GIRFT Children and Young People: Testicular torsion pathway

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

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1. Foreword

Testicular torsion occurs when a testicle twists on its axis, cutting off the blood supply and causing sudden scrotal pain and tenderness. Torsion can happen at any age but is most common in teenagers and young adults. If the testicle is twisted, it can die within six hours unless the blood flow is restored by emergency surgery.

Despite being a time-critical surgical emergency, the GIRFT national report on paediatric general surgery and urology found that too many children and young people underwent surgery too late for many testes to be saved, with contributing factors including delays in contacting a healthcare provider and transfers between healthcare providers for surgery, leading to unacceptable delays and increasing the risk of testicular loss. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) has recently published a report on testicular torsion, with recommendations on these themes.

This pathway responds to those findings and recommendations. It has been developed by a national multi-disciplinary group of Urologists, Paediatric Surgeons, General Surgeons, Anaesthetists, Emergency Care Physicians, Radiologists and ODN leads who came together to build a national pathway for children and young people experiencing acute testicular pain. A Delphi consensus process was undertaken to develop the pathway by establishing statements of consensus.

We hope that this pathway streamlines care and supports clinical decision making to get the right child to theatre at the right time, while limiting the number of children and young people who undergo surgery and are then found to not have torsion.

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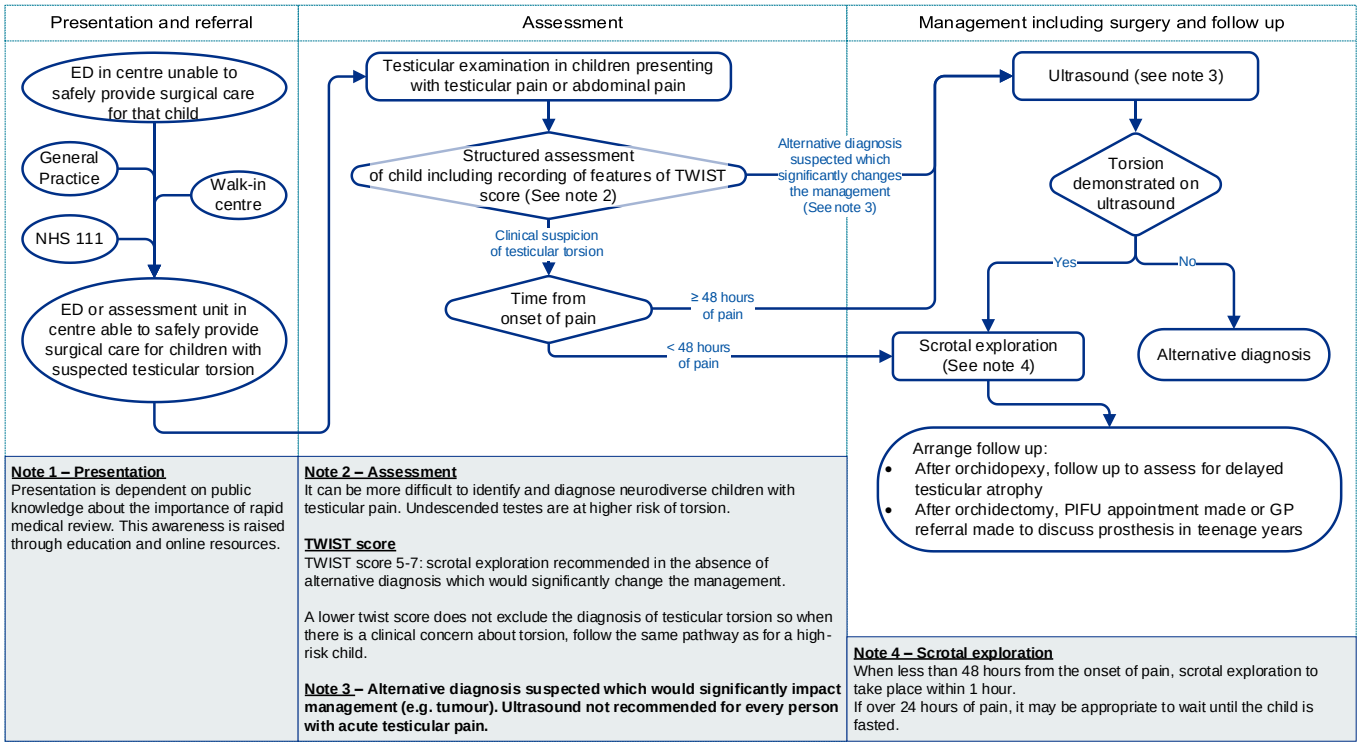
2. Summary of key pathway components

Awareness	Education should be delivered by schools and a national media campaign.
Referral	Referral pathways from primary to secondary care should minimise the number of transfers and use low thresholds so children are referred immediately to a hospital where scrotal exploration can be performed.
Assessment	Children should be reviewed by a surgical decision maker within 60 minutes of arrival at the ED. Assessments should consider any risks associated with undescended testes, abdominal pain and neurodiversity, and should be supported by a structured assessment. A TWIST score of 5 or over in a child with less than 48 hours of pain mandates a scrotal exploration in the absence of an alternative diagnosis. A score 0 – 4 does not exclude torsion.
Ultrasound	Newborns with suspected antenatal torsion should undergo an ultrasound. When there is suspected torsion, a child should not be transferred nor surgical treatment significantly delayed for an ultrasound. An ultrasound is indicated if the pain has been present for 48 hours or more.
Surgery	Children with suspected torsion should be operated on within 1 hour of decision for surgery if they have had pain for less than 48 hours. If they have had over 24 hours of pain it may be appropriate to wait until they are fasted to operate.
Follow up	After orchidopexy: follow up to assess for delayed testicular atrophy After orchidectomy: PIFU appointment or GP referral to discuss a prosthesis in their later teenage years.
Maintaining skills	Videos and CPD activity to refresh skills should be provided for surgeons working in centres providing acute surgical care for children

3. Testicular torsion pathway



Click to see this pathway diagram on a full page.

Pathway scope

The same assessment and investigation pathway should be followed in non-specialist and specialist hospitals.

Children under the age of 2 years with suspected testicular torsion should be assessed in a paediatric surgical specialist centre, or where the transfer distances are significant, in a local hospital equipped to safely care for infants requiring scrotal exploration.

3.1 Raising awareness

Education about testicular torsion should be delivered by schools and by a national media campaign.

A key facet for a child or young adult experiencing acute testicular pain is recognising the importance of severe pain lasting for more than an hour, knowing to mention it to an adult and the adult knowing that this requires emergency treatment. A body of work has already been undertaken by a group of UK clinicians to provide online resources aimed at teenagers, along with parental information and PSHE lesson plans which can be implemented in schools (www.testicularhealth.info). These resources are already endorsed by the NHS, the British Association of Paediatric Urologists, the Urology Foundation and Highgate but additional work to integrate them into the PSHE national curriculum has been recognised by this group.

The GIRFT team are having ongoing meetings with OHID, the DoE and a healthcare communications company to discuss effective delivery of education in school and how to effectively raise awareness.

3.2 Referral pathways

- **ICBs and ODNs should develop local referral pathways to result in referral from primary care to an appropriate secondary care centre. The development of these referral pathways should include emergency departments, anaesthetists, urologists, general surgeons, paediatric surgeons/urologists, paediatricians, ambulance trusts, commissioners, NHS 111 and primary care providers.**
- **Referral pathways should minimise the number of transfers a patient undergoes, aiming for a maximum of 1 transfer between healthcare providers (including transfer from primary to secondary care).**
- **NHS111 algorithms and primary care should have a low threshold for immediate referral for children with acute testicular pain to a hospital where scrotal exploration can be performed on site for that child.**

3.3 Assessment

- **Timely evaluation by a surgical decision maker means review within 60 minutes of arriving at the emergency department.**
- **Children with abdominal pain should always have a testicular examination.**
- **There should be an awareness that children with undescended testes have an increased risk of testicular torsion.**
- **Neurodiverse CYP (e.g. with learning difficulties, autistic spectrum disorder, neurodisability) pose difficulty around the identification and diagnosis of the cause of testicular pain and a higher index of suspicion is required.**
- **A TWIST score should be used to support a structured assessment of a child or young person with testicular pain.**
- **A child with a painful undescended testis can be managed in their local centre if the urologist/general surgeon feels confident to do this.**

TWIST score

- **A TWIST score of 5 or over in a child with less than 48 hours of pain mandates a scrotal exploration in a child or young person of any age in the absence of an alternative diagnosis that would significantly change management.**
- **A TWIST score of 0-4 does not completely exclude testicular torsion.**

Ultrasound

- **Newborns with a suspected antenatal torsion should undergo an ultrasound to exclude alternative diagnoses.**
- **An ultrasound is indicated if there is a strong suspicion of an alternative diagnosis which significantly changes the management.**
- **When there is a suspected testicular torsion a child should not be transferred for an ultrasound to be undertaken.**
- **When there is a suspected testicular torsion a child's surgical treatment should not be significantly delayed for an ultrasound to be undertaken.**
- **Ultrasound can be used as an adjunct to diagnosis of torsion for CYP with < 48 hours of pain if it does not result in a significant delay to treatment.**
- **An ultrasound is indicated if the pain has been present for ≥ 48 hours.**

3.4 Surgery

- **Children with suspected testicular torsion should be operated on within 1 hour of decision for surgery if they have had pain for less than 48 hours. In some situations it may be appropriate to wait until they are fasted if they have had >24 hours of pain.**

3.5 Follow up

- **After orchidopexy for torsion a boy should have follow-up to assess for delayed testicular atrophy.**
- **Boys undergoing orchidectomy should have a PIFU appointment made (or a GP re-referral made) to discuss a prosthesis in their later teenage years.**

3.6 Revalidation and maintaining skills

- **Educational videos on testicular pain in children should be provided and promoted for surgeons working in centres providing acute surgical care for children.**
- **Annual local CPD activity should be provided to enable surgeons to stay up to date.**
- **Surgeons working in departments responsible for undertaking paediatric scrotal explorations should demonstrate evidence of annual CPD activity.**

4. Patient experience

Anthony, a 4-year-old boy from Liverpool, was playing at his friends in January 2023 when he developed a sudden pain in his lower abdomen and felt sick. He described the pain as feeling like boulders at the bottom of his stomach and below his stomach. He vomited several times and his parents brought him home and gave him paracetamol for the pain.

The pain was still there the next morning, so Anthony's parents rang their local GP surgery and were told the GP would call back. When they didn't get a call back, they called the practice again but were unable to get an appointment.

Anthony had been in pain for over 24 hours, so his parents took him to their nearest A&E that evening. The A&E happened to be in a specialist children's hospital. Anthony had a scrotal exploration within an hour of arrival at the hospital.

> **"Once we were at the hospital the care for Anthony was excellent. I wish we'd been sent there straight away. Hopefully other parents are warned to go directly to A&E in future." – Anthony's dad**

The scrotal exploration confirmed a testicular torsion. During the operation the affected testis was untwisted and the other testis was fixed. Based on the time since the onset of pain, it was unlikely the testis had survived, but it had regained some colour when untwisted so there was some hope. Anthony was sent home with plans for a follow-up appointment 6 months later.

After a few days, it was clear that the testis was not recovering as it had remained very small and on physical examination during follow-up, the hospital doctor confirmed that the testis had not survived.

5. Audit points and areas for future research

- **To determine the role that structured assessment plays in diagnosis of torsion**
- **To determine the role of POCUS for rapid diagnosis of testicular torsion**

Awareness	• Research: Evaluate impact of the education and awareness programme through qualitative research.
Referral	• Audit: >95% of children with testicular pain should be seen in 1 or fewer healthcare settings prior to being in a centre which can undertake definitive surgical management. • Audit: >95% of children presenting with acute testicular pain should be seen by a surgical decision maker within 60 minutes of arriving in ED.
Assessment	• Audit: Regional orchidectomy and testicular atrophy rates for children with testicular torsion should reduce year-on-year. Percentage of children > 6 months of age with diagnosis of testicular torsion and no surgical intervention should approach zero. • Research: The role of structured examination and the impact of treatment pathways on the management of children with acute testicular pain should be evaluated
Ultrasound	• Research: Evaluation of point of care ultrasound to reduce negative exploration rates and feasibility studies on availability of ultrasound.
Surgery	• Audit: >95% of children who have had less than 24 hours of testicular pain and a decision for theatre should be in theatre within an hour of that decision being made.
Follow up	• Audit: >80% of children who have had an orchidectomy should have a follow-up outpatient appointment

6. Resources and further information

Recommended document	Author	Overview
NCEPOD report on testicular torsion	National Confidential Enquiry into Patient Outcome and Death (NCEPOD)	NCEPOD study to review the complete pathway and quality of care provided to children and young people 2 – 24 years of age who present to hospital with testicular torsion.
Consensus for best practice in scrotal exploration for suspected testicular torsion	British Urology Researchers in Surgical Training (BURST) and British Association or Urological Surgeons (BAUS)	Developed by a panel of 16 expert urologists rating agreement on statements for best practice in scrotal exploration once the decision to operate had been made.
Testicularhealth.info	NHS.uk, The Urology Foundation, British Association of Paediatric Urologists (BAPU), Highgate School	Personal health education website on testicular health aimed at young people and including information on testicular torsion.
Patient information leaflet for scrotal exploration	BAUS	This information leaflet, written for adults, describes testicular torsion and the procedure of scrotal exploration and fixation, including risks.

7. Appendices

7.1 Preliminary analysis

This work is supported by a systematic review and meta-analysis being undertaken by the study team. This systematic review aims to: (1) determine the influence of duration of symptoms prior to surgery on the rate of orchidectomy and long-term testicular atrophy; (2) determine the sensitivity and specificity of the TWIST score and; (3) determine the sensitivity and specificity of ultrasound for diagnosis testicular torsion.

In summary, the preliminary results of the systematic review show that the proportion of testicles being able to be salvaged during surgery reduces as time progresses (Table 1) and the proportion of testicles not undergoing atrophy (getting smaller) if they are saved also reduces as time progresses (Table 2). Data on duration of symptoms was extracted from 27 studies where all participants were <25 years of age.

Duration of pain before surgery	Proportion of testes salvaged	CI	I^2
<6 hours	92%	89-96%	31.4%
6-12 hours	72%	63-81%	56.0%
12-24 hours	51%	36-66%	80.8%
24-48 hours	20%	1-48%	24.7%
Over 6 hrs	49%	27-70%	88.8%
Over 12 hrs	20%	8-48%	50.6%
Over 24 hrs	26%	16-35%	79%
Over 48 hrs	13%	1-26%	22.5%

Table 1. Duration of pain before surgery and the proportion of testicles that could be salvaged at operation.

Duration of pain before surgery	Proportion of salvaged testicles which have not atrophied	CI	I^2
<6 hours	91%	82-100%	0%
6-12 hours	44%	7-82%	82%
12-24 hours	38%	1-76%	80%
>24 hours	25%	6-42%	54%

Table 2. Duration of pain before surgery and the proportion of testicles that did not undergo atrophy at follow-up.

The TWIST score is the most widely published score used for stratifying the risk of a person with acute testicular pain having testicular torsion. It is a 7 point score generated from 5 clinical features: Testicular swelling (2); hard testis (2); high riding testis (1); nausea or vomiting (1) and absent cremasteric reflex (1). The TWIST score describes the categorisation of patients into low risk (Score 0-2), intermediate risk (3-4) and high risk (5-7). Data on the performance of the TWIST score were extracted from 11 studies, 8 of which were prospective studies and all participants were <25 years of age (Table 3). With both the TWIST score and the performance of ultrasound scan the ideal test will have a high sensitivity meaning that

children and young people who have testicular torsion have a high likelihood of having a positive test. Accepting a lower sensitivity means that there is an acceptance that some children and young people may have an unnecessary procedure but that this is preferable over missing a torsion.

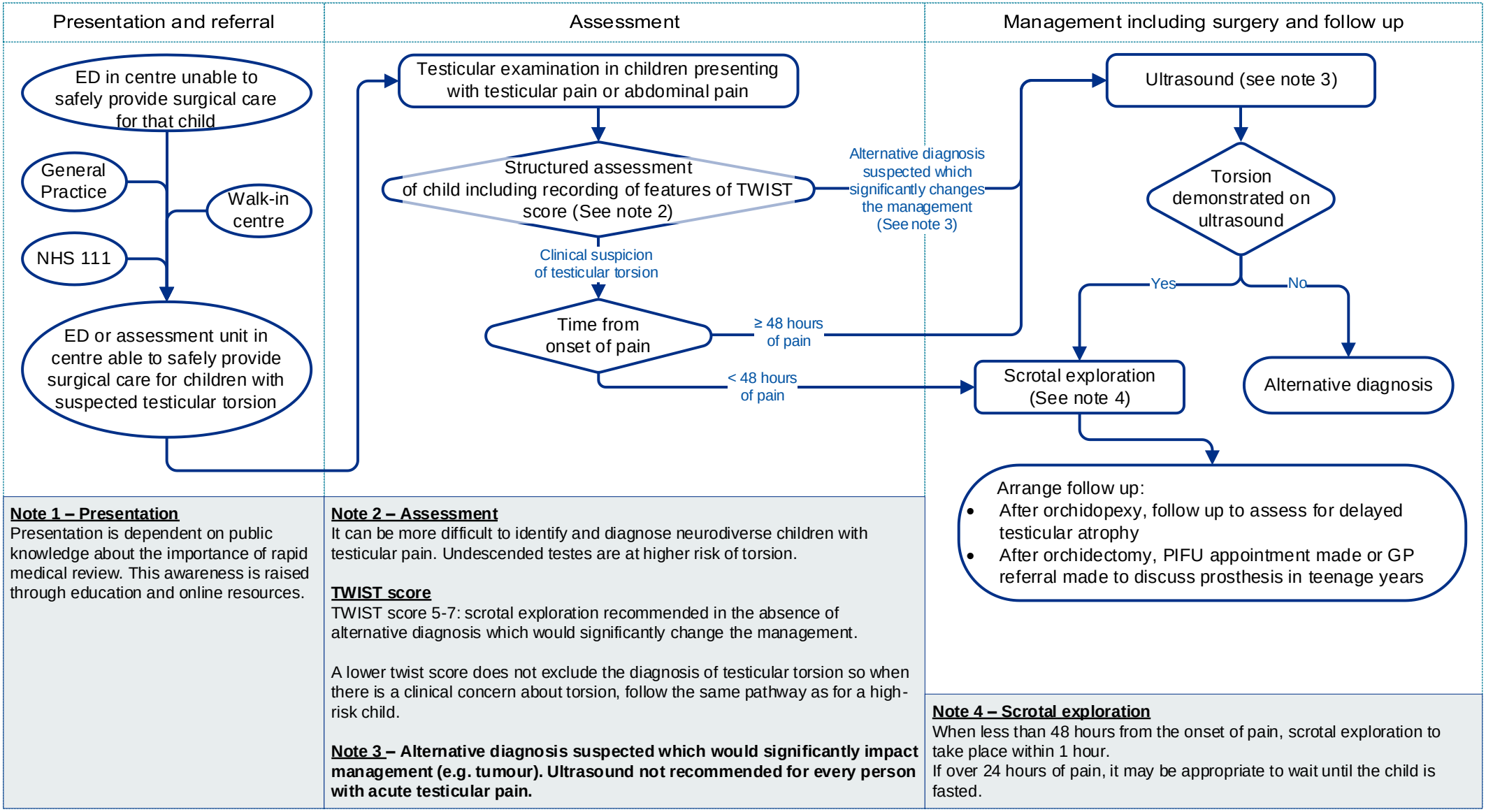
	Sensitivity	95% CI	Specificity	95% CI
TWIST 3-7 vs TWIST 0-2	95.3%	82-99%	78%	67-86%
TWIST 5-7 vs TWIST 0-4	67%	47-82%	98%	94-99%
TWIST 5-7 vs TWIST 0-2	96%	74-99%	98%	89-100%

Table 3. Performance of the TWIST score

The meta-analysis reveals that the TWIST score performs best at the extremes of the score but that 1 in 25 children and young people with testicular torsion have a TWIST score of 0-2 and 1 in 3 children and young people with testicular torsion have a TWIST score of 0-4. It was noted that only one of the TWIST studies takes into account the age or pubertal stage of the patient which have a significant impact on the positive and negative predictive value of the test as the prevalence changes with age.

The performance of ultrasound was reviewed within the same systematic review and 42 studies met the inclusion criteria. A radiological diagnosis of testicular torsion was taken as a radiologist's diagnosis with radiological findings which included a combination of reduced or absent testicular flow, alteration in echotexture of the testis, whirlpool sign or evidence of alternative diagnosis. The overall sensitivity and specificity was 92% (95% CI 87-95%) and 98% (95% CI 95-99%) respectively but when studies were restricted to only studies performed after 2010 the sensitivity is shown to improve to 96% (95% CI 90-98%) and specificity is shown to be 96% (95% CI 89-99%).

7.2 Full pathway diagram



Note 1 – Presentation
Presentation is dependent on public knowledge about the importance of rapid medical review. This awareness is raised through education and online resources.

Note 2 – Assessment
It can be more difficult to identify and diagnose neurodiverse children with testicular pain. Undescended testes are at higher risk of torsion.

TWIST score
TWIST score 5-7: scrotal exploration recommended in the absence of alternative diagnosis which would significantly change the management.

A lower twist score does not exclude the diagnosis of testicular torsion so when there is a clinical concern about torsion, follow the same pathway as for a high-risk child.

Note 3 – Alternative diagnosis suspected which would significantly impact management (e.g. tumour). Ultrasound not recommended for every person with acute testicular pain.

Note 4 – Scrotal exploration
When less than 48 hours from the onset of pain, scrotal exploration to take place within 1 hour.
If over 24 hours of pain, it may be appropriate to wait until the child is fasted.

Acknowledgements

A Delphi consensus process was undertaken to develop the testicular pain pathway. This process used well-established methods within a pragmatic framework. A multi-disciplinary panel were presented with and discussed the relevant data and evidence. Consensus statements were framed around this and presented to attendees, who used an electronic voting system for real-time scoring of each statement.

Scores were awarded on a scale of 1 – 9. A score of 1-3 indicated disagreement, 4-6 indicated agreement and 7-9 indicated strong agreement. To meet consensus a statement was required to have >70% of respondents scoring it 7-9 and <15% of respondents scoring it 1-3. Each consensus statement was discussed in depth, allowing the statements to be developed further or re-framed. These reframed statements were then presented again to be scored.

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