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Nonoperative management of adhesive small bowel obstruction: what is the break point?

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Abstract

BACKGROUND: The current management paradigm for recurrent adhesive small bowel obstruction (SBO) is nonoperative. Rates of recurrence differ based on time interval between and number of previous occurrences. Optimal time to intervene has not been determined.

METHODS: We constructed a Markov model to evaluate costs and quality of life on a hypothetical cohort of 40-year-old patients after their first episode of medical management for postoperative SBO. We estimated a relative risk reduction of .55 with surgical intervention and a relative risk increase of 2.1, 2.9, and 5.7 after the medical management of the 2nd, 3rd, and 4th SBO.

RESULTS: Surgery performed after earlier episodes of SBO was more costly but also more effective. The cost difference between surgery after the 1st SBO recurrence vs the 2nd SBO recurrence was $1,643, with an increase of .135 quality-adjusted life years (QALYs), the incremental cost-effectiveness ratio was $12,170 per QALY.

CONCLUSIONS: Surgery after the first episode of SBO provides a small increase in QALY at a small cost since surgical intervention lowers the risk of recurrence.

Acute small bowel obstructions (SBOs) caused by adhesions are a significant burden to patients, surgeons, and the health care system overall. A 2011 study estimated the yearly cost attributed to lysis of adhesions at close to $2.3 billion a year.[1] Approximately 93% of patients will develop adhesions after laparotomy, 1% of all general surgical admission can be attributed to adhesive disease, and 3.3% of all laparotomies performed for obstruction are due to adhesions.[2] Morbidity and mortality have improved significantly over the last half century owing to advancements in fluid and electrolyte management, critical care, and radiologic imaging.[3,4] These advancements, including the use of contrast study protocols, have allowed surgeons to more rapidly identify and treat patients whose adhesive bowel obstructions will not likely resolve without intervention.[5,6] As 60% to 70% of patients with partial SBOs due to adhesions will resolve with nonoperative management, conventional wisdom dictates that intervening in these patients is not indicated.[7,8] However, a significant portion of these

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patients require readmissions, some serially, and the probability that they will have another episode increases with each readmission.[9,10]

The current management paradigm for adhesive SBO is nonoperative unless there is evidence of bowel compromise or resolution failure. Our group follows this paradigm as long as avoiding repeat operation appears to be in the patient's best interest. Rates of recurrence seem to differ based on the time interval between occurrences and the number of previous occurrences. Determining the optimal time to operate requires weighing the morbidity, mortality, cost, and quality-of-life impact of operative vs medical management. To aid in this decision-making process, we conducted an economic analysis comparing the costs and outcomes associated with performing surgery after the 1st, 2nd, 3rd, 4th, or 5th SBO recurrence.[11] Our hypothesis was that after the 2nd admission for SBO that resolves medically it becomes cost-effective to intervene on the patient, lyse their adhesions, and decrease their risk for recurrence.

Methods

Overview

We constructed a Markov microsimulation model using TreeAgePro 2014 (TreeAge Software, Inc., Williamston, MA). The model simulated a hypothetical cohort of patients (100,000 first-order simulations) 40 years old that have had a laparotomy and are post-medical treatment for an adhesion-related SBO. We compared the costs and outcomes between various strategies of performing surgical management of an SBO after the 1st, 2nd, 3rd, 4th, or 5th recurrence, with medical treatment for the other recurrences. We assumed that patients would only undergo surgery once and that subsequent SBOs would be managed with medical treatment. A selection of the model is shown in Fig. 1.

Patients remained in the stable health state until they experienced a recurrence of an SBO, after which the patient transitioned to surgery or medical treatment for one cycle, incurred the costs and utility decrements, after which the patient transitioned back to stable, as shown in Fig. 1. If a patient transitioned to surgery, there were additional risks of complication such as acute renal injury, deep vein thrombosis, ileus, myocardial infarction, pulmonary embolism, pneumonia, surgical site infections, and death. Patients continued in the model until they died or reached the end of simulation, whichever came first. The model was run for 10 years in 2-month increments with a half-cycle correction. To test the model results for uncertainty in the parameter inputs, we conducted probabilistic sensitivity analyses where each input was simultaneously varied randomly over a given distribution and range of possible values (1,000 first-order simulations with 1,000 second-order simulations).

Input parameters

Costs were incurred by medical treatment or surgery, with additional costs from major surgical complications, as summarized in Table 1. The costs in the model represent Medicare reimbursement rates. All costs were adjusted to 2013 US dollars.

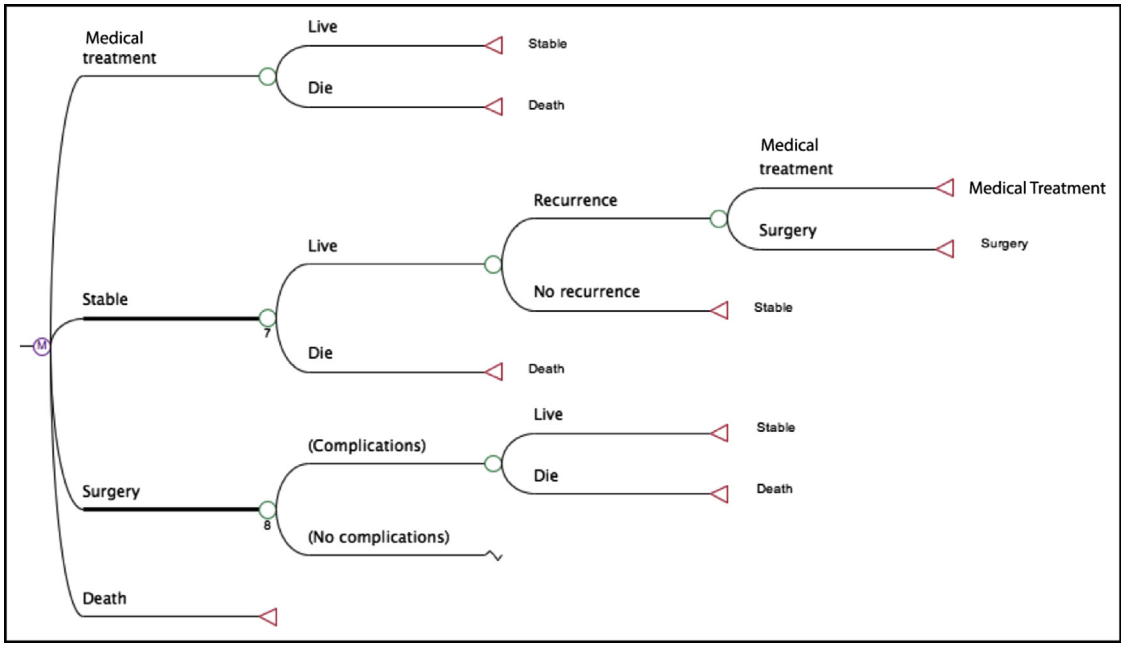

Figure 1 Markov model. Note: complications include acute renal injury, deep vein thrombosis, ileus, myocardial infarction, pulmonary embolism, pneumonia, and skin and suture infections.