

Impact of a Clinical Pathway for Acute Nephrolithiasis in a Pediatric Emergency Department

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Development of a Pediatric Nephrolithiasis Pathway

Overall Aim: Streamline and standardize care for children presenting to SCH ED with suspected or proven nephrolithiasis

Specific Aim: Reduce CT utilization in ED



!
Consider other diagnosis:
 Appendicitis
 Ovarian/Testicular torsion
 Small bowel obstruction
 UPJ obstruction
 UTI

Inclusion Criteria

- 1 year or older
- Symptomatic/chief complaint of UTI flank pain, nausea or vomiting and
- High suspicion of Nephrolithiasis

Exclusion Criteria

- Less than 1 year
- Low suspicion of Nephrolithiasis
- Concern for septic shock (use septic shock pathway)

UA Concern for Infection:
[Consider UTI Pathway](#)

- Nitrites OR
- Leukocytes esterase OR
- Microscopy shows bacteria OR
- ≥ 10 WBC/HPF

Presenting Symptoms

- Pain (47-80%)
- Gross Hematuria (32-55%)
- Nausea/vomiting

[Clinical Predictors for Nephrolithiasis](#)

- Personal history of nephrolithiasis
- > 5 RBC per HPF on microscopic urinalysis
- History of nausea/vomiting
- Flank pain on physical exam

US First Line Imaging

Imaging

- [Abdominal ultrasound or renal bladder ultrasound](#)
- CT (not required)
- If ultrasound not diagnostic/clinical suspicion high discuss with urology prior to CT scan

IV Fluids: 20mL/kg, NS, 1L maximum

NPO

[Pain Medications](#)

- Ketorolac
- Morphine

Anti-emetics

- Ondansetron

Urinalysis

- Reflex culture

Contact Urology to determine appropriateness of low-dose CT scan

Indeterminate



Negative
Consider other diagnosis



UA negative for infection

UA positive for infection

Reassessment

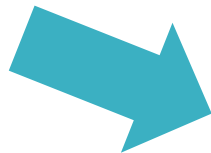
- [Pain Management \(oxycodone, ibuprofen and acetaminophen\)](#)
- Tamsulosin (only over 2 years of age) if ureteral calculus
- Maintenance IV Fluids
- Trial PO (Clear liquids)

Suspected Infection

- Urology consultation
- Antibiotics
- Labs: CBC with diff; BUN; creatinine; lytes; blood culture if concern for obstructed stone & sepsis (Use septic shock pathway)

Urology consultation to determine need for admission and plan of care (if not already consulted)
Indications for consult: suspected infection; inability to tolerate PO; poor pain control; return to the ED



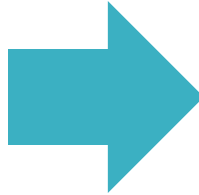


		Component	Status
Nephrolithiasis Plan, ED Nephrolithiasis (Planned Pending)			
Ordersets			
		DO NOT USE this plan for ASYMPTOMATIC children.	
		.	
		<= CLICK LEFTMOST ICON to review Nephrolithiasis pathway	
		Last modified: 12/07/2016 Clinical Owner: Russ Miqita MD and Jonathan Elli	
		INCLUSION CRITERIA: Symptomatic children 1 year OR OLDER with high sus	
<input checked="" type="checkbox"/>		Follow Nephrolithiasis Pathway	
		For patients meeting Exclusion Criteria, uncheck Follow Pathway order above	
		EXCLUSION CRITERIA: Using pathway for children YOUNGER THAN 1 year,	
<input type="checkbox"/>		Exclude from Nephrolithiasis Pathway	
Laboratory			
<input checked="" type="checkbox"/>		Microscopic with Urinalysis	
<input checked="" type="checkbox"/>		Urine Culture	
Medications			
		NOTE: Evidence suggests ketorolac + morphine is the most efficacious pain	
		IV ketorolac for children OLDER THAN 6 months:	
<input type="checkbox"/>		ketorolac	
		IV morphine for children 6 months OR OLDER:	
<input type="checkbox"/>		morphine	
		IV ondansetron:	
<input type="checkbox"/>		ondansetron	
Continuous Infusions			
		Includes all orders relating to peripheral IVs (place, access, lock, etc) and mec	
<input checked="" type="checkbox"/>		Peripheral IV Plan	Planned Pen...
<input checked="" type="checkbox"/>		Peripheral IV	
<input checked="" type="checkbox"/>		NS (NS BOLUS -)	
<input checked="" type="checkbox"/>		NS IV TKO ED ONLY	
Radiology			
<input type="checkbox"/>		US Renal Sonoqram Complete	
Nutrition			
		For dietary restrictions, order modified diet	
<input checked="" type="checkbox"/>		NPO	

METHODS

Pathway implemented Oct 2015

Pre-Pathway:
Jan 2013 – Oct 2015



Post-Pathway:
Oct 2015 – Oct 2016

Outcome Metrics:

ED LOS
CT utilization
Admission Rates

Balance Metrics:
Readmission Rates



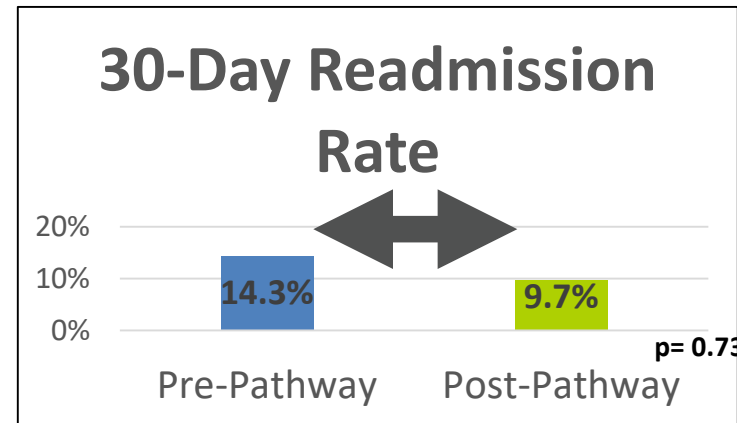
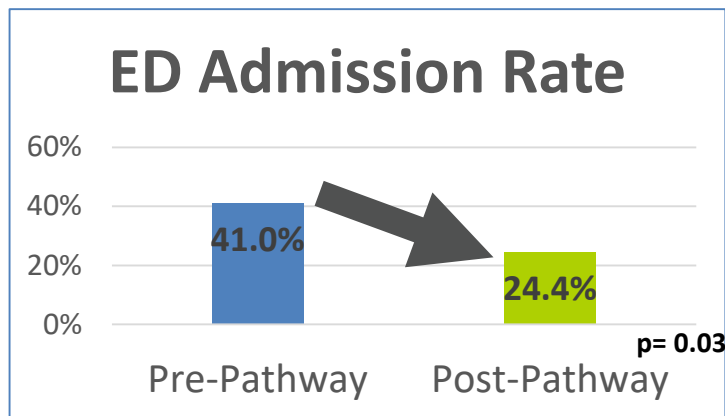
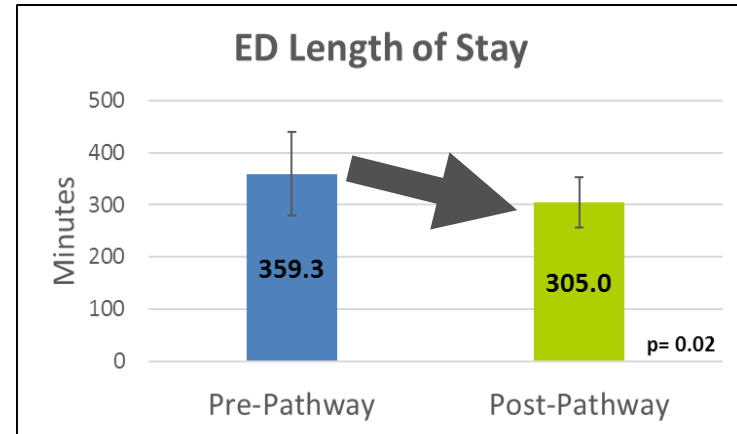
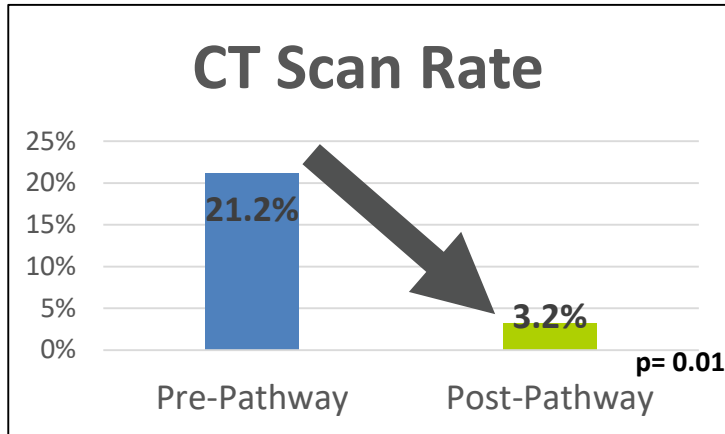
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Results

		PRE	%	POST	%
	N	83		41	
	Age	14.3 ± 4.9		14.1 ± 5.0	
Sex	Male	40	48%	21	51%
	Female	43	52%	20	49%
Race	White	57	68.7%	25	61%
	Black	1	1.2%	2	4.9%
	Hispanic	8	9.6%	6	14.6%
	Asian	2	2.4%	4	9.8%
	Other	7	8.4%	1	2.4%
	Refused	8	9.6%	3	7.3%

Results

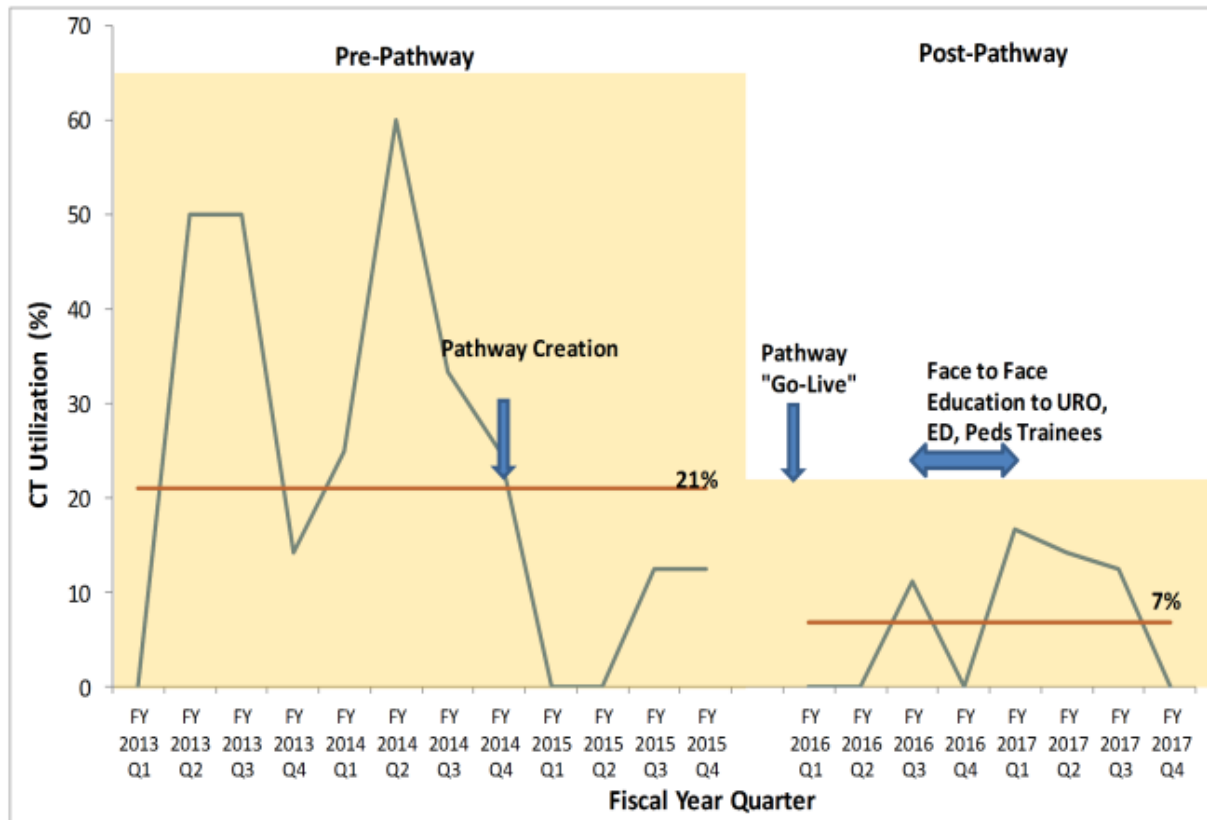


Continuous Process Improvement = Continual Appraisal of Outcomes

Figure 1: CT utilization pre and post-pathway initiation.

Red line: total utilization across time period

Yellow box: +/- 2 SDs above 0, across time period



Lessons Learned & Next Steps

Implementing change for a diagnostic test:

- 1) Combined ED and Urology champions
- 2) Education and awareness for initial improvement
- 3) Orderset/Pathway to maintain optimal outcomes
- 4) Guidance to providers for indeterminate results
- 5) Favorable culture for reducing CT scans

Next steps:

- 1) Regional expansion



ACKNOWLEDGEMENTS

CSW Nephrolithiasis Team:

Urology, Owner
Urology, Owner
Urology, Stakeholder
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Emergency Department, CNS
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Pharmacy Informatics
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