Prevalence of Kidney Stones in Patients With Enteric Disorders

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Methods
We developed a state-transition Markov model to estimate the US prevalence of malabsorptive enteric disorders and the total number of individuals with enteric disease and kidney stones and/or CKD. The model development included:

- 54 interviews with expert medical specialists who identified
- A 4-year review of claims data (June 2012–June 2016) from the BMIRrhen Health Analytics System (Figure 2) generated estimates of the percent of patients with an enteric disorder developing CKD to include those with and without a kidney stone history. Patients with pre-existing history of kidney stones and/or CKD were excluded from the claims analysis
- The model used a stacked incidence flow where the incidence of malabsorptive enteric conditions and competing risk of mortality were modeled over time to estimate:
  - Prevalent population with relevant enteric conditions
  - The risk and consequent number of stone-forming patients
  - Recurrent kidney stones (2+ stone events in lifetime)
- For every new patient with an incident enteric condition, the model incorporated assumptions about the probability of CKD and stone formation to estimate the prevalent population of patients developing recurrent kidney stones and CKD (Figure 2)

Results
The 2019 US prevalence of patients with enteric conditions associated with CKD and/or recurrent kidney stones was estimated to be approximately 250,000

- The most frequent malabsorptive enteric conditions were Roux-en-Y gastric bypass (RYGB) and IBD (Figure 3)
- Furthermore, patients with enteric disease, particularly those with a history of kidney stones, are more likely to develop CKD
  - The risk of CKD was directly proportional to stone occurrence across all enteric disease populations (Figure 5)

Discussion
• This model provides prevalence and incidence estimates of EH and its underlying causes, along with the estimated prevalence of recurrent kidney stones and CKD within the EHR population
• The limitations include:
  - Some patients with relevant enteric conditions may have been misclassified based on accuracy of clinical diagnostic coding. This study did not review subject medical records.
  - Although the model accounted for the competing risk of mortality, comparing rates of other non-enteric causes of kidney stones and CKD were not accounted for in this model. Enteric conditions were analyzed in isolation
  - Future research comparing the relative rates of kidney stone events and the relationship with urinary oxalate excretion are needed to confirm these findings

Conclusions
• Based on the analysis of data across various sources, there are approximately 250,000 EH patients with KS disease and/or CKD in the US
• Approximately 100,000 patients have recurrent KS disease
• A large proportion (70%) have CKD
• Additional epidemiological research and a specific diagnostic code could further improve efforts to understand and improve the recognition of EH

References

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Figure 1. Schematic of Enteric Hyperoxaluria

Figure 2. Methodology for Estimating the Prevalence of Malabsorptive Enteric Disorders and Stone-Forming Patients (with and without CKD)

Figure 3. Prevalence of Enteric Hyperoxaluria

Figure 4. Risk of Developing Kidney Stones by Incident Condition

Figure 5. Risk of Developing CKD by Enteric Condition

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