Letters

RESEARCH LETTER

National Imaging Trends for Suspected Urinary Stone Disease in the Emergency Department

Flank pain from urinary stone disease (USD) is a common presentation to the emergency department (ED) in the US.[1] The American Urological Association (AUA) currently recommends computed tomography (CT) as the preferred initial imaging study for suspected USD,[2] and CT has become the dominant imaging modality used for this purpose in the ED.[1] In 2014, Smith-Bindman et al[3] reported results from a multicenter randomized clinical trial comparing ultrasonography with CT in patients who presented to the ED with suspected USD and showed that an ultrasonography-first strategy was not associated with more serious adverse events, missed high-risk diagnoses, or delays in urologic procedures. The ultrasonography-first strategy also has the potential advantage of exposing patients to lower cumulative doses of radiation. There is now consensus among representatives from the American College of Emergency Physicians, American College of Radiology, and AUA that supports ultrasonography for the initial evaluation of suspected uncomplicated USD.[4] More recent studies have yet to determine whether practice patterns have changed.

Editorial

Methods | We used data from the Nationwide Emergency Department Sample from January 2012 to December 2018. Per Stanford institutional review board guidelines, this project did not meet the definition of human participants research because we did not receive or have access to individually identifiable information. Informed consent was waived owing to the use of deidentified data. We selected patients 18 years or older who presented to the ED with suspected USD according to *International Classification of Diseases, Ninth Revision (ICD-9)* and *ICD-10* codes. We excluded patients who were pregnant and those with end-stage kidney disease. We used *Current Procedural Terminology* codes from the ED visits and *ICD-9* and *ICD-10* procedure codes to assess the imaging modality for each patient. We analyzed trends of ED visits with no imaging, CT alone, ultrasonography alone, or CT and ultrasonography.

Results | We identified 7 549 046 unique ED visits for suspected USD between 2012 and 2018. We chose alternating years between 2012 and 2018 as representative years (**Table**). Patients were similar in age (mean [SD] age, 45.0 [0.12] years in 2012 and 46.3 (0.12) years in 2018) and sex distribution (40.1% female in 2012; 42.1% in 2018). Most ED visits for suspected USD were followed by routine discharge from the ED (88.9% in 2012; 96.0% in 2018). The proportion of visits with no imaging study decreased from 50.5% in 2012 to 39.1% in 2018. While visits with ultrasonography increased from 1.49% in 2012 to 2.07% in 2018, visits with CT increased from 48.6% in 2012 to 59.2% in 2018 (**Figure**). These imaging trends were similar for men and women, teaching hospital status (teaching or nonteaching hospital), and payer type (private insurance, Medicare, or Medicaid).

Table. Baseline Characteristics of Patients With Suspected Urinary Stone Disease Seen in the Emergency Department in 2012, 2014, 2016, and 2018

	No. (%)			
Patient characteristics	2012 (n = 1 213 888)	2014 (n = 1 245 787)	2016 (n = 943 614)	2018 (n = 812 406)
Age, mean (SD)	45.0 (0.12)	45.8 (0.12)	45.5 (0.11)	46.3 (0.12)
Female	486 295 (40.1)	508 960 (40.9)	383 949 (40.7)	342 235 (42.1)
Male	727 484 (59.9)	736 766 (59.1)	554 144 (58.7)	470 136 (57.9)
Primary payer				
Medicare	172 685 (14.2)	198 509 (15.9)	146 324 (15.5)	136 291 (16.8)
Medicaid	154 007 (12.7)	203 068 (16.3)	164 579 (17.4)	141 874 (17.5)
Private	599 397 (49.4)	610 696 (49.0)	472 323 (50.1)	397 274 (48.9)
Self-pay	224 134 (18.5)	178 039 (14.3)	121 635 (12.9)	107 095 (13.2)
No charge	10 247 (0.84)	9181 (0.7)	3955 (0.4)	3074 (0.4)
Disposition from ED				
Routine	1 078 652 (88.9)	1 123 216 (90.1)	905 191 (95.9)	779 618 (96.0)
Transfer to short term	13 493 (1.1)	11 376 (0.9)	8317 (0.9)	7558 (0.9)
Transfer to intermediate care or SNF	1820 (0.2)	2587 (0.2)	1697 (0.2)	1568 (0.2)
Home health care	477 (0.0)	604 (0.1)	431 (0.0)	1085 (0.1)
Against medical advice	3946 (0.3)	4039 (0.3)	3332 (0.4)	2958 (0.4)
Admitted	113 793 (9.4)	102 705 (8.2)	23 860 (2.5)	19 045 (2.3)
Died	32 (0.0)	14 (0.0)	11 (0.0)	12 (0.0)

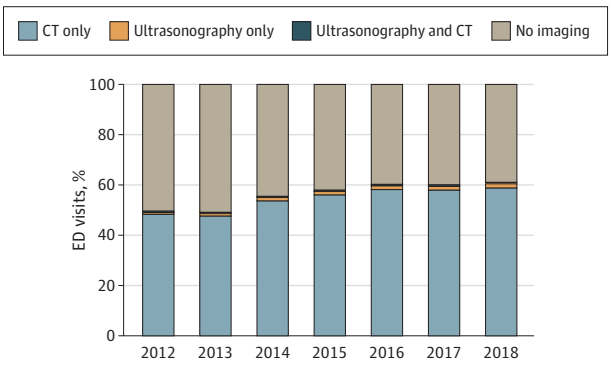
(continued)

Table. Baseline Characteristics of Patients With Suspected Urinary Stone Disease Seen in the Emergency Department in 2012, 2014, 2016, and 2018 (continued)

Patient characteristics	No. (%)			
	2012 (n = 1 213 888)	2014 (n = 1 245 787)	2016 (n = 943 614)	2018 (n = 812 406)
Median household income, $				
1-42 999	318 193 (26.2)	338 876 (27.2)	268 085 (28.4)	239 312 (29.5)
43 000-53 999	307 496 (25.3)	355 455 (28.5)	255 673 (27.1)	224 151 (27.6)
54 000-70 999	301 616 (24.9)	288 848 (23.2)	213 612 (22.6)	175 647 (21.6)
71 000 or more	264 992 (21.8)	241 150 (19.4)	191 577 (20.3)	162 642 (20.0)
Geographic region				
Northeast	224 958 (18.5)	218 407 (17.5)	176 255 (18.7)	158 363 (19.5)
Midwest	276 864 (22.8)	286 451 (23.0)	208 865 (22.1)	176 434 (21.7)
South	501 783 (41.3)	526 915 (42.3)	392 333 (41.6)	336 353 (41.4)
West	210 283 (17.3)	214 013 (17.2)	166 162 (17.6)	141 257 (17.4)
Hospital teaching status				
Metropolitan				
Nonteaching	535 197 (44.1)	414 283 (33.3)	308 679 (32.7)	212 954 (26.2)
Teaching	441 500 (36.4)	615 512 (49.4)	460 209 (48.8)	445 188 (54.8)
Nonmetropolitan	237 190 (19.5)	215 992 (17.3)	174 726 (18.5)	154 263. (19.0)
Hospital urban status				
Large metropolitan area	546 106 (45.0)	564 328 (45.3)	425 954 (45.1)	374 410 (46.1)
Small metropolitan area	360 564 (29.7)	367 987 (29.4)	330 142 (35.0)	274 214 (33.8)
Micropolitan area	156 916 (12.9)	141 346 (11.4)	93 891 (10.0)	83 691 (10.3)
Nonurban	77 281 (6.4)	68 368 (5.5)	57 739 (6.1)	52 567 (6.6)
Trauma center level				
Not a trauma center	435 403 (35.9)	660 352 (53.0)	573 888 (60.8)	492 861 (60.7)
Level 1	117 748 (9.7)	118 706 (9.5)	87 998 (9.3)	83 752 (10.3)
Level 2	109 471 (9.0)	132 569 (10.6)	131 629 (13.9)	112 558 (13.9)
Level 3	106 432 (8.8)	146 931 (11.8)	132 657 (14.1)	118 768 (14.6)

Abbreviations: ED, emergency department; SNF, skilled nursing facility.

Figure. Trends of Imaging Modality in Patients With Suspected Urinary Stone Disease Seen in the Emergency Department (ED) From 2012 to 2018



CT indicates computed tomography.

Discussion | The results of this cohort study suggest that as of 2018, fewer than 3% of annual ED visits for suspected USD included ultrasonography, whereas more than 50% of annual ED visits included CT. One limitation of this analysis is that we identified the imaging modality associated with an eventual diagnosis of USD, which may not always reflect the choice of imaging modality made by clinicians while they were evaluating symptoms preceding a diagnosis of USD. Even so, CT is the dominant imaging tool being used in ED visits associated with USD. Ultrasonography may be preferable to CT for the following reasons: (1) to our knowledge, no studies have documented the superiority of CT in improving USD outcomes or in reducing morbidity[3]; (2) although CT is highly sensitive for stone detection, the superior sensitivity of CT may not matter for smaller stones that pass without intervention; (3) use of point-of-care ultrasonography may be associated with shorter wait times in the ED; and (4) use of ultrasonography limits the exposure of patients with recurrent stone events to repetitive doses of ionizing radiation.[5]

These imaging trends should encourage the AUA to follow the lead of the European Urological Association and update guidelines that recommend ultrasonography for the initial evaluation of suspected USD.[6] Greater awareness of evidence and updated guidelines may increase adoption of an ultrasonography-first strategy. These changes may reduce radiation exposure to patients and limit health care costs.

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