

Improving pathways of care following emergency department discharge for renal colic

1. Project Lead/Key Contact

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2. Why are you interested in the IHQI program?

Delays in diagnosis and treatment of kidney stones can lead to significant pain and disability for patients, as well as increase the risk of serious complications, such as urinary tract infection, renal insufficiency, and sepsis. As a urologist at UNC, I've personally treated or had colleagues who have treated patients with largely avoidable complications stemming from lack of timely access to diagnosis and treatment of kidney stones. As a health services researcher, I've developed kidney stone care pathways and calculated the cost of kidney stone care to the US health care system. However, years of training and now independent practice have taught me that it is one thing to identify potential predictors of care quality, but a whole other matter to translate these observations into meaningful health care interventions that materially improve patient care. IHQI offers the opportunity to help improve systems of care and care quality for the patients that we care for every day and to gain critical leadership and change management skills within a large and complex academic medical center.

This proposal builds upon my experience with the High Value Practice Academic Alliance's Value Innovation Teaching and Leadership (VITAL) Program, which allowed me to develop a basic implementation science toolkit necessary to translate real world data into meaningful policy and/or clinical interventions that improve the value of "everyday" health care delivery, and it was through this program that I conceived of the current proposal. If selected to the IHQI Improvement Scholars program, I hope to build upon the basic skills in implementation science developed during the VITAL program. Specifically, I will leverage the experiential learning and professional development afforded through the Improvement Scholars Program to effectively integrate the technical skills developed during VITAL into a real-world clinical improvement project that aims to enhance the value of care provided to patients presenting to the UNC ED with renal colic.

3. Which UNC Health improvement priority will your project address?

This project directly addresses the **improvement priority areas of health equity promotion, patient harm prevention and outpatient care improvement** by attempting to standardize the care of renal colic patients through optimizing management in the ED and improving flows/transitions to the ambulatory setting, as well as providing additional tools for primary care providers to access urology care for patients with suspected or newly diagnosed kidney stones.

4. What is the problem or gap in quality you seek to improve?

The primary problem/gap in quality we seek to improve is lack of timely access to follow-up urology care in two scenarios: 1) patients newly diagnosed with kidney stones in the ED setting and 2) for patients for whom their primary care provider has high suspicion of kidney stones. Access to urology care at UNC has traditionally been extremely limited and current staffing shortages and other issues have led to significant delays in appropriate patients receiving definitive surgical treatment within the recommended time frame.¹ Through this proposal we aim to improve timely access by addressing two key drivers: 1) appropriateness of patients being referred to urology for consultation and 2) expanded and streamlined access to urgent urology care for patients deemed high-risk or likely to need surgical intervention.

Individuals suffering from renal colic are uniquely vulnerable to delays/fragmentation of care as the care cycle associated with renal colic is characterized by multiple treatment options and large variation in practice and care setting (see Figure 1).² The creation of condition-specific integrated practice units (IPUs) consisting of a multidisciplinary cadre of providers tasked with serving the complex and interrelated needs of patients with a particular condition represents one mechanism by which to overcome delays/fragmentation of care. The long term objective of this project is to effectively create a UNC-wide renal colic IPU by developing a series of standardized care practices across multiple care settings that seek to optimize management in the ED and improve flows/transitions to the ambulatory setting. **We will build upon existing quality improvement literature** demonstrating clinical benefits associated with the creation of standardized imaging and analgesic algorithms/bundles for patients presenting to the ED with suspected renal colic.³

5. Describe the patient population affected, scope, and impact of the problem (1 page)

Urinary stone disease is a common condition—affecting 1 in 10 US adults—uniquely amenable to clinical improvement projects seeking to maximize patient experience and care delivery value. **This chronic disease (50% of first-time stone formers will experience a recurrence within 5 years) incurs high population-level costs (~\$4.5 billion annually)**, the majority of which are attributable to related acute care encounters (See Table 1).⁴ In 2009, there were 1.3 million ED visits in the US for upper urinary tract stone disease, resulting in over 3,600 ED visits per day, ~80% of which were “treat and release” encounters.⁵ In the US, working age adults are disproportionately impacted by acute renal colic episodes⁶, which may contribute up to 3.1 million lost workdays per year among the privately insured, translating into an additional \$775 million in indirect costs, on top of distress, pain, and disruption of life routines for patients.⁷

UNC is located within the Southeast US “Stone Belt”,⁸ where stone disease prevalence is as much as 50% higher than other US regions. A query of UNC’s Clinical Data Warehouse revealed that, between January 2016 and January 2023, 10,194 individuals were treated at either UNC Medical Center or UNC Hillsborough EDs for an admitting diagnosis of renal colic, which likely underrepresents the magnitude of the condition as many patients are initially diagnosed with non-specific symptoms such as “flank pain” or “lower abdominal pain.” A retrospective chart review of patients presenting to UNC Main or Hillsborough EDs between November 28 and December 17, 2022, found that post-ED discharge pathways of care are highly variable and fragmented. Of the 1,782 total ED “treat and release” encounters over that 20 day period, 15 (0.8% of total ED volume; ~ 0.75 ED discharges per day) had a primary discharge diagnosis of a urinary calculus or flank pain (this figure likely underrepresents the magnitude of the condition at UNC for the following reasons: 1) renal colic is less commonly diagnosed during colder winter months⁹, and 2) discharge diagnoses may not specify a urinary stone but rather associated non-specific symptomatology). Of those, **26.7% experienced an ED revisit within 30 days**, while **just 25% of patients had a subsequent ambulatory encounter within UNC to assess for stone passage/symptom improvement within 60 days**. Furthermore, **only 6.7% of initial ED encounters had definitive intervention at UNC within 6 weeks of initial diagnosis** (current American Urological Association guidelines recommend intervention within 6 weeks of initial diagnosis for patients failing a trial of stone passage).¹ While this retrospective chart review did not document the percentage of ED discharges that would be considered “high-risk” and needing urgent follow-up, prior research has found that approximately 10% of those diagnosed with kidney stones will ultimately need definitive surgical intervention. Thus, it is reasonable to estimate that, at a minimum, 1-2 ED discharges per week (lower limit given seasonality) may fall into the category of needing urgent urology follow-up.

Given gaps in ambulatory/specialty care follow-up, it is unclear what the true denominator of this data is (e.g. the patients who failed a trial of stone passage vs those whose symptoms improved). It is highly likely that those who were unable to receive post-acute care follow-up at UNC sought

care at external institutions such as Duke or WakeMed. For example, in the subset of UNC patients who are attributed to our Blue Premier Value Care plan (dual-sided risk agreement with BCBSNC), we were able to assess health care system leakage using paid claims data. We found that that **~43% of renal colic-based ED encounters among this cohort occurred within out-of-network health facilities**, corresponding to significant revenue dollars leaving UNC health care system and increasing the risk of care fragmentation and poor outcomes. While we haven't yet reviewed inpatient, ambulatory surgery or outpatient visit renal colic encounters, the national data cited previously suggests dollars spent in these care settings far exceeds ED visits.

6. What do you think are the underlying causes of the problem?

The aforementioned variation in renal colic care can in large part be attributed to care delays/fragmentation attributable to the engagement of multiple care silos: the emergency department (ED) for the acute phase of the disease, ambulatory/hospital-based surgical centers for definitive treatment, and long-term office-based preventive care. **Despite the breadth of care utilized by these patients, the ED universally serves as the health system entry point for the index episode of pain, regardless of socioeconomic status or medical complexity. However, subsequent care pathways vary widely with regards to the cost, timing, and type of care received, representing an opportunity for multidisciplinary care improvement.**

For example, both the timing and setting of definitive surgical treatment has been shown to have a profound impact on episode-related costs. Using all-payer claims data our group examined predictors of ambulatory versus hospital-based elective treatment of urinary stones.¹⁰ We found that non-clinical factors such as underinsurance were associated with lower odds of receiving surgery in the ambulatory setting, leading to significantly higher mean index 30-day acute care costs. As evidenced by our finding that ambulatory surgery was associated with lower odds of 30-day ED revisit, it may be that patients undergoing ambulatory-based surgery experience more timely and better coordinated care following their ED encounter, which in turn leads to improved patient outcomes and costs. We also found that insurance status influences rates of undergoing surgery at the same facility (aka index facility) as the one that a patient originally presented to for their initial renal colic episode.¹¹ Notably, individuals who underwent definitive surgery at an index facility experienced shorter times to definitive surgery and lower episode-based costs. Recently submitted work by our group suggests that delays in ambulatory-based follow-up for renal colic led to an additional \$200 million in annual healthcare costs due to potentially avoidable ED visits, again demonstrating the benefits of well-coordinated/timely outpatient follow-up.

These findings suggest that ensuring well-coordinated timely post-ED discharge care for renal colic patients will both improve the patient experience and decrease episode-related costs. **Patients receiving care for renal colic at UNC face several challenges to receiving timely post-acute care**, which can largely be attributed to "supply-side" constraints that prevent timely access to ambulatory urologic care. We seek to overcome this constraint by expanding urgent urologic care capacity and promoting appropriate triaging of patients to primary care providers.

7. What is the history of improvement or attempted improvement at UNC Health?

Patients seeking care at UNC EDs are not immune to previously identified inefficiencies in renal colic care. Unfortunately, there is currently no standardized treatment algorithm for patients presenting to UNC EDs with suspected renal colic, as has been successfully developed at other academic medical centers.³ Similarly, there is currently no formal process for coordinating outpatient follow-up between the ED and urology departments upon discharge from the ED, which in turn leads to both delays in care and patient attrition to outside health systems.

Building upon ongoing efforts by the UNC Department of Urology to improve care access to patients with acute urologic conditions (e.g. recently established weekly urgent urology

care clinic), this proposal seeks to improve the value of renal colic care provided to UNC patients through a series of PDSA cycles aiming to both optimize management in the ED and improve flows/transitions between the ED and subsequent ambulatory clinical and/or surgical encounters. Since its inception in November 2022, the urgent urologic care clinic has treated over 150 patients with acute care needs, ~60% of which have been related to newly diagnosed urinary stones. This clinic consists of 13 weekly clinic slots staffed by the urology faculty member on-call for that week. Access to the clinic is currently spearheaded by our practice manager and director of clinical operations, who determine appropriateness on a case-by-case basis. We hope to use insights gained from this proposal as a means to standardize/formalize the process by which requests are made to add patients to this clinic. Additionally, we hope that the results of this proposal will provide compelling data to support the expansion of this clinic’s capacity. While it is still too early to assess the impact of this clinic on renal colic workflows at UNC, we have observed a decrease in department-wide time-to-third new patient appointments from 50 to 40 days (45 to 35 for stone-related diagnoses) exclusive of virtual visits, although this is still well above our goal of 14 days. One piece of the proposed intervention, a urology e-consult tool, is currently active and successfully being used for other common urologic conditions, specifically hematuria.

The current proposal compliments previously funded innovation pilot awards through the UNC Center for Health Innovation that seek to address gaps in care following acute care encounters and aligns well with UNC’s Care Redesign efforts that aim to create clinical care pathways that reduce unwanted variation, improve patient outcomes, and make it easier for providers to deliver the desired care. One specific project that is currently underway is related to use of the HEART score by ED providers for patients presenting to the ED with chest pain. The goal is to improve appropriateness of cardiology follow-up referrals in order to increase timely access to cardiology specialty care. Fundamentally, the gap in care and the proposed solution/improvement effort is aligned with the issues faced in kidney stone care. If this proposal is funded, we will consult with the Care Redesign leaders and HEART project team to learn from them.

This work also compliments current efforts within the UNC Health Alliance to address and improve system-wide drivers of ED utilization for the approximately 200,000 members in our Value Care plans. Furthermore, the ED utilization workgroup has already developed several tools that will help this project team implement the current proposal, including an ED utilization key driver diagram, standardized chart audit tool, and Epic reporting tools such as workbench reports for recent ED discharges. Additionally, UNC Health Alliance has identified reducing leakage, or patients going out-of-network for health care, as a top priority for our Value Care populations. Increasing access to in-network (UNC or independent Health Alliance providers) outpatient specialty care and procedures is an extremely important piece of this overall work and the current proposal aligns perfectly with other initiatives in place.

8. Please complete the “Measures Table”.

| | |
|---|---|
| Primary Outcome Measure: Time to ambulatory follow-up (PCP for non-urgent cases and urology clinic for urgent cases) for patients being discharged from the ED for a diagnosis of renal colic. | |
| Secondary Outcome Measure: Rate of 30-day ED revisit after initial encounter | |
| Process Measures: | Balancing Measure: |
| Utilization rate of urology E-Consult feature | Rate of diagnostic imaging (e.g. CT abdomen and pelvis) utilization in ED and ED length of stay |
| Utilization rate of standardized discharge instructions + referral triage algorithm (high risk follow-up to urology vs. low risk follow-up to PCP) | |

9. What ideas do you have for changes that will result in improvement?

This project aims to improve post-acute care flows for patients being discharged from the ED with a diagnosis of renal colic through two specific interventions:

- 1) Develop and implement a standardized set of **language-specific (English and Spanish) discharge instructions** (to be uploaded into patients' after visit summary) for patients being discharged from the ED. This document will contain information on the natural history of urinary stones (e.g. rates of spontaneous passage), measures to be taken at home to help facilitate spontaneous stone passage (e.g. copious fluid intake and use of alpha-blocker therapy), analgesic regimens to be utilized during the trial of passage, and signs/symptoms to look for that would require urgent outpatient evaluation. Additionally, we will include contact information for both outpatient scheduling as well as triage lines.
 - a. Additionally, we will **validate a basic triage algorithm** that helps ED providers determine if the patient is appropriate for urology versus primary care provider follow-up (e.g. uncomplicated urinary stone <10 mm in diameter) as well as the timing of this follow-up (e.g. urgent follow-up for patients with concomitant infection/renal injury and/or high likelihood of requiring surgical intervention based on large stone size). This basic algorithm will initially be introduced through educational sessions sponsored by the Department of Urology and be included in a standardized dot phrase that includes embedded smart text to facilitate data collection/subsequent validation. Should post-implementation analyses reveal a clinical benefit associated with this algorithm, we will subsequently work with UNC's embedded EPIC team to develop an embedded workspace pop-up **after the project support period**.
 - b. In recognition that it may be difficult to integrate new algorithms/discharge instructions into ED providers workflow, we will be conducting weekly huddles to audit ED discharge charts in real time and ensure that appropriate follow-up is being scheduled through the ED. If we are seeing low implementation of discharge instruction / follow-up algorithm in the ED, we will conduct telephone and/or MyChart outreach to high-risk individuals and coordinate timely access to the urgent care urology clinic directly with the patients.
- 2) Develop and validate a **new process map** for post-ED discharge care flows for renal colic patients (see Figure 2). Care-coordination efforts surrounding the treatment of renal colic to date have largely focused on timely access to specialist care.¹² However, outside of major urban centers significant per-capita urologist shortages exist. Furthermore, many first-time stone formers have never seen a urologist, making timely outpatient urology access difficult. **It is conceivable that a significant number of uncomplicated renal colic episodes could be effectively managed in the primary care setting**, which in turn may help to address outpatient access issues, especially among the socioeconomically disadvantaged who often face disproportionately high barriers to specialist care. Work previously conducted by our group utilizing both all-payer claims data and primary hospital data shows that both delays in care as well as fragmentation of care for renal colic patients being discharged from the ED leads to both higher costs and worse perioperative outcomes.^{2,13} With these insights in mind, we have developed the below process map that seeks to standardize post-ED discharge care pathways.
 - a. Additionally, we seek to overcome delays in care posed by limited outpatient urology availability through an innovative partnership with the Department of Internal Medicine that leverages the use of a previously developed **Urology e-consult** order that will include embedded educational material that helps familiarize the requesting provider with treatment algorithms for uncomplicated renal colic. This e-consult tool will also be available to primary care providers who are seeing a patient in clinic with suspected renal colic (e.g flank pain with hematuria) but for which no official diagnosis has yet been made. Should modification of the e-consult tool prove difficult (e.g. inability to incorporate text into the order prompt itself), we will establish a standardized dot phrase that will be included in every e-consult response. We have had initial discussions with Amy Shaheen (VP of Practice Quality and

Innovation and UNCHA and a PCP at UNC IM Eastowne) about partnering with UNC IM Eastowne to pilot the use of the e-consult tool.

- 3) Utilize the recently established UNC urgent urology care clinic to expedite evaluation of patients inappropriate for e-consult and/or who are deemed high-risk for ED revisit/readmission or meet criteria for urgent procedural intervention.

Collectively, these interventions will improve access to timely and evidence-based post-acute care evaluation and management services following a new renal colic diagnosis, thereby **reducing rates of potentially avoidable ED visits and/or readmissions** (e.g. AHRQ Prevention Quality Indicators) while simultaneously **reducing care fragmentation** by retaining patients within the same parent health system/provider group.^{14,15,16}

10. How has this problem been addressed successfully elsewhere?

Extensive research has shown that oftentimes, less than 10% of patients presenting to the ED for renal colic require hospitalization. Recently submitted research by our group, utilizing secondary all-payer claims data suggests that ~30% of all ED visits for renal colic are potentially avoidable and generate over \$300 million in direct health costs annually. Unfortunately, current efforts to mitigate the financial impact of these potentially unnecessary visits have been largely descriptive and focus on identifying predictors of potentially avoidable higher acuity care.¹⁷

To successfully implement our intervention at UNC, review of existing literature points to necessary improvements in 1: improving/standardizing care in the ED and 2: standardizing follow-up. It appears that most published interventions have focused on the former. At the University of Washington, new pathways were implemented to help with both stone diagnosis and stone discharge. This intervention ultimately showed increased utilization of appropriate low-appropriate imaging, increase in non-narcotic pain medication at time of discharge, and no further increase in re-presentations to ED.³ Other similar findings have been reported in pediatric kidney stone populations, showing that clinical pathways are the only factor associated with changing ED workflows.¹⁸ It appears that the biggest challenges that face work on the ED phase of our intervention will be buy-in and utilization by our ED partners. It is easy to conclude that high utilization of our proposed UNC pathway will yield even more robust results compared to the improvement seen at other hospital systems.

Regarding standardizing follow-up and outpatient treatment, little has been published to showcase successful models of post-ED discharge care coordination. Pediatric literature suggests that clinical pathways implemented at tertiary care centers help reduce post-ED visit high dose CT scans.¹⁹ In non-urology related fields, health policy research shows the utility of provider teams, with far superior outcomes compared to solo providers when caring for groups of patients.²⁰ Our project specifically focuses on provider care teams and timely interdisciplinary collaboration, promoting access to a wide range of healthcare providers to enhance patient care both during initial presentation and follow-up.

11. How will high performance management tools be used to support the work?

During project implementation, the project team plans to utilize weekly virtual huddles to review recent ED renal colic encounters and e-consults for renal colic from primary care providers. We also plan to utilize asynchronous team/communication tools such as Microsoft Teams, specifically the group chat function, to do troubleshooting and/or other asynchronous communication during project planning and implementation. These weekly huddles will also allow us to audit charts in real time and ensure that appropriate follow-up is being scheduled through the ED and if not identify barriers to implementation while simultaneously reaching out to high-risk individuals and coordinate timely access to the urgent care urology clinic. We will also use these meetings to identify, in real time, barriers to project implementation and develop timely solutions to these

issues. For example, we may integrate a visual management board into the ED identifying renal colic patients as being on a care “pathway,” thereby improving protocol adherence.

12. Please describe how your project addresses the Quintuple Aim.

Our project will directly address each component of the Quintuple Aim. Patient health and experience will be enhanced by standardizing post-ED discharge care flows and medication prescribing, which in turn will lead to decreased variation in both the quality and timing of subsequent ambulatory follow-up, both of which have been shown by this group to improve perioperative outcomes and costs. The use of standardized language-specific discharge instructions will also help reduce previously documented disparities in care experienced by non-English speaking patients and will also improve provider experience by removing obstacles to timely and safe ED discharge posed by language barriers and potential confusion around appropriate prescribing. Integration of the previously developed urology e-consult function into the proposal will improve timely access to guideline driven care for patients while simultaneously reducing the knowledge burden placed on non-urology providers who have less experience managing renal colic. Collectively, these interventions will lead to lower episode-specific costs by 1) reducing delays in post-discharge follow-up care, which in turn will reduce potentially avoidable ED revisits, 2) improve ED workflows that lead to shorter ED lengths of stay, and 3) reducing care fragmentation both within and between health systems.

13. Please describe the support and engagement you have from leadership.

We believe that one of the strengths of our proposal is the significant buy-in from service line leaders within the Departments of Urology, Emergency Medicine, and Internal Medicine, as well as leadership from the Health Alliance. **Dr. Matt Nielsen** (urology) has been intimately involved with the development of this proposal and has a vested interest in its timely implementation. Under his leadership the Department implemented the urgent urology care clinic and urology e-consult order set, both of which seek to improve timely access to high-value urologic care at UNC. **Dr. Charul Haugan** (Medical Director of Clinical Optimization at UNC Health) and **Dr. Abhi Mehrotra** (Vice-Chair, Strategic Initiatives & Operations; Assistant Medical Director, Emergency Department - Chapel Hill; Medical Director, Emergency Department – Hillsborough) have also been supportive of the proposal, which was presented at the ED operations meeting in the Spring of 2022. The proposal was well received, and it was suggested that it initially be implemented within the Hillsborough ED followed by broader system uptake. In addition to offering basic data collation support, the ED leadership team will work to identify frontline site leads to help with project implementation and execution if the proposal is accepted. **Dr. Amy Shaheen** has also been actively involved in the development of this proposal, particularly as it pertains to improving workflows between the Department of Internal Medicine and Urology (e.g. e-consult pathway). Through her role as Vice President of Practice Quality & Innovation at the UNC Health Alliance she has offered to support the project with both data analytics and workflow design expertise.

14. Who will comprise the project team?

- **Dr. David Friedlander, MD MPH** is an associate professor of urology and will serve as the project lead. He has recently completed the High Value Practice Academic Alliance’s Value Innovation Teaching and Leadership (VITAL) Program and worked on several quality improvement projects during his residency and fellowship training. He also has basic training in Lean Six Sigma through his MPH year. He will also draw from his experience as the current American Urological Association Science and Quality fellow, where he is currently actively involved in quality measurement design and validation initiatives.
- **Dr. Jamie Jarmul, MD PhD** a physician leader and manager of advanced analytics projects for the UNC Health Alliance. Dr. Jarmul is a co-lead for one of the UNCHA strategic committees related to ED utilization (UNCHA PPSE ED Utilization Workgroup) and is involved in many

improvement efforts within the HA to reduce ED utilization. She has expressed support for this proposal, given that it aligns with the priorities of the ED utilization workgroup, and has offered to assist with tools related to measuring and tracking improvement efforts for reducing ED utilization. These tools include Epic workbench reporting tools, chart audit tools and other operational data definitions for relevant process and outcome measures within the health care system. She will serve on the project team as a consultant/stakeholder for the Health Alliance ED Utilization workgroup and analytics/ambulatory population health subject matter expert.

- Drs. Friedlander, Jarmul and the Department of Urology endourology fellow will serve as the core project team and will meet weekly either in person or via zoom, as well as use enterprise communication tools such as Microsoft Teams for daily communication. Drs. Jarmul and Friedlander already meet regularly and have worked closely on the current proposal, including data acquisition/interpretation. Dr. Friedlander will serve as the day-to-day point of contact for the entire team and regularly interact with the Improvement Scholars project coordinator.
- Dr. Matthew Nielsen, MD MS will serve as both the program sponsor and supervisor. Dr. Nielsen has extensive experience in quality improvement efforts across multiple institutions and previously served as an associate director at the UNC IHQI. Drs. Nielsen and Friedlander already meet monthly regarding ongoing research and departmental quality improvement efforts and will increase the frequency of these meetings during phase two of the proposal to determine the impact of the intervention on acute urology clinic and e-consult capacity/throughput.
- Dr. Charul Haugan, MD, FACEP and Abhi Mehrotra, MD, MBA will serve as ancillary members of the team given their prominent roles within Emergency Department strategic operations. As Medical Director of Clinical Optimization, Dr. Haugan has access to a wide array of data reporting tools that will help with real-time monitoring of adherence to our ED intervention as well as regularly identifying our cohort of eligible patients, whereas Dr. Mehrotra will provide guidance on intervention scaling across clinical sites.
- Dr. Amy Shaheen, MD MS is the Vice President of Practice Quality and Innovation for the UNC Health Alliance and in this capacity leads the team that helps providers, clinics, and staff transform care delivery to Value. She will serve as a consultant/stakeholder for primary care on the project team during development and implementation of the improvement interventions. Her team will provide guidance on analytics and reporting and will help iterate our proposed care redesign workflow for post-ED discharge care.

15. How will you ensure sufficient time to dedicate to the project over the scholar year?

Dr. Friedlander currently has 50% protected research time as a result of ongoing grant support for projects that directly align with the current proposal. He will carve out a portion of this time (a minimum of 2 hours per week) to devote to the current proposal. Additionally, he has the full support of his chair Dr. Matt Nielsen (as evidenced by the accompanying support letter) to carry-out the proposal, who has indicated that clinical schedule adjustments can be made as needed.

16. What factors do you anticipate will foster and hinder improvement?

We feel that the proposal's strong interdisciplinary leadership team with a proven track record in quality improvement efforts greatly enhances our chances of eliciting sustained system-level change through our proposal. Additionally, we feel that established/validated work within the field³ will serve as a powerful springboard for project implementation. Nevertheless, competing demands across the three departments involved in this proposal may serve as a barrier to project success. However, the lead project team is deeply committed to improving the quality of care delivered to renal colic patients and will leverage both cultural and structural (e.g. urgent urology care clinic and increasing number of stone providers) to help mitigate the impact of these barriers.

17. What ideas do you have for sustaining the improvement? How do you see the work you start with IHQI's support continuing?

Central to the long-term success and sustainability of our intervention is the fact that the US healthcare system continues to transition away from a traditional fee-for-service reimbursement model to one focused on value-based care. Critical to the success of this transition will be the integration of specialty services into larger alternative payment arrangements. Our hope is that the proposed intervention will dramatically improve the value of care delivered to patients receiving care at UNC for renal colic and that the proposed treatment algorithm could eventually be developed into an EPIC-embedded point-of-care decision aid (which my research group is currently working to validate). Even if our treatment algorithm is not ultimately embedded within EPIC, we plan to hold quarterly versus semi-annual educational conferences with ED providers to remind them of the standardized discharge instructions (which can be easily entered into the AVS through a department-wide dot phrase) and basic triage algorithm that will also be supported through smart text embedded dot phrases. Similarly, the Department of Urology plans to maintain the urgent urology care clinic for the foreseeable future, which we hope will serve as an operational hub for both this proposal and future projects concerned with the value of post-acute care provided to patients with an underlying urological diagnosis. Ultimately, we believe that this proposal will serve as a “proof-of-concept” for specialty integration into broader systemwide value-based arrangements at UNC that has the effect of improving interdisciplinary collaboration and quality of care.

We plan to use the findings of this proposal to eventually justify funding (e.g. Clinical Investment Fund) for a dedicated post-ED discharge triage nurse and/or digital/automated patient management resource (e.g. automated texts with symptom prompts) who would follow-up with all patients being discharged from the ED with a diagnosis of renal colic. This individual/software would be responsible for assessing symptom control and determine if more expedited outpatient evaluation is warranted.

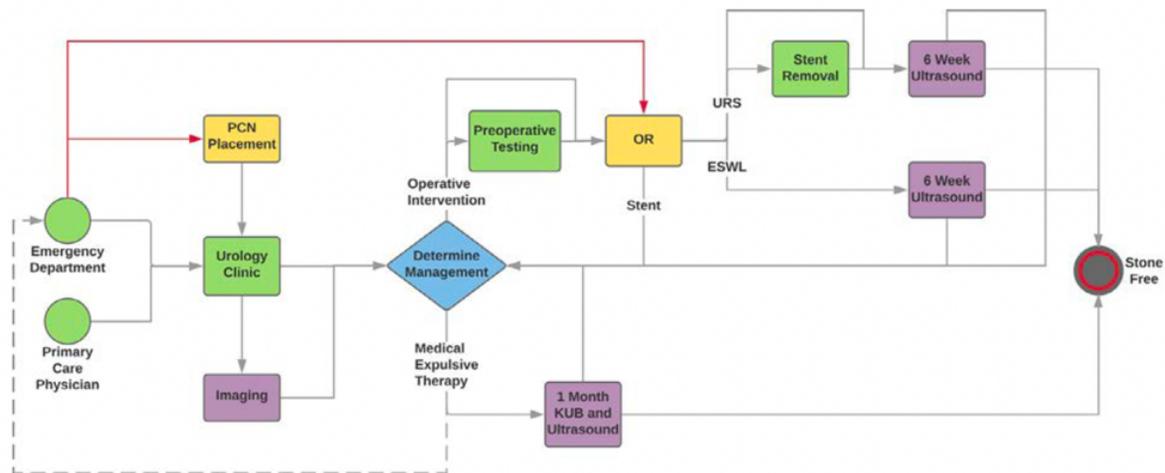
18. Implementation Timeline

| Task | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | July | Aug |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
| Finalize proposed process map | x | | | | | | | | | | | |
| Finalize standardized ED discharge instructions | x | | | | | | | | | | | |
| Finalize ED discharge dot phrase containing triage algorithm | x | | | | | | | | | | | |
| Educational sessions at HBH and main EDs regarding project roll out | | x | | | | | | | | | | |
| Formalize process of post-ED discharge PCP vs. Urology referral | | x | | | | | | | | | | |
| Perform patient surveys regarding ease of discharge instructions and referral process | | | x | x | x | x | x | x | x | x | x | x |
| Review effectiveness of standardized d/c | | | x | x | x | | | x | x | | | |

| | | | | | | | | | | | | |
|--|--|---|--|---|---|---|---|---|---|--|---|---|
| instructions and referral algorithm (PDSA) | | | | | | | | | | | | |
| Educational session with Department of Medicine regarding post-ED care flows and e-consult utility | | X | | | | | X | | | | | |
| Review effectiveness/appropriateness of e-consult utility/ educational materials (PDSA) | | | | X | X | X | | X | X | | X | |
| Review urology e-consult and urgent care clinic capacity constraints (PDSA) | | | | X | X | X | | X | X | | X | |
| Present to IHQI | | | | | | | | | | | | X |

Appendix

Figure 1. Current state of fragmented care flows following ED discharge for renal colic



PCN: percutaneous nephrostomy tube, OR: operating room, KUB: kidney, ureters, bladder plain film

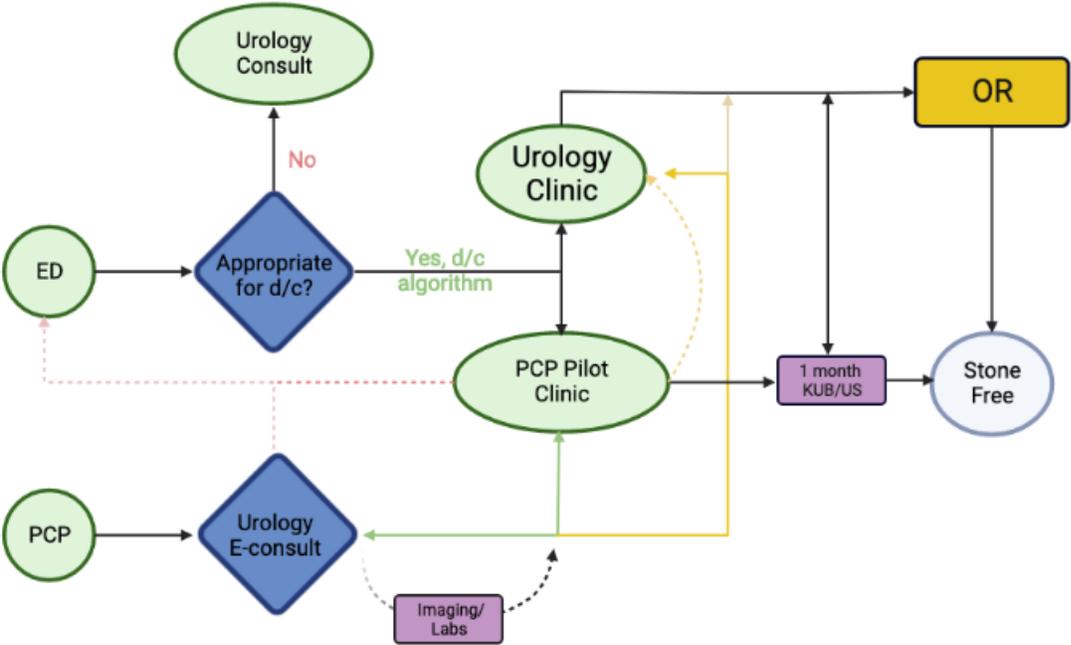
Table 1. Nationally representative charges^a for treatment of urinary tract stones by site of service

| | 2002 | | 2003 | | 2004 | | 2005 | | 2006 | |
|---------------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|------------------|---------|
| | Charges | Percent | Charges | Percent | Charges | Percent | Charges | Percent | Charges | Percent |
| Total | \$7,475,084,781 | 100% | \$8,095,566,784 | 100% | \$9,391,542,719 | 100% | \$9,560,942,896 | 100% | \$10,312,491,612 | 100% |
| Site of Service | | | | | | | | | | |
| Inpatient | \$3,512,357,740 | 47.0% | \$3,866,759,108 | 47.8% | \$4,716,972,285 | 50.2% | \$5,126,615,955 | 53.6% | \$5,529,565,189 | 53.6% |
| Hospital Outpatient | \$197,332,733 | 2.6% | \$243,410,909 | 3.0% | \$434,304,532 | 4.6% | \$164,949,881 | 1.7% | \$386,695,285 | 3.7% |
| Ambulatory Surgery | \$3,488,642,437 | 46.7% | \$3,528,743,343 | 43.6% | \$3,625,673,640 | 38.6% | \$3,718,361,442 | 38.9% | \$4,036,479,078 | 39.1% |
| Physician Office | \$93,990,872 | 1.3% | \$146,695,186 | 1.8% | \$273,051,811 | 2.9% | \$194,363,644 | 2.0% | \$130,193,542 | 1.3% |
| Emergency Room | \$182,760,998 | 2.4% | \$309,958,238 | 3.8% | \$341,540,451 | 3.6% | \$356,651,974 | 3.7% | \$229,558,519 | 2.2% |

^aDoes not include medication related costs.

SOURCE: Healthcare Cost and Utilization Project, National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, i3 Claims Database; 2002-2006.

Figure 2. Proposed process map for post-ED discharge



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