

Weighing the Risks and Benefits of Nonoperative Management of Appendicitis

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Historically, even in the not-so-distant past, many medical and surgical treatments have, famously or infamously, become commonplace without critical analysis of their efficacy, such as hormonal replacement therapy,¹ lobotomies,² and arthroscopy for osteoarthritis.³ The advent of evidence-based medicine has promoted a more critical approach. Remarkably, one of the most common surgical conditions in the world still has widespread variations in care, and many basic but unanswered questions remain regarding the best management. In this well-done study, Lipsett et al⁴ carefully analyzed over 115 000 children with appendicitis using data from the Pediatric Health Information Systems registry, identifying an increasing trend toward nonoperative management (NOM) in children (resulting in up to one-third of patients being managed in this fashion most recently) and assessed longer-term outcomes. Outcomes studied included failure of NOM, subsequent health care use, rates of perforated appendicitis, and postoperative complications. The coronavirus disease 2019 pandemic (postdating the endpoints of their study) has increased the NOM fraction, since it is an effective short- and possibly long-term option which decreases the exposure of surgical teams to the virus.⁵

The authors found that most failures, defined as a subsequent encounter with surgical code for appendectomy

or a diagnosis code for perforated appendicitis, were early (median of 2 days, with 92% of failures occurring within 2 weeks). The database could not identify children who failed NOM during the index admission, potentially underestimating the early failure rate. Attrition from patients and families seeking treatment elsewhere after unsuccessful NOM may also underestimate the short- and/or long-term failure rate.

As with all database studies, there is a trade-off between fine-grained information and large numbers of data points. The definition of perforated appendicitis is variable: many centers define it as a hole in the appendix or an external appendicolith, but there are other definitions. Coding can be problematic as well. The ICD-10 system was implemented in late 2015, and 1 recent analysis found that the likelihood of being coded with perforated appendicitis was increased after the switch to ICD-10: the odds in 2016 were 1.5 times higher than the estimated likelihood before the implementation.⁶ Lipsett et al did exclude hospitals with an absolute change of 50% in the rate of either perforated appendicitis or NOM over the transition period (1 year before and after ICD-10), removing over 31 000 children from the analysis.⁴

Almost half of the children in this study who failed NOM presented with perforated appendicitis at the time of the recurrence. The fraction

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of these patients who had a missed perforation at presentation versus progression of disease leading to failure cannot be determined. Children undergoing NOM were more likely to experience a subsequent related emergency department visit, hospitalization, or advanced imaging study. True failure of NOM probably accounts for most of the difference, but (reasonable) increased parenteral and patient anxiety over abdominal and systemic complaints that might otherwise be ignored or observed likely contributes to increased use of medical services. A slightly higher (1.9% vs 1.2%) postoperative complication rate was also found for appendectomy after NOM failure.

Inherent in any database study, the basis of patient selection (NOM versus appendectomy) is unknown in this report. Ultrasound and computer tomography scans are not very accurate in differentiating acute appendicitis from early perforation, and the former is very operator dependent. Likewise, type and duration of antibiotic therapy may have varied and is also unknown.

The success rate of NOM dropped very sharply in the first two weeks, but interestingly children slowly continued to require appendectomy over the long term (5 years), as the tail of the NOM success curve slowly drifted downward. The percentage of nonoperatively managed children with appendicitis who will require appendectomy over their lifetime is unknowable. A small percentage of children have carcinoid tumors in the appendix and are almost all effectively “cured” by appendectomy. The lifetime implications of NOM in this cohort are also unknown.

As the pandemic has shown, not all people agree on disease treatment or prevention, even in situations where there is widespread scientific consensus. The media-enhanced perception of acute appendicitis as a life-threatening surgical emergency will likely push many toward that option. Conversely, suspicion and mistrust of surgeons and the medical establishment will make nonoperative treatment more appealing to others.

There are several multiinstitutional prospective trials underway. Our institution is part of 1 of the multinational prospective RCTs, and enrollment to NOM was often difficult and consent fragile and fungible (parents requesting operation if very rapid improvement was not rapidly seen). One large study (10 children's hospitals, 1076 participants enrolled) is slated for completion in late 2023 and is a case-control study with the family or patient choosing treatment.⁷ The primary outcome variable is success at 1 year after treatment. This may provide additional insight into patient and family preference. Another large international multinational randomized prospective trial (APPY) has completed enrollment.⁸ This study also has nearly 1000 children, with treatment failure as a primary outcome.

Noninferiority trials determine whether a new intervention is “not unacceptably less efficacious” than a treatment already in use. Although NOM of acute appendicitis is undeniably less efficacious (by 25% to 30% over the first few years), avoiding even a relatively simple operation is appealing. Informed discussion with the patient and family remains the best option at present.

ABBREVIATIONS

CT: computer tomography
ICD-10: *International Classification of Diseases, Tenth Revision*
NOM: nonoperative management (of appendicitis)

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