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# Urologic emergencies before and after COVID-19: a retrospective chart review

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**Introduction:** During the coronavirus disease 2019 (COVID-19) pandemic, decreased presentations for various emergent conditions have been observed. Our objective was to compare the volume of patients with urologic emergencies presenting to emergency departments (EDs) within a single health system before and after the onset of the COVID-19 pandemic.

**Materials and methods:** A retrospective chart review was performed for 3 EDs within a single health system in the United States to identify all ED consults to urology from January 1, 2019 to May 31, 2020. For emergent consults, covariates were extracted, including demographic information, insurance status, Charlson Comorbidity Index (CCI) score, travel distance from home to the ED, and whether the patient had seen a provider in the hospital system before. Data were compared

between COVID-19 months (March-May 2020) and corresponding months in 2019.

**Results:** The study period encompassed 1,179 consults and 373 urologic emergencies. We observed not only a 22% decrease in urologic presentations to the ED compared to corresponding months in 2019, but also a 54% decrease in the proportion of urologic presentations that were truly emergent. For patients with emergent diagnoses, April 2020 saw an increase in Medicare/Medicaid coverage and a decrease in private insurance, May 2020 saw a decreased travel distance from home to the ED, and March and May 2020 saw an increase in patients who had previously seen a health system provider outside of the ED. No changes were seen in demographic characteristics or CCI.

**Conclusions:** During the early COVID-19 pandemic, urologic emergencies within a single health system decreased by 54% compared to the corresponding months pre-pandemic. Those who do present for care may be influenced by both locality and provider familiarity.

**Key Words:** urologic emergencies, COVID-19

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## Introduction

During the novel coronavirus disease 2019 (COVID-19) pandemic declared by the World Health Organization on March 11, 2020,<sup>1</sup> studies have noted decreases in presentations for emergent conditions such as myocardial infarction and stroke.<sup>2,3</sup> Without evidence that the incidences of these conditions have truly decreased, there is concern that patients may be deferring emergent care due to fear of COVID-19

exposure. Given these concerns, there have been efforts made in cardiology and neurology to encourage the general public to seek treatment for symptoms of myocardial infarction and stroke, respectively.<sup>4,5</sup>

There exists limited data on how COVID-19 has affected urologic emergencies – such as testicular torsion, priapism, and obstructing kidney stones in the setting of infection. In Europe, emergency department (ED) consults to urology at single institutions were noted to decrease by over 50% over a 1-week period in Italy<sup>6,7</sup> and a 3-week period in Portugal<sup>8</sup> compared to the same weeks in 2019. In the United States, a single study found that kidney stone presentations to the ED decreased by 36% from the previous year during a 6-week period.<sup>9</sup> However, it remains unknown how this trend has played out over the course of the pandemic, as well as whether the proportion of truly emergent cases has changed.

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Our primary objective was to compare the volume of patients with urologic emergencies presenting to EDs within a single health system in the United States from before the onset of the coronavirus disease 2019 (COVID-19) pandemic and after. Our secondary objectives were to compare the following characteristics for pre-and post-COVID-19 urologic emergencies: insurance status, distance traveled, Charlson Comorbidity Index (CCI), and previous encounter with a provider within the health system. We hypothesized that the volume of patients with urologic emergencies presenting to the ED has decreased since the onset of COVID-19. This is the first study on practice patterns for general urologic emergencies before and after COVID-19 for a United States institution.

## Materials and methods

This retrospective chart review study was approved by the Institutional Review Board of the University of Pennsylvania. An electronic medical record report was run to identify all inpatient urology consult orders placed between January 1, 2019 to May 31, 2020 within a single health system. Patients within a single health system for whom consult orders were placed by the EDs or the urology service were selected for further review. The EDs included were located in an urban center and consisted of a tertiary referral center and two community hospitals.

Patient charts were reviewed to confirm that the patients presented to the ED and to determine the presenting chief complaint or visit diagnosis for which the urology service was consulted. The following diagnoses qualified as urologic emergencies: 1) acute urinary retention, 2) kidney stones (obstructed and infected, obstructed in a solitary kidney, bilateral obstruction, or obstruction with intractable symptoms), 3) any non-stone, upper tract causes of the kidney stone subsections, 4) testicular torsion, 5) ischemic priapism, 6) paraphimosis, 7) Fournier's gangrene, and 8) miscellaneous emergencies. These categories were defined based on the American Urological Association (AUA) curriculum<sup>10</sup> and recent work triaging kidney stone care during COVID-19.<sup>11</sup> Patients were excluded from further analysis if their diagnosis did not fall under the designated categories of urologic emergencies, if they presented with a complication within 30 days of surgery, or if they presented as a trauma. Postoperative complications were excluded to avoid confounding from reduced surgical activity. Traumas were excluded due to the non-elective nature of many presentations, as well as

potential confounding from changes in community activity levels.<sup>6</sup>

If a patient was confirmed to have presented to the ED and their chief complaint or diagnosis was deemed to be a urologic emergency, the following information was extracted from the chart: ED location, date presented, specific visit diagnosis, age, gender, insurance status, CCI score, home ZIP code, and whether the patient had seen a provider in the hospital system before. Travel distance was calculated using the home ZIP code and the presenting ED location using Google maps data. For patients presenting with either testicular torsion or priapism, for which outcomes are time-dependent on the order of hours to days,<sup>12,13</sup> time to presentation was determined based on the reported time of symptom onset in the chart and the time of the first ED triage note.

Data was extracted by five trained reviewers. To assess inter-rater reliability for diagnostic categories, Randolph's free-marginal multi-rater kappa<sup>14</sup> was calculated using an official online calculator,<sup>15</sup> with kappa value categories defined as poor ( $< 0$ ), slight (0-0.20), fair (0.21-0.40), moderate (0.41-0.60), substantial (0.61-0.80), and almost perfect (0.81-1.00).<sup>16</sup> To assess inter-rater reliability for CCI score and time to presentation, the intraclass correlation coefficient (ICC) was calculated using the Real Statistics Resource Pack software<sup>17</sup> based on a single-rating, absolute agreement, 2-way random-effects model, with ICC value categories defined as poor ( $< 0.50$ ), moderate (0.50-0.75), good (0.75-0.90), and excellent ( $> 0.90$ ).<sup>18</sup>

The number of patients presenting to the ED with urologic emergencies was totaled and stratified by month from January 1, 2019 to May 31, 2020. For each month during the designated period, the following percentages were determined: patients with urologic ED presentations that qualified as emergent, patients with each insurance type, and patients with each provider status. Descriptive statistics (median/IQR) were used to quantify travel distance, CCI score, and time to presentation when appropriate.

For comparison purposes, the onset of COVID-19 will be defined as March 1, 2020. This was the day that the epicenter of US COVID cases, New York City, reported its first case, and this date has been used in previous work to define the beginning of the period in which US medical operations and social life were significantly affected.<sup>4</sup> Thus, for this study all months prior to March 2020 are considered pre-COVID-19, and all subsequent months (March-May 2020) are considered during the COVID-19 pandemic.

## Results

A total of 1,179 patients presented to the ED and had an inpatient urology consult ordered between January 1, 2019 and May 31, 2020. Of these patients, 373 presented with a urologic emergency. Table 1 shows the characteristics of patients with urologic emergencies for the overall study period. Most patients were male, were insured by either Medicare or Medicaid, and had seen a hospital system provider before in a non-ED encounter. For both the COVID-19 months and the corresponding months in 2019, the most common emergent diagnoses were acute urinary retention (35.5% in 2019, 48.6% in

**TABLE 1. Characteristics of emergent urologic presentations**

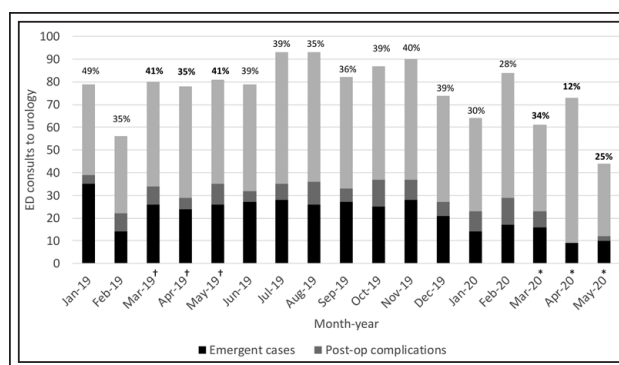
<b>Median age in years (IQR)</b>	<b>61 (36-73)</b>
<b>Gender (%)</b>	
Male	268 (71.8%)
Female	104 (27.9%)
Other	1 (0.3%)
<b>Insurance (%)</b>	
Uninsured	15 (4.0%)
Private insurance	142 (38.1%)
Medicare	116 (31.1%)
Medicaid	77 (20.6%)
Both Medicare and Medicaid	23 (6.2%)
<b>Median CCI score (IQR)</b>	<b>3 (0-6)</b>
<b>Median travel distance* in miles (IQR)</b>	<b>5.0 (2.3-12.5)</b>
<b>Penn provider status (%)</b>	
Has not seen a Penn provider before encounter	39 (10.5%)
Has seen a Penn provider before in a non-ED encounter	313 (83.9%)
Has seen a Penn provider before in an ED encounter only	21 (5.6%)
<b>Median time to presentation in hours (IQR)</b>	
Priapism	4.3 (3.4-6.6)
Testicular torsion	9 (2.5-36)

\*travel distance calculated from home address ZIP code to presenting ED address.

CCI = Charlson Comorbidity Index

ED = emergency department

SD = standard deviation.

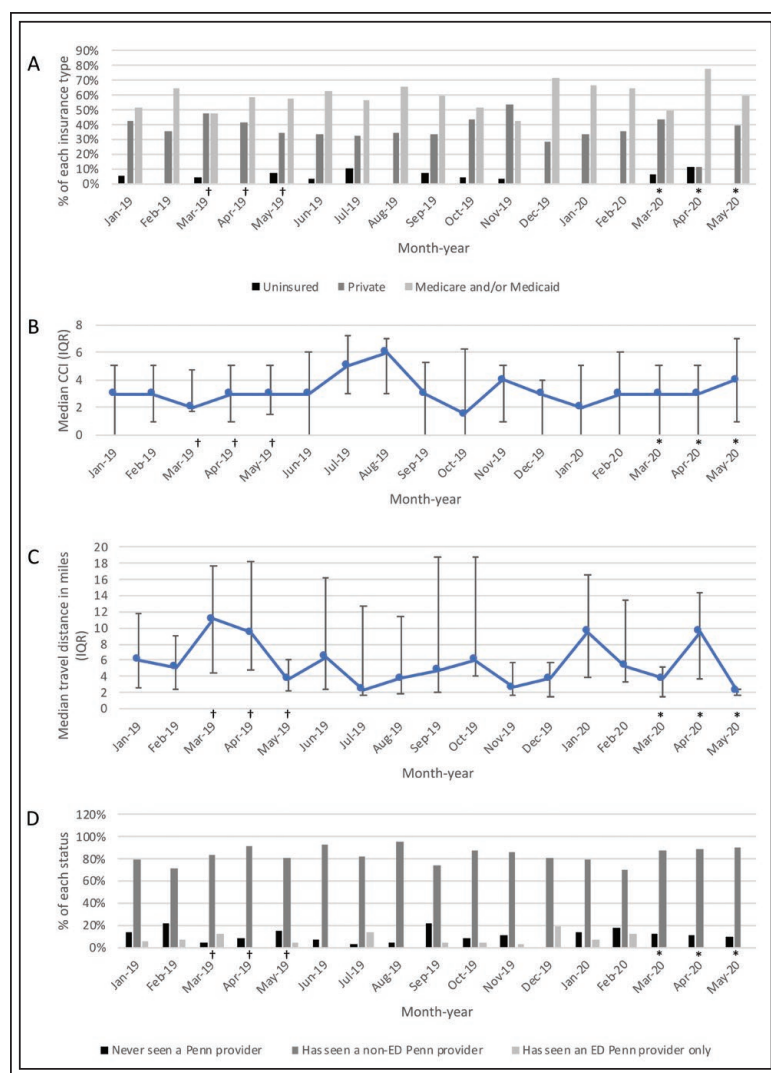


**Figure 1.** Volume of urologic emergencies as a proportion of total emergency department consults to urology before and during the COVID-19 pandemic. \*Months during the COVID-19 pandemic. †Months in 2019 corresponding to COVID-19 months in 2020. Percentages listed above each bar are the percentages of emergent cases out of all ED consults to urology for the month, excluding postoperative complications.

2020) and kidney stones (22.4% in 2019, 25.7% in 2020). Relatively fewer postoperative complications were noted in April and May 2020 (0%-4.8%), decreased from the corresponding pre-COVID months (6.8%-12.5%).

Compared to March-May 2019, total consults to urology during March-May 2020 decreased 22% (from 217 to 169), and emergent consults decreased 54% (from 76 to 35). The monthly trend of the volume of urologic emergencies as a proportion of total ED consults to urology is shown in Figure 1. Excluding postoperative complications, a lower proportion of ED consults to urology met emergent criteria during each of the COVID-19 months of March 2020 (34.0%), April 2020 (12.3%), and May 2020 (25.0%) compared to the same months the previous year (40.6%, 35.3%, and 41.3%, respectively). Furthermore, the proportions of emergent consults during COVID-19 months (12.3%-34.0%) were generally lower than those of other months in the year (28.3%-49.3%).

For patients with urologic emergencies during the study period, April 2020 saw the highest proportion of patients with Medicare/Medicaid (77.8%, up from 58.3% in April 2019) and the lowest proportion of patients with private insurance (11.1%, down from 41.7% in April 2019), Figure 2. CCI score during the COVID-19 months did not appear to deviate from previous trends throughout the year. May 2020 saw the lowest travel distance from home to the ED for the study period (median 2.2 miles, IQR 1.7-2.3), which was also decreased from May 2019 (median of 3.2 miles, IQR 2.3-6.1). In March and May 2020, relatively more



**Figure 2.** For patients with urologic emergencies presenting to the emergency department before and during COVID-19: **A)** insurance type; **B)** median Charlson Comorbidity Index (CCI) score; **C)** mean travel distance from home to the ED; **D)** Penn provider status.

\*Months during the COVID-19 pandemic. †Months in 2019 corresponding to COVID-19 months in 2020.

patients had previously seen a non-ED provider in the hospital system compared to the same months in 2019 (88% in March 2020 versus 84% in March 2019; 90% in May 2020 versus 81% in May 2019). There did not appear to be any notable trends in age or gender during COVID-19 months compared to preceding months. For patients presenting with priapism or testicular torsion, time to presentation on a monthly basis over the study period did not appear to deviate from previous months, although evaluation was limited by low numbers.

For data abstraction among the five reviewers, Randolph's free-marginal multi-rater kappa was

0.68 for diagnosis category, indicating substantial agreement. The ICC was 0.83 for CCI score and 0.78 for time to presentation, indicating good agreement.

## Discussion

Our retrospective chart review found that within a single health system in the United States, the volume of patients presenting to the ED with urologic emergencies decreased during COVID-19 (March-May 2020) compared to the same months the previous year. Our observed decrease in non-triaged ED consultations to urology mirrors both decreased urologic consult volume at European institutions<sup>6-8</sup> and the overall decrease in emergency department volume within our health system (30%-40% during the designated COVID-19 period). However, in contrast to European studies which found no significant differences in case urgency before and after the pandemic based on standardized triage levels,<sup>6-8</sup> we found that the proportion of urologic consults deemed emergent by urology-specific criteria decreased by 54% during the pandemic. The negative findings in previous studies may be explained by that possibility that standardized triage systems not specific to urology do not truly reflect case severity, as previously hypothesized.<sup>8</sup>

Similar to other non-urologic emergencies such as myocardial infarction and stroke, assuming that the community incidence of these emergent conditions has not decreased, our primary finding supports the concern that patients may be avoiding emergency care due to fear

of COVID-19. The concern that patients may be avoiding medical settings due to perceived infection risk is supported by a Gallup poll conducted the week of March 30, 2020, a few weeks after the onset of the WHO-defined pandemic on March 11, in which 86% of respondents reported that they would be either "very concerned" or "moderately concerned" about being exposed to coronavirus at a doctor's office or hospital should they need medical treatment.<sup>8</sup> Furthermore, patients may feel guilty about bothering doctors during the pandemic and subsequently present to the hospital at later stages.<sup>19</sup> It may be especially prudent during



this time to emphasize to patients the importance of presenting for care in specific emergent situations.

Among patients presenting with urologic emergencies, the decreased travel distance seen during March and May 2020 may reflect patients receiving local care in order to limit travel into an urban center. An alternative possibility is that non-local patients are not receiving care at all, which would indicate that travel distance may disproportionally hinder access to care during the pandemic. While such a scenario could have dire implications for outcomes, ultimately local and regional presentation patterns during the pandemic have yet to be fully defined. Patients during COVID-19 months were more likely to have previously seen a provider within the health system beyond the ED, suggesting that in addition to travel distance and convenience, perhaps trust in a provider or previous continuity within a health system also influences where patients present for care during a pandemic. A decrease in private insurance coverage and a corresponding increase in federal government insurance was observed in April 2020. This shift may reflect workers losing private insurance when becoming unemployed during the pandemic and then becoming newly eligible for Medicaid due to income losses.<sup>20</sup> However, this trend was not noted in May 2020, and it remains to be seen how insurance coverage evolves over the course of the pandemic.

This study has a number of limitations. First, data was collected from a single health system and does not represent the myriad of health systems and practices across the country, although the combination of a tertiary referral center combined with two community hospitals in an urban center does encompass a diverse group of patients. Second, low numbers preclude high-quality statistical analysis on patient subgroups and limit conclusions about trends for both patient characteristics and specific diagnoses (testicular torsion, priapism, etc.). However, out of existing studies on urologic emergencies during COVID-19, the present study includes the highest number of urologic consults. Third, the miscellaneous category for urologic emergencies is somewhat subjective by nature, although inter-rater reliability for the diagnostic category was deemed to be substantial.

Despite its limitations, this study has notable strengths. Existing work on urologic emergencies during COVID-19 has been largely limited by short data collection periods generally less than 1 month. By including patients from January 1, 2019 to May 31, 2020, the present study allows for comparison of patient volumes both immediately before and 3 months

after the onset of COVID-19 while also presenting data on seasonal trends. It is also the first study to examine trends in general urologic emergencies in the United States during COVID-19 and the first to utilize urology-specific criteria for emergencies. Our findings generate hypotheses regarding the epidemiology of emergent urologic presentations during COVID-19, which may be further elucidated with larger data sets and longer follow up.

## Conclusions

Within a single urban health system, the COVID-19 pandemic saw not only a decrease in urologic presentations to the ED, but also a decrease in the proportion of urologic presentations that were truly emergent. Those who do present for care may be influenced by both locality and provider familiarity. □

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## References

1. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. World Health Organization. Available from URL: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---31-august-2020>. Accessed May 2, 2020.
2. Garcia S, Albaghdadi MS, Meraj PM et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol* 2020;75(22):2871-2872.
3. Zhao J, Rudd A, Liu R. Challenges and potential solutions of stroke care during the coronavirus disease 2019 (COVID-19) outbreak. *Stroke* 2020;51(5):1356-1357.
4. Bernstein LS. Patients with heart attacks, strokes and even appendicitis vanish from hospitals. The Washington Post. Available from URL: [https://www.washingtonpost.com/health/patients-with-heart-attacks-strokes-and-even-appendicitis-vanish-from-hospitals/2020/04/19/9ca3ef24-7eb4-11ea-9040-68981f488eed\\_story.html](https://www.washingtonpost.com/health/patients-with-heart-attacks-strokes-and-even-appendicitis-vanish-from-hospitals/2020/04/19/9ca3ef24-7eb4-11ea-9040-68981f488eed_story.html). Accessed May 2, 2020.
5. McNamara D. COVID-19: Are Acute Stroke Patients Avoiding Emergency Care? Medscape Medical News. Available from URL: <https://www.medscape.com/viewarticle/928337>. Accessed May 2, 2020.
6. Motterle G, Morlacco A, Iafrate M et al. The impact of COVID-19 pandemic on urological emergencies: a single-center experience. *World J Urol* 2020;1-5.
7. Novara G, Bartoletti R, Crestani A et al. Impact of the COVID-19 pandemic on urological practice in emergency departments in Italy. *BJU Int* 2020;126(2):245-247.
8. Madanelo M, Ferreira C, Nunes-Carneiro D et al. The impact of the COVID-19 pandemic on the utilization of emergency urological services. *BJU Int* 2020;126(2):256-258.

9. Kachroo N, Wright HC, Sivalingam S. A tale of two eras: the effect of the COVID-19 pandemic on stone disease presentations. *Urology* 2020;144:270-272.
10. Kaplan D, Kohn T. Urologic Emergencies. AUAUniversity. Available from URL: <https://www.auanet.org/education/auauniversity/for-medical-students/medical-students-curriculum/medical-student-curriculum/urologic-emergencies>. Accessed May 2, 2020.
11. Mervosch S, Lee JC, Gamio L, Popovich N. See How All 50 States Are Reopening. The New York Times. Available from URL: <https://www.nytimes.com/interactive/2020/us/states-reopen-map-coronavirus.html>. Accessed June 3, 2020.
12. Cummings JM, Boullier JA, Sekhon D, Bose K. Adult testicular torsion. *J Urol* 2002;167(5):2109-2110.
13. El-Bahnasawy MS, Dawood A, Farouk A. Low-flow priapism: risk factors for erectile dysfunction. *BJU Int* 2002;89(3):285-290.
14. Randolph JJ. Free-marginal multirater kappa: An alternative to Fleiss' fixed-marginal multirater kappa. Paper presented at the Joensuu University Learning and Instruction Symposium, Joensuu, Finland, October 14-15, 2005.
15. Randolph JJ. Online Kappa Calculator. Available from URL: <http://justus.randolph.name/kappa>.
16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 33 1977;(1):159-174.
17. Zaiontz C. Real Statistics Using Excel. Available from URL: <https://www.real-statistics.com>. Accessed July 9, 2020.
18. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med* 2016;15(2):155-163.
19. Rosenbaum L. The untold toll - the pandemic's effects on patients without Covid-19. *N Engl J Med* 2020;38 (24):2368-2371.
20. Banthin J, Simpson M, Buettgens M, Blumberg L, Wang R. Changes in Health Insurance Coverage Due to the COVID-19 Recession: Preliminary Estimates Using Microsimulation. Urban Institute. Available from URL: <https://www.rwjf.org/en/library/research/2020/07/changes-in-health-insurance-coverage-due-to-the-covid-19-recession--preliminary-estimates-using-microsimulation.html>. Accessed July 20, 2020.