Update on appendicitis, and management of common post-op problems

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For CareConnect team

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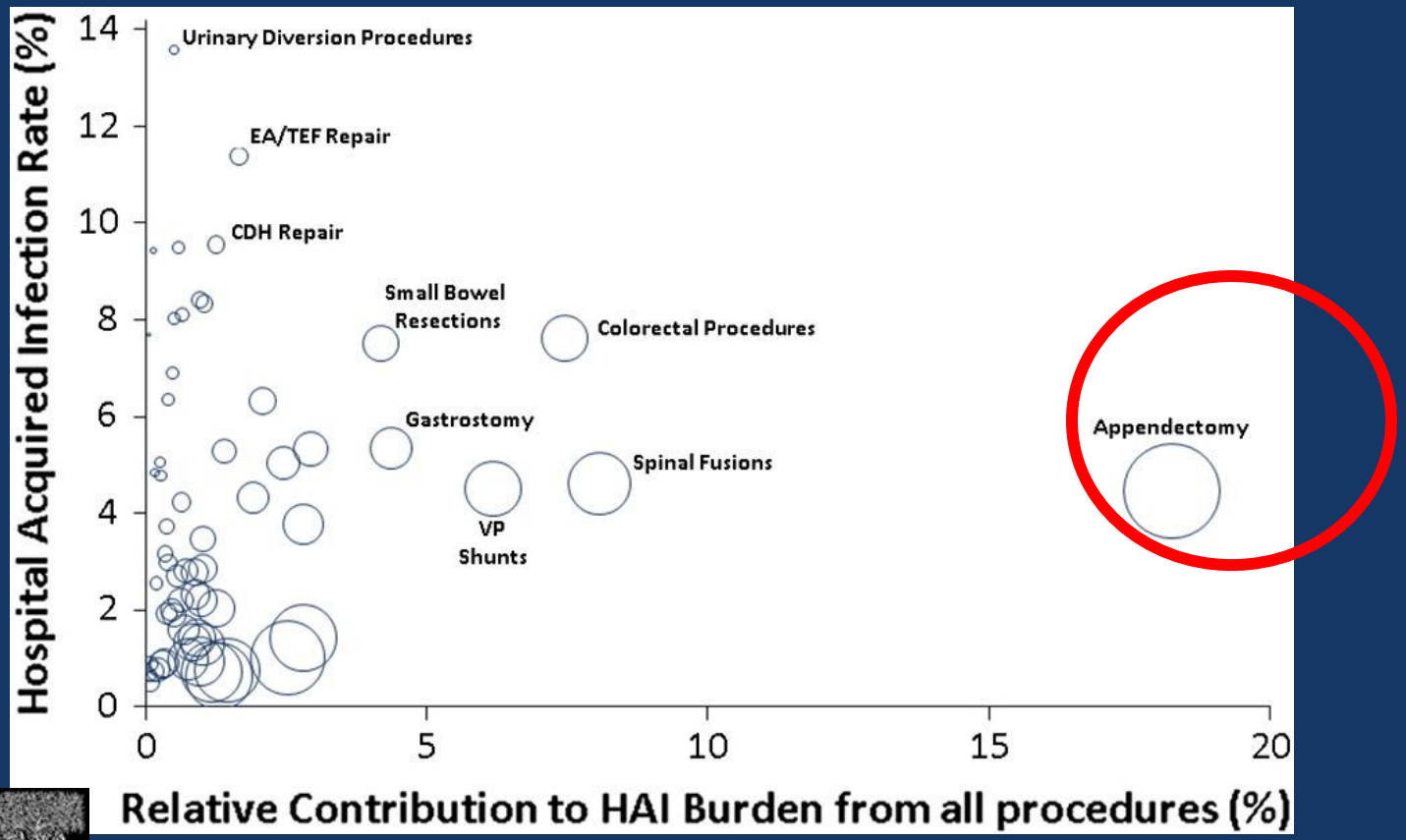
Nemours Alfred I. duPont Hospital for Children

Appendicitis: scope of the disease

- Over 70,000 cases annually in children in USA
- Lifetime risk of appendicitis: 9% for boys, 7% for girls
- Peak incidence 12 to 18 years

Burden of Appendectomy: Hospital-Acquired Infection



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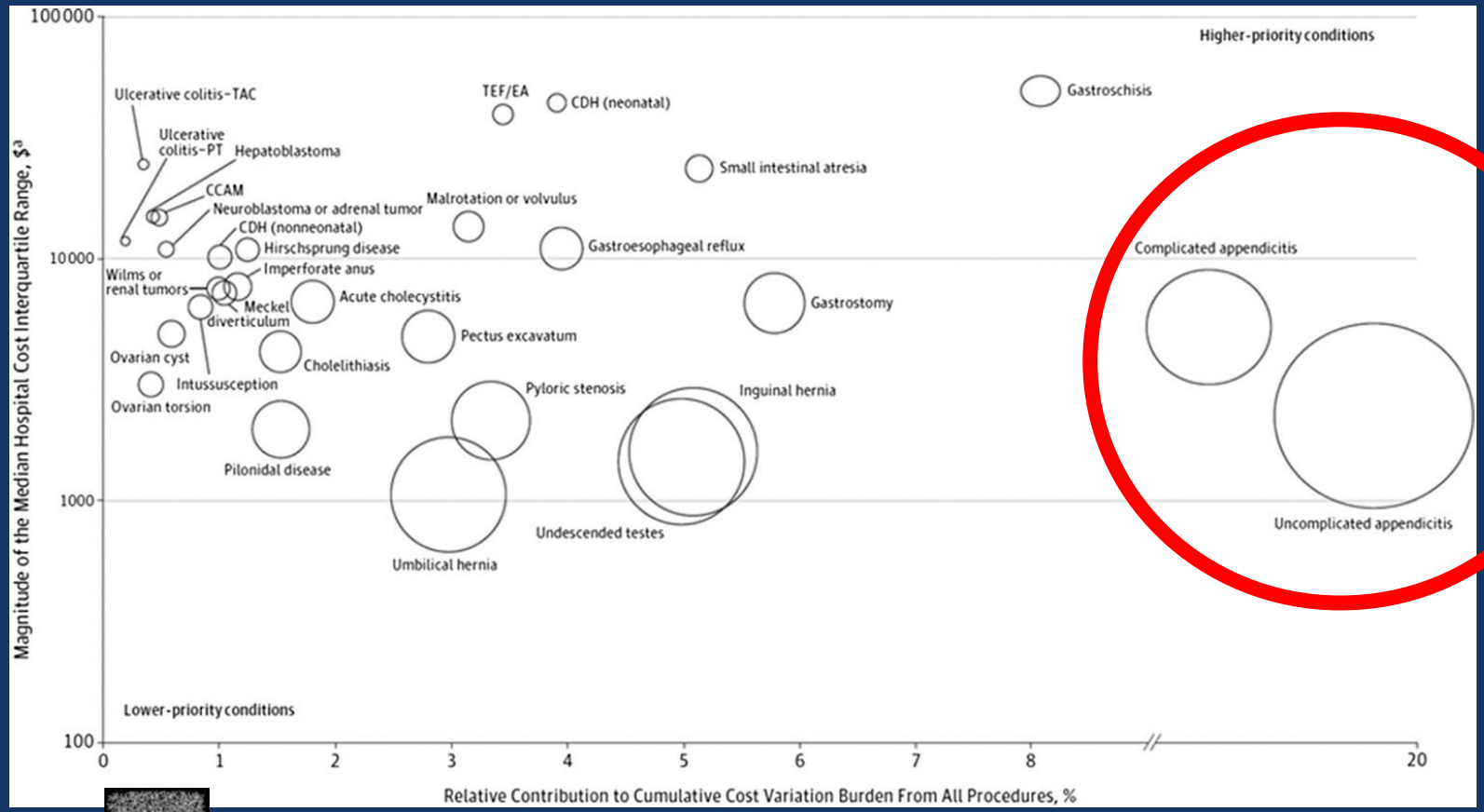
Burden of Appendectomy: Cost Variation



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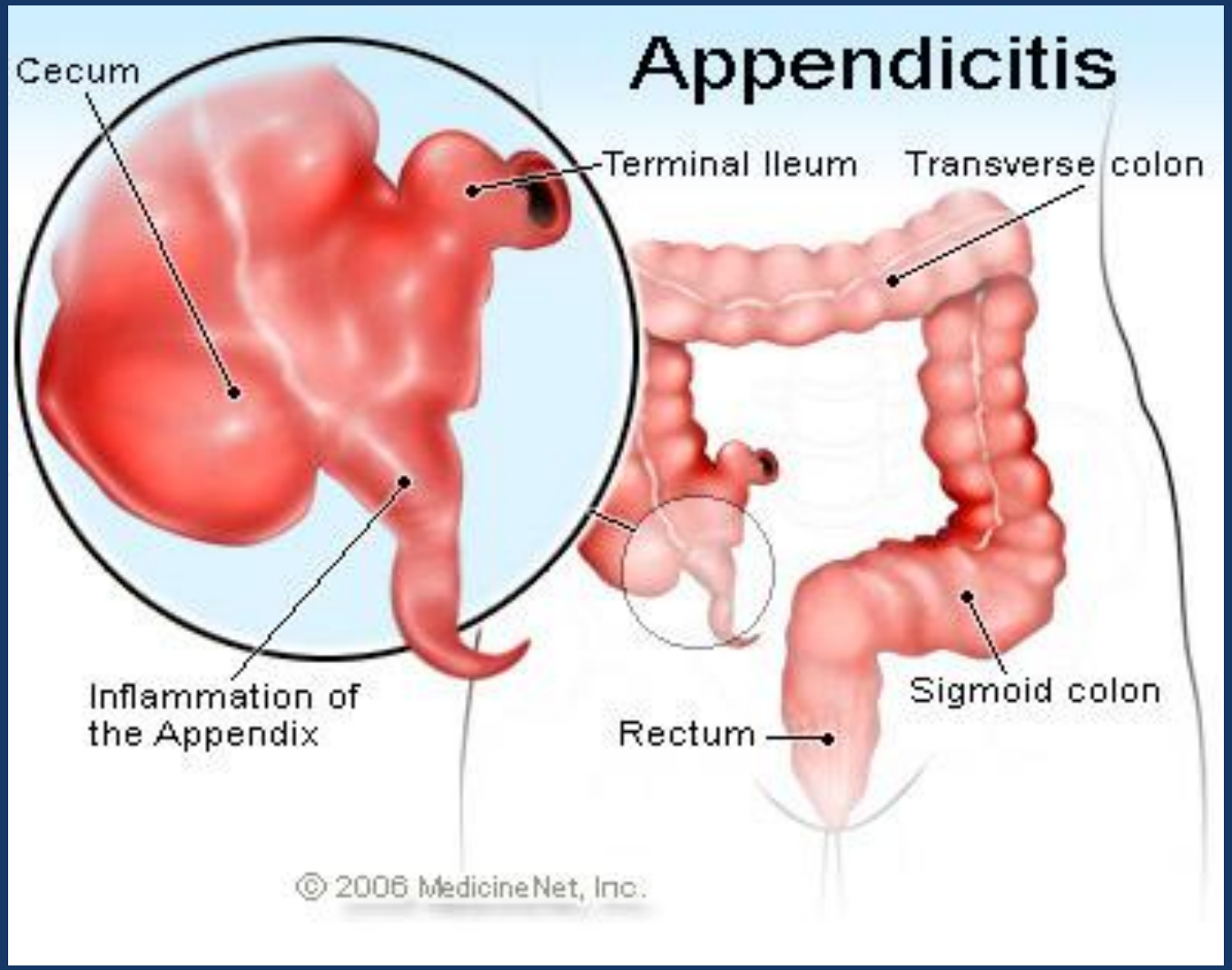
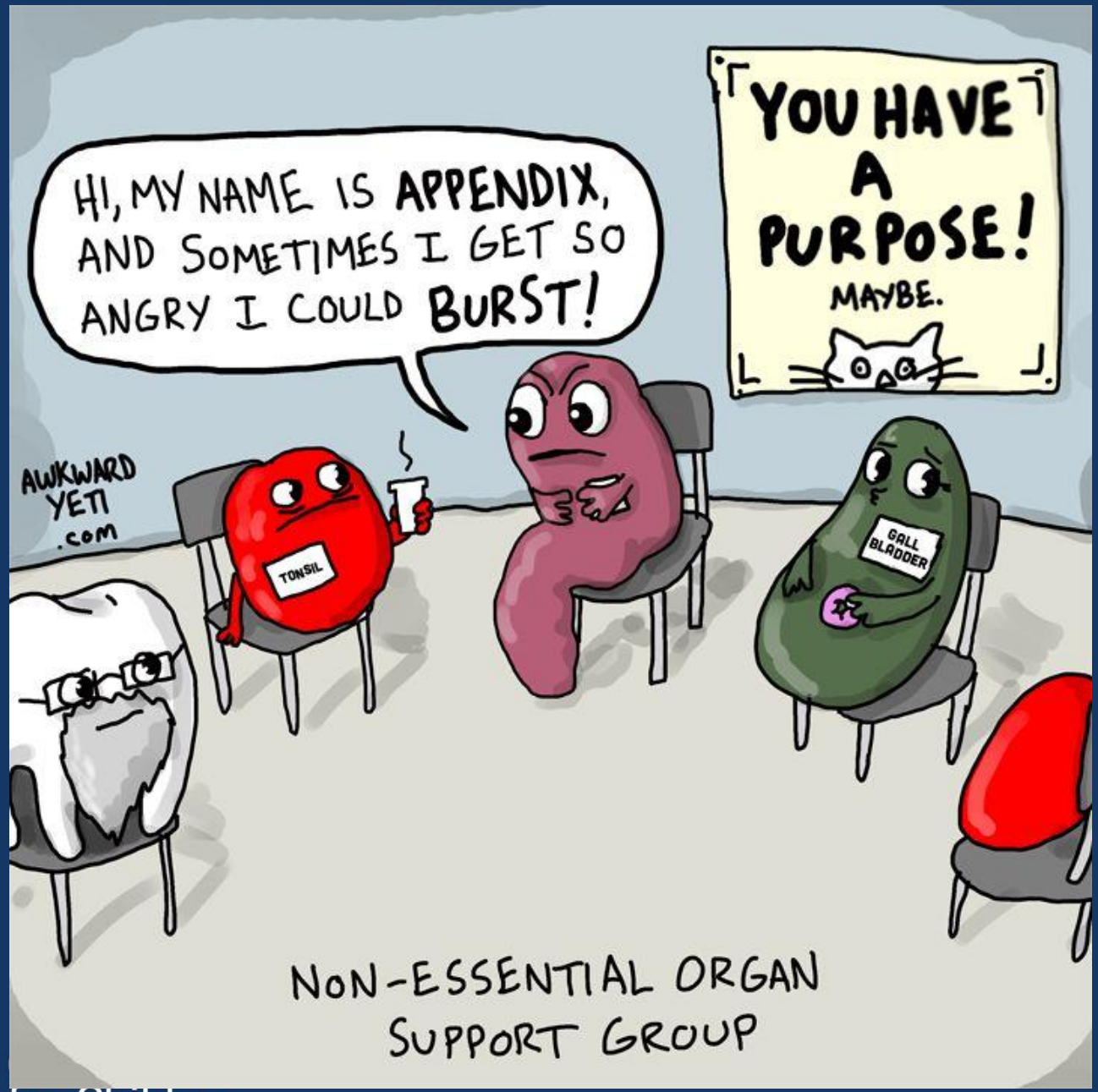
Objectives

- Why do children get appendicitis?
- What are typical presenting features?
- How do we make the diagnosis?
- How do we decide WHETHER to operate?
- How do we decide WHEN to operate?
- What is the difference in how we approach perforated vs non-perforated appendicitis?
- Does every child with appendicitis actually need surgery?

Why does appendicitis occur?




HI, MY NAME IS APPENDIX, AND SOMETIMES I GET SO ANGRY I COULD BURST!
YOU HAVE A PURPOSE!
MAYBE.
AWKWARD YETI .com
TONSIL
GALL BLADDER
NON-ESSENTIAL ORGAN SUPPORT GROUP

Who is more likely to present with perforated appendicitis?

A. Younger patients
B. Patients with developmental delay
C. Uninsured patients
D. Minorities
E. All of the above

More likely to present with perforated appendicitis:

- **Perforation rates are reported from 20%-80% in children**
- **Younger kids**
  - 82% in children under 5
  - Nearly 100% of 1-year-olds
- **Developmental delay**
- **Uninsured**
- **Minorities**

Kokoska ER1, Bird TM, Robbins JM, Smith SD, Corsi JM, Campbell BT. Racial disparities in the management of pediatric appendicitis. J Surg Res. 2007 Jan;137(1):83-8.

Approach to physical exam in suspected appendicitis

- Child does NOT want to move around
- Focal tenderness
- Percussion of the abdomen causes discomfort (this is better than rebound tenderness)
- Psoas, obturator, Rovsing's, heel strike
- Watch them walk around

Once diagnosis of appendicitis has been established…

- **Non-ruptured**
  - Short duration of symptoms, no suggestion of rupture on imaging
  - Start antibiotics
  - Perform appendectomy
- **Ruptured**
  - Have radiology evaluate for drainable fluid collection
  - Antibiotics
  - Operation if above management fails

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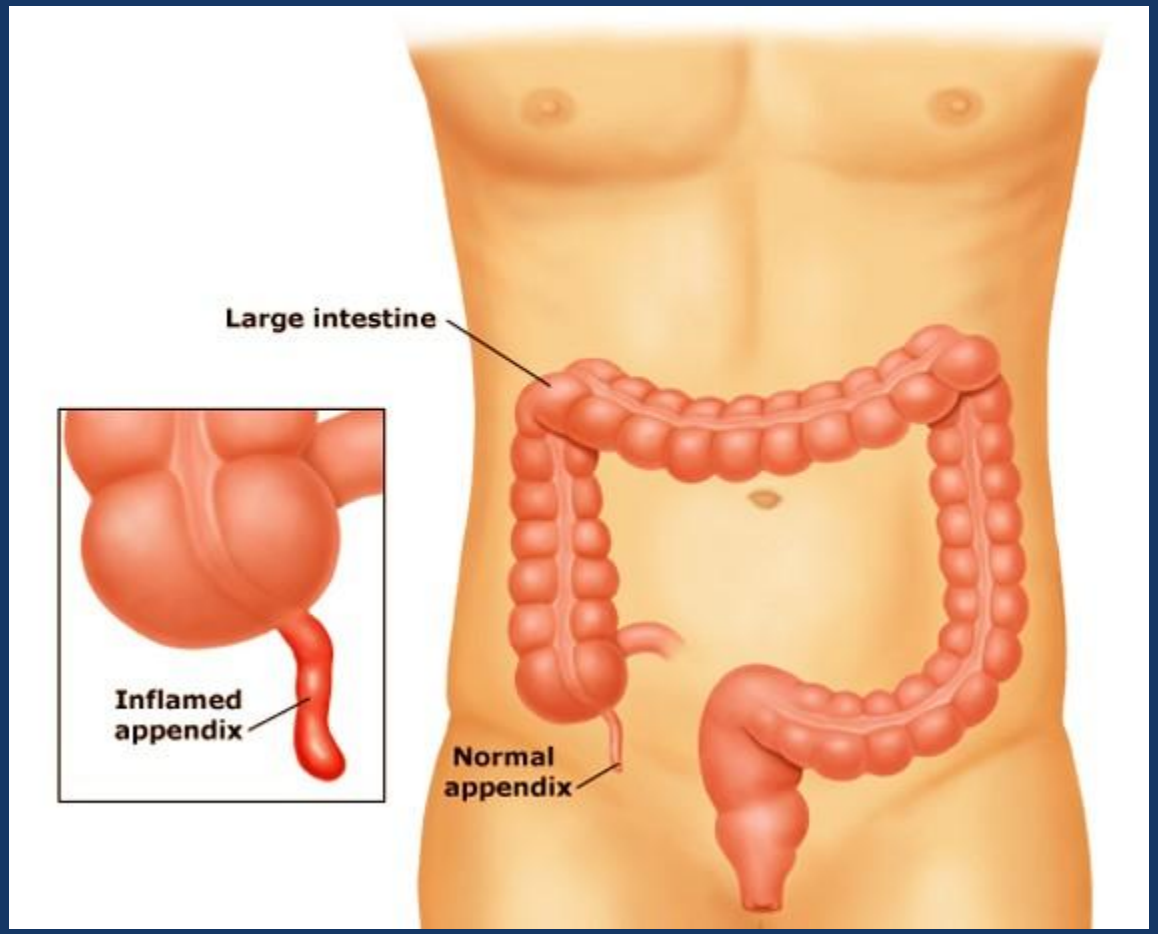
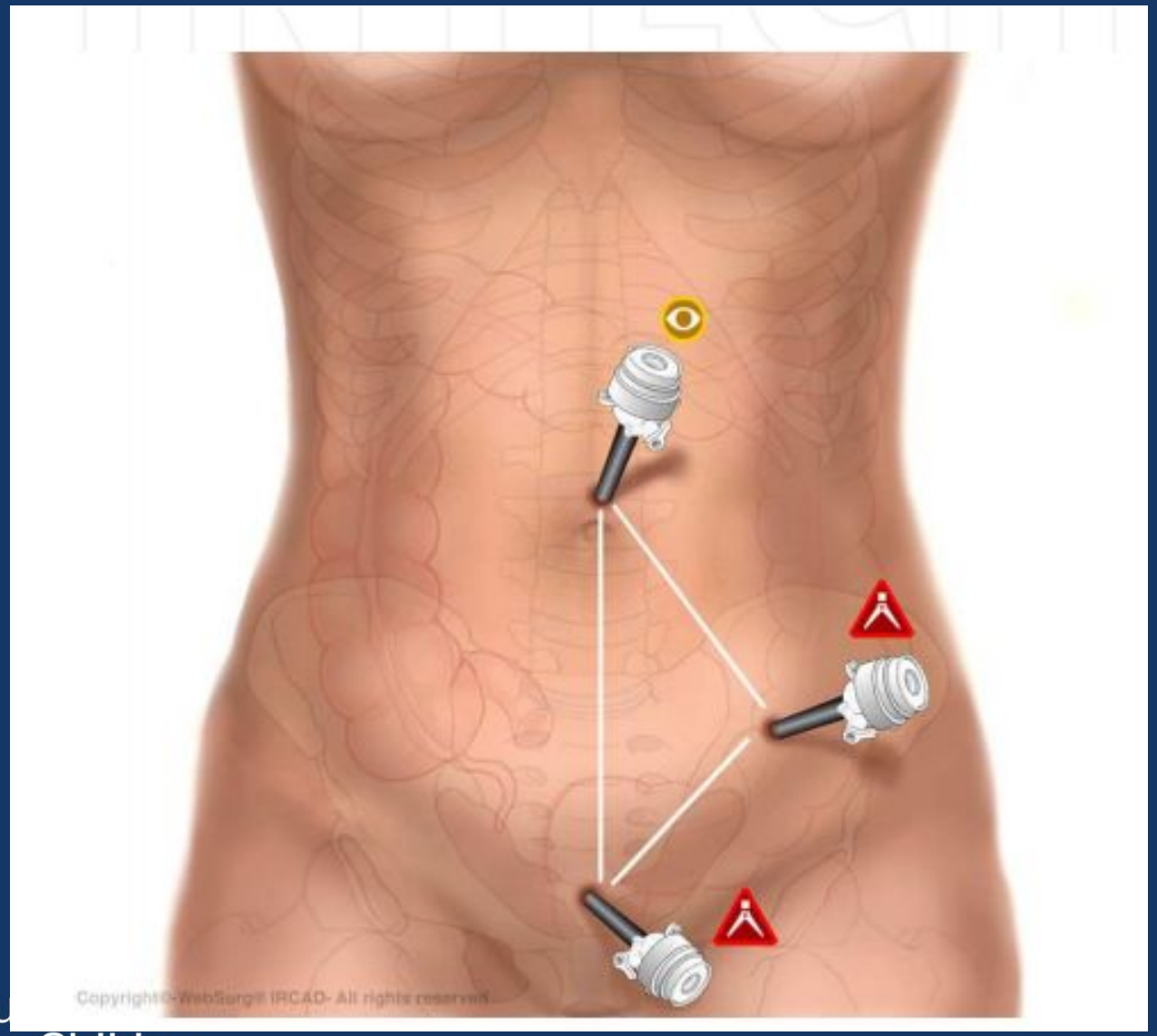
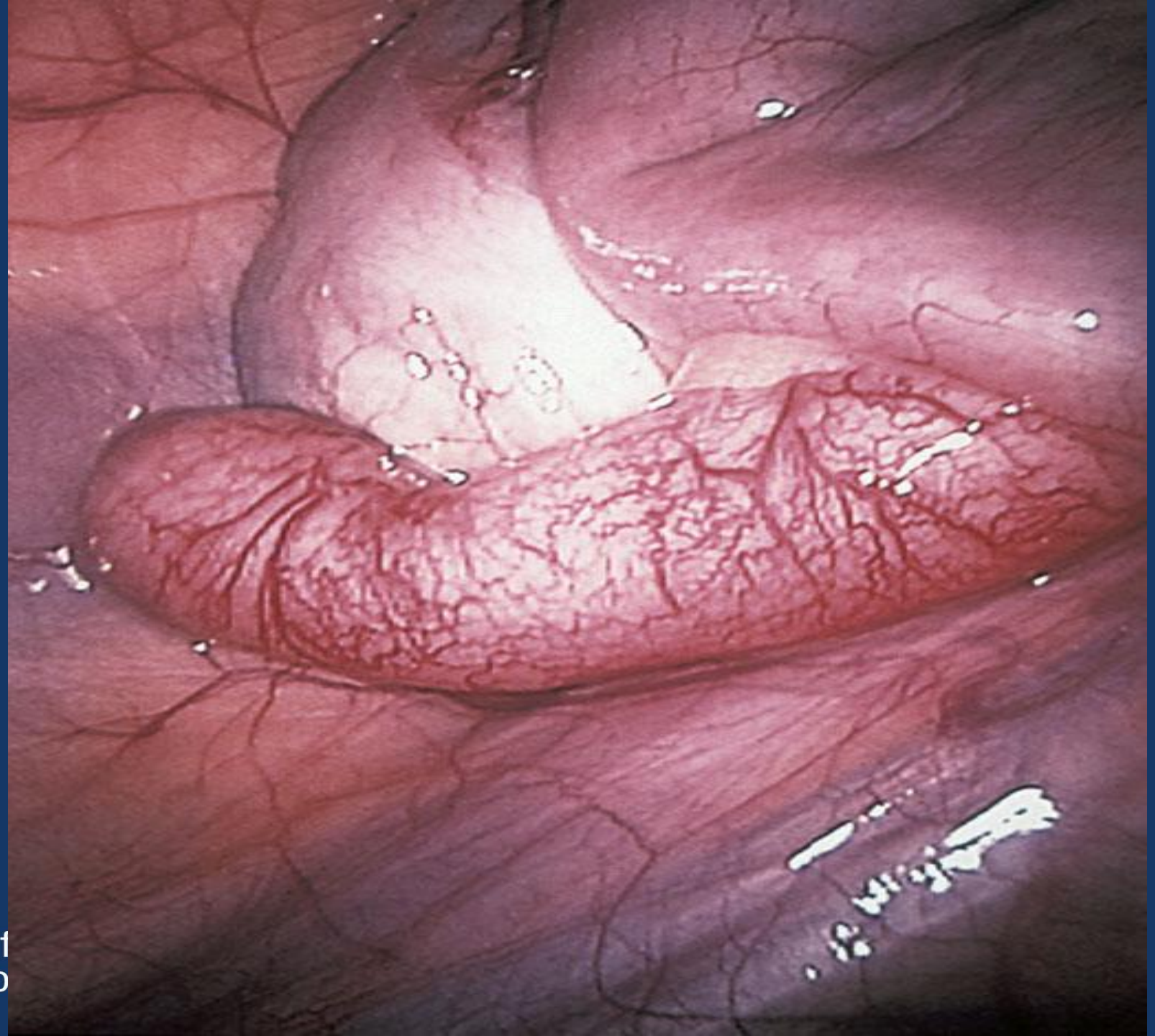
Surgical approach



Port placement





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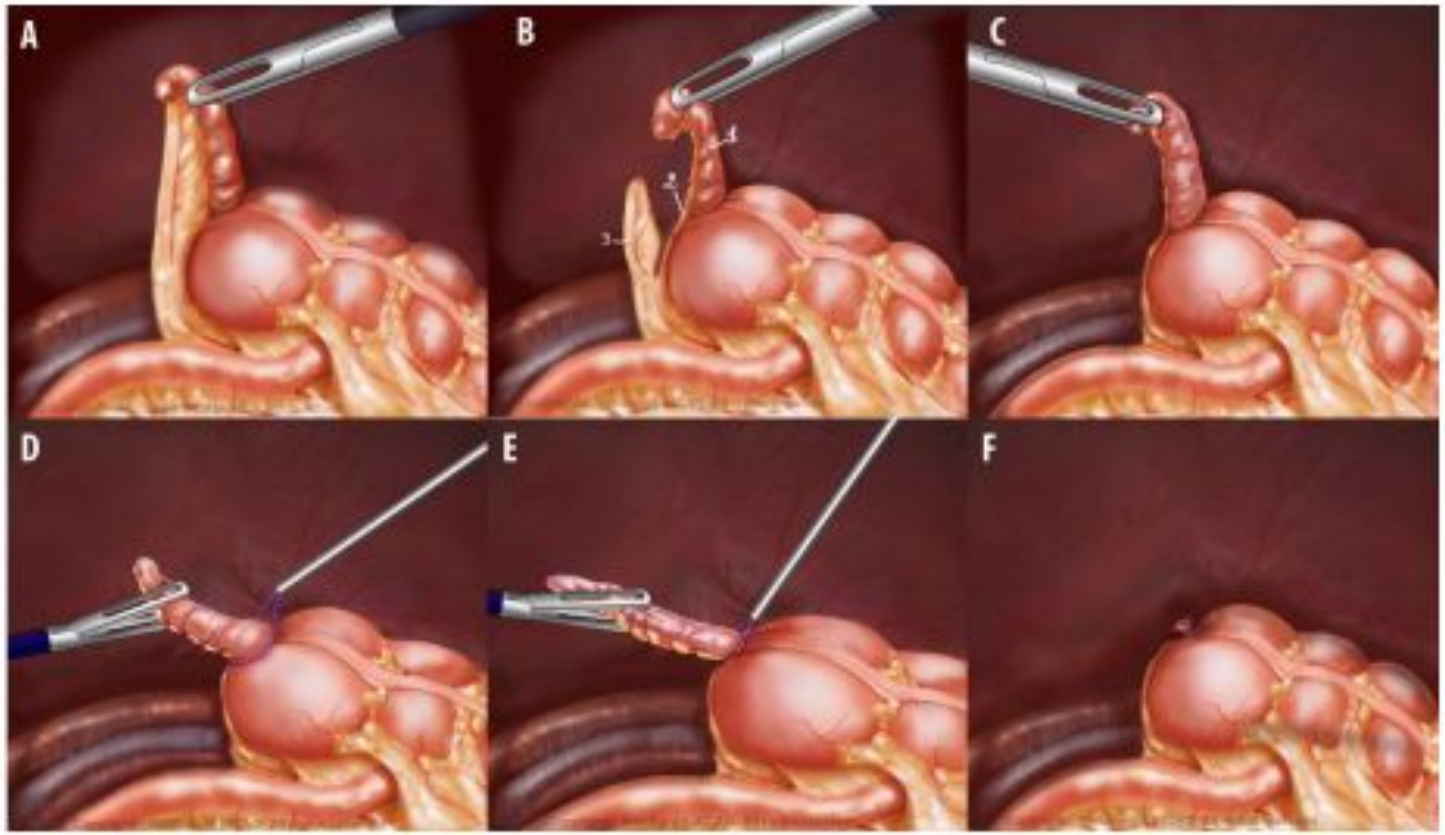
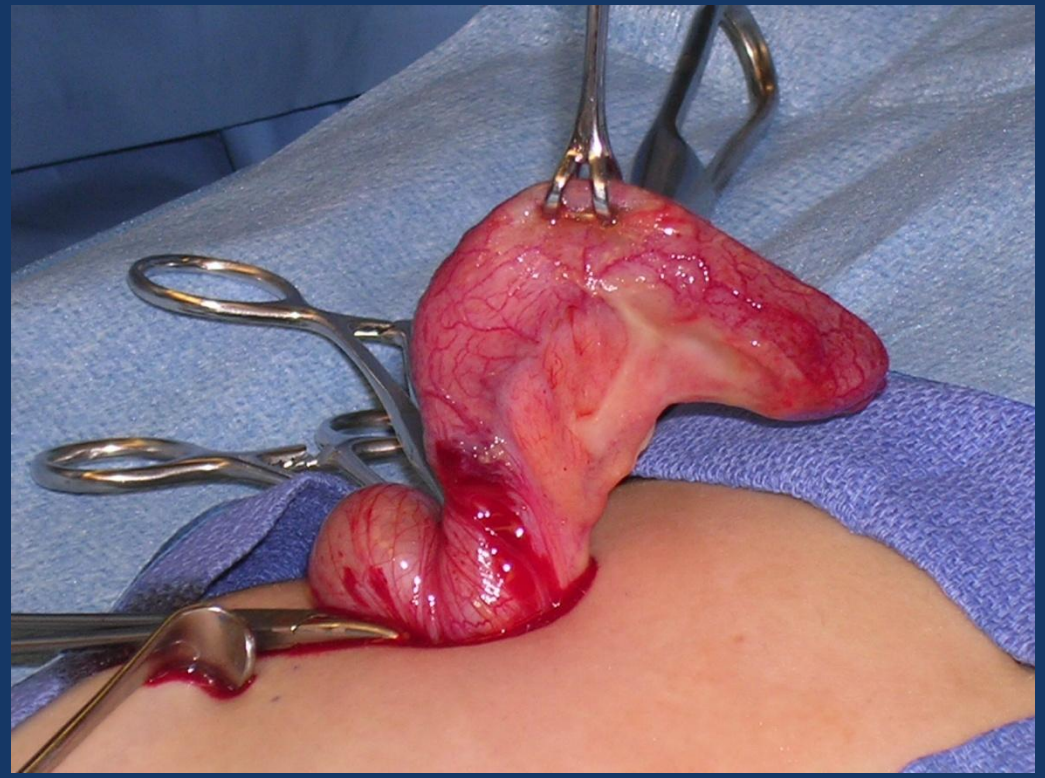
Lap appy with Endo-loops

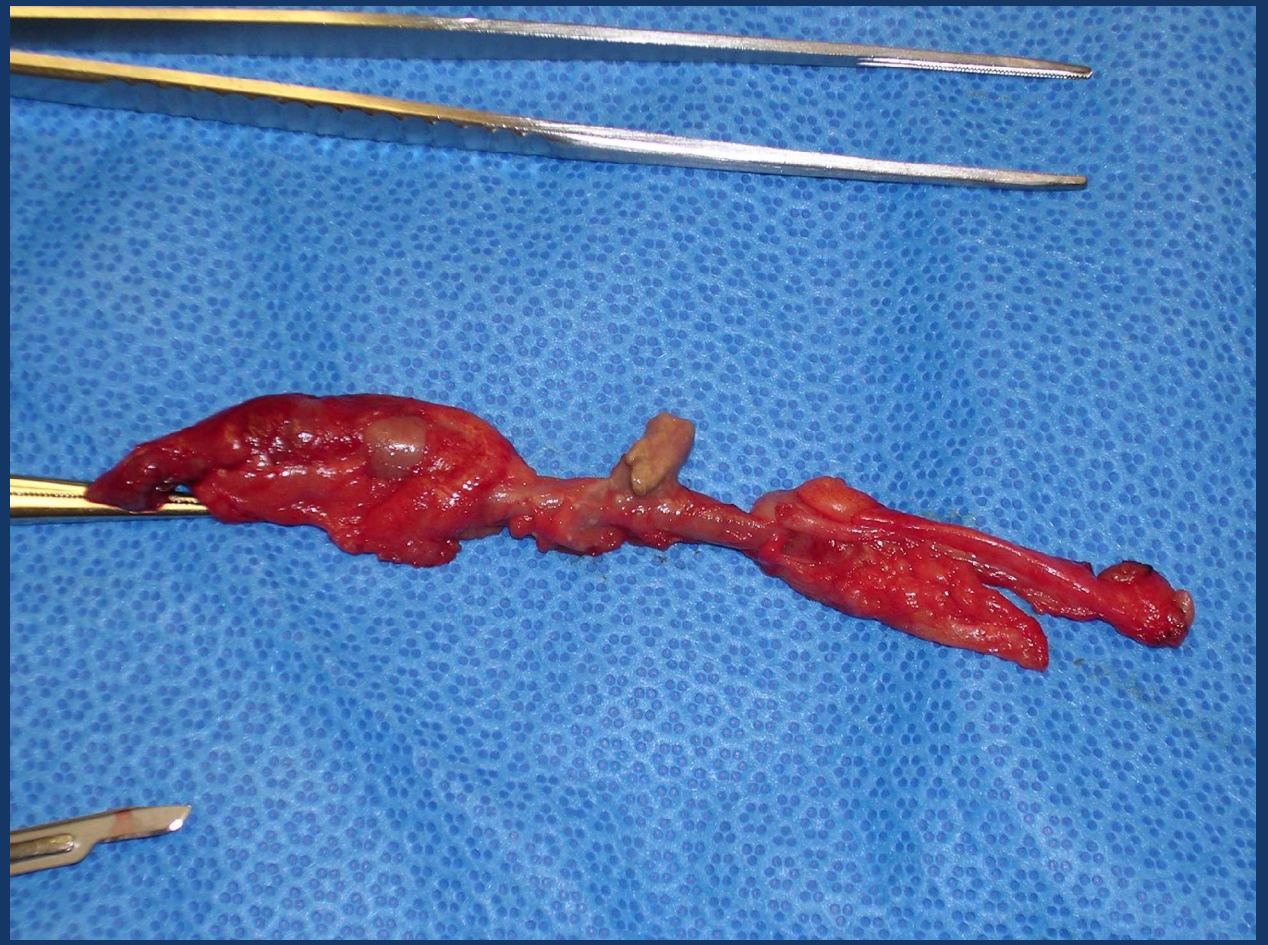


Lap appy with stapler

Open appendectomy



Appendix with fecalith



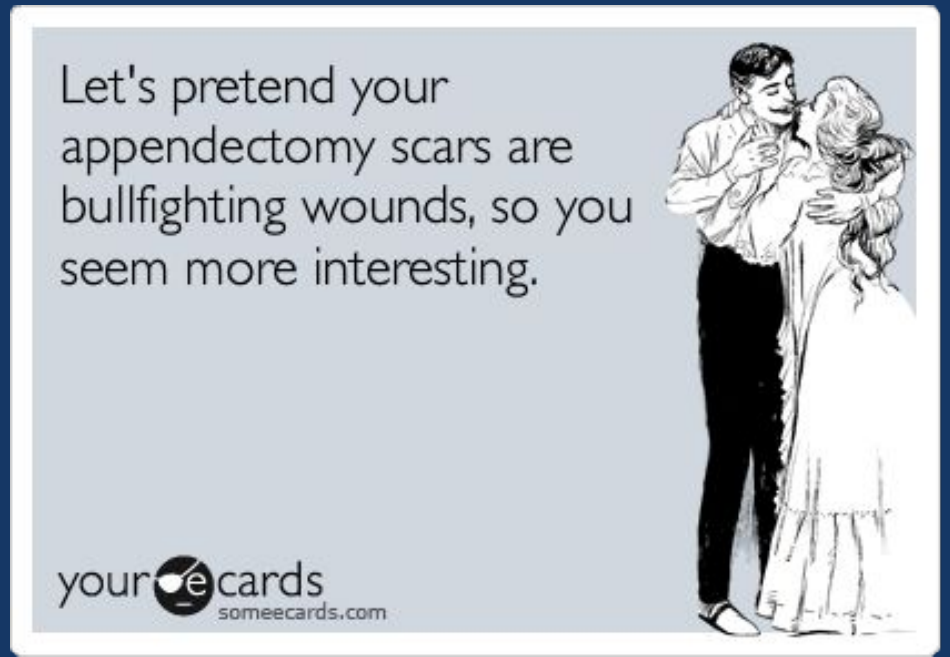
Laparoscopic vs open appendectomy?

- Laparoscopy is standard of care
- Lower complication rate
- Less scar
- Less pain
- Ability to evaluate other intra-abdominal organs if the appendix looks normal
  - Gallbladder
  - Ovaries
  - Inguinal canal
  - Terminal ileum

Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev. 2010 Oct 6;(10).

Post-op course

- Most patients can go home on the day of surgery
- Recovery is usually quick
- Back to school within a week, sports within 2 weeks
- Very low risk surgery with good outcomes
- Risk of infection is about 5%: at port sites or in abdomen



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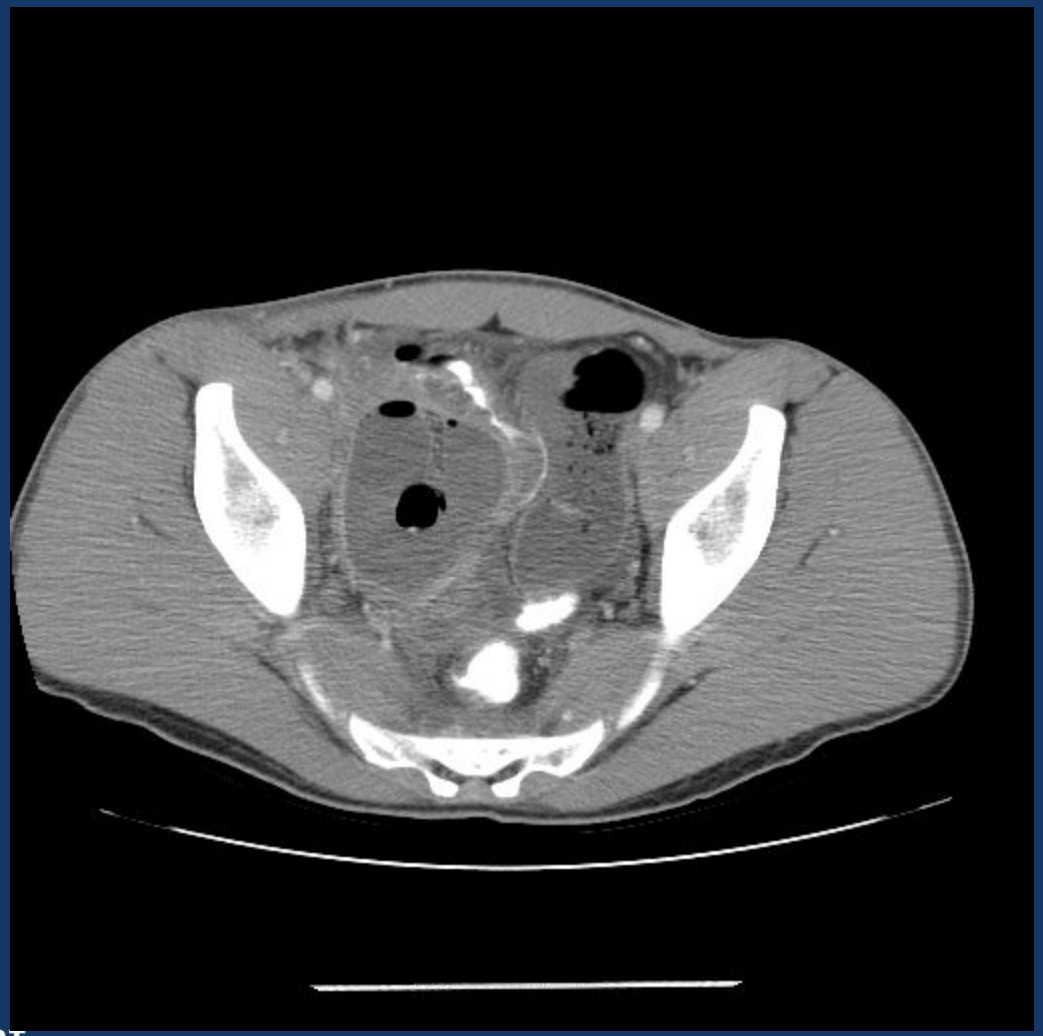
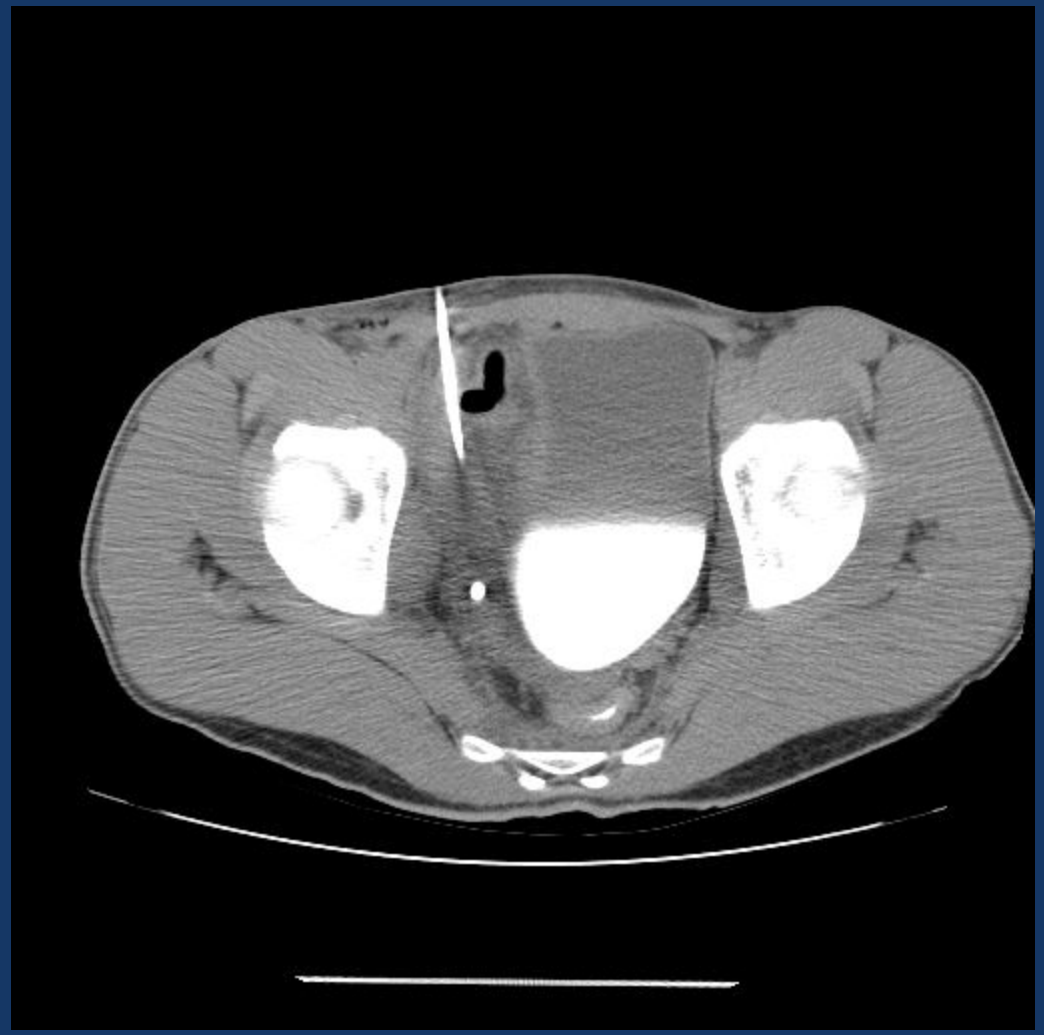
- **Ruptured**
  - Have radiology evaluate for drainable fluid collection
  - Antibiotics
  - Operation in acute setting if above management fails
  - Interval appendectomy 6-8 weeks later…
  - ALTERNATIVELY: Just take out the appendix!!

CT: ruptured appendix with abscess



After placement of percutaneous drain



How to counsel families of children with ruptured appendicitis

- If kids tolerate a diet, pain resolves, fever resolves oral antibiotics and home
- Plan interval appy 6-8 weeks later
- Non-operative management may not work and surgery may be needed (Failure rate 20%)
- At home they should watch for signs of persistent/recurrent appendicitis
- High-anxiety time for patients and families

A 10-year-old boy comes to see you in the office after recent hospitalization for perforated appendicitis. He has 3 more days of antibiotics left. His mom is worried because appetite is poor and his energy level is low. On exam he has diffuse lower abdominal tenderness. You recommend:

A. Extending course of oral antibiotics
B. CT scan to evaluate for persistent or recurrent appendicitis
C. CT scan to evaluate for intra-abdominal abscess
D. Follow-up with surgeon.

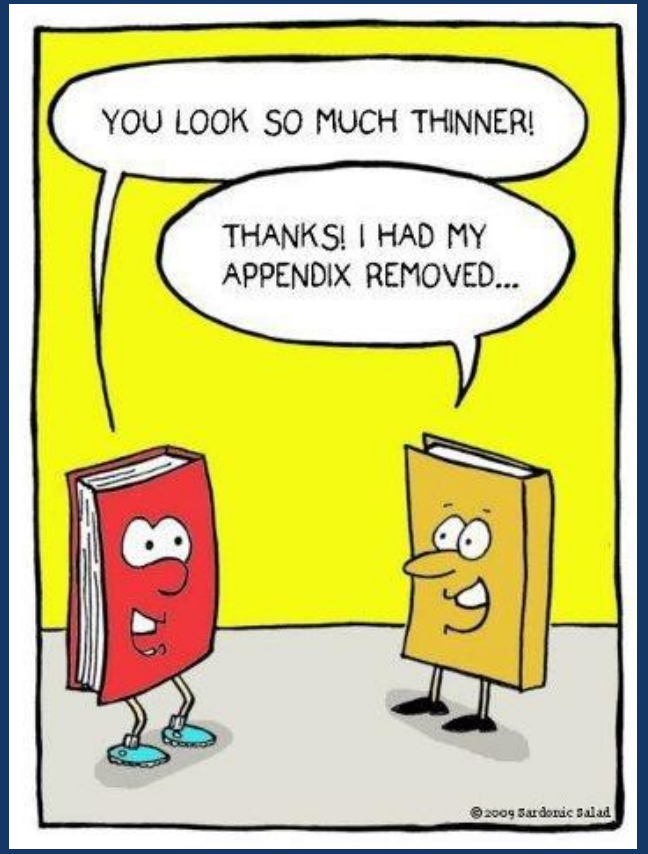
Is interval appendectomy necessary?

- **In adults, many surgeons do not do this operation**
- **In kids, data are limited:**
  - 2-year follow-up of 96 patients
  - Perforated appendicitis treated non-operatively with antibiotics
  - 6 became worse; 41 had interval appendectomy
  - 49 received no further treatment
  - 57% no recurrence
  - 43% had recurrence within one month to 2 years
  - Presence of appendicolith: 72% rate of recurrence vs 26% in those without appendicolith

Ein SH[1], Langer JC, Daneman A. **Nonoperative management of pediatric ruptured appendix with inflammatory mass or abscess: presence of an appendicolith predicts recurrent appendicitis.** J Pediatr Surg. 2005 Oct;40(10):1612-5.

Approach to interval appendectomy

- More strongly recommended if fecalith present
- Observation is a reasonable option
- Best choice for an individual patient depends on their anxiety and parental anxiety



Immediate operation for ruptured appendicitis: perhaps a better option?

A systematic review and individual patient data meta-analysis of published randomized clinical trials comparing early versus interval appendectomy for children with perforated appendicitis

If there is a drainable abscess at time of presentation IR drainage and abx
If no drainable abscess, just take it out.

Take home points

- **Uncomplicated appendicitis:**
  - Lap appy is still standard of care
  - Non-operative management may be an acceptable option but not enough is known about long-term risk of recurrent appendicitis

- **Complicated appendicitis:**
  - Can be managed with immediate operation, delayed appendectomy or no appendectomy
  - Immediate operation is probably more efficient and less stressful for patients and parents

Why it is important to know history: Was it complicated or uncomplicated appendicitis?

- If child was discharged home on abx, or kept in hospital for several days on IV abx, it was complicated appendicitis
- Uncomplicated appendicitis: single peri-operative dose of abx
- Complicated appendicitis: total 7 days abx (IV/PO)
- Kids who had complicated appendicitis are more prone to postop abscess, antibiotic-associated diarrhea, C Diff colitis
- Lower threshold to refer back to surgeon for possible imaging/evaluation in ED

Common postop complaints

- Wound drainage, redness, swelling refer to surgon for eval before just starting abx if concerned about surgical site infection
- Diarrhea consider abx-associated diarrhea vs C Diff
- Abdominal pain more concerning if accompanied by fever/general malaise/poor appetite. Often can be attributed to constipation.
- Rash, sore throat, rhinorrhea etc

How to triage

- All CareConnect notes will be cc'd to operating surgeon
- If non-urgent question that needs surgeon evaluation, instruct patient to call surgeon directly (302 651 5888 for DE; 407 650 7622 for Orlando)
- If urgent, can attempt to contact surgeon for guidance or send patient to ER

- Open to your suggestions??

Thank you very much!

- Questions?

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