidney stones (ICD-9 codes 592.0, 592.1, and 592.9) within 90 days of the patient's index ED visit.

Primary outcomes

We then measured the frequency of ED revisit, as well as use of stone prevention strategies among participants. A person was said to have a revisit if there was another ED encounter for stones between 90 and 180 days after the index claim. We defined use of stone prevention strategies by laboratory claims for 24-hour urine collection⁸ or prescription fills for PPT agents (based on National Drug Codes for thiazide diuretics, alkali citrate therapy, or allopurinol) during the same claims window.

Statistical analysis

For our first analytic step, we compared subjects who received post-ED follow-up care and those who did not. Specifically, we made bivariate comparisons, using t-tests and chi-square tests where appropriate, over a variety of sociodemographic characteristics including age, gender, employment status (salaried versus non-salaried), urbanicity, benefit plan type (comprehensive plan, health maintenance organization, point of service, preferred provider organization, or other non-capitated), and region of residence (East, West, South and Midwest). We also evaluated differences in the level of comorbid illness between these subjects, using a composite measure.

We then examined associations between the receipt of follow-up care and ED revisit, as well as use of stone prevention strategies. To account for measured differences, we fit multivariable logistic regression models, including the characteristics described above as covariates. Given the concern for confounding by disease severity, we also controlled for whether a given subject underwent surgery, was hospitalized, or had another ED encounter for kidney stones within the first 90 days of her/his index visit. We calculated robust standard errors using the Huber-White sandwich estimator.

We performed all analyses using SAS (version 9.3). All statistical tests were two-sided with a type I error rate set at 0.05. Our study had local institutional review board approval.

Results

Over the study period, we identified 70,294 patients with an ED visit for kidney stones. Less than half (48.0%) had outpatient follow-up care within 90 days of their index visit. Only two-thirds of the patients (68.3%) that did were seen by a urologist. Table 1 displays differences between patients with and without follow-up care. Younger patients ($P<0.001$), those with non-salaried employment ($P<0.001$), and those who lived in a rural area ($P<0.001$) were less likely to receive follow-up care.

In total, 1,428 patients (2.0%) had an ED revisit within 90 to 180 days of their index visit. While the frequency of ED revisit did not differ between patients with and without follow-up care (2.1% versus 2.0%; $P=0.672$), those with follow-up care were more likely to undergo 24-hour urine testing (2.7% versus 0.9%; $P<0.001$) and be prescribed a PPT agent (12.7% versus 10.3%; $P<0.001$). After controlling for important sociodemographic and disease severity differences, patients who received follow-up care were more likely to undergo 24-hour urine testing (predicted probability, 2.2% vs. 0.9%; $P<0.001$) and be prescribed PPT (predicted probability, 10.6% vs. 8.9%; $P<0.001$), when compared to those who did not.

Among patients who received follow-up care, use of stone prevention strategies was higher when the care was delivered by a urologist (predicted probability, 13.7% vs. 12.3%; $P=0.001$).

Put differently, patients who received follow-up care had 2.5 times higher odds of undergoing 24-hour urine testing than those without follow-up care (Table 2). In addition, they had 22% higher odds of being prescribed a PPT agent (Table 2). When compared to patients who received their follow-up care from a non-urologist, those seen by a urologist had higher odds of both 24-hour urine testing (OR, 1.28; 95% CI, 1.08 to 1.50) and being prescribed a PPT agent (OR, 1.10; 95% CI, 1.02 to 1.18).

Discussion

In the present study, we evaluated the frequency of post-ED follow-up care during an acute stone episode. We found that less than half of patients seen in the ED for acute renal colic had a timely ambulatory visit after discharge. The lack of follow-up care has downstream consequences for patients. Namely, patients without it were less likely to undergo 24-hour urine testing and be prescribed PPT. Who patients see in follow-up is also important, as those with visits to a urologist were most likely to receive stone prevention strategies. Collectively, these findings suggest opportunities for improving urinary stone disease care.

The literature on ED follow-up trends for kidney stones is sparse. A report from Sterrett and colleagues found that greater than 80% of patients seen in their institution's ED over a two-year period for ureteral stone disease had appropriate outpatient follow-up.⁹ However, their findings, which are based on the experience of a single tertiary care center, may not be generalizable. The much lower rate of follow-up care that we observed among a much larger population of adults is consistent with studies on other patients with chronic medical conditions (e.g., chronic obstructive pulmonary disease, congestive heart failure, diabetes), demonstrating poor compliance with follow-up recommendations after ED discharge.^{4-6,10}

Our study must be considered in the context of several limitations. First, lack of follow-up care after an ED encounter for kidney stones may be due to provider or patient factors. For example, an emergency medicine physician may not explicitly recommend follow-up care in the discharge instructions, or if such a recommendation is made, a patient may choose to not comply with it. Since we cannot determine with medical claims data whether a patient was given follow-up recommendations, we are unable to assess the contribution of provider nonfeasance (versus patient noncompliance) to the low rates of follow-up. The MarketScan database contains information about working adults and their dependents with employer sponsored insurance. As such our results may not be extrapolated to elderly patients or patients with government sponsored insurance such as Medicaid or Medicare. Regardless, the highest prevalence of kidney stones is among working aged adults—a population that is well represented by our cohort. Moreover, MarketScan data lack granular clinical information (e.g., stone size and number), which could influence patient follow-up. However, to account for possible differences in disease severity, we controlled for subsequent ED revisit, hospitalization, or stone-directed surgery within 90 to 180 days of the index visit. Further, while we know whether patients filled a prescription for a PPT agent

and whether they completed a 24-hour urine collection, we cannot discern from medical claims data the frequency with which prescribed medications were not filled, nor do we know how many 24-hour urine collections were ordered by providers but never completed by patients. As such, we likely underestimate the frequency with which stone preventive strategies are being recommended. Finally, we acknowledge that our primary measure—use of stone prevention strategies—is an intermediate outcome, and future studies are needed to examine how receipt of follow-up care relates to symptomatic stone recurrence.

Despite these limitations, our findings have important implications for patients and our healthcare system. Low follow-up rates correspond with lower use of stone prevention strategies, which may ultimately lead to increased rates of stone recurrence. With nearly half of patients experiencing a symptomatic stone event within 10 years of their first,^{11–13} urinary stone disease is best viewed a chronic condition. Clinical trials have demonstrated that PPT can reduce radiographic stone recurrence by up to 81%.¹⁴ Moreover, observational data show that patients who are compliant with PPT regimens have fewer ED visits, hospitalizations, and surgical procedures.¹⁵ Taken together, our results indicate that patients who fail to have timely ED follow-up are missing important opportunities for future stone prevention.

Specifically, our data highlight the need to improve linkages between the ED and outpatient clinics, helping ensure urologic follow-up. There are a variety of modalities that could be used to improve follow-up rates. Recent analyses have demonstrated improved patient follow-up with automated appointment reminders via telephone or texting.^{16,17} With the growing use of electronic health records, follow-up could also be improved through patient portal messages or direct communication between ED providers and outpatient clinics via health information exchanges.

Conclusions

To summarize, nearly half of patients in our study who were seen acutely in the ED for kidney stones did not receive follow-up care. Given that follow-up was associated with greater use of secondary stone prevention, there is an urgent need to examine trends in post-ED stone care using more contemporary data. Insofar as rates of follow-up remain low, efforts to enhance linkages across settings may be needed in order to provide patients more comprehensive care.

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Table 1

Baseline characteristics of patients with and without follow-up care.

	No Follow-up	Follow-up	p-value
Age			<.0001
18–34	20.23	18.51	
35–44	23.83	23.99	
45–54	30.42	31.05	
55–64	25.52	26.46	
Gender			0.0013
Female	36.70	35.53	
Male	63.30	64.47	
Comorbidity Score			<.0001
0	87.88	88.21	
1	8.52	8.87	
2	2.41	2.11	
3+	1.19	0.81	
Employment			<.0001
Salaried	18.64	21.43	
Non-Salaried	81.36	78.57	
Urban status			<.0001
Urban	75.83	79.02	
Rural	24.17	20.98	
Plan Type			<.0001
Comprehensive	11.74	10.40	
Health maintenance Organization	17.63	19.04	
Other non-capitated	57.71	56.34	
Point of service	12.62	14.01	
Preferred provider organization	0.29	0.2	
Region			<.0001
Northeast	7.55	8.3	
South	46.62	46.11	
West	16.18	16.93	
Midwest	29.65	28.66	

Table 2

Odds of stone prevention strategies among patients with follow-up care compared to those with no follow-up care.

Exposure	24-Hour Urine Collection		Preventive Pharmacological Therapy		Any Secondary Prevention	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Receipt of follow up care among all patients	2.55	2.23–2.91	1.22	1.16–1.28	1.3	1.24–1.36
Receipt of care by a urologist among patients receiving follow up care	1.28	1.08–1.50	1.1	1.02–1.18	1.13	1.05–1.21