

Best Practice Recommendations

SUSPECTED APPENDICITIS IN CHILDREN

SETTING	South West Surgery in Children Operational Delivery Network (SW SIC ODN)
FOR STAFF	Staff involved in the pathways for children and young people with suspected appendicitis
PATIENTS	Children who are being considered for appendicectomy procedures in organisations across the SW SIC ODN region

Guidance

Summary

The recent GIRFT report on Paediatric General Surgery made recommendations on the treatment of appendicitis in children based on concern at variation in practice and a nationally high negative appendicectomy rate (1).

- All departments must have an approved pathway for children with a suspected appendicitis which meets existing published standards in order to ensure timely assessment and treatment (1, 2)
- All children aged 5 years and above should expect to have their appendicectomy surgery delivered at their local provider (1, 2, 3).
- Children under 5 years with **suspected appendicitis** should be discussed with the specialist centre and transferred for assessment and surgery where it is felt clinically appropriate (1, 2, 3).
- The current negative appendix rate is 10-20% in the UK (based on HES data and national audit data). The recommendation in the GIRFT report is that we should aim to improve regional pathways to reduce this towards 5% (1, 4).
- All surgical outcomes must be coded appropriately and codes for non-specific outcomes should be avoided to support improvements in clarity of outcomes (anticipated 95% of procedures should be accurately coded and use of 'unspecified coding' is avoided) (1, 4)

Assessment

- All children admitted with suspected appendicitis should include assessment and examination by the acute paediatricians and a clear shared care policy should be in place with surgical teams (1).
- All children should be assessed using a nationally approved Paediatric Early Warning Score (PEWS) system (5), which should include a pain score using an appropriate paediatric pain tool.
- A period of active monitoring is appropriate in children where the diagnosis is unclear. Serial bloods should be performed where a period of monitoring has been decided (6)
- Investigations should include access to ultrasound imaging for all children when the clinical diagnosis is unclear (Appendix C). This will be of greatest benefit in post-menarche females and where the diagnosis is unclear (1, 4, 7, 8, 9).
- If appendicitis is diagnosed, intravenous antibiotics should be commenced (see Appendix A) and the child should be booked for theatre (8).
- Imaging findings suggestive of appendix mass or appendix abscess should prompt discussion with the specialist centre. Conservative management or interventional drainage may be the most suitable management

Operative Period

- Following the decision to operate, all children should have proceeded to theatre within 12 hours (1, 2, 3)
- Laparoscopy is the preferred technique in the majority of cases nationally and reduces post-operative pain (8, 10).
- Where complex appendicitis is found at operation, ensure appropriate samples for microbiology are taken and antibiotic therapy adjusted accordingly (see Appendix A) (8).
- Where complex appendicitis is found, a conversation should occur between the surgeon and anaesthetist regarding the most appropriate vascular access to leave for the child; consider insertion of PICC or mid-line where prolonged intravenous access is anticipated (e.g. for antibiotics).

Post-operative

- Where simple appendicitis or no appendicitis diagnosed
 - Stop antibiotic treatment
 - Prescribe simple analgesics
- Where complex appendicitis has been diagnosed (11):
 - Continue antibiotics intravenously for 3 days then review (Appendix A)
 - Prescribe appropriate analgesia for moderate severe pain which could include a PCA (see Appendix B).
- Children should be discharged once discharge criteria are met:
 - Mobile, eating and drinking, afebrile, pain controlled on simple analgesics
- Where the clinical condition is not improving or deteriorating post-operatively:
 - Repeat blood tests
 - Undertake ultrasound imaging for possible collections at day 5
 - Ensure the child receives appropriate PEWS scoring and resuscitation
 - Consultation with the specialist centre should be made to ascertain whether transfer is necessary, or if treatment should be continued locally.

Audit and service review

- As part of the SW SIC ODN, centres should participate in audits of their suspected appendicitis pathway for children against these recommendations to identify opportunities to improve safety, quality and performance. Key performance and outcome measures such as negative appendix rate, coding quality, percentage of laparoscopic procedures undertaken, collection rate, re-intervention rate, and length of stay should be considered at local and network level.

Appendix A – Suggested Antibiotic Regimens

Pre-operative:

- First line cefuroxime and metronidazole
- Penicillin anaphylaxis teicoplanin and metronidazole

Intra-operative

- If complex appendicitis (gangrene/free pus/visible perforation), start IV gentamicin (7mg/kg)

Post-operative

- Simple appendicitis no further antibiotics, home next day
- Complex appendicitis 3 days IV antibiotics then review and if antibiotics are still required, consider oral switch with microbiology consultation

Appendix B – Analgesic Recommendations

- Children should have pain assessment at all stages of their perioperative care
- Where complex appendicitis is found at surgery, consider a PCA for post-operative analgesia if appropriate protocols exist and appropriately trained staff are able to review regularly.

Appendix C - Ultrasound Imaging

- Ultrasound is a helpful adjunct in children with abdominal pain
- Access to ultrasound within day time hours 7 days per week can help inform clinical decision making
- It is particularly helpful in post-menarche female when assessing for ovarian pathology

Table A

REFERENCES	<ol style="list-style-type: none"> 1. Paediatric Surgery, GIRFT Programme National Specialty Report authored by Simon Kenny(February 2021) (link here) 2. Commissioning guide: Paediatric Emergency Appendicectomy, Royal College of Surgeons (2015) (link here). 3. Children's Surgical Forum of The Royal College of Surgeons of England (2013) Royal College of Surgeons Standards for Childrens Surgery (link here) 4. de Castro, S.M.M., Geerdink, T.H., Macco, S., van Veen, R.N., Jensch, S. and Vrouenraets, B.C. Mandatory imaging in the work-up of children suspected of having appendicitis reduces the rate of unnecessary surgeries. Journal of Pediatric Surgery, 53(10), pp.2028–2031 (2018). 5. Guidelines for the Provision of Anaesthetic Services; Chapter 10 Chapter 10: Guidelines for the Provision of Paediatric Anaesthesia Services 2020, Royal College of Anaesthetists (link here) 6. Bachoo, P. Mahomed, A, Ninan, G. Youngston G, Acute Appendicitis the continuing role for active observation. Paediatric Surgery International, 2001, 17: 125-128 7. Rentea R, St Peter S, Snyder C. Pediatric appendicitis: state of the art review. Paediatric Surgery International March 2017, 33(3):269-283 8. Synder, M.J., Guthrie, M. and Cagle, S. Acute appendicitis: efficient diagnosis and management. American Family Physician 98(1), 25-33 (2018) 9. Unsdorfer, K. An J, Binkovitz L. Pediatr Radiol. 2021 February ; 51(2): 265–272. Pediatric appendiceal ultrasound: maintaining accuracy, increasing determinacy and improving clinical outcomes following the introduction of a standardized reporting template 10. Esposito, C., Calvo, A.I., Castagnetti, M., Alicchio, F., Suarez, C., Giurin, I. and Settimi, A. (2012). Open Versus Laparoscopic Appendectomy in the Pediatric Population: A Literature Review and Analysis of Complications. Journal of Laparoendoscopic & Advanced Surgical Techniques, 22(8), pp.834–839 11. Cameron D et al. (2018) Development and Implications of an Evidence-based and Public Health-relevant Definition of Complicated Appendicitis in Children. Ann of Surg For information: RIFT Study Group: Appendicitis risk prediction models in children presenting with right iliac fossa pain (RIFT study): a prospective, multicentre validation study. Lancet Child Adolesc Health. 2020 Apr;4(4):271-280.
AUTHORISING BODY	<p>This document was approved through the SW SIC ODN General Surgery & Urology Working Group on the 24/01/2022 and subsequent follow up email. For further information regarding this group please contact the SW SIC ODN core team on the details below.</p>
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