GETTING IT RIGHT FIRST TIME

Paediatric acute abdominal pain and appendicectomy:

Best practice pathway guidance

June 2022

GIRFT is part of an aligned set of programmes within NHS England and NHS Improvement

Overview

Who should read this pathway guide?

This document is aimed at a range of stakeholders:

- Health care professionals involved in the care of children with acute abdominal pain and appendicectomy; and
- Local and national commissioners, service improvement leads, operational delivery networks (ODNs), Integrated Care Systems (ICS) children and young person leads, and others involved in ensuring an efficient and effective approach to delivering high quality services for children across England.

What is the pathway guide's aim?

The guide sets out a consensus best practice pathway for managing paediatric acute abdominal pain and appendicectomy. It seeks to convey best practice in a way that can be adapted and adopted by different units across England to support improved outcomes for children in need of this service, and a sustainable NHS.

Research methodology

Delphi panel methodology was used to identify areas of consensus in how children with acute abdominal pain, including appendicitis, should be managed in the NHS.

Engagement with relevant professional organisations facilitated the identification of 35 individuals with appropriate expertise to inform the development of a best practice pathway. These experts were drawn from specialist and non-specialist centres, and included nurses with special interests in pain, surgery, community care and discharge planning, and clinicians from the specialities of emergency medicine, radiology, infectious diseases, anaesthetics, general surgery and paediatric surgery.

A number of meetings were convened, focused on different elements of the pathway, with each producing a number of recommendations. The cumulative 105 recommendations were voted on by the panel of experts to identify areas of consensus, which was established in relation to 94 of the 105 recommendations. These areas of consensus underpin the pathway presented in this document.

Further information on the approach taken can be found here:
https://future.nhs.uk/connect.ti/NHSECYPTransformation/view?objectID=136159685

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1. Foreword

One of the cornerstones of the National Health Service is its aspiration to provide the same standard of care for every citizen, regardless of geography, socioeconomic status, race or age. That aspiration is supported by evidence that reduction in variation across pathways of care improves outcomes, raises quality and is more cost-effective.

On my visits to providers of children's surgical care in 2018, we found some great examples of how pathways could achieve these aims but also noted huge variation in all aspects of the management of children with abdominal pain. This variation was seen from how they are assessed and treated in Paediatric Emergency Departments through to aspects of post-operative care following appendicectomy. As a consequence, we saw the adverse impact this had on outcomes and quality.

Since those visits, we have seen huge progress. The number of children who have a normal appendix removed (negative appendicectomy) has reduced by half, and the percentage of children undergoing laparoscopic appendicectomy has increased from 55% to over 80%, which demonstrates how the GIRFT process can improve quality of care.

This pathway encompasses the whole child's pathway, from presentation out of hospital with abdominal pain to discharge from hospital for those children who require surgery. We are aware that not everyone will need to be aware of the fine details of all aspects of the pathway and have designed it and accompanying materials so that clinical teams at different stages of the pathway can see the aspects which pertain to them.

This document was a result of rapid collaboration between a wide range of clinicians and brings home the complexity of what might at first seem a simple problem. Seen from the eyes of a child and their family it also reinforces the need for oversight of what can be a complex and inconsistent journey, which is often reflected in complaints and litigation. The support of professional societies: the British Association of Paediatric Surgeons, the Association of Paediatric Anaesthetists, the British Association of Paediatric Radiologists, the GIRFT radiology workstream, NHS 111, is much appreciated.

Abdominal pain is a ubiquitous feature of childhood, and recognition of serious pathology can be challenging. This pathway represents the consensus view from clinicians from all specialties on some unifying principles that can aid in providing the best care for children. We present a number of key quality actions that clinical teams and providers can take, with support from commissioners and networks. We have aligned this guidance with 111 algorithms to reduce inconsistency in early decisions. We have also identified key areas of uncertainty where evidence is lacking and research required.

We make no apology for an emphasis on appendicectomy in the later stages of the pathway as this is the most common intra-abdominal emergency in children. We will build on this pathway with further iterations focussing on management of rarer surgical emergencies, such as ovarian torsion and intussusception, in due course.

In the consensus workshops, we heard clear evidence of an association between lower socioeconomic status, ethnicity and poorer outcomes. The reasons for this are likely to be multiple but this evidence reinforces the need for consistent pathways and an approach to quality improvement that tackles inequalities head on.

Taken together, if applied to all regions of the country, this pathway will significantly improve the quality of care for the children and families we care for. We look forward to working with you to achieve this goal.

Professor Simon Kenny

GIRFT Clinical Lead for Paediatric Surgery
National Clinical Director for children and young people with NHS England
Consultant paediatric surgeon at Alder Hey Children's Hospital

I welcome this best practice pathway guide on paediatric pain and appendicectomy, which picks up on one of the key findings from the Getting It Right First Time review of paediatric general surgery and urology: that the care for children with acute appendicitis needs to improve. Making sure that children are cared for within defined care pathways can reduce variation in care, improve outcomes and shorten lengths of stay.

Professor Simon Kenny has successfully corralled a multi-disciplinary team of experts to identify what best practice should look like. He has developed this practical guide to help teams responsible for providing care for children with abdominal pain and appendicitis to understand how they can deliver pathway improvements and level up care across the country.

GIRFT can only succeed with the backing of clinicians, managers and all of us involved in delivering care. I hope that with this collaborative approach we can continue to improve the quality of treatment and care we provide for children in the NHS.

Professor Tim Briggs CBE

GIRFT Programme Chair and National Director of Clinical Improvement for the NHS. Professor Tim Briggs is Consultant Orthopaedic Surgeon at the Royal National Orthopaedic Hospital NHS Trust, where he is also Director of Strategy and External Affairs. He led the first review of orthopaedic surgery that became the pilot for the GIRFT programme, which he now chairs. Professor Briggs is also National Director of Clinical Improvement for the NHS

About GIRFT and the GIRFT Academy

Getting It Right First Time (GIRFT) is an NHS programme designed to improve the quality of care within the NHS by reducing unwarranted variation. By tackling variation in the way services are delivered across the NHS, and by sharing best practice between trusts, GIRFT identifies changes that will help improve care and patient outcomes, as well as delivering efficiencies such as the reduction of unnecessary procedures and cost savings.

The GIRFT Academy has been established to provide easily accessible materials to support best practice delivery across specialties and adoption of innovations in care.

Importantly, GIRFT Academy is led by frontline clinicians who are expert in the areas they are working on. This means advice is developed by teams with a deep understanding of their discipline, generated by the management of services on a daily basis.

The GIRFT programme is one element of the government's response to the recommendations of Lord Carter's report on operational productivity and performance in NHS acute trusts in England, published in 2016. The Carter Report highlighted the GIRFT programme within its theme on quality and efficiency, outlining the orthopaedic GIRFT pilots which identified the scale of benefit to tackling unwarranted variation.

For more information on the GIRFT programme, visit our website at:

www.gettingitrightfirsttime.co.uk

2. Introduction

The NHS Long Term Plan recognised the need for children's services to evolve to ensure that 'children and young people are able to access high quality services as close to home as possible.' In 2018, the GIRFT programme conducted a national review of paediatric general surgery and urology to consider how services needed to evolve to deliver the ambitions set out in the Long Term Plan. The review uncovered significant opportunities to improve care and outcomes for children requiring general surgery and urology.

One of the key findings contained in the December 2021 GIRFT national report was that 'care for children with acute appendicitis needs to improve.' The report found that 10% of children undergoing appendicectomy were having a normal appendix removed, which compares unfavourably with the USA and other European countries, where the rate is 2.5% or lower. The report also identified significant variation in the lengths of hospital stay for children with simple and complex appendicitis.

The GIRFT national report made specific suggestions around how services could be improved:

- Providing better training of general surgeons in paediatric surgery to improve leadership and outcomes in non-specialist trusts;
- Ensuring that the care of each child with possible appendicitis in non-specialist trusts is shared between general surgeons and paediatricians;
- Improving use of 7-day diagnostic imaging; and
- Caring for children within defined care pathways.

A specific recommendation called for the development of a model appendicectomy pathway, which this document seeks to address.

3. Benefits of improving care for children with acute abdominal pain

Acute abdominal pain in children typically leads to interaction with the NHS either via the child's GP, NHS 111 or, more often than not, the emergency department (ED). Appendicitis accounts for a significant portion of emergency care cases amongst children and is one of the most common operations in the UK. Appendicitis is considered to be low-complexity surgery and in most cases, emergency care is provided by the local, non-specialist trust. However, if a child presents at a specialist trust with an emergency department, surgery would normally be carried out there.

A wide range of health care professionals are involved in the diagnosis and treatment of children with acute abdominal pain, including appendicitis. Developing and delivering a best practice pathway has multiple benefits including but not limited to:

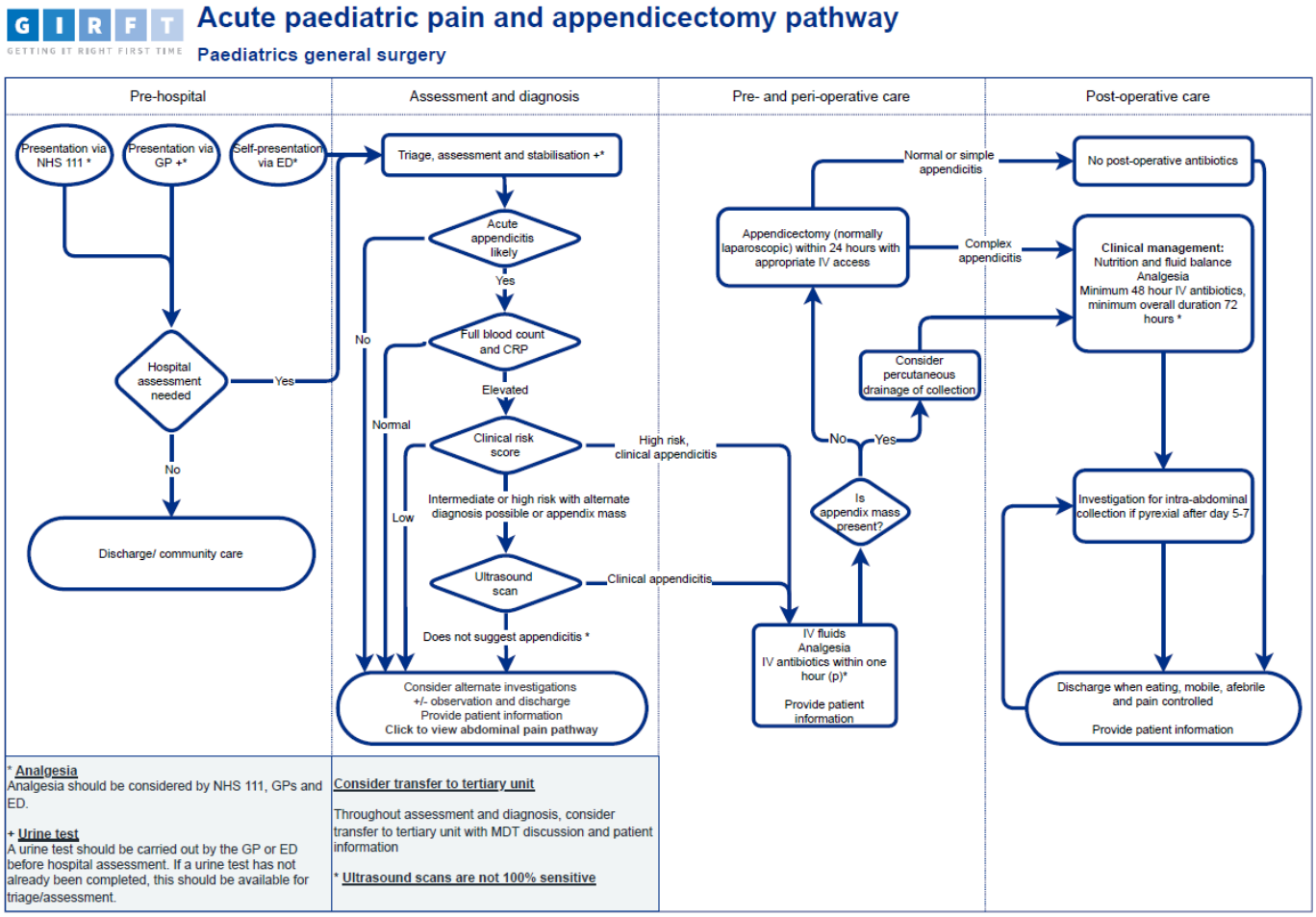
- **Reduction in unwarranted variation** in the quality of care;
- **Improved outcomes**, including a reduction in negative appendicectomies;
- **Improved patient experience**, including reduced presentations prior to diagnosis, shorter lengths of stay following treatment and reduced readmission rates;
- **Enhanced coordination** between professionals involved in the delivery of care and treatment;
- **Greater productivity and efficiency** driven by a shared understanding of what is required to deliver high quality care; and
- **Greater opportunities for staff** training and development.

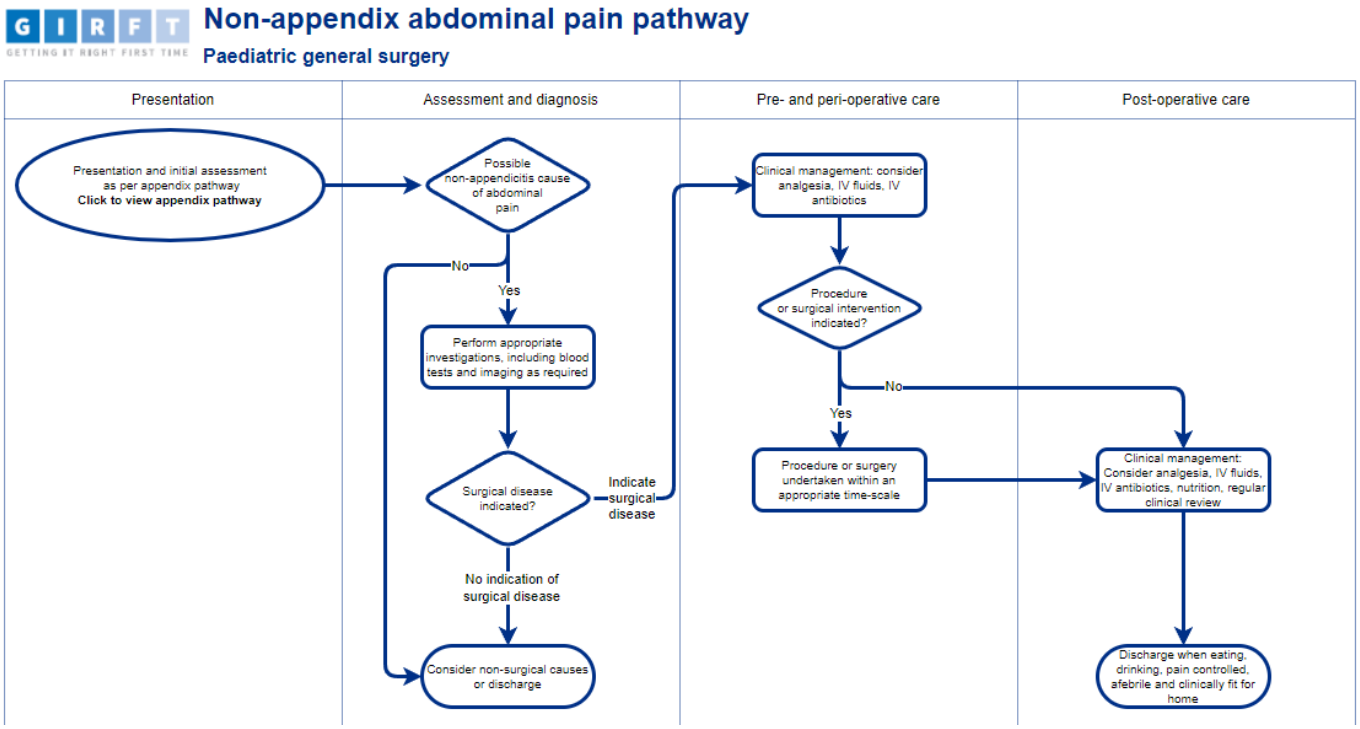
Public Health England Fingertips profiles: Emergency admissions < 18 years by County

Public Health England Fingertips profiles: Deprivation score (IMD 2015) for young people

4. The paediatric acute abdominal pain and appendicectomy pathway

The way that care is provided to children with acute abdominal pain and those in need of an appendicectomy can be summarised in a flow diagram. This pathway covers both simple and complex appendicitis. More detail is provided in the subsequent paragraphs and a full page pathway is provided in the appendix.





Pre-hospital

For children who initially present via NHS 111 or the GP, an initial assessment should be conducted to advise the child and family whether further assessment in hospital is required. If a child presents in primary care with abdominal pain, appropriate analgesia should be considered and a urine test performed.

Assessment and diagnosis

During this phase of the pathway, a number of diagnostic tests are completed to identify whether the child's abdominal pain is caused by appendicitis, and whether any appendicitis is normal or complex, as explained by the definitions in figure 1.

Alternative surgical causes will also need to be considered and would follow a different pathway to appendicectomy.

Definitions:

- **Normal appendix:** No macroscopic evidence of inflammation
- **Simple appendicitis:** Inflamed appendix
- **Complex appendicitis:** Gangrenous appendix, perforated appendix +/- visible faecolith

Pre- and peri-operative care

Once children have a diagnosis of appendicitis, antibiotics should be started within 1 hour, and fluids will need to be monitored. It is recommended that appendicectomy should be conducted within 24 hours of diagnosis. If there is a clinical diagnosis of appendix mass, it is reasonable to treat this without surgery but drainage of an abscess may need to be considered.

Post-operative care

The pathway sets out a number of considerations to support a rapid recovery and ensure that any complications are addressed in a timely manner. Different approaches to antibiotics are set out for simple and complex appendicitis.

5. Delivering improvements in paediatric acute abdominal pain and appendicectomy

This section of the guide provides detailed consideration of the key areas for quality improvement in paediatric abdominal pain and appendicectomy. Explanatory remarks, aimed particularly at the non-clinician, can be found under each heading, including guidance on what good care might look like.

Later stages of the document are organised around these good quality care criteria, so that relevant supporting material, including case studies, can be easily identified by those who are undertaking quality improvement work on their own paediatric abdominal pain and appendicectomy service.

Pressing ‘control’ and clicking the link in a particular box will take you to a summary of the issue.

A	Universal use of analgesia in children's pathways for abdominal pain	B	Adoption of a diagnostic pathway for children with suspected appendicitis	C	Consistent identification of the sick child with abdominal pain with appropriate early management	D	Consistent involvement of the multidisciplinary team to care for children with abdominal pain
E	Availability of appropriate imaging in centres admitting children with abdominal pain, supported by ODNs	F	Monitoring and focus on time from clinical diagnosis of appendicitis to operation	G	Adoption of consistent, appropriate, antibiotic strategies for appendicitis	H	Provision of accessible, age-appropriate patient and family resources to support their journey through the healthcare system

5A Universal use of analgesia throughout children's pathway for abdominal pain

Key quality actions:

- **At every step of the pathway assess child's pain and give appropriate analgesia, from presentation to resolution of pain**
- **Hospitals should have a children's pain pathway that is used consistently**

Children with abdominal pain often receive sub-optimal analgesia, which can be associated with future excessive physical sensitivity (hyperaesthesia) and intolerance of painful procedures.

At the time of making a primary care appointment, attending an urgent care centre, being triaged in A&E or receiving advice from NHS 111, it is important to ensure the appropriate use of simple oral analgesia. Parents and carers should be reassured that analgesia will not mask serious disease but that it enables a child to be more comfortable and allows for a more accurate assessment of their condition, earlier in the patient journey.

Pain should be monitored throughout the patient pathway and analgesia administered to keep it under control and improve the child's experience of care, as detailed in figure 2.

Figure 2: pain pathway overview

Pain pathway element	Key considerations
Assessment of pain	• Measurement of the severity and intensity of pain using appropriate validated pain assessment tool depending on child's age and cognitive ability. • Assessment of the cause, location and the type and nature of pain (e.g. visceral or spasmodic) including exacerbating and relieving factors • Assessment of the impact of pain (e.g. preventing mobility/deep breathing/coughing or sleep)
Management of pain	The principles of WHO analgesic ladder should be used and applied from presentation: • Analgesia should be prescribed and given regularly • If nausea / vomiting present or likely, prescribe IV paracetamol instead of oral and consider NSAIDs if appropriate If simple analgesia is insufficient, then consider oral or IV opioids, they do not mask abdominal pathology. • If NBM or nausea/vomiting present or likely consider IV opioids (via infusion/PCA/NCA) in conjunction with IV anti-emetics (preoperative initiation may be required). • For intra-operative pain control: Multimodal analgesia along with consideration of regional techniques
Supporting high quality pain pathway delivery in children	To support acute pain management, secondary care providers should: • Train healthcare professionals to manage pain • Implement evidence-based institutional protocols for pain management (Example in appendix) • Task specialist pain management teams to lead paediatric pain management • Audit practice

Read our case study on the introduction of a pain pathway

"She only got paracetamol during the day – she wasn't given more than that. Just Calpol, so it didn't really keep the pain under control. She seems quite strong with pain but just because a kid isn't showing it, doesn't mean she isn't feeling it."

Mum of paediatric appendicitis patient

5B Adoption of a diagnostic pathway for children with suspected appendicitis

Key quality actions:

- **Implementation of a documented, structured clinical assessment of the child with abdominal pain**
- **In a child with suspected appendicitis, perform screening blood tests to guide decision-making**
- **Perform a clinical risk score for children when indicated**

Children with appendicitis are part of a larger cohort of patients presenting with abdominal pain and can be difficult to diagnose. Lack of structured assessment in the accident and emergency department can lead to largely avoidable challenges including:

- Negative appendicectomies, where the appendix is removed for suspected appendicitis but is subsequently found to be normal; and
- Children being sent home when they require an appendicectomy, only having to be admitted for surgery at a later date.

Both scenarios provide children with a poor experience of care and do not make best use of NHS resources. The GIRFT national report on paediatric surgery explores variation across the country and clearly demonstrates the need for service change. It also highlights that delayed surgery is a common cause for litigation.

A key factor in driving this change is ensuring that emergency departments consistently use a structured Abdominal Pain Pathway (APP) to stratify risk and guide investigation. This can help support early decision making on whether a child should be admitted or discharged with appropriate safeguards, such as telephone consultations and ambulatory clinics.

Further detail on the importance of diagnostic imaging and joint models of care is provided later in the document.

Model Hospital audit: Appendicectomy - % emergency excision of normal appendix

5C Consistent identification of the sick child with abdominal pain with appropriate early management

Key quality actions:

- **Rapid access to appropriate services for children with severe abdominal pain, facilitated by secondary care**
- **Consistent referral to paediatric abdominal pain guidance for identification of the unwell child**

Operational delivery networks for children's surgery should have clearly identified age related guidance on where children requiring appendicectomy should be treated. Typically, non-specialist hospitals should offer appendicectomy for children of five years and over, with specialist centres providing surgical care for under fives.

When initial presentation is through primary care, the primary care team should perform an assessment which enables referral to the appropriate speciality. Under fives with a suspected surgical diagnosis in primary care should be initially assessed by their local paediatric centre rather than being referred directly to a specialist centre. The receiving secondary care team must have a referral system in place which does not create long delays for the patient or the primary care practitioners who are referring the patient.

Non-specialist and specialist centres must have the appropriate resources, capability, and capacity to provide high quality care to all children who are assessed and admitted for surgery. This requires consistent policies in paediatric, surgical and anaesthetic departments and assurance that comprehensive surgical rotas will be in place to provide the required service.

An ongoing commitment to training is essential to ensure that staff are equipped with the required skills and up to date knowledge on best practice. ODNs should play an important role in supporting a levelling up of quality in the geographies that they serve. Facilitating a networked approach to the provision of care can ensure comprehensive provision of high-quality care and rapid patient access to specialist centres across the network when required. Decisions about transferring patients who are clinically unstable should be undertaken by a multidisciplinary team.

Once children have been admitted to the appropriate care setting, it is essential that a consistent approach is taken to identifying the unwell child and agreeing the appropriate pathway for them to follow. System-wide Paediatric Observations Tracking (SPOT) has been developed to provide a consistent approach and common language to recognise and respond promptly to the acutely ill or deteriorating infant, child or young person in all hospital settings across England.

5D Consistent involvement of the multidisciplinary team to care for children with abdominal pain

Key quality actions:

- **In non-specialist centres, paediatricians should lead clinical decisions and care for children under five, and general surgeons should undertake shared care with paediatricians with all children aged five and over**
- **Emergency abdominal surgery on children under the age of 5 should be performed in a specialist centre unless emergency life-saving surgery is required**
- **There should be early involvement of the multidisciplinary team in assessment and management of the unwell child**

Optimal decision-making about children with acute abdominal pain can be achieved through multi-disciplinary working. In particular, a joint care model that brings together paediatricians and general surgeons can increase the likelihood of an accurate diagnosis and appropriate course of action being agreed, to optimise the child's experience and outcomes.

This approach can reduce avoidable admissions and rates of negative appendicectomy. Paediatricians are more experienced at dealing with children with unexplained symptoms and their families than general surgeons. In a well child with suspected appendicitis when clinical examination and investigations suggest that the child does not have appendicitis, a watch and wait strategy is preferable to surgery with a high risk of negative findings. For unwell children with abdominal pain in non-specialist centres, specialist centres should be available for clinical advice and referral.

Identification of a sick child with suspected surgical abdominal pain by emergency department practitioners is expected to result in a review by the speciality team within 2 hours of arrival in the emergency department. In non-specialist centres, this should include paediatricians and general surgeons (when the child is aged 5 and over) and in specialist centres it should include paediatric surgeons. In non-specialist centres, general surgeons can be asked for advice and assessment for children aged 5 or under.

A number of trusts use emergency decision units, staffed by consultant paediatricians or paediatric advanced nurse practitioners working with surgical teams, which the GIRFT national report on paediatric surgery considered to be effective.

For children admitted with any cause of abdominal pain, a consultant paediatrician should be the named lead consultant in non-specialist centres. General surgical consultants should provide joint care for children aged 5 years and over with a suspected surgical cause of their abdominal pain. For children under the age of 5 years, the paediatric team have responsibility for the child. In specialist centres, children with suspected surgical abdominal pain should be under the care of a Paediatric Surgical consultant (FRCS Paed).

Read our case study on ensuring closer involvement of paediatricians in care of children with abdominal pain and in need of appendicectomy

5E Availability of appropriate imaging in centres admitting children with abdominal pain, supported by ODNs

Key quality actions:

- **Timely availability of radiology support to inform diagnosis and clinical decision-making**
- **ODN development of a network to support provision of services and training**

Traditionally, appendicitis has been considered to require a clinical diagnosis. Today, the use of imaging, such as ultrasound, along with structured scoring systems and biomarkers, has been shown to reduce the number of negative appendicectomies and improve accuracy of diagnosis. One study from a single hospital has found that adoption of universal ultrasound imaging in appendicitis could result in significant savings.

Ultrasound is the gold standard imaging tool for diagnosing appendicitis in children: it is cheaper than computed tomography (CT) and magnetic resonance imaging (MRI); it avoids the radiation dosage of CT; and in experienced hands, it provides similar levels of diagnostic accuracy to CT and MRI.

Clinical standards for seven day services published by NHS England, call for inpatient access to ultrasound within specific timescales for critical (1 hour), urgent (12 hours) and non-urgent patients (24 hours). However, a current inequity in access to paediatric radiology expertise contributes to variation in prompt and accurate diagnosis for children. Variation and delays to diagnosis are exacerbated out-of-hours and over the weekend, particularly in non-specialist centres.

This is especially the case with appendicitis, as the peak time for children to present to emergency departments with abdominal pain is in the early evening. The result is that children often undergo surgery without preoperative imaging or are admitted pending ultrasound.

Operational delivery networks have an important role to play in reviewing capability and capacity to deliver ultrasound imaging for children with suspected appendicitis who meet the screening criteria set out in figure 3. They should work with trusts to ensure that all children who require ultrasound imaging can access it seven days a week via networked care with other centres where required.

Figure 3: Diagnostic imaging for appendicitis:

- Imaging is recommended for children with suspected appendicitis who have:
  - (1) An intermediate risk score using the children's appendicitis score
  - (2) A high risk score and diagnostic uncertainty
  - (3) A low risk score whose symptoms are not resolving
- First-line imaging of all children with suspected appendicitis requiring imaging should be ultrasound scan.

Training the existing workforce in paediatric ultrasound, including radiographers, ultrasonographers and surgeons, is also a key lever for supporting better access to imaging for children and should be supported by ODNs and Integrated Care Boards.

Read our case study on reducing variation in access to abdominal ultrasound.

5F Monitoring and focus on time from clinical diagnosis of appendicitis to operation

Key quality actions:

- **Introduce consistent policy that appendicectomy should be performed within 24 hours of listing**
- **Introduce IT systems that permit monitoring of performance at provider and ODN level**

In 2014, The British Association of Paediatric Surgeons (BAPS) and the Royal College of Surgeons (RCS) issued commissioning guidance stating that >90% of appendicectomies should be performed within 12 hours of decision to operate. There is strong evidence that better outcomes are observed in children who have inpatient waits of less than 24 hours until surgical intervention and some evidence which suggests that operating within 12 hours may confer a benefit.

Although the evidence base is unclear, there was clear consensus amongst the group of experts involved in the development of the paediatric abdominal pain and appendicectomy pathway that appendicectomy should be performed within 24 hours of listing.

As a key indicator of service performance, this metric should be closely monitored by trusts to assess the responsiveness of their service. This is an important issue related to quality of care and child experience, as well as efficiency.

Read our case study on the introduction of a new emergency surgery listing system

Model Hospital audit: Median pre-operative length of stay for appendicectomy in 0 – 16 year olds

5G Adoption of consistent, appropriate antibiotic strategies for appendicitis

Key quality actions:

- **Ensure consistent antibiotic policy for all children at provider level**
- **Introduce consistent intraoperative swabbing and monitor for antibiotic resistance**
- **Adhere to antibiotic stewardship guidelines**

Antibiotics play an important role in preventing infection in children undergoing surgery for appendicitis. However, there is not a consistent approach to their use across the country. For example, the GIRFT national report identified considerable variation between surgeons in the duration of intravenous antibiotics prescribed to children following surgery for complex appendicitis.

Ensuring a more consistent, evidence-based approach to antibiotic use for children with appendicitis will deliver a number of benefits.

Members of the expert group have reported relatively high rates of antimicrobial resistance when routinely performing serosal swabs in children with appendicitis, compared to literature from over two decades ago. Appropriate use of antibiotics will help to reduce antimicrobial resistance by ensuring good antibiotic stewardship. As well as considering evidence specific to the use of antibiotics in children with appendicitis, NICE guidelines on antibiotic stewardship should be observed.

Providing children with appendicitis with the right antibiotic, at the right time and for the most appropriate duration will also help to ensure that hospital stays are not prolonged unnecessarily or curtailed with a heightened risk of readmission.

A standardised approach, based on a review of existing evidence and input from the expert group which has reviewed this pathway, should be followed. Antibiotic choice should consider local guidance on appropriate broad-spectrum antibiotics which take local resistance patterns into account. Specific guidance on antibiotic usage includes:

Pathway reference	Relevant timeframe	Antibiotic guidance
At point of appendicitis diagnosis	One hour	IV antibiotics
Pre-operative	Within one hour prior to skin incision	IV antibiotics
Children with complex appendicitis	Minimum overall duration of 72 hours after appendicectomy	IV antibiotics for at least 48 hours, then consider switching to oral
Children with macroscopically normal appendix or normal appendicitis with no peritoneal contamination	No antibiotics required	N/A

Model Hospital audit: Long length of stay rate for complex appendicectomy in 0-16 year olds (peritonitis or abscess) (> 6 days) (24mths to qtr end)

Read our case study on the value of seeking a microbiological culture in appendicitis and auditing local practice.

5H Provision of accessible, age-appropriate patient and family resources to support their journey through the healthcare system

Key quality actions:

- **Provision of child and parent appropriate resources to guide through their healthcare journey**
- **Ensure that patient materials are accessible for parents and their children**

Providing children and their families with information about the care the child will receive is an important tool for giving reassurance, managing expectations and ensuring that children and/or their families can be involved in shared decision-making where appropriate.

Helping parents to develop a good understanding of what is going to happen to their child and alerting them to potential complications of their treatment, can facilitate effective and appropriate advocacy by parents on behalf of their child if they are concerned about any aspect of their care, or if their child is in pain. High quality patient information for children and their parents can also support the child's recovery and their transition back to normal life after surgery. This can lead to better patient outcomes and an improved experience for children and their families.

It is widely recognised that more could be done to ensure that patient information is provided in appropriate and accessible formats at the appropriate point of the pathway for children with abdominal pain and appendicectomy. In particular, there is little information available for children themselves, which needs to be addressed as this is vital for ensuring that children are engaged in their care.

"Half the day, we didn't know what was going on …No one directly told me, until just before the CT scan, that they might have to do an operation. It only clicked when I saw a label go onto her wrist saying she was going to the surgical ward...I had to ask - I thought, what's going on? Maybe they don't want to worry you, but it would have been good to be kept informed."

Mum of paediatric appendicitis patient

*"On the surgical ward it was amazing - hearing all about the operation. It might have helped to have information before that though – it was all quite a blur. Consent forms were being read out – I just couldn't get my head around it – she was only five and I knew she would have an operation. I felt like I needed **my** mum – I didn't know what to do! I felt like I was signing her life away but I had to trust the doctors."*

Mum of paediatric appendicitis patient

6. Good practice case studies

For each of the areas for quality improvement described in section 4 (see above), a number of good practice case studies have been collated. These studies draw on the experience of teams that have already achieved quality improvement in the highlighted area of care for children with acute abdominal pain and appendicitis.

6A Universal use of analgesia in children's pathways for abdominal pain

Improving pain management for children through a refreshed pain protocol

University Hospitals Plymouth NHS Trust

Motivation and aims

A regional quality improvement exercise in the South West focused on the children's pathway for suspected appendicitis and demonstrated that pain management before, during and after appendicectomy was poor.

Audit data were collected from 12 centres across the region from the moment a child arrived at hospital to the point of discharge. The exercise found that all clinical teams systematically underreported pain in children when compared to the scores that children gave themselves. This was surprising to the clinicians, who were prompted to review and refresh their approach to managing children's pain.

What was done

Following a review of current practice, a new pain protocol was put in place which sought to put assessment and appropriate action at the heart of the pain pathway. The review identified a degree of reticence amongst clinicians to give stronger pain killers, such as opiates, to children with higher pain scores. In addition, patient-controlled analgesia was not prescribed for children before, during or after appendicectomy. The new pathway was focused on pain management at admission, on the ward, post-operatively and at discharge to ensure pain was managed effectively across the whole patient pathway. The pain pathway was shared with everyone in the region.

Successes/ key points of good practice

- A consistent approach to pain assessment was instigated across the hospital, using the Paediatric Early Warning System (PEWS) approach
- Clinical practice changed to ensure that children in need of stronger pain relief were prescribed opiates on admission
- Use of patient-controlled analgesia was routinely prescribed following appendicectomy

Lessons learned

- A multi-disciplinary approach is essential to ensure that all those involved in providing care to children with abdominal pain and those in need of appendicectomies are aware of the agreed protocols. This would include junior doctors, paediatricians, surgeons, emergency department teams.

Auditing patients with abdominal pain to improve pain management in children

Imperial College Healthcare NHS Trust

Motivation and aims

Pain management is a human right and clinicians have a duty to deliver appropriate pain relief for their patients. The paediatric emergency department is the first secondary care interface for children with abdominal pain and the team at Imperial was interested to understand their current approach to abdominal pain and how it might be improved.

What was done

An audit of children with abdominal pain was conducted, including 1647 attendances to the paediatric emergency department. 71 children were triaged as having abdominal pain and another 64 reported abdominal pain during their assessments. The audit established that 4 of the 1,647 children had appendicitis.

The audit allowed an assessment of whether the hospital's pain protocol was being followed and helped to identify areas of good practice and instances where there was room for improvement.

Successes/ key points of good practice

- There was good recognition of pain at triage and nurses were used to administer simple analgesia at this point to reduce delays to pain relief
- A clear and consistent understanding of pain scales supported a unified approach across the team
- Using empathy in assessing pain is a vital tool to support an accurate assessment. Children can be particularly good at over or underestimating their pain, so a combination of questioning and observation of their behaviour is important to ensure an accurate understanding of the level of pain that needs to be brought under control with analgesia

Lessons learned

- It is important to dispel myths about not using opiates in children
    - These medicines provide stronger pain relief, which is often required for children with acute abdominal pain and appendicitis
- Pain relief does not mask any symptoms of illness and should not be withheld for this reason

6D Consistent involvement of the multidisciplinary team to care for children with abdominal pain

Delivering a pathway change to ensure all children under 16 are referred to paediatrics

Salisbury NHS Foundation Trust

Motivation and aims

Historically, children with abdominal pain were referred by GPs to an adult surgery coordinator who would arrange for the child to go to the surgical department for further investigation.

A serious case review led to a reassessment of the pathway. Although the referring GP had recognised that the child was very sick, a cascade of delays once the child arrived in hospital meant that, once diagnosed with appendicitis and sent for surgery, the child's health had deteriorated to such an extent that they did not survive surgery.

What was done

A multi-disciplinary group of clinicians came together to assess what had gone wrong during the delivery of the child's care. Having children looked after by an exclusively adult team was considered a major risk and a decision was made to adjust the pathway for children under sixteen presenting with abdominal pain. A new policy was developed requiring any emergency department or GP referrals to be routed to the paediatric team. Patients are now reviewed on the children's ward and referred urgently to the surgical team if needed. Simultaneous referrals to paediatrics and the surgical team are encouraged if there appears to be an urgent need for appendicectomy.

Successes/ key points of good practice

- A clear and simple message – 'if an under sixteen has abdominal pain, call paediatrics' – was communicated to primary care and the emergency department via regular messaging and information forums
- The paediatric team were driving the change and were able to demonstrate how it would ease the surgical workload, so it was relatively easy to generate buy-in for the change
- The programme has worked well and no children with appendicitis have been transferred to paediatric intensive care unit (PICU) since the pathway has been adapted
- The routine involvement of paediatricians in the care of children with abdominal pain has delivered a better experience for more patients

Lessons learned

- Important to focus on communication to ensure that everyone is aware of the agreed pathway, including junior doctors
- The paediatric team has worked closely with the surgical team to deliver ongoing improvements to the pathway, including via attendance at surgical away days
- Appendicitis is hard to diagnose in children and the involvement of paediatricians and surgeons can help support improved decision-making and better patient care

6E Availability of appropriate imaging in centres admitting children with abdominal pain

Reducing variation in access to abdominal ultrasound

Great North Children's Hospital, The Newcastle Upon Tyne Hospitals NHS Foundation Trust

Motivation and aims

The radiology and imaging service at the Great North Children's hospital is a relatively small team with only a few dedicated specialist paediatric radiologists, this means that often radiologists who are not specialised in paediatrics or who have limited paediatric experience are required to carry out ultrasound scans on children on the out-of-hours rota.

The service has a strong culture of doing their utmost to ensure that children receive the correct diagnosis and effective treatment at the earliest stage possible, in order to achieve the best outcomes for the child.

There is an ethos of working with colleagues across disciplines to improve quality, and through conversations with clinicians and follow-ups on children seen, opportunities were identified to reduce cases where appendicitis or other conditions were missed in children as well as the negative appendicectomy rate (the removal of a child's healthy appendix.)

What was done

A dedicated handbook was created, which set out exemplar images for diagnosis of many paediatric conditions as well as advice and 'helpful tips' for ultrasounds in children. In the context of abdominal pain and potential diagnosis of appendicitis these included standard practice performing a complete abdominal scan as opposed to targeted right iliac fossa examination and also if the bladder is full, then a post void interrogation of the appendix. Also, to look for a 'starry sky' appearance in the liver, which may suggest inflammatory change/ appendicitis.

The handbook is used by consultant radiologists, trainee's and sonographers with varying specialist interests and experience. It has generated significant interest and has been endorsed by and shared with members of the British Society of Paediatric Radiology.

Successes/ key points of good practice

- The handbook has increased staff confidence to do ultrasound scans in children.
- The Trust's negative appendicectomy has been in the lowest quartile for several years, and the positive predictive rates for ultrasound findings has been high.
- A full, systematic, abdominal scan should be conducted, not just the appendix. This can be an opportunity to alternative causes of abdominal pain including: inflammatory bowel disease, lymphangioma, pyelonephritis, gall stones and ovarian torsion and others.
- The culture and ethos of the service has helped with recruitment and attracting funding from the deanery to provide education in the form of supported investment in additional scanners, with a plan to establish 'hot' and 'cold' ultrasound rooms. The intention is to establish a 'hot' room for A&E admissions and emergency assessments, with elective activity in a 'cold' room, thus increasing and maintaining activity.

Lessons learned

- Education must be continuous, as there is a regular turnover of staff including trainees on rotation, and changes like updates to scanners.
- While the expectations of colleagues in the trust do mean there is a high volume of work for a small workforce, these expectations also help maintain the service's ethos and culture of doing their utmost to accommodate requests.
- Almost all children presenting with paediatric pain will receive an ultrasound scan, which is relatively high compared to other trusts, but was considered to deliver significant clinical value by getting children to the point of definitive treatment more quickly.

6F Monitoring and focus on time from clinical diagnosis of appendicitis to operation

Introducing technology to manage children's waiting lists and support improved patient experience and outcomes

Alder Hey Children's Hospital

Motivation and aims

The management of children needing emergency surgery at Alder Hey was historically reliant on a highly manual system. A list of patients requiring surgery was kept on a clipboard and each time a clinician wished to book in an additional patient, they would need to track down the person holding the clipboard to get their name added to the list. The process was long and troublesome, often taking up over 30 minutes of valuable clinical time for each new patient. Furthermore, the list was booked in chronological order, not by clinical priority, so prioritisation was an additional, ineffective and manual process.

What was done

A team of clinicians, administrators and IT personnel worked together to identify the key challenges associated with the manual system and to work on a solution. An inhouse system called ELIS (Emergency Listing Information System) was developed to book and manage children that need emergency surgery.

Successes/ key points of good practice

- Replacement of the manual process led to greatly improved efficiency, as clinicians were able to book their patients onto the theatre list from anywhere
- Patients were prioritised for surgery in a systematic way, improving patient experience and outcomes
- Widespread access to the listing system supported a shared understanding of levels availability in the emergency theatre and informed clinical decision making
- Monthly audits of team performance against treatment time targets were easy to conduct and allowed the team to focus on addressing any breaches and putting appropriate improvement plans in place
- A dashboard approach to data allowed additional information to be reviewed easily, related to age, duration of cases, priority categories etc. This helped inform decision making, work planning and performance improvement
- The system is also used to help the team monitor fasting prior to surgery, so that no child arrives for surgery overly dehydrated or having fasted excessively
- The team that delivered the ELIS system won an internal award for game changing innovation

Lessons learned

- There was an over-reliance on one member of the development team, who later left the trust, to develop the code to support the system. This created some challenges with regards to system updates and improvements. Additional work has been conducted to ensure enough developers understand the system to provide adequate support.
- Although it was easy to introduce the system, as people wanted a more automated process, a concerted effort was made to ensure people were putting the correct information into the system. As well as providing demonstrations and training, for the first few weeks, clinicians were still required to come to the theatre to make bookings, albeit via the system. Once confidence had improved, requests could be made from anywhere in the hospital
- There was a slight drop off in communication between clinicians and anaesthetists as they no longer crossed paths during the booking process. The importance of good communication was reinforced and anaesthetists were given phones so that they could be contacted easily.

6G Adoption of consistent, appropriate antibiotic strategies for appendicitis

The value of seeking a microbiological culture in appendicitis and auditing local practice

South Tees Hospitals NHS Foundation Trust

Motivation and aims

Most children have uncomplicated appendicitis (inflamed, no perforation, no pus), will have a smooth recovery and need no further postoperative antibiotics. In the UK, over 30% however have complicated appendicitis and having microbiological guidance for postoperative antibiotic prescribing is ideal. Seeking that microbiology information at surgery can be achieved by laparoscopic suctioning or needle aspiration of pus/free fluid. If there is no fluid to sample, some paediatric surgeons will run a microbiology swab over the removed appendix – a similar mindset to an intra-peritoneal swab taken at the time of open appendicectomy.

Complicated appendicitis is very relevant in the North East of England as we have higher numbers (42%). Such cases are more challenging for us to operate on and care for but crucially these children often need extended courses of in hospital intravenous antibiotics, may require radiological drainage or the use of CT to explain lack of post operative progress (radiation exposure) and have prolonged physical and psychological recoveries. This negatively impacts their schooling and social networks and puts considerable pressures on their families and carers.

As an audit question, we were interested to know whether taking the samples were of value (altered management) and to ensure our microbiology guidance was consistent with the organisms grown in our population.

What was done

Study on the patterns of antimicrobial resistance in Paediatric Appendicitis in James Cook University Hospital, Middlesbrough. We sought local data on appendicitis related fluid cultures in under 18 year olds between Sept 2018 and Apr 2020. In total, 24 samples were identified as being taken at appendicectomy and we wished to assess how many of the isolates were resistant to our 1st line therapy (Co-amoxiclav given pre or perioperatively). We also sought antibiotic sensitivity of the coliforms to piperacillin tazobactam, cefuroxime and gentamicin.

Our results may not give a true representation nationwide of resistant isolates in appendicitis but if it prompts local audits then a national picture will be possible. As these samples were mostly from perforated appendicitis it did not capture the microbes involved in simple appendicitis (where often no swab or sample was taken). Other non-coliform organisms are important to identify such as Streptococcus anginosus group (milleri group).

Of the 24, 18 had more than one isolate (Polymicrobial) 6 a single isolate (monomicrobial) - E Coli being the most common pathogen (present in 19 samples). 10 samples were resistant to Co-amoxiclav and of those resistant samples, 8 were sensitive to Piperacillin-Tazobactam. The remaining 2 resistant samples were sensitive to Gentamicin.

Successes/ key points of good practice

- If a child is unwell with appendicitis, remember to mention at the pre-operative WHO brief that you need to send a sample (e.g. laparoscopic suction trap)
- Sending a sample of fluid allows for more detailed microbiological testing (compared with a swab) – the larger volume of material increases the chance of positive organism growth
- We altered our first line antibiotic based on these audit results – but a continual education process (hospital inductions) is required across general surgery, paediatric and emergency department medical and nursing teams if that change is to be rapid, sustained and comprehensive
- By starting treatment with an effective antibiotic at an earlier stage, children have a better outcome and faster recovery to normal life and schooling

Lessons learned

- Taking a sample of fluid or pus at the time of surgery remains highly relevant particularly in complicated appendicitis
- Auditing of local antibiotic resistance in these fluid samples will ensure your appendicitis pathways contain the most relevant and effective antibiotics for your population

7. Additional information

For each of the seven areas for quality improvement described in section 4 above, a number of resources have been collated. References or links are provided, along with an overview of the content.

Overarching guidance:

Recommended document	Author	Overview
Acute abdominal pain pathway – report of consensus process and consensus recommendations	Rachel Harwood, Simon Kenny	This paper formed the basis for this pathway document and sets out the consensus process used to develop the guidelines on acute abdominal pain in children.

7A Universal use of analgesia throughout children's pathway for abdominal pain

Recommended document	Author	Overview
Scenario: Choice of Analgesic	NICE	Part of a NICE Clinical Knowledge Summary (CKS) looking at which analgesia should be prescribed for children under 16 years old
WHO Analgesic Ladder	Anekar A, Cascella M.	Summary of the WHO Analgesic Ladder and its clinical significance

7B Adoption of a diagnostic pathway for children with suspected appendicitis

Recommended document	Author	Overview
Quality metrics for emergency abdominal surgery in children: a systematic review	British Journal of Anaesthesia Sogbodjor LA, Singleton G, Davenport M, Walker S, Moonesinghe SR.	Systematic review of research on the perioperative care of children undergoing emergency abdominal surgery
A new 2-step risk-stratification clinical score for suspected appendicitis in children	Yap T, Chen Y, Low WWX, Jacobsen A, Shen L, Low Y	A study to develop a new Children's Appendicitis Score (CAS) by combining 3 inflammatory markers and a set of predictors for suspected appendicitis in children
Appendicitis risk prediction models in children presenting with right iliac fossa pain (RIFT study): a prospective, multicentre validation study	The Lancet Child and Adolescent Health Collaborative RSGobotWMR	A review that identified acute appendicitis risk prediction models and evaluated their performance
Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines	World Journal of Emergency Surgery Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al.	World Society of Emergency Surgery update to acute appendicitis guidelines

7C Consistent identification of the sick child with abdominal pain with appropriate early management

Recommended document	Author	Overview

Sepsis Trust Clinical Tools	Nutbeam T, Daniels R on behalf of the UK Sepsis Trust,	Sepsis screening and action tools for children being seen through different care settings, including: • Out of hours/telephone triage • General practice • Prehospital care/ ambulance services • Acute hospital inpatients
Sepsis: recognition, diagnosis and early management	NICE	NICE guideline NG51
Acute Abdominal Pain Pathway	Healthier Together	A clinical assessment/management tool for children focused on management in primary care and community settings
Abdominal Pain Pathway for remote assessment	Healthier Together	A clinical support tool for remote assessment
Acute Abdominal Pain Pathway – management acute setting	Healthier Together	A clinical assessment/management tool for children focused on management in acute settings

7D Consistent involvement of the multidisciplinary team to care for children with abdominal pain

Recommended document	Author	Overview
Multidisciplinary working in perioperative care	Centre for Perioperative Care	A rapid research review that explores the benefits of multidisciplinary team working to support people having surgery and the factors that may help and hinder the development and sustainability of multidisciplinary working.
What are the key factors for successful multidisciplinary team working?	Cordis Bright	Document designed to share good practice observed within seven NHS Vanguards in relation to MDT working in integrated health and social care.

7E Availability of appropriate imaging in centres admitting children with abdominal pain, supported by ODNs

Recommended document	Author	Overview
Quality metrics for emergency abdominal surgery in children: a systematic review	British Journal of Anaesthesia Sogbodjor LA, Singleton G, Davenport M, Walker S, Moonesinghe SR.	Systematic review of research on the perioperative care of children undergoing emergency abdominal surgery
Acute Appendicitis: A Meta-Analysis of the Diagnostic Accuracy of US, CT, and MRI as Second-Line Imaging Tests after an Initial US	Radiology Eng KA, Abadeh A, Ligocki C, Lee YK, Moineddin R, Adams-Webber T, et al.	An evaluation of the sensitivity, specificity, and diagnostic odds ratios of US, CT, and MRI as second-line imaging modalities after initial US for assessing acute appendicitis in children and adults.
Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines	World Journal of Emergency Surgery Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al.	World Society of Emergency Surgery update to acute appendicitis guidelines

7F Monitoring and focus on time from clinical diagnosis of appendicitis to operation

Recommended document	Author	Overview
Quality metrics for emergency abdominal surgery in children: a systematic review	British Journal of Anaesthesia Sogbodjor LA, Singleton G, Davenport M, Walker S, Moonesinghe SR.	Systematic review of research on the perioperative care of children undergoing emergency abdominal surgery
Paediatric Emergency Appendicectomy - Commissioning guide	Royal College of Surgeons British Association of Paediatric Surgeons	A commissioning guide to paediatric emergency appendicectomy from 2015

7G Adoption of consistent, appropriate, antibiotic strategies for appendicitis

Recommended document	Author	Overview
Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines	World Journal of Emergency Surgery Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al.	World Society of Emergency Surgery update to acute appendicitis guidelines
The use of pre- or postoperative antibiotics in surgery for appendicitis: A systematic review	Scandinavian Journal of Surgery Daskalakis K, Juhlin C, Pahlman L.	Review of literature regarding the use of pre- and/or postoperative antibiotics in the management of appendicitis
Systematic Review and Meta-Analysis of Postoperative Antibiotics for Patients with a Complex Appendicitis	Digestive Surgery van den Boom AL, de Wijkerslooth EML, Wijnhoven BPL.	A review to critically appraise studies on the duration of antibiotic treatment following appendicectomy for complex appendicitis
Start Smart – Then Focus	Public Health England	Antimicrobial stewardship toolkit for English hospitals
Antibiotic prophylaxis in surgery	SIGN Guideline	A national clinical guideline to provide evidence-based recommendations to reduce inappropriate prophylactic antibiotic prescribing. Recommendations for common surgical procedures in children have been included in this guideline.

7H Provision of accessible, age-appropriate patient and family resources to support their journey through the healthcare

Recommended document	Author	Overview
Domain 3: Communication partnership and teamwork	General Medical Council	Good practice overview for communicating with patients and their families
The provision of play in health service delivery	The National Association of Health Play Specialists, Tonkin A Hosted by NHS England	A literature review that seeks to explore the role of play and why it's inclusion within health service delivery is so important for children

8. Delivery checklist

Pathway component	Key actions
7A Universal use of analgesia in children's pathways for abdominal pain	• At every step of the pathway assess child's pain and give appropriate analgesia, from presentation to resolution of pain • Hospitals should have a children's pain pathway that is used consistently
7B Adoption of a diagnostic pathway for children with suspected appendicitis	• Implementation of a documented, structured clinical assessment of the child with abdominal pain • In a child with suspected appendicitis, perform screening blood tests to guide decision-making • Perform a clinical risk score for children when indicated
7C Consistent identification of the sick child with abdominal pain with appropriate early management	• Rapid access to appropriate services for children with severe abdominal pain, facilitated by secondary care • Consistent referral to paediatric abdominal pain guidance for identification of the unwell child
7D Consistent involvement of the multidisciplinary team to care for children with abdominal pain	• In non-specialist centres, paediatricians and general surgeons should undertake shared care and decision-making in children aged five and over • Emergency abdominal surgery on children under the age of 5 should be performed in a specialist centre unless emergency life-saving surgery is required. • There should be early involvement of the multidisciplinary team in assessment and management of the unwell child
7E Availability of appropriate imaging in centres admitting children with abdominal pain, supported by ODNs	• Timely availability of radiology support to inform diagnosis and clinical decision-making • ODN development of a network to support provision of services and training
7F Monitoring and focus on time from clinical diagnosis of appendicitis to operation	• Introduce consistent policy that appendicectomy should be performed within 24 hours of listing • Introduce IT systems that permit monitoring of performance at provider and ODN level
7G Adoption of consistent, appropriate, antibiotic strategies for appendicitis	• Ensure consistent antibiotic policy for all children at provider level • Introduce consistent intraoperative swabbing and monitor for antibiotic resistance • Adhere to antibiotic stewardship guidelines
7H Provision of accessible, age-appropriate patient and family resources to support their journey through the healthcare system	• Provision of child and parent appropriate resources to guide through their healthcare journey • Ensure that patient materials are accessible for parents and their children

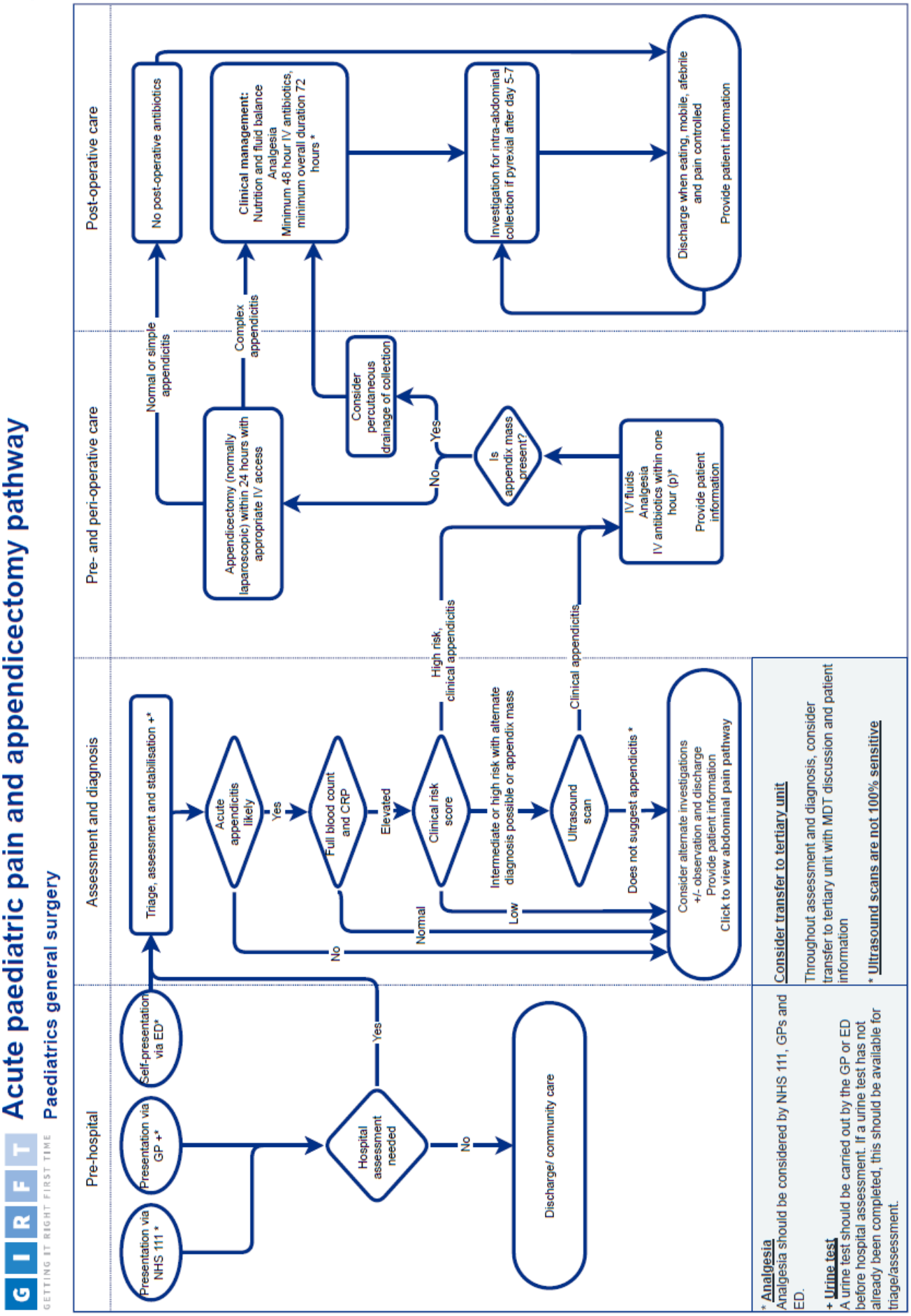
9. Areas for further research

For those wishing to carry out additional research, the following priorities could help drive further improvements to care for children with acute abdominal pain:

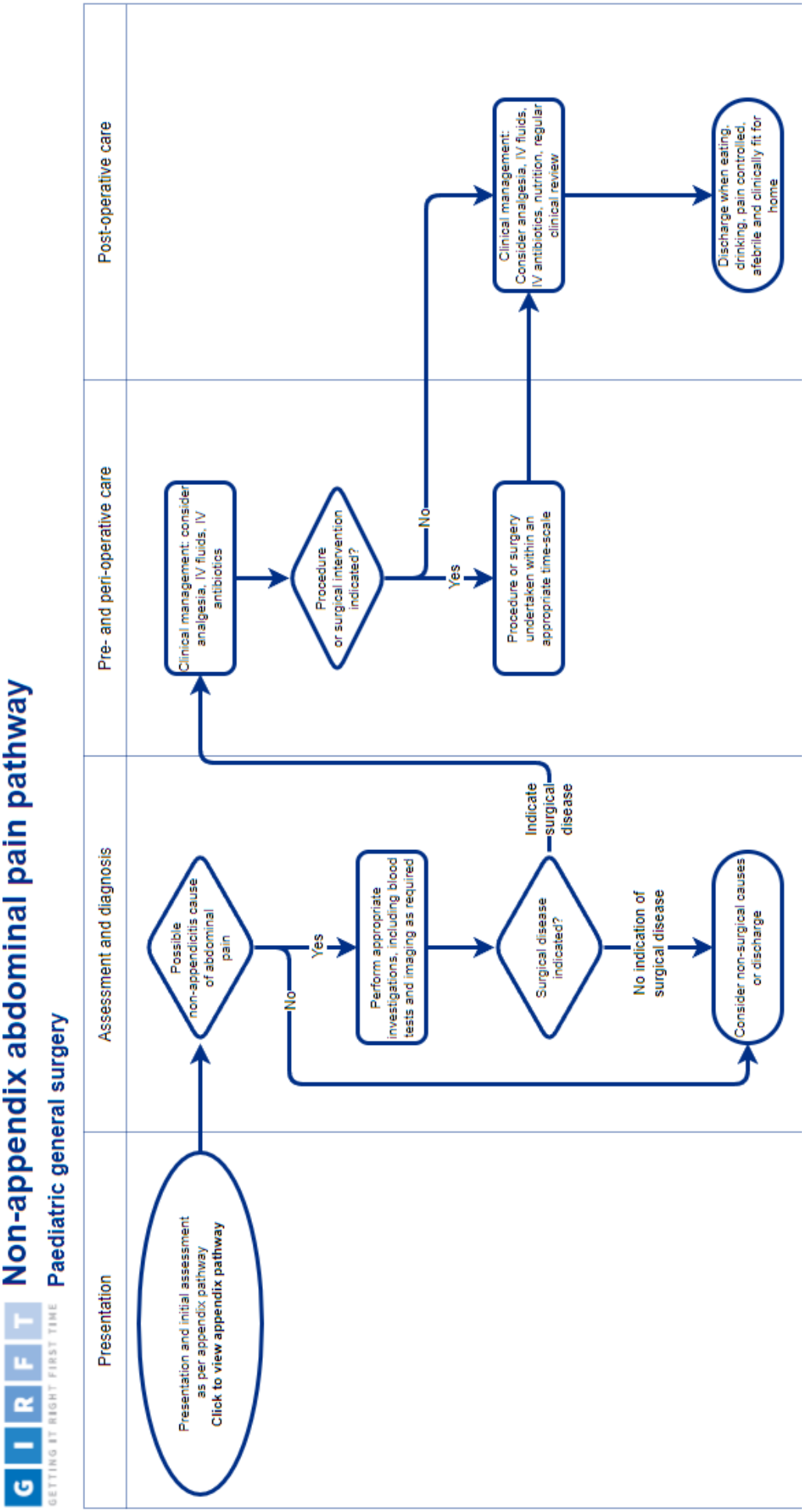
Pathway component	Key knowledge gaps
7A Universal use of analgesia in children's pathways for abdominal pain	• The impact of the method of local anaesthetic delivery during a surgical procedure on the post-operative morphine requirements
7B Adoption of a diagnostic pathway for children with suspected appendicitis	• The relationship between individual symptoms and clusters of symptoms with the final diagnosis/disposition of the child • Comparison between the performance of the Shera Score and the Children's Appendicitis Score in UK practice • The utility of additional blood tests, particularly procalcitonin
7C Consistent identification of the sick child with abdominal pain with appropriate early management	• The utility of Paediatric Early Warning Score (PEWS) in ED settings to facilitate early identification of the unwell child • The utility of PEWS in ED settings to differentiate between surgical and non-surgical causes of abdominal pain • The safety and efficacy of non-operative management (NOM) in children with simple appendicitis
7D Consistent involvement of the multidisciplinary team to care for children with abdominal pain	• No priority research identified
7E Availability of appropriate imaging in centres admitting children with abdominal pain, supported by ODNs	• The impact of early imaging on length of stay, negative appendicectomy rate and repeated presentations
7F Monitoring and focus on time from clinical diagnosis of appendicitis to operation	• The impact of the duration between diagnosis of appendicitis and appendicectomy when performed within 6 hours, 12 hours and 24 hours for simple and complex appendicitis
7G Adoption of consistent, appropriate, antibiotic strategies for appendicitis	• The optimum antibiotic regime for children with complex appendicitis
7H Provision of accessible, age-appropriate patient and family resources to support their journey through the healthcare system	• No priority research identified, although patient materials are being developed
Other areas for additional research	• There are few data available on the patient reported outcomes of time to return to school and quality of life after abdominal operations, particularly appendicectomy. These outcomes are important to families and further research into these outcomes are needed • Indications for percutaneous drainage of IAC • The role of non-operative management of simple appendicitis

Appendix

Full page pathway – acute paediatric pain and appendicectomy pathway



Full page pathway – acute paediatric pain – non-appendix



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