# Declaration of Conflicts of Interest

<table>
<thead>
<tr>
<th>Advisory Boards</th>
<th>Speaker’s Bureau</th>
<th>Payment/Honoraria</th>
<th>Grants/Research Support</th>
<th>Clinical Trials</th>
<th>Investments</th>
<th>Patents</th>
</tr>
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<tr>
<td><strong>NONE TO DISCLOSE</strong></td>
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Background

› Kidney stones affect 10.6% of men and 7.1% of women (Scales et al., 2012)

› They are a common and growing source of emergency department (ED) visits (Graham, 2011)
The Past

- **ED**
  - Emergency Department (ED)
  - Triage by 1 of 4 endourologists
  - Acute Stone Clinic (ASC)

  - Day 1
  - Day 1-5
  - Day 7-10
The Problem: no shows

- Patients referred to the ASC with stones <5mm were more likely to miss their appointment
  - Urology underutilization
  - Impaired access

- Commonly cited reasons
  - symptom resolution
  - spontaneous stone passage
Small Acute Ureteral Stone Workflow (SAUS Protocol)

**Stone Intake**
- Ureteral Stone <5mm

**Worklist to Stone Triage**
- (Activate SAUS Protocol)

**Stone Triage Books**
- Renal/Bladder ultrasound and KUB in 1-2 weeks

**Stone Triage sends worklist to RN Case Manager when Ultrasound booked**

**Chart check to Endourology RN Case Manager based on ultrasound booking date**

- RN Case Manager contacts patient with instructions pre-ultrasound

  - Hydro or stone still present on report
    - Schedule into Acute Stone Clinic
  - No Hydro, No ureteral stone in report
  - No hydro, no ureteral stone but non distant renal calculi

**RN Case Manager contacts patient**

**Ongoing Symptoms**
- Yes
  - Offer Acute Stone Clinic or brochure mail out
  - RN Case Manager to review with Stone Urologist for further instructions
    - Letter to Family Physician from Urologist
  - Schedule into Acute Stone Clinic
  - Offer Elective Stone Clinic to discuss referral to Nephrology or Metabolic evaluation
- No
  - Ongoing Symptoms
Objectives

1. Review **clinical outcomes** of all patients enrolled in the SAUS Protocol since its inception

2. Delineate the **natural history** of small acute ureteral stones and their **passage rate**
Methods

› Retrospective EMR (HealthQuest) review of all patients enrolled in the SAUS Protocol since its inception
  – June 21\textsuperscript{st} 2018 → June 26\textsuperscript{th} 2019
  – 216 adult patients identified

› Data collected and stored in an encrypted REDCap database
## Patient Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean patient age (y)</td>
<td>48.7</td>
<td>49.9</td>
<td>49</td>
</tr>
<tr>
<td>Mean stone size (mm)</td>
<td>3.91</td>
<td>3.63</td>
<td>3.82</td>
</tr>
<tr>
<td>Number of patients</td>
<td>147</td>
<td>69</td>
<td>2:1 m:f</td>
</tr>
</tbody>
</table>


Timeline

Mean time to US = 19.18d

- ED
- Acute Stone Triage: 1.48d
- New Pt. Letter: 2.68d
- US booked: 0.34d
- US: 14.68d
- Results discussed: 1.32d
- ASC: 7.93d
Imaging: Findings on Follow Up Ultrasound

- None (normal): 78.7%
- Ureteral stone(s): 7.4%
- Hydronephrosis: 6.9%
- Uncertain: 6.9%
Imaging: Findings on Follow Up Ultrasound

- **Uncertain**: 6.9%
- **Hydronephrosis**: 6.9%
- **Ureteral stone(s)**: 7.4%
- **None (normal)**: 78.7%

A period of conservative management may allow for natural passage of the majority of stones <5mm.
Imaging: what happened to patients with negative ultrasounds?

- None (normal): 78.7%
- Ureteral stone(s): 7.4%
- Hydronephrosis: 6.9%
- Uncertain: 6.9%
Imaging: what happened to patients with negative ultrasounds?

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<tr>
<th>Disposition</th>
<th>F/U w GP</th>
<th>ASC</th>
<th>ESC</th>
<th>Refused all F/U</th>
</tr>
</thead>
<tbody>
<tr>
<td># of pts (n=163)</td>
<td>40.5% (66)</td>
<td>37.4% (61)</td>
<td>15.9% (26)</td>
<td>5.5% (9)</td>
</tr>
</tbody>
</table>

› ASC:
– 24/61 (39%) because they still had symptoms
– 11/61 (18%) because the RN Case Manager was not able to reach them so the ASC appointment was never cancelled
– 26/61 (43%) unknown

The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC
Imaging: what happened to patients with positive ultrasounds?

Follow Up Ultrasound Findings

- None (normal): 78.7%
- Ureteral stone(s)): 7.4%
- Hydronephrosis: 6.9%
- Uncertain: 6.9%
Imaging: what happened to patients with **positive** ultrasounds?

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<tr>
<th>DISPOSITION</th>
<th>ASC</th>
<th>ESC</th>
<th>F/U w GP</th>
<th>Cystoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Pts (n=31)</td>
<td>90.3% (28)</td>
<td>3.2% (1)</td>
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</tr>
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<tr>
<th>INTERVENTION</th>
<th>None (stone passed)</th>
<th>URS</th>
<th>F/U Imaging</th>
<th>SWL</th>
<th>No Show</th>
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<tr>
<td># of Pts (n=31)</td>
<td>38.7% (12)</td>
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<td>9.7% (3)</td>
<td>6.5% (2)</td>
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F/U US directs most patients with a stone to the ASC, but <50% require intervention.
Imaging: ureteral stone location

Ureteral Stone Location

- **Distal**
  - Follow Up: 12/16 (75%)
  - Initial: 142/216 (66%)

- **Mid**
  - Follow Up: 3/16 (19%)
  - Initial: 23/216 (11%)

- **Proximal**
  - Follow Up: 1/16 (6%)
  - Initial: 42/216 (19%)
Imaging: ureteral stone location

- **Distal**: 142/216 (66%), 12/16 (75%) follow-up, 23/216 (11%) initial
- **Mid**: 3/16 (19%), 23/216 (11%) initial
- **Proximal**: 1/16 (6%), 42/216 (19%) initial

- In 81.25% of cases the ureteral stone location did not change (13/16) in the 19.18d from initial to follow-up imaging.
Timeline

Mean time to phone call = 20.5d
Phone call: Symptoms

By 20.5 days, 2 out of 3 patients were symptom free.
Phone call: Symptom accuracy

For stones <5mm, the presence of symptoms at 3wks does not accurately predict stone presence.
Phone call: Stone Passage

By 20.5 days, 1 out of 3 patients were confident that they had passed their stone.
Patients are quite accurate at reporting stone passage.
Timeline

1.48d ED
2.68d Acute Stone Triage
0.34d New Pt. Letter
14.68d US booked
1.32dResults discussed
7.93d ASC
Mean time to ASC = 28.43d
The SAUS Protocol rerouted 53.2% of patients bound for the ASC unnecessarily.
Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.

Disposition – ASC Symptoms

- Refused all F/U
- ESC
- ASC
- F/U with GP

31.7% Sx
67.3% No sx
Disposition – ASC Symptoms

At this point, 161/216 (74.5%) of SAUS patients were completely symptom-free
The SAUS Protocol minimized the number of interventions performed.
Stone passage by location

The stone passage rate is independent of position within the ureter.
## Conclusions

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<tr>
<th>Ureteral stone location did not change significantly in the 19.18d from initial to f/u imaging</th>
<th>The stone passage rate is independent of position within the ureter</th>
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<td>A period of conservative management may allow for natural passage of the majority of stones &lt;5mm</td>
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Conclusions

- Ureteral stone location did not change significantly in the 19.18d from initial to f/u imaging.
- The stone passage rate is independent of position within the ureter.
- For stones <5mm, the presence of symptoms at 3wks does not accurately predict stone presence.
- F/U US directs most patients with a stone to the ASC, but <50% require intervention.
- Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.
- Patients are quite accurate at reporting stone passage.
- A period of conservative management may allow for natural passage of the majority of stones <5mm.
- By 20.5 days, 1 out of 3 patients are confident that they have passed their stone.
- By 20.5 days, 2 out of 3 patients were symptom free.
- The SAUS Protocol rerouted 53.2% of all patients bound for the ASC unnecessarily.
- The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC.
- The SAUS Protocol minimized the number of interventions performed.
Conclusions

| Stone location within the ureter does not change and does not affect patient outcomes | For stones <5mm, the presence of symptoms at 3wks does not accurately predict stone presence |
| F/U US directs most patients with a stone to the ASC, but <50% require intervention | Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified |
| A period of conservative management may allow for natural passage of the majority of stones <5mm | By 20.5 days, 1 out of 3 patients are confident that they have passed their stone |
| The SAUS Protocol rerouted 53.2% of all patients bound for the ASC unnecessarily | The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC |
| | By 20.5 days, 2 out of 3 patients were symptom free |
| | The SAUS Protocol minimized the number of interventions performed |

Patients are quite accurate at reporting stone passage.
Conclusions

- Stone location within the ureter does not change and does not affect patient outcomes
- F/U US directs most patients with a stone to the ASC, but <50% require intervention
- A period of conservative management may allow for natural passage of the majority of stones <5mm
- The SAUS Protocol rerouted 53.2% of all patients bound for the ASC unnecessarily
- For stones <5mm, the presence of symptoms at 3wks does not accurately predict stone presence
- Patients are quite accurate at reporting stone passage
- By 20.5 days, 1 out of 3 patients are confident that they have passed their stone
- The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC
- By 20.5 days, 2 out of 3 patients were symptom free
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Patients are better at detecting the absence of a stone than the presence of a stone.
Conclusions

- Stone location within the ureter does not change and does not affect patient outcomes.

- F/U US directs most patients with a stone to the ASC, but <50% require intervention.

- Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.

- A period of conservative management allows for the passage of the majority of stones <5mm and complete symptom resolution.

- The SAUS Protocol rerouted 53.2% of all patients bound for the ASC unnecessarily.

- The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC.

- The SAUS Protocol minimized the number of interventions performed.

- Patients are bad at knowing if they have a stone, but are good at knowing if they’ve passed one.

- By 20.5 days, 2 out of 3 patients were symptom free.

- Patients are better at detecting the absence of a stone than the presence of a stone.

- By 20.5 days, 1 out of 3 patients are confident that they have passed their stone.

- Patients are quite accurate at reporting stone passage.

- Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.

- The SAUS Protocol minimized the number of interventions performed.
Conclusions

| Stone location within the ureter does not change and does not affect patient outcomes |
| F/U US directs most patients with a stone to the ASC, but <50% require intervention |
| Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified |
| A period of conservative management allows for the passage of the majority of stones <5mm and complete symptom resolution |
| The SAUS Protocol rerouted 53.2% of all patients bound for the ASC unnecessarily |
| The SAUS Protocol redirected 62.6% of stone-free patients bound for the ASC |
| The SAUS Protocol minimized the number of interventions performed |

Patients are bad at knowing if they have a stone, but are good at knowing if they’ve passed one.
Conclusions

- Stone location within the ureter does not change and does not affect patient outcomes.
- F/U US directs most patients with a stone to the ASC, but <50% require intervention.
- Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.
- A period of conservative management allows for the passage of the majority of stones <5mm and complete symptom resolution.
- The SAUS Protocol is effective at prioritizing ASC appointments, thus improving access, and minimizing risks and costs associated with unnecessary interventions.
- Patients are bad at knowing if they have a stone, but are good at knowing if they’ve passed one.
- By 20.5 days, 2 out of 3 patients were symptom free.
- Patients are better at detecting the absence of a stone than the presence of a stone.
- By 20.5 days, 1 out of 3 patients are confident that they have passed their stone.
- Patients are quite accurate at reporting stone passage.
- The SAUS Protocol redirected 62.6% of stone-free patients.
- Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.
Conclusions

Stone location within the ureter does not change and does not affect patient outcomes.

F/U US directs most patients with a stone to the ASC, but <50% require intervention.

Even with the SAUS Protocol, 2/3 of ASC appointments for stones <5mm may not be justified.

Patients are bad at knowing if they have a stone, but are good at knowing if they’ve passed one.

A period of conservative management allows for the passage of the majority of stones <5mm and complete symptom resolution.

The SAUS Protocol is effective at prioritizing ASC appointments, thus improving access, and minimizing risks and costs associated with unnecessary interventions.
Conclusions

Stone location within the ureter does not change and does not affect patient outcomes.

The SAUS Protocol is not perfect.

A period of conservative management allows for the passage of the majority of stones <5mm and complete symptom resolution.

Patients are bad at knowing if they have a stone, but are good at knowing if they’ve passed one.

The SAUS Protocol is effective at prioritizing ASC appointments, thus improving access, and minimizing risks and costs associated with unnecessary interventions.

Patients are better at detecting the absence of a stone than the presence of a stone.

By 20.5 days, 1 out of 3 patients are confident that they have passed their stone.

Patients are quite accurate at reporting stone passage.

By 20.5 days, 2 out of 3 patients were symptom-free.

The SAUS Protocol is not perfect.
LIMITATIONS

› Retrospective chart review
  – Weakness inherent in the design

› Ultrasound assessments of stone burden
  – Inter-observer variability

› ED revisit rate unknown
  – Data acquisition currently underway
FUTURE DIRECTIONS

• Elucidate impact of protocol on ED revisit rates
• Examine what happens to patients that did not see urology
  • How many are referred back to urology within a year
• Improve SAUS protocol
  • Adjust timing of patient call
Timeline

1.48d  
Acute Stone Triage

2.68d  
New Pt. Letter

0.34d  
US booked

14.68d  
US

1.32d  
Results discussed

7.93d  
ASC

RN phone call
References


Acknowledgements

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› This project was funded by the 2019 William H. Lakey Summer Studentship – thank you for your generosity
Questions?