

**Report:**

**Dedicated Acute Stone Service for Patients with Recent Hospital Admission with Renal**

**Colic:**

**A 2 year review of a Personalized Enhanced Care Pathway**

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## **Introduction**

The incidence and prevalence of stone disease is rising globally (1). Ureteral colic is one of the most common emergency urologic presentations in the UK resulting in an estimated 6000 patients a year being admitted to hospital (2).

Patients with acute pain or obstruction from urinary stones require urgent and enhanced care. These patients are at a higher risk of obstruction, acute kidney injury and sepsis.

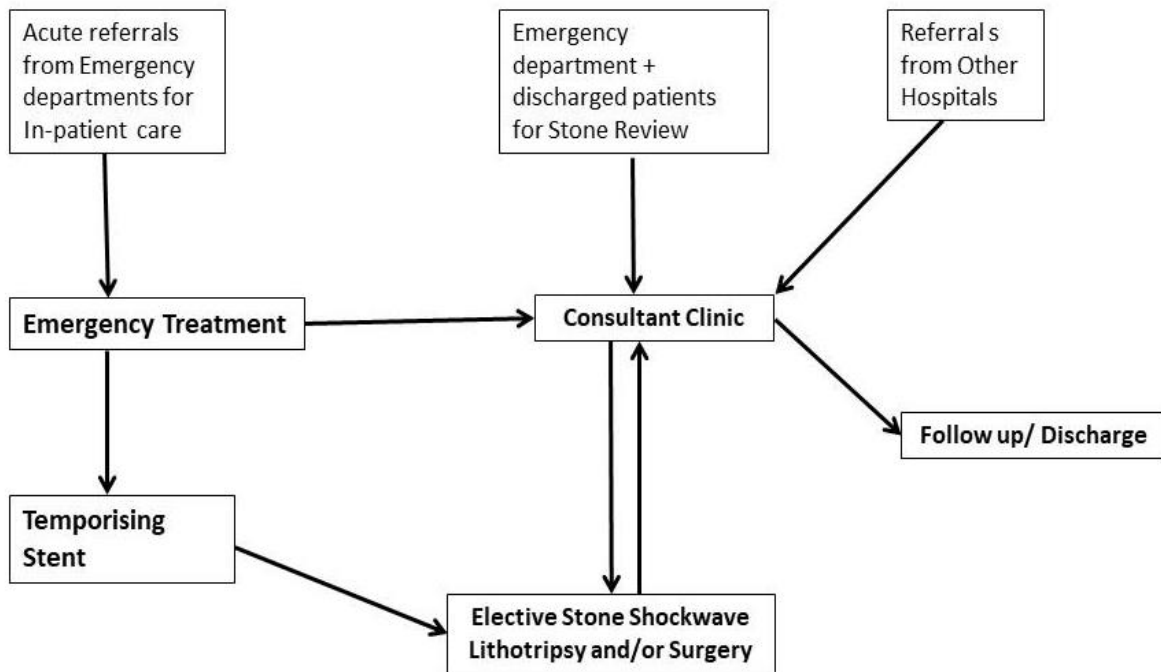
Most patients are treated symptomatically in the emergency departments(ED) and referred to the stone clinic. Yellappa et al. reported a 64% spontaneous ureteric stone passage with an average time to stone expulsion of 17 days (range 6-29days) (3).

Approximately 90% of stones less than 5mm pass within 4 weeks, conversely up to 95% of stones more than 8mm can become impacted, requiring intervention (3). If pain is ongoing and not tolerated or the stone is unlikely to pass, the NICE guidelines recommend that patients with ureteric stones should have surgical treatment (ESWL or ureteroscopy) within 48 hours of diagnosis or readmission (4). Evidence shows the benefit of early intervention in avoiding repeated or ancillary procedures, and stent insertion (5).

In patients who have been deemed to not require emergency treatment (stable kidney function, no sepsis and well controlled pain); a referral to a specialist stone service is enabled by the emergency department. However, there is often a significant delay in enabling this definitive review. In the United Kingdom's National Health Service, it is often because demand outstrips capacity. This is typically multifactorial with a lack of specialist doctors/urologists, imaging access and clinic space. Therefore there is the risk of repeated

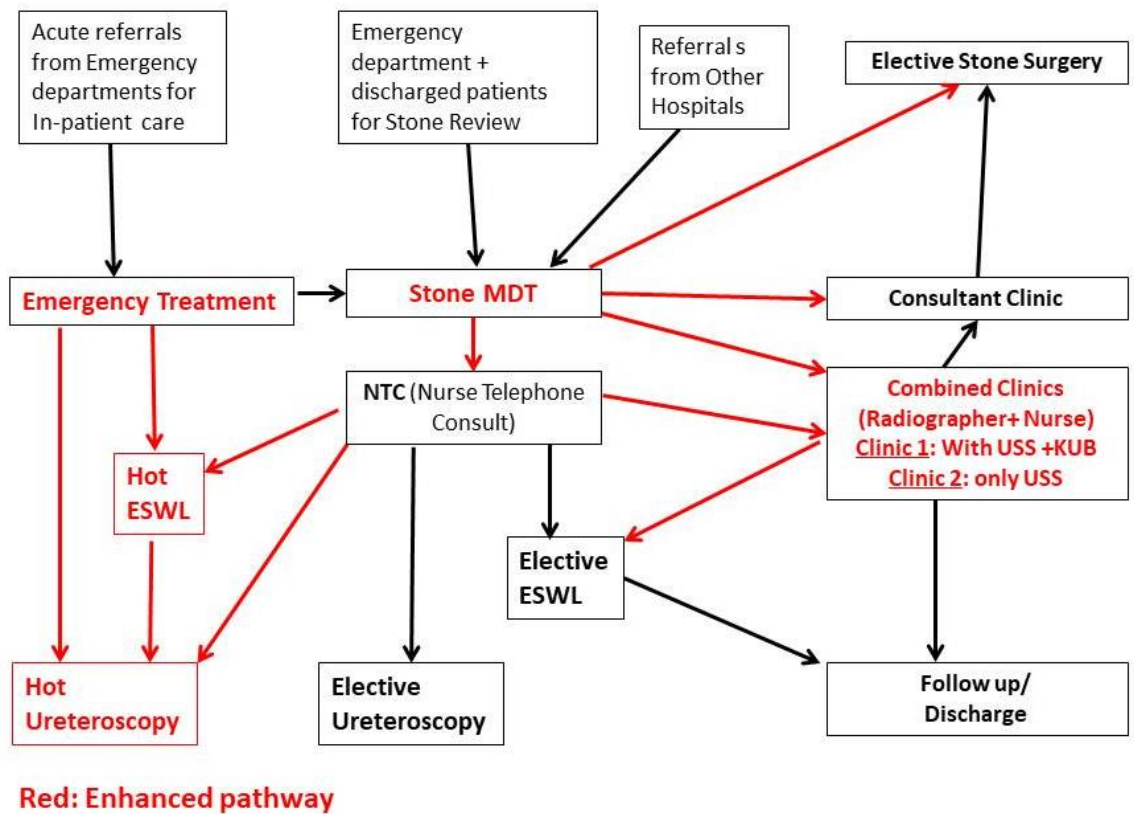
patient attendances to ED, auxiliary procedures such as stent insertion or nephrostomy and associated morbidity and reduced quality of life. The patient care pathway before the introduction of the Acute Stone Service clinic (ASSc) is explained in Figure 1.

**Figure 1: Initial (pre-ASSc) Stone Patient Care Pathway**



ASSc was envisaged taking into account medical workforce shortages facing an increasing demand on services with a 15% year on year increase in patient numbers across specialities (6). This care pathway was formulated to offer these patients an enhanced care pathway, with a 'hub and spoke model'—the hub being the Stone multi-disciplinary team meeting (sMDT). The sMDT consists of urologists, radiographers, nurses and administrators who formulate each patient's personalised care plan. Subsequent service delivery is enabled by specialist nurse practitioners (SNP) and diagnostic radiographers after a period of training and supervised care delivery (Figure 2).

**Figure 2: Acute Stone Service Patient Care Pathway**



These clinic bench points also had finite time limits to see patients by, so as to minimise delays, enabling structured time-limited patient management. Enabling targeted time for each care point intended to reduce morbidity and improve service delivery in patients with acute stones; including improved quality of life through understanding their disease early on (shared care); enhancing care for a sub-set of patients who were clinically or symptomatically struggling and minimising risk of auxiliary procedures, sepsis, and kidney disease.

ASSc aims to identify patients who are at risk of obstructive kidney damage and provide accelerated treatment, reduce the risk of renal failure and sepsis and reduce delays and A&E visits. This review reports on the benefit of a sMDT-driven ASSc in providing an accelerated care pathway with a consultant-directed (through sMDT) acute stone service.

## **Patients and Methods:**

### **Study Design**

ASSc pathway starts with the review of referrals at the sMDT, received from the Emergency Departments (EDs) for two major hospitals. Both referring EDs have a referral protocol requiring a non-contrast CT-diagnosed stone, an X-ray KUB (ureteric stone radio-visibility) & urinalysis results.

sMDT is a weekly discussion meeting with stone service urologists, radiographers, specialist nurses and administration staff. Support from diagnostic radiologists, interventional radiologists, metabolic physicians and dieticians were available. sMDT review enables pathway decision (Figure 2). A nurse telephone consultation (NTC) is enabled in the first instance to evaluate symptoms, adequacy of pain relief and to map out their personalised stone management care pathway. Patients requiring urgent treatment are expedited. Subsequent Combined Review Clinic with a nurse and diagnostic radiographer enabled review within 4-6 weeks. At every index point of patient contact there is an opportunity to enhance care.

Patients deemed not to require enhanced care were referred through to consultant clinics. In the first six months, two specialist nurses underwent training and started the 'at 6 week' combined SNP & renal sonography clinic for patients with ureteric radiolucent stones. Here, patients were evaluated for symptom improvement and stone passage – clear urine, resolution of hydronephrosis (if present previously) and improved renal function (if deranged before). CT review was considered if any of the above factors were unfavourable.

## **Data Collation**

Data was obtained over a two year period ending June 2020. All patients referred to the sMDT, mainly from the EDs of the two regional hospitals as well as tertiary referrals were included. Parameters reviewed include the time interval to first clinician contact, time taken for patients to be seen, and treatment initiated.

All patients underwent imaging studies; CT, renal ultrasound and abdominal X-ray to identify urolithiasis. Data was collected on demographic characteristics (age and gender), laboratory tests (urinalysis, creatinine, eGFR, baseline eGFR, haemoglobin, calcium, and uric acid), imaging (dates and results), dates of consultations and actions following.

## **Ethics**

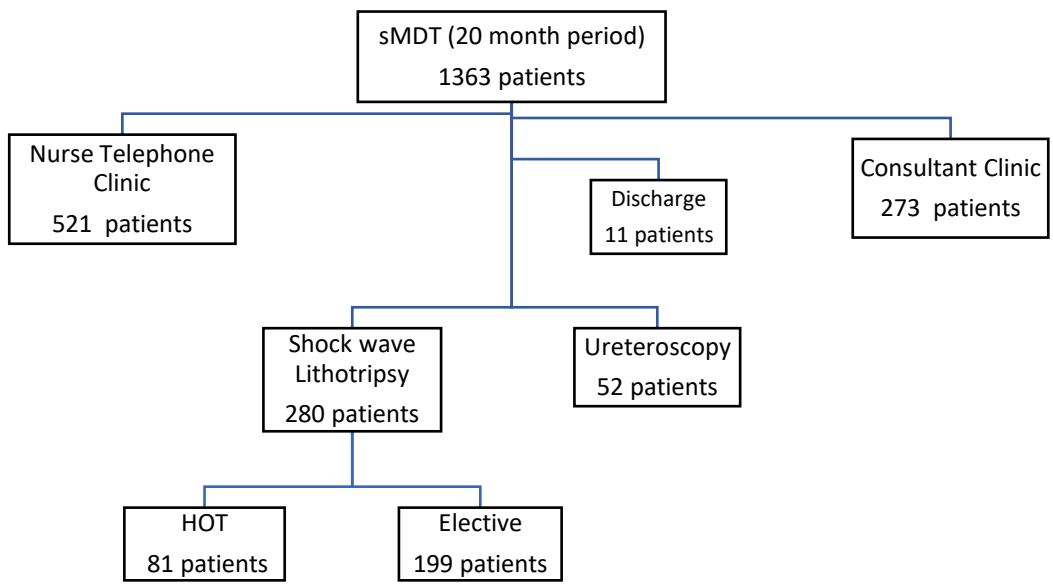
This study was registered as Clinical Quality improvement project and an Ethics approval submission was not deemed necessary.

## **Results**

Over a two year period ending June 2020, 1363 patients were referred to the Stone MDT. Mean age was 48 years (range 16-92); with males slightly older (48.9yrs cf. 47.5years); and a male to female ratio of 2.2:1. Average time to the nurse telephone clinic was 5.2 days (93%), with only 36 patients contacted later due to their unavailability. Average interval from sMDT to the ASSc combined clinic (scheduled to be within 6 weeks) was 5.6 weeks. 104 patients were seen by 8 weeks and only 15 were reviewed later than 8 weeks; all due to patient logistics.

From the sMDT; 52% of patients were deemed suitable for conservative management with 93% of these patients having a specialist nurse telephone consultation within 5 days. Over a fifth of patients discussed were directly scheduled for shock wave lithotripsy with almost a third requiring urgent treatment. sMDT decision map reports on this (Figure 3).

**Figure 3: Stone Multi-Disciplinary Meeting Decision Map**



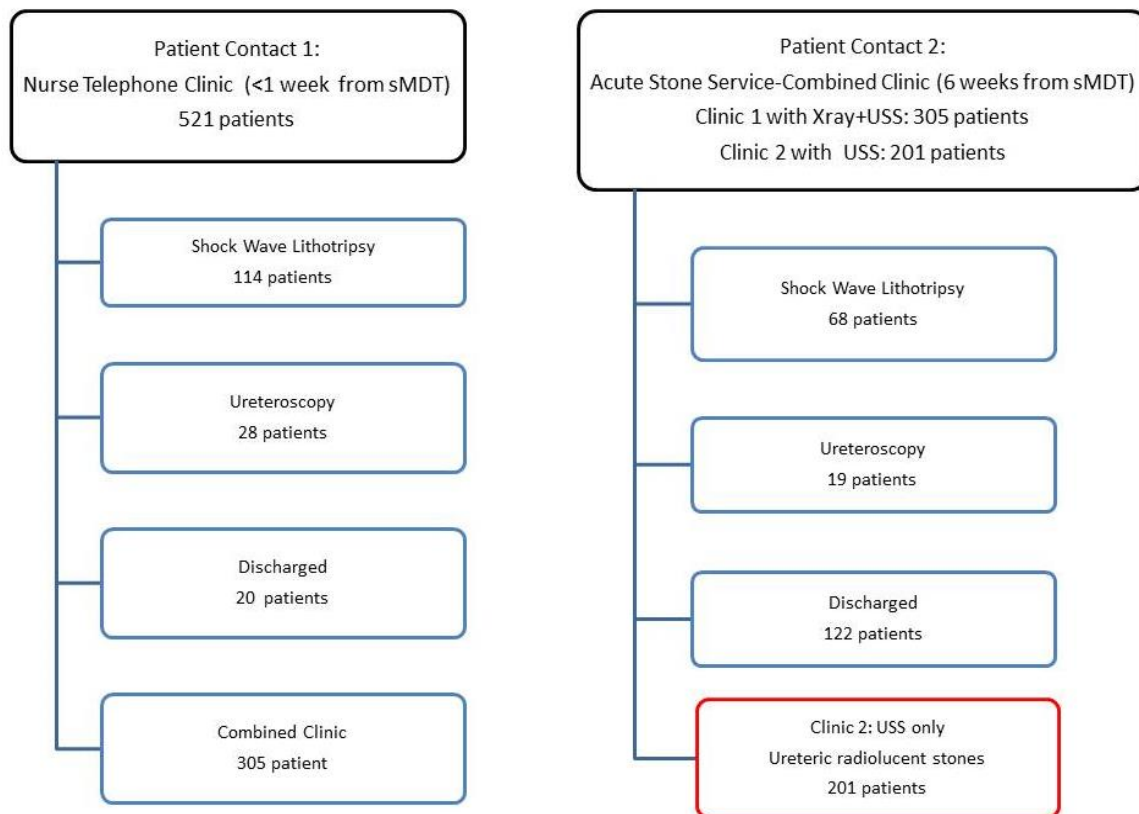
521 patients had a telephonic consultation with the SNP and a definite treatment plan for a further 142 patients. 20 patients were discharged. 305 patients were referred on to the 6-week combined clinic. Two thirds of these patients were seen within 6 weeks. A further 87 patients were scheduled for treatment with almost half the patients subsequently discharged.



From the sMDT, only 474 of patients were referred for direct consultant/specialist review; for complex renal stones, passage of stone during admission, bladder stones, or for radiolucent ureteric stones. Of these patients, the SNP & diagnostic radiographers reviewed almost half of these patients with radiolucent ureteric stones. Only 20% of the patients required a routine consultant review.

Overall, 462 patients were scheduled for shockwave lithotripsy with almost half of these requiring urgent slots. 99 patients were listed for ureteroscopy. 153 patients were discharged from the service within 6 weeks of referral (Figure 4).

**Figure 4: Patient Contact Clinics Outcome**



84% of the patients did not need a direct Urologist's clinic visit. The patients were deemed to have completed their ASSc pathway once treatment was enabled for the acute stone. Subsequent follow-up aimed at interval review in a Stone Consultant routine clinic was needed only for 150 patients, with a further 13 patients scheduled by the specialist nurses for a follow up CT scan.

## **Discussion**

Telemedicine and virtual clinics (VC) are promoted as part of the United Kingdom National Health Service Long Term Plan (7). Advancements have been made in telemedicine notably in the fields of orthopaedics, renal medicine, ophthalmology, dermatology and primary care (8-10). A virtual fracture clinic showed statistically significant reductions in patients seen face-to-face (F2F), number of non-attendances to first F2F appointment, and days to first clinic review, demonstrating an increase in patients seen within 72 hours and significant cost-savings (8).

Uptake of telehealth as a method of triage and delivery of care is particularly significant now, in reducing physical contact during the COVID-19 pandemic. Relative to the rapid advancements in technology, the use of VC has been slow and fragmented (11, 12). Many barriers to adapting VCs include funding, limited training and clinician perceptions on effectiveness and safety (11, 12). Growing inclusion of telehealth in undergraduate medical training curricula should increase readiness and trust in telehealth as a part of everyday practice. A systematic review on tele-urology evidenced that, encouragingly,

patients and staff find VCs an acceptable alternative to FTF appointments (13). Far from being concerned, patients welcomed the offer for VCs as safe, thorough and professional (13). The Getting It Right First Time (GIRFT) urology report has emphasised the need to improve secondary care pathways for patients with urinary tract stones and mentions the adoption of stone VC run by specialist nurses (2).

The current climate of Covid-19 marks a watershed in medical practice as has led to rapid adoption of VC as normal practice, particularly in Urology, where recent evidence supports that some routine clinic activity could be replaced by telemedicine (13-14). Safir et al. comparing teleurology to conventional F2F visits for haematuria consultations, demonstrated improved access and patient compliance; with greater patient satisfaction in all domains and reduced time to access (from 72 days to 12 days) (15). Others have reported high (>90%) satisfaction rates, reduction in FTF visits, monetary savings within the first year, carbon-footprint reduction and found to be dependable for reviewing investigation results (16-17).

This study reports similar benefits with a particular emphasis on the expediting personalised stone management, prevention of complications from delay in treatment and reduction in pain.

### **Dedicated New Service for Acute Stone Patients (mainly ureteric stones):**

Our service development builds a new and unique care pathway for acute stone patients; 69% of whom had ureteric stones. This dedicated service with care delivered by specialised nurses and diagnostic radiographers has enabled timely care, with personalised enhancement for patients based on the trifecta of pain control, sepsis risk, and renal function compromise. This service has significantly reduced the delay to treatment delivery reducing risk of sepsis, kidney insufficiency, patient morbidity and auxiliary procedures; thereby improving on historical norms. This required a virtual review of, on average, 15 patients per week: only 12 of which required VC appointment or F2F. This in turn required only a four-person (2 specialist nurse & 2 diagnostic radiographers) clinic per week which proved to be a financially profitable service for the hospital.

### **Role of nurses and radiographers in Stone Clinics**

Nurse-led follow-up clinics, already established in the fields of cardiology and oncology, have shown to be cost-effective with similar quality of care outcomes. Across the UK, nurse-led urology telephone clinics have been implemented for post-operative follow-up, triage for acute cystitis and urogynaecology follow-up (18-22).

Stone nurse practitioners conducted telephone consultations, assessing symptoms and evaluating the need for enhanced care, with the intention of reducing unnecessary readmission to ED. Patients were better counselled on outcomes and lifestyle modifications, allowing for swifter access to treatment for higher risk patients. Our study is the first to report on stone patients undergoing diagnostic combined review with SNP and

diagnostic radiographers, enabling imaging and clinical review at 6 weeks post-event; especially for ureteric stones. Others have reported on nurse-led VC follow-up for asymptomatic stone surveillance in high-risk groups and were well-received by patients, reduced 'did not attend' (23), and reduced overall clinic costs by a third (24). However, 18% returned for FTF consultation due to recurrence of stone or symptoms (24).

### **Comparison of our study with other VCs**

Only two studies have been published on the outcomes of an acute virtual stone clinic. Smith et al. reviewed 526 acute renal colic patients, triaged within one week by a consultant-led MDT including the stone registrar, shock wave lithotripsy radiographer and stone nurse, compared to a six month delay to review prior (25). Quarter of the patients were discharged following the VC review without any further clinical investigations, two thirds were discharged after a second VC review and subsequent investigations and waiting lists were reduced by over 50%. No adverse events were reported as a result of the intervention. Connor and colleagues reviewed a larger cohort of 1008 colic patients and demonstrated that a specialist-led (specialist nurse or consultant) acute ureteric colic VC provided clinical, fiscal and environmental benefits (17). Following the VC, 16% were discharged, 18% required a second VC, 48% required a F2F clinic and 17% required stone intervention. The clinic significantly reduced time to treatment decision from a median of 28 days to 2 days. A secondary outcome was the environmental impact with a reduction in >9000 patient journey miles, suggesting that this could be doubled in a rural setting.

Both studies reported a significant reduction in clinic appointments; a VC cost of £24 and £29 per patient compared with £173 per new patient for a FTF clinic. Both studies were limited by a lack of formally evaluated patient feedback (17, 25). Perceived limitations of the VC are technical difficulties and a less empathetic consultation due to the lack of F2F interaction.

### **Limitations of our study**

Only fifteen patients reported re-attending the ED or the primary care services between time of referral and treatment. However, we could not independently verify the numbers due to inability to access the ED IT services which were different to the rest of the hospital. It has therefore limited the ability to assess the effect on patient morbidity. We also did not have a formulated objective feedback service. It is important to note that of the 1006 patients who did not require direct contact with a urological surgeon during their whole ASSc treatment pathway, none requested or opined on the lack of a urologist F2F, suggesting confidence in the service and expertise of the SNP and diagnostic radiographer.

### **Future Implications**

This new service model for acute stone patients (mainly ureteric) can be enabled by adequately trained specialist nurses and diagnostic radiographers providing safe, urgent and graded service for this high-risk patient group, thereby preventing/reducing sepsis events, minimising renal injury and patient morbidity. The SNPs seem to have better discipline in ordering screening blood tests, better counselling and enabling dietary referral. This could become a model for a hub and spoke centralised service with all

treatment options available at the hub such as 'Hot'/Urgent shock wave lithotripsy, 'Hot'/primary ureteroscopy with patients reverting back to home units for non-urgent care. This should potentiate a better repertoire of treatment options for the acute stone patients but may require more miles on the clock for a small number of patients.

**Conclusion:**

Acute Stone Clinics reduced treatment delays, evaluating 93% patients within 2 weeks and treating 85% of patients in fewer than 6 weeks. Accelerated care in high-risk patients minimised risk of renal dysfunction, sepsis and reduced quality of life from on-going pain. All reported greater satisfaction from early nurse telephone consultation, understanding of their care pathway, titration of pain relief and treatment soon after index event.

This service is unique in being run by specialist nurses and diagnostic radiographers, enabling personalised enhancement of patient care at each clinical encounter. This combination service of virtual and combined clinician F2F clinics is a time-sensitive service with immediate discharge, F2F consultation or intervention. ASSc has been shown to improve the patient journey and minimise risk, therefore strengthens the case for increased integration of nurse & radiographer led stone clinics as safe and cost-effective alternatives to FTF urologist clinics, for both acute renal colic referrals and follow up.

## Reference

1. Raheem OA, Khandwala YS, Sur RL, Ghani KR, Denstedt JD. Burden of Urolithiasis: Trends in Prevalence, Treatments, and Costs. *Eur Urol Focus*. 2017; 3(1):18-26.
2. Harrison S. Getting it right first time: urology programme national specialty report. NHS Improvement, 2018.
3. Yallappa S, Amer T, Jones P, et al. Natural history of conservatively managed ureteral stones: analysis of 6600 patients. *Journal of Endourology*. 2018; 32(5):371-379.
4. National Institute for Health and Care Excellence (NICE). Renal and ureteric stones: Quality standard (QS195), 2020.  
Available at: <https://www.nice.org.uk/guidance/qs195/chapter/Quality-statement-3-Timing-of-surgical-treatment>. Accessed Oct. 2020
5. Renal and ureteric stones: assessment and management. Timing of surgery [NG118], Intervention Evidence Review, 2019.  
<https://www.nice.org.uk/guidance/ng118/evidence/g-timing-of-surgery-pdf-6653382740>. Accessed Oct. 2020
6. Trends in Upper Tract Stone Disease in England: Evidence from the Hospital Episodes Statistics Database. Rukin NJ, Siddiqui ZA, Chedgy ECP, Somani BK. *Urol Int* 2017;98: 391–396,
7. Department of Health. NHS Long Term Plan. NHS England; 2019 p. 25.
8. McKirdy A, Imbuldeniya AM. The clinical and cost effectiveness of a virtual fracture clinic service: An interrupted time series analysis and before-and-after comparison. *Bone & joint research*. 2017; 6(5):259-269.



9. Mark D, Fitzmaurice G, Haughey K, O'Donnell M, Harty J. Assessment of the quality of care and financial impact of a virtual renal clinic compared with the traditional outpatient service model. *International Journal of Clinical Practice*. 2011; 65(10):1100-1107.
10. Kotecha A, Bonstein K, Cable R, Cammack J, Clipston J, Foster P. Qualitative investigation of patients' experience of a glaucoma virtual clinic in a specialist ophthalmic hospital in London, UK. *BMJ Open*. 2015; 5(12):e009463.
11. Peddle K. Telehealth in context: Socio-technical barriers to telehealth use in Labrador, Canada. *Computer Supported Cooperative Work (CSCW)*. 2007; 16(6):595-614.
12. Smith AC, Gray LC. Telemedicine across the ages. *Med J Aust*. 2009; 190(1):15-9.
13. Connor MJ, Winkler M, Miah S. COVID-19 pandemic—is virtual urology clinic the answer to keeping the cancer pathway moving? *BJU Int*. 2020; 125(6): E3-4
14. Luciani LG, Mattevi D, Cai T, Giusti G, Proietti S, Malossini G. Teleurology in the time of COVID-19 pandemic: here to stay?. *Urology*. 2020; 140: 4-6.
15. Safir IJ, Zholudev V, Laganosky D, et al. Patient acceptance of teleurology via telephone vs face-to-face clinic visits for hematuria consultation at a Veterans Affairs Medical Center. *Urology practice*. 2018; 5(4):253-259.
16. Miah S, Dunford C, Edison M, et al. A prospective clinical, cost and environmental analysis of a clinician-led virtual urology clinic. *Ann R Coll Surg Engl*. 2019; 101(1):30-34.

17. Connor MJ, Miah S, Edison MA, et al. Clinical, fiscal and environmental benefits of a specialist-led virtual ureteric colic clinic: a prospective study. *BJU Int.* 2019; 124(6):1034-1039.
18. Leahy M, Krishnasamy M, Herschtal A, et al. Satisfaction with nurse-led telephone follow up for low to intermediate risk prostate cancer patients treated with radical radiotherapy. A comparative study. *Eur J Oncol Nurs.* 2013; 17: 162-169
19. Robertson AF, Windsor PM, Smith A. Evaluation of a nurse-led service for follow up of patients with prostate cancer. *Int J Urol Nurs.* 2013; 7(2):92-97.
20. Schauberger CW, Merkitich KW, Prell AM. Acute cystitis in women: experience with a telephone-based algorithm. *WMJ-MADISON-*. 2007; 106(6):326.
21. Schimpf MO, Fenner DE, Smith TM, Tucker J, Berger MB. Patient satisfaction with nurse-led telephone follow-up in an ambulatory setting. *Female pelvic medicine & reconstructive surgery.* 2016; 22(6):430.
22. Jeffery S, Doumouchtsis SK, Fynes M. Patient satisfaction with nurse-led telephone follow-up in women with lower urinary tract symptoms. *J Telemed Telecare.* 13(7):369–373.
23. Ferguson J, Aning J. Prostate cancer survivorship: a nurse-led service model. *Br J Nurs.* 2015; 24(18):S14–21
24. Hughes T, Pietropaolo A, Archer M, Davis T, Tear L, Somani BK. Lessons Learnt (Clinical Outcomes and Cost Savings) from Virtual Stone Clinic and Their Application in the Era Post-COVID-19: Prospective Outcomes over a 6-Year Period from a University Teaching Hospital. *J. Endourol.* 2020 (ahead of print).

25. Smith T, Blach O, Baker S, Newman L, Guest K, Symes A. Virtual stone clinic–the future of stone management? J Clin Urol. 2018; 11(5):361-367.