Knowing which first-time kidney stone patients are likely to experience another symptomatic kidney stone could help physicians advise patients on whether to follow stone prevention diets or take medications. A new tool described in the Journal of the American Society of Nephrology accomplishes just that.

“We developed the Recurrence of Kidney Stone (ROKS) nomogram that uses 11 questions about the patient to calculate the probability of having another symptomatic kidney stone at 2, 5, or 10 years after the first stone,” said lead author Andrew Rule, MD, of the Mayo Clinic in Rochester, Minnesota. The nomogram is available on the Internet at http://www.qxmd.com/calculate-online/nephrology/recurrence-of-kidney-stone-roks.

Characteristics linked with recurrence

Although several studies have identified predictors for recurrence after a first stone episode, clinicians don’t have access to a formal prediction tool for routine use in patients. “Kidney stones are common and affect about 6 percent to 9 percent of the population. Of greatest concern to the patient after a symptomatic kidney stone is whether this excruciating painful event will ever happen again,” said Rule. To develop a tool that might address this concern, Rule and his colleagues performed a general population cohort study of all validated incident kidney stone formers in Olmsted County, Minnesota, from 1984 to 2012. As they followed up patients for a second episode the investigators hoped to develop a predictive tool that used only characteristics commonly available at the time of the first episode.

The team found that 4908 residents of Olmsted County received a new diagnosis of kidney stones during the study period. After reviewing the patients’ charts, the researchers excluded patients in the following categories: prevalent stone formers, asymptomatic only, suspected stone only, no evidence of kidney stone disease, age younger than 18 years, no research authorization, and never a resident of Olmsted County. This left 2239 patients as validated first-time symptomatic stone formers. These patients were followed up for a total of 20,548 person years, with a...
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Second Kidney Stone
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median follow-up time of 11.2 years from the time of stone diagnosis; 707 patients had a second symptomatic stone during this time. The symptomatic recurrence rates at 2, 5, 10, and 15 years were 11 percent, 20 percent, 31 percent, and 39 percent, respectively.

After following up the patients and recording their characteristics, the investigators found that factors contributing to a higher risk of symptomatic recurrence included younger age, male gender, white race, family history of kidney stones, blood seen in the urine, stone made of uric acid, obstructing stone in the kidney pelvis, any additional nonobstructing stone, and any past painful event attributed to a kidney stone even though a stone was never seen. Male sex, white race, and family history of kidney stones may relate to genetic factors that contribute to recurrence. Younger age may also reflect a genetic component that causes an earlier manifestation of stones and their recurrence. The investigators noted that the presence of a stone at the renal pelvis or lower pole suggests a predisposition to form a stone too large to be passed into the ureter, whereas patients who form smaller stones that pass to the ureterovesical junction may not always experience symptoms with future stones. Finally, the chemistry and biology of uric acid stones differ from those of calcium stones and likely influence the risk of recurrence.

Individualized risk scores
As an example case, the researchers described a 30-year-old (82 points) white (30 points) woman who presented with flank pain from her first symptomatic kidney stone, along with gross hematuria (8 points). Her father also had kidney stones (48 points), and she had a similar pain episode 5 years ago that resolved on its own without a visible stone (70 points). A 10-mm renal pelvic stone was surgically removed (75 points + 15 points for the symptomatic stone not being at the ureterovesical junction) that was 100 percent calcium oxalate. She also had an 8-mm upper-pole nonobstructing stone (54 points). The total for her nomogram was 382 points, and her risk of symptomatic recurrence at 2, 5, and 10 years was 49 percent, 75 percent, and 91 percent, respectively. For patients with such high risks, physicians may advise drinking lots of water and eating a low-salt, low-animal protein diet. Sometimes a low-oxalate diet is also recommended. Medications that may be prescribed to prevent kidney stones in high-risk patients include thiazide diuretics, which lower calcium in the urine, and potassium citrate, which increases citrate in the urine to help prevent stones from forming.

Although additional research is needed to see whether treatment decisions based specifically on the ROK nomogram will reduce symptomatic episodes, the nomogram may be useful in clinical trials that include high-risk stone formers.

In an accompanying editorial, Brian Ehrlich, MD, of Massachusetts General Hospital and Harvard Medical School, and David Goldfarb, MD, of the York Harbor VA Healthcare System and the NYU School of Medicine, noted that the nomogram to demonstrate value, it now should be tested prospectively in additional populations of stone formers. “Whether additional variables can be included to increase the usefulness of this tool will be of interest in the future,” they wrote. The authors also pointed out that an interesting aspect of how the tool’s utility will extrapolate to other locations is the latitude of Olmsted County. The prevalence of kidney stones is higher in warmer climates, likely because higher temperatures lead to reduced urine volume and to higher concentrations of stone-forming salts. “Based on previously published data and the current nomogram, it follows that stone recurrence in Rochester, MN, where monthly average high temperatures are below 4.4 degrees Celsius for 7 months per year, may actually underestimate recurrence rates in lower latitudes and warmer climates,” they wrote.

The article is entitled “The ROKS Nomogram for Predicting a Second Symptomatic Stone Episode.” The editorial is entitled “A Nomogram for the Prediction of Kidney Stone Recurrence.”

Kidney Donation Costs
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el, lodging, services such as child care or elder care, and lost wages. Research indicates that more than 20 percent of living kidney donors report financial hardship after donation. Many states have developed ways to reimburse at least some of the costs, but these initiatives have not been consistently associated with an increase in living donation. To look at the potential links between costs and donation rates, Gill and his colleagues divided the population of the United States on the basis of the median household income level of residents’ zip codes and examined the rates of living donation between 1999 and 2010 in high-income and low-income populations. The 33,178 zip codes in the US Census were grouped into the following income quintiles: Q1 (<$30,962), Q2 ($30,962 to $57,314), Q3 ($57,315 to $44,723), Q4 ($44,724 to $56,580), and Q5 ($56,580). Between 1999 and 2004, the rate of growth in living donation per million population was directly related to income, increasing progressively from the lowest to the highest income quintile, with annualized changes of 0.55 for Q1 and 1.77 for Q5. Between 2005 and 2010, donation declined in Q1, Q2, and Q3; was stable in Q4; and continued to grow in Q5. These findings indicate that lower-income populations consistently had lower rates of living donation compared with higher-income populations and that the difference in living donation rates between lower-income and higher-income populations was much larger in recent years than in the past. “Since 2004, lower-income populations experienced a large decline in living donation, while living donation in higher-income populations was more stable,” Gill said.

Factors that sustained living donation, at least for higher-income populations, likely include the advancement of minimally invasive surgical techniques, increased patient education, and insufficient numbers of deceased donors to meet transplant demands. Factors that may have contributed to disparities in living donation between income groups include the higher prevalence of obesity, diabetes, and other chronic health conditions in low-income populations, which can interfere with living donation; a higher proportion of individuals without health insurance in low-income populations; and differences in health literacy between income groups.

Overcoming financial barriers
Although addressing the costs of living organ donation may not bring levels back to where they were in the 1990s, it could certainly boost the numbers, especially during periods of economic volatility. “These results suggest that financial barriers to living donation need to be further addressed in order to make it easier for patients to consider and pursue living kidney donation,” said Gill.

Doing so could have far-reaching effects, noted Didier Mandelbrot, MD, who was not involved with the study and is a nephrologist at the University of Wisconsin School of Medicine and Public Health in Madison. “These financial barriers end up limiting the number of recipients who can benefit from live donation, and also limit the financial benefits of live donation to society,” he said.

Mandelbrot stressed that although programs to reduce financial burdens of live donation, such as the National Living Donor Assistance Center (NLDAC), exist in the United States, these programs appear to have limited impact. “Unlike the Canadian program for living donors, the US program does not reimburse lost wages and incidental expenses such as child care,” he said.

In addition, NLDAC’s requirement for means testing to determine whether recipients and donors qualify for assistance adds to the paperwork and difficulty in using the program. The Canadian program does not include means testing. Expanding NLDAC to more closely resemble the Canadian program may help reduce financial barriers to live kidney donation, and therefore improve outcomes for kidney transplantation, according to Mandelbrot.

Study authors include Jianghu Dong, MSc and John Gill, MD, MS.

Disclosures: The authors reported no financial disclosures.

The article, entitled “Population Income and Longitudinal Trends in Living Kidney Donation in the United States,” is available online at http://jasn.asnjournals.org/.

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