Kidney stones are formed and develop in nearly one in every ten Americans. Often, this results in severe pain and a trip to the emergency room, leading to missed work and high healthcare expenditures. The rate of kidney stone occurrences has risen in recent years, and as a result, the economic impact of kidney stones – direct treatment and indirect costs from lost worker productivity – has exceeded $5 billion annually. But the Yale Stone Team believes kidney stones can be a preventable disease.

“We believe failure of patients to prevent stones is not only due to a lack of implementation of standard hydration and diet recommendations, but rather a lack of education and identification of individualized risk factors for stones,” suggested Dr. Dinesh Singh, Assistant Professor, Urology and Director, Endourology and Laparoscopy. Dr. Singh and the other members of Yale's stone team deploy a collaborative and proactive approach to treatment. Urology, nephrology, and nutrition experts work together to help patients with treatment, teaching them how to manage their existing stones and providing strategies to reduce the risk of future kidney stone development. Once one stone has formed, odds increase to 50-50 that another will develop within the next ten years. Dr. Singh and his team are working to make that probability more favorable to the patient.

When patients arrive for their appointment, it is a “one-stop shop” according to Dr. Singh. They meet with physicians representing each aspect of the clinic team, receiving a unified, but unique message from each physician based on their specialty. The urologists, Drs. Dinesh Singh and Piruz Motamedenia, Assistant Professor of Urology, use innovative, low radiation imaging to identify stones and best decide what options are available for treatment. If surgery is needed, priority is placed on performing state-of-the-art procedures that are minimally invasive for the patient and offer the optimal outcome. Dr. Nirav Dahl, Associate Professor, Medicine (Nephrology), studies the genetics of patient stones and provides options for patients to managing their care with medicine in combination with diet. Nearly 25% of the genetic component to stones is familial, and when a patient has a first degree relative (parent, sibling, or child) with stones, their own risk increases significantly. Dr. Dahl uses a battery of tests from both urine and serum to identify the patient’s individual risk factors for stones and thus, can modify that patient’s risk for future stones. Amy Bragagnini, RD, Clinical Dietician, provides dietary recommendations based on the context of all medical issues present, including obesity and diabetes, two common issues found in kidney stone patients.

Expanding beyond the clinical setting, the Yale Stone Research Team, a collaboration representing urology, emergency medicine, biostatistics, and radiology, is leading efforts to better manage patients who present with flank pain, to better identify patients who need imaging, and to reduce the harms of radiation in stone patients who are often subjected to multiple and sometimes high dose CT scans.

The team discovered five factors most predictive of a kidney stone: Sex of the patient, Timing or duration of their pain, Origin or race of the patient, Nausea or vomiting symptoms, and Erythrocytes or blood in the patient’s urine, which is known as a “STONE score.” These factors were determined to accurately and reliably predict which patients do and do not have a stone present in their urinary, based on their STONE score. This groundbreaking discovery led the team to publish their findings in The AJR in 2014.

Two years later in 2016, a group of physicians and researchers from Massachusetts General Hospital, who, after applying their own patient data to the STONE algorithm and found the same results, published an external validation of the STONE score. The STONE score is used in emergency rooms at Yale New Haven Hospital and its application is increasing nationwide.

“Not only was the STONE score an exceptional development by our team, but receiving external validation from our counterparts at Mass General was especially exciting,” said Dr. Singh.

The Yale Stone Research Team next took this study one step further and explored the concept of using the STONE score to filter patients away from unnecessary high-dose CT scans and instead to ultra-low-dose CT scans. In a randomized study of more than 250 patients, they determined that those who received the low dose scans received nearly the same diagnosis as patients given the standard scan. 2-3% of stones were missed with the low dose procedure, but were found to be 5MM or less in size and thus, non-clinically important.

The number of high-dose CT scans performed on kidney stone patients has skyrocketed in part due to an overall increase in patients developing stones, and simply, because of the indiscriminate use of CT scans. In 2007, the rate of CT scans performed in the U.S. was nearly 228 per 1,000 people, more than double the rate in Canada and four times the rate in the United Kingdom. This has led to an estimated 1 in every 500 to 1 in every 1,500 patients being put at risk of developing additional malignancies from radiation exposure.

Yale is an ardent advocate in its efforts to increase the utilization of low dose CT scans by publishing research articles with randomized studies as well as giving lectures across the US. Its efforts have not gone unrecognized. When the study results were published, only 2% of academic healthcare institutions were utilizing low dose scans, and the most recent estimate shows an increase of up to 8%.

The collaborative efforts led by the Yale Stone Disease Team and the Stone Research Team have moved Yale to the forefront of stone disease diagnosis and treatment. And as a result, patients are the benefactors. “They truly become our patients,” said Dr. Singh. “We are shepherds of their stones and it is our duty to provide the latest in technology and be surgically state-of-the-art.”