Whittington Health NHS

Paediatric Appendicitis

Subject:	Paediatric appendicitis
Policy Number	N/A
Ratified By:	Clinical Guidelines Committee
Date Ratified:	Original, September 2010 Reviewed with minor change November 2014, Mr H Mukhtar (Consultant Surgeon) Dr J Raine (Consultant Paediatrician)
Version:	2.0
Policy Executive Owner:	SCD and WCF Divisional Director
Designation of Author:	Consultant Surgeon, Mr H Mukhtar Consultant Paediatrician, Dr J Raine
Name of Assurance Committee:	As above
Date Issued:	November 2014
Review Date:	3 years hence
Target Audience:	Clinical staff and radiologists involved in paediatrics/surgery
Key Words:	acute abdomen, appendicitis, paediatrics, children

Version Control Sheet

Version	Date	Author	Status	Comment
1.0	March 2010 Approval with amendmemnts September 2010 intranet uploadin	Mr H Mukhtar Dr J Raine	Off line	New guideline. Reviewed June 2014 with minor amendment
2.0	Nov 2014	Mr H Mukhtar Dr J Raine	Update Live as of Nov 2014	Minor amendents: • Revised template • Anti-microbial section • Modification of the Trust antibiotic guidelines to relect guideline changes • Reference addition

	Please see Whittington Health Guideline: **Paediatric Surgery Policy**

	Please see Whittington Health Guideline: **The Management of Diabetic Children Undergoing Surgery** *(Paediatric Guidelines / Medical Protocols)* *http://whittnet.whittington.nhs.uk/clickthrough.asp?c=11954*

➢ Abbreviations contained within this guideline

BNFc	British National Formulary for Children
CRP	C-reactive protein
CT	Computer tomography
IV	Intravenous
NCA	Nurse-controlled analgesia
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
PAS	Paediatric Appendicitis Score
PCA	Patient-controlled analgesia
U&Es	Urea & Electrolytes
US	Ultrasound scan
SpR	Specialist Registrar
WCC	White Cell Count

➢ Criteria for use

Any suspected appendicitis in a patient under 18 years old.

➢ Background

Appendicitis is the most common condition requiring emergency abdominal surgery in children. Peak incidence is in the teens with the condition becoming less common under the age of 10 and rare in infants. Overall, there is an estimated incidence of 4 per 1000 school-age children per year and it accounts for up to 30% of paediatric presentations to emergency departments with abdominal pain.[1]

As the inflammation spreads to involve the parietal peritoneum, there is a shift in pain perception from the peri-umbilical region to the right lower quadrant of the abdomen. At this stage the pain is typically more severe, continuous, and often associated with constitutional symptoms i.e fever, anorexia and nausea and vomiting.

Children are much more susceptible to rapid progression to perforation than adults.[2,3,4]

Although up to one-third of children have the classic presentation of diffuse central abdominal pain followed by vomiting and localization of the pain to the right iliac fossa and pyrexia, these are generally older children.

The presentation in preschool children is more often atypical, and tends to be delayed,[5,6,7] as symptoms are more difficult to elicit from a non-verbal population. Perforation of the appendix is an almost universal finding at laparotomy in this age group if there is a delay in diganosis.[5,6,7]

Paediatricians and surgeons must therefore be involved early to avoid the potential complications of a delayed diagnosis.

➢ Assessment

All children with suspected appendicitis should be reviewed by the surgical on-call team. Cases of diagnostic uncertainty, should be assessed/managed jointly by the paediatric and surgical teams throughout the patient's admission or until a definitive diagnosis is made.

Appendicitis is a clinical diagnosis and definite management must not be delayed for radiological confirmation.

As well as a full history and examination, all patients should have:

- urinalysis
- full blood count, U&Es and CRP
- if appropriate, a pregnancy test

Pain assessment using the validated paediatric pain assessment tool should be undertaken as soon as possible and appropriate analgesia administered without delay, if indicated. Pain assessment and response to analgesics should be clearly documented.

Please refer to Whittington Health Guideline*:*

The Administration of Analgesia to Children 1 year and above and Paediatric Pain Assessment

http://whittnet.whittington.nhs.uk/clickthrough.asp?c=12106

The classic triad of appendicitis is vomiting, fever and abdominal pain,[5,8] but the full complement does not have to be present for a diagnosis to be made.[9,10]

Predictive factors significantly associated with perforated appendix are age under 9 years, abdominal pain lasting longer than 48 hours, temperature of more than 37.9°C and signs of peritoneal irritation[11].

In cases of diagnostic uncertainty, **abdominal ultrasonography** is a useful modality in the paediatric population due to the lack of ionising radiation and its good sensitivity and specificity.[12]

In comparison, **CT scanning** is not operator dependent and offers superior diagnostic accuracy. However, the large dose of ionising radiation from CT and the risk of subsequent radiation-induced malignancy are of particular concern in the paediatric population. (A one year old child undergoing a CT scan would have an increased lifetime risk of fatal radiation-induced-malignancy of 0.18%).[13] It is, therefore, recommended that a CT scan should be ordered only after discussion with the responsible consultant surgeon or paediatrician.

Both imaging modalities should be used to facilitate earlier diagnosis and subsequent surgery. **Potential unavailability or anticipated delays in obtaining investigations (e.g. outside normal working hours) should not lead to unacceptable delays that could compromise further clinical management**.

➢ Clinical Management

Admit patients on paediatric ward for observations and perioperative management

Pain management:

- Paracetamol, diclofenac, and morphine are all standard medications used for analgesia in the acute abdomen. These must be prescribed as per the doses stated in the BNFc.
- Post-operatively, the patients may require PCA/NCA, with daily review by the pain team.
- Appendicectomy patients should only be discharged on a short supply of paracetamol and ibuprofen. Pain that is not controlled by simple analgesia after a reasonable time post-appendicectomy should be brought to the attention of the operative surgeon's team.

Please refer to Whittington NHS Trust Guideline*: '*

The Administration of Analgesia to Children 1 year and above and Paediatric Pain Assessment

http://whittnet.whittington.nhs.uk/clickthrough.asp?c=12106

Fluid management:

- Paediatric fluid management is different from adults.

	**Please see Whittington Health Guideline:** *Intravenous Fluid Management for Paediatric Patients Guideline* **http://whittnet.whittington.nhs.uk/clickthrough.asp?c=10619**

Antimicrobials:

- If the child is clinically suspected to have acute appendicitis with no signs of sepsis such as a fever≥ 38°C, a tachycardia and a raised white cell count than iv antibiotics can be offered as an alternative initial treatment with close monitoring. Any deterioration in clinical condition or the presence of the signs of sepsis listed above should lead to the prompt reassessment of the child.

- In the presence of signs of sepsis and/or clinical signs of generalised peritonitis (perforated appendix), high dose IV co-amoxiclav should be initiated immediately (unless contraindicated; discuss with on-call microbiologist).

- All appendicectomies require iv co-amoxiclav at induction of anaesthesia (if the patient has not received iv antibiotics in the previous 4 hours). If the patient is systematically unwell or has signs of peritonitis than gentamicin 7mg/kg should be added at induction (see gentamicin and antibiotic protocols).

- Penicillin-allergic patients should be discussed with microbiology. For penicillin-allergic patients with signs of sepsis and/or clinical signs of generalised peritonitis, please refer to antibiotic protocol for children

- Further antimicrobial therapy is then determined by findings at surgery:
    - if the appendix is normal, no further antibiotic therapy is required.
    - if inflamed, 2 further doses of IV antibiotics are required.
    - if gangrenous or perforated , the patient will require a 5 day course of antibiotics and then a further review (see paediatric antibiotic guideline)

Please refer to Whittington Health Guideline*:*

Antibiotic Protocols for Children >4 Weeks of Age

http://whittnet.whittington.nhs.uk/clickthrough.asp?c=10745

Emergency Theatre Arrangements

- There is a single theatre which is used for both trauma and emergency surgery, and is available 24 hours a day.
- **Once the decision to proceed with appendicectomy has been taken, the surgical team should perform the operation before midnight on the same day (NCEPOD list).**
- In any cases where this will not happen, the on-call surgical registrar should inform the on-call surgical consultant.
- If the patient's clinical condition warrants immediate surgery (e.g. to avoid impending perforation), this needs to be performed, regardless of the time of day.
- In exceptional circumstances, opening of a second emergency operating room should be discussed with the responsible consultant surgeon, consultant anaesthetist and theatre manager to facilitate timely management.
- It is the responsibility of the on-call surgical registrar to book the child onto the emergency list and ensure that the order of the list is as per clinical priority.

Service for Children under 5 years old:

- Patients under 2 years old should be referred to a tertiary centre with appropriate paediatric surgery facilities. It is the responsibility of the surgical team to organise the referral and ensure prompt and safe transfer.
- Patients between 2 and 5 years should be discussed with the on-call consultant surgeon and anaesthetist as soon as possible; delay in discussion (and potential transfer) can lead to complications including death.
- Patients aged 5 or over can have their operation performed by the on-call surgical registrar, after discussion with the on-call consultant surgeon.

	Please see Whittington Health Guideline: **Paediatric Surgery Policy**

➢ Contacts (inside and outside the Trust including out-of-hours contacts)

- On-call surgical registrar: bleep 3376
- On-call paediatric registrar: bleep 3111/3322
- On-call radiology registrar through switchboard
- On-call surgical and paediatric consultants through switchboard

➢ References (evidence upon which the guideline is based)

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2. Sivit CJ, Applegate KE. Imaging of acute appendicitis in children. Semin Ultrasound CT MR 2003; 24: 74-82
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5. Irish MS, Pearl RH, Caty MG, et al. The approach to common abdominal diagnosis in infants and children. Pediatr Clin North Am 1998; 45: 729-772
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7. Rao PM, Rhea JT, Novelline RA, et al. Helical CT technique for the diagnosis of

appendicitis: prospective evaluation of a focused appendix CT examination. Radiology 1997; 202: 139-144

8. Alloo J, Gerstle T, Shilyansky J, Ein SH. Appendicitis in children less than 3 years of age: a 28-year review. Pediatr Surg Int 2004; 19: 777-779.

9. Becker T, Kharbanda A, Bachur R. Atypical Clinical Features of Pediatric Appendicitis. Academic Emergency Medicine 2007; 14:124-129

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11. Yen-Shih P, Hung-Chang L, Chun-Yan Y, et al. Clinical Criteria for Diagnosing Perforated Appendix in Pediatric Patients. Pediatric Emergency Care 2006; 22: 475-479

12. . Brennan GDG. Pediatric appendicitis: pathophysiology and appropriate use of diagnostic imaging. Can J Emerg Med 2006; 8: 425-432

13. Brenner DJ. Estimating cancer risks from pediatric CT: going from qualitative to the quantitative. Pediatr Radiol 2002; 32: 228-231

14. Peter C. Minneci, Jason P. Sulkowski, Kristine M. Nacion, Justin B. Mahida, Jennifer N. Cooper, R. Lawrence Moss, Katherine J. Deans. **Feasibility of a Nonoperative Management Strategy for Uncomplicated Acute Appendicitis in Children**. *Journal of the American College of Surgeons*, 2014; DOI: 10.1016/j.jamcollsurg.2014.02.031

- **Compliance with this guideline (how and when the guideline will be monitored e.g. audit and which committee the results will be reported to)**

See compliance monitoring table below

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval

		Yes/No	Comments
1.	**Does the procedural document affect one group less or more favourably than another on the basis of:**		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
2.	**Is there any evidence that some groups are affected differently?**	No	
3.	**If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?**	No	
4.	**Is the impact of the procedural document likely to be negative?**	No	
5.	**If so can the impact be avoided?**	N/A	
6.	**What alternatives are there to achieving the procedural document without the impact?**	N/A	
7.	**Can we reduce the impact by taking different action?**	N/A	

If you have identified a potential discriminatory impact of this procedural document, please refer it to the Director of Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.

For advice in respect of answering the above questions, please contact the Director of Human Resources.

Checklist for the Review and Approval of Procedural Document

To be completed and attached to any procedural document when submitted to the relevant committee for consideration and approval.

	Title of document being reviewed:	Yes/No	Comments
1.	**Title**		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	**Rationale**		
	Are reasons for development of the document stated?	Yes	
3.	**Development Process**		
	Is it clear that the relevant people/groups have been involved in the development of the document?	Yes	
	Are people involved in the development?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	
4.	**Content**		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
5.	**Evidence Base**		
	Are key references cited in full?	N/A	
	Are supporting documents referenced?	N/A	
6.	**Approval**		
	Does the document identify which committee/ group will approve it?	Yes	
7.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	Yes	
8.	**Document Control**		
	Does the document identify where it will be held?	Yes	

	Title of document being reviewed:	Yes/No	Comments
9.	**Process to Monitor Compliance and Effectiveness**		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance with the document?	Yes	
10.	**Review Date**		
	Is the review date identified?	Yes	
	Is the frequency of review identified? If so is it acceptable?	Yes	
11.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

Tool to Develop Monitoring Arrangements for Policies and guidelines

What key element(s) need(s) monitoring as per local approved policy or guidance?	Who will lead on this aspect of monitoring? Name the lead and what is the role of the multidisciplinary team or others if any.	What tool will be used to monitor/check/observe/Asses s/inspect/ authenticate that everything is working according to this key element from the approved policy?	How often is the need to monitor each element? How often is the need complete a report ? How often is the need to share the report?	What committee will the completed report go to?
Element to be monitored	**Lead**	**Tool**	**Frequency**	**Reporting arrangements**
All	**Hasan Mukhtar**	**Audit**	**Bi-annually**	**Surgical/ Paediatric meetings**