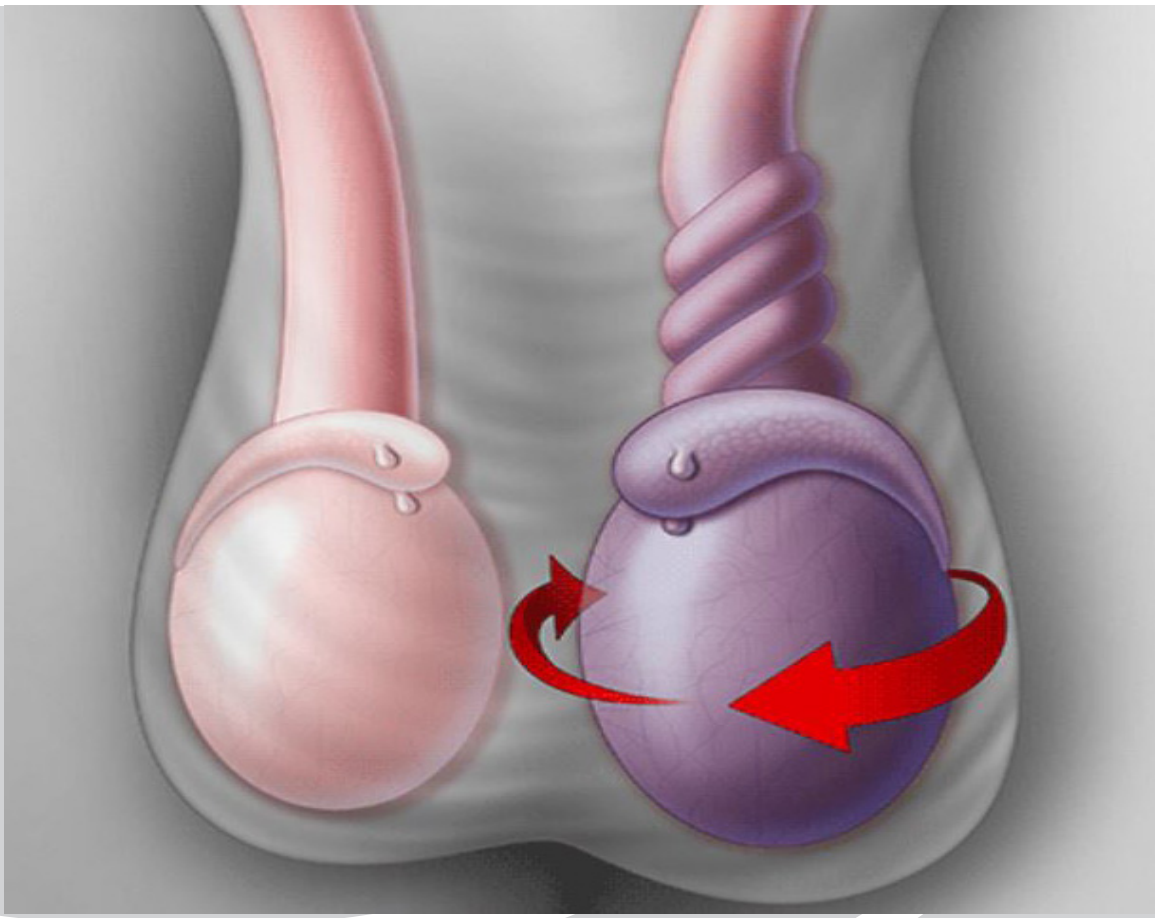
Twist and Shout

A review of the pathway and quality of care provided to children and young people aged 2-24 years who presented to hospital with testicular torsion



NCEPOD

Improving the quality of healthcare

TWIST AND SHOUT

A review of the pathway and quality of care provided to children and young people aged 2-24 years who presented to hospital with testicular torsion

A report published by the National Confidential Enquiry into Patient Outcome and Death (2024)

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) is an independent body to which a corporate commitment has been made by the medical and surgical royal colleges, associations and faculties related to its area of activity.
NCEPOD is a company, limited by guarantee (3019382) and a registered charity (1075588).

The report has been compiled by:
Antony Michalski PhD MRCP FRCPCH - Clinical Co-ordinator
Great Ormond Street Hospital for Children NHS Trust
Martin Sinclair MB ChB FRCS - Clinical Co-ordinator
East Suffolk and North Essex NHS Foundation Trust
Heather Freeth - Senior Clinical Researcher, NCEPOD
Nicholas Mahoney BA (Hons) - Researcher, NCEPOD
Holly Hamilton - Research Assistant, NCEPOD
Rachael Gomez - Senior Administrative Officer, NCEPOD
Marisa Mason PhD - Chief Executive, NCEPOD

The authors and trustees of NCEPOD would like to thank the NCEPOD staff for their work in collecting, importing, analysing, and reviewing the data for this report: Peyman Aleboyeh, Donna Ellis, Shelly Galea, D'Marieanne Koomson, Mariusz Kosek, Eva Nwosu, Karen Protopapa, Hannah Shotton, Neil Smith, and Anisa Warsame.

This report should be cited as: The National Confidential Enquiry into Patient Outcome and Death. '*Twist and Shout*' 2024. London

Cohort: 1st April 2021 to 31st March 2022

The Medical and Surgical Clinical Outcome Review Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes. The Clinical Outcome Review Programmes, which encompass confidential enquiries, are designed to help assess the quality of healthcare, and stimulate improvement in safety and effectiveness by systematically enabling clinicians, managers, and policy makers to learn from adverse events and other relevant data. HQIP holds the contract to commission, manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical, and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations, and crown dependencies www.hqip.org.uk/national-programmes.

ISBN: 978-1-7393029-3-1

Cover image ©2014 The Children's Hospital of Philadelphia. Reprinted with permission.

CONTENTS

EXECUTIVE SUMMARY

Testicular torsion occurs when the spermatic cord twists and cuts off the blood supply to the testicle. Testicular torsion is a surgical emergency requiring prompt diagnosis and surgical intervention to preserve the testicle. Delay in recognising testicular torsion and delay in presenting to hospital is known to lead to poorer outcomes.

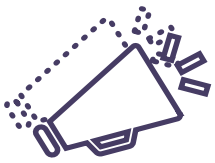
There needs to be greater public awareness about testicular torsion. Hospitals need to be equipped to deal with testicular torsion as an emergency operation, with senior clinicians able to decide whether surgery is needed and to be able to perform the surgery/anaesthetise the patient. If these services are not available, then there should be robust transfer arrangements in place to get the patient to theatre. Patients will need good information at discharge, and the option to return for further follow-up should they need psychological support or wish to discuss the use of a prosthesis.

IN THIS STUDY

The pathway and quality of care provided to patients aged 2-24 years who presented to hospital with testicular torsion was reviewed. The sampling period of 1st April 2021 to 31st March 2022 was used and data were included from 574 clinician questionnaires, 143 organisational questionnaires and the assessment of 635 sets of case notes.

1. INCREASE PUBLIC AWARENESS

Increased awareness and education may reduce embarrassment and get people talking.



Testicular torsion was not recognised by 157/239 (65.7%) patients or 83/239 (34.7%) parents/carers.

Only 294/403 (73.0%) patients had contacted a healthcare professional within six hours of developing symptoms.

2. ENSURE PATHWAYS MINIMISE THE NEED FOR TRANSFERS

Directing patients to hospitals where surgery for testicular torsion can be undertaken will minimise the need for transfer and reduce the risk of delay to theatre.

60/475 (12.6%) patients were referred by a GP, 34/475 (7.2%) from an urgent treatment centre and 25/475 (5.3%) NHS 111.

91/143 (63.6%) hospitals reported that patients were transferred out of the hospital for treatment on occasions.

Patients not on a pathway were more likely to have their testicle removed (154/389; 39.6%) compared with those who were (16/67; 23.9%).

3. URGENT SENIOR REVIEW, DECISION-MAKING AND OPERATION

Urgent review by senior decision-makers and access to senior specialists in urology, paediatric surgery, or general surgery for urgent surgery is essential for prompt treatment.

136/435 (31.3%) patients had their first assessment on arrival at hospital performed by a junior specialist trainee.

113/422 (26.8%) patients had not had their first ST3+ surgical review within two hours of arrival and 40/422 (9.5%) patients waited more than four hours.

There was a delay in making a diagnosis in 116/635 (18.3%) patients which impacted their care in 69/116 (59.5%) cases.

4. EXTENDED FOLLOW-UP

Patient-initiated follow-up after surgery may encourage patients to seek psychological support and/or the use of prosthetic implants.

Information on prosthetic replacements could only be found in the case notes of 139/534 (26.0%) patients who had a testicle removed, with an explanation recorded for 83/139 (59.7%) patients.

Adequate written information given to the patient and family at discharge could only be found in the case notes of 123/233 (52.8%) patients.

FOREWORD

There are many conditions in medicine and surgery where time is of the essence. In terms of life changing events testicular torsion is high on that list. The time frame for treatment delivery is a mere six hours if there is to be a reasonable chance of avoiding orchidectomy.

However, as this report identifies, there are many factors that can contribute to delay in diagnosis and treatment of testicular torsion.

Firstly, given the sensitive nature of the condition, boys and young men, parents/carers, and teachers all need to be educated and made aware of the necessity of seeking advice promptly in the event of testicular pain or suspected torsion.

Secondly, once any part of the health service is contacted, they must refer the patient urgently to an appropriate hospital so that surgery can be performed. Sending a patient to a hospital without appropriate surgical emergency services will only lead to unnecessary transfer delay. Once the patient is admitted, there must be prompt senior surgical review and timely access to theatres.

Thirdly, if an orchidectomy was performed then the opportunity for follow-up discussions about prostheses or psychological support should be available to all patients. The impact of this procedure at such a developmentally sensitive age should not be underestimated, and it might take time for the patient to want to explore the follow-up services.

One area that this study could not resolve was the role of Doppler ultrasound in supporting a diagnosis of testicular torsion. Current guidance does not recommend its use, so it could not be assessed and therefore we were not able to make a recommendation about whether it improved the quality of care. However, there is a growing debate amongst the professions which needs to be further explored as it used in other countries. If undertaken by appropriately trained personnel, its use may reduce the number of unnecessary surgical explorations. Conversely, adding it into the pathway may cause further delays if it is not undertaken immediately upon arrival, or by someone suitably trained. We therefore leave this area open for discussion between the relevant specialties and colleges.

I hope that this study will help to galvanise an appropriate widespread awareness campaign among the public and professions to overcome the stigma surrounding testicular torsion and ensure that prompt intervention improves outcomes.

As ever, the trustees are indebted to the NCEPOD staff, our clinical co-ordinators and all the multi-professional study advisors, reviewers and clinicians who give so generously of their time and without whom this study could not have been undertaken.

Ian C Martin
NCEPOD Chair

RECOMMENDATIONS

These recommendations have been formed by a consensus exercise involving all those listed in the acknowledgements. The recommendations have been independently edited by medical editors experienced in developing recommendations for healthcare audiences to act on.

The recommendations highlight areas that are suitable for regular local clinical audit and quality improvement initiatives by those providing care to this group of patients. The results of such work should be presented at quality or governance meetings and action plans to improve care should be shared with executive boards. Quality improvement tools highlighted in this report will support this.

The recommendations in this report support those made previously by other organisations, and for added value should be read alongside the following:

GIRFT 2021. Paediatric general surgery and urology
NICE 2023. Clinical knowledge summary: scrotal pain and swelling
HSIB 2019. Management of acute onset testicular pain

Executive boards are ultimately responsible for supporting the implementation of these recommendations. Suggested target audiences to action recommendations are listed in italics under each recommendation.

	PUBLIC AWARENESS AND EDUCATION
1	Raise awareness about testicular torsion, including the need to urgently attend an emergency department if someone experiences testicular pain. This should include a continued public awareness campaign for all who may be affected, including parents/carers, and raised at all stages of development: a. Maternity/antenatal care (e.g. advice for care of a new baby in the red book) and post-natal care. b. Nursery education. c. The health education curriculum in primary and secondary education. d. Further/higher education. SEE SECTION ON **USEFUL LINKS** ***Primary audiences - national:*** *NHS England, Office for Health Inequalities and Disparities, Welsh Government, Public Health Wales, Department of Health Northern Ireland, Public Health Agency, Departments of Education.* ***Primary audiences - local:*** *Midwives, health visitors, special educational needs staff, school nurses.* ***Supported by:*** *Royal College of Midwives, Royal College of Paediatrics and Child Health, British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Association of Paediatric Anaesthetists of GB and Ireland, British Association of Urological Surgeons, Royal College of Surgeons, Association of Surgeons of GB and Ireland, Getting It Right First Time, Commissioners, Integrated Care Boards.*

	RECOGNITION OF TESTICULAR TORSION IN PRIMARY CARE AND THE EMERGENCY DEPARTMENT
2	Update training modules for primary care, and emergency department staff, to emphasise the importance of early recognition of testicular torsion, including atypical or warning presentations, urgent referral pathways and timely surgery. ***Primary audiences:*** *NHS 111, Ambulance Trusts, Royal College of General Practitioners, Royal College of Emergency Medicine.* ***Supported by:*** *British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Association of Paediatric Anaesthetists of GB and Ireland, British Association of Urological Surgeons, Royal College of Surgeons, Association of Surgeons of GB and Ireland, Royal College of Paediatrics and Child Health, NHS England, Welsh Government, Department of Health Northern Ireland.*
	PATHWAY UP TO AND INCLUDING ARRIVAL AT HOSPITAL
3	Reduce delays for patients with testicular pain/suspected testicular torsion by: a. Minimising transfers to another hospital by referring patients to a hospital where scrotal exploration can be performed safely on-site – ideally including a pre-alert to the receiving hospital. b. Ensuring that any essential transfer is as urgent as possible*, including when patients self-present but need to be at another hospital. c. Having a clear, documented clinical pathway of care for patients with testicular pain/suspected testicular torsion in hospitals where surgery for testicular torsion is undertaken, which is communicated to all healthcare professionals involved in the care of this group of patients. d. Auditing the testicular torsion pathway, at least annually, to identify areas for improvement. **This is in line with the GIRFT report on paediatric surgery and urology.* ***Primary audiences - national:*** *Royal College of General Practitioners, NHS 111, Ambulance Trusts* ***Primary audiences - local:*** *Medical Directors, Directors of Nursing, Integrated Care Boards, Operational Delivery Networks Commissioners* ***Supported by:*** *British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Association of Paediatric Anaesthetists of GB and Ireland, British Association of Urological Surgeons, Royal College of Surgeons, Association of Surgeons of GB and Ireland, Royal College of Paediatrics and Child Health, Royal College of Emergency Medicine, Royal College of Anaesthetists, Association of Anaesthetists, Royal College of Radiologists, NHS England, Welsh Government, Department of Health Northern Ireland.*
	PATHWAY IN HOSPITAL
4	Patients with suspected testicular torsion should have an urgent* referral and clinical review by a senior surgical decision-maker (minimum ST3 or equivalent) specialising in urology, paediatric surgery, or general surgery. **NCEPOD Classification of Intervention* ***Primary audiences - national (to agree a timeframe):*** *NHS England, Welsh Government, Department of Health Northern Ireland, British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Association of Paediatric Anaesthetists of GB and Ireland, British Association of Urological Surgeons, Royal College of Surgeons, Association of Surgeons of GB and Ireland, Royal College of Emergency Medicine.* ***Primary audiences - local:*** *Emergency Medicine Physicians, Paediatric Surgeons, Urologists, General Surgeons, Anaesthetists, Radiologists* ***Supported by:*** *Medical Directors, Directors of Nursing*

5	A consensus is needed on the role of Doppler ultrasound in the care pathway for suspected testicular torsion to aid surgical decision-making whilst not adding delay to surgery. ***Primary audiences:*** *British Association of Urological Surgeons, British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Association of Paediatric Anaesthetists of GB and Ireland, Royal College of Paediatrics and Child Health, Royal College of Radiologists, Royal College of Surgeons, Association of Surgeons, National Institute for Health and Care Excellence* ***Supported by:*** *NHS England, Welsh Government, Department of Health Northern Ireland, medical directors, National Institute for Health and Care Research Health Technology Assessment*
6	Perform surgery for testicular torsion as an immediate or urgent procedure (NCEPOD 1 or 2)*, once the decision to operate has been made. **NCEPOD Classification of Intervention* *This also supports the GIRFT report on paediatric surgery and urology* ***Primary audiences:*** *Consultant Surgeons, Consultant Anaesthetists* ***Supported by:*** *Clinical Directors and Medical Directors*
DISCHARGE AND FOLLOW-UP	
7	Discharge information for patients, and parent/carers should include: a. Any follow-up arrangements. b. Delayed side effects that might occur following orchidectomy, or the risk of late testicular atrophy in patients who had an operation that led to no orchidectomy, but fixation (orchidopexy), including risks to fertility. c. Details of patient-initiated follow-up (PIFU) follow-up e.g. to discuss prosthetic implants for patients who underwent an orchidectomy. d. How to access psychological support. ***Primary audiences:*** *The medical team or specialist nurses caring for patients following surgery for testicular torsion.* ***Supported by:*** *Clinical Directors and Medical Directors.*
8	Review the care of all patients who underwent an orchidectomy in a multidisciplinary morbidity and mortality meeting. This should include primary care and, ideally a regional approach to shared-learning and quality improvement. ***Primary audiences:*** *The medical team or specialist nurses caring for patients following surgery for testicular torsion.* ***Supported by:*** *Clinical Directors and Medical Directors.*

INTRODUCTION

Testicular torsion occurs when the spermatic cord twists and cuts off the blood supply to the testicle. Testicular torsion is a surgical emergency requiring prompt diagnosis and surgical intervention to preserve the testicle. Delay in presenting to hospital has been consistently shown to lead to poor outcomes.[1]

After admission to hospital for suspected testicular torsion, operative delay also adversely affects the chance of salvaging the testicle. In a systematic review of 1,283 patients, when surgical intervention occurred within a six-hour window from the onset of testicular pain, there was a 97% chance of the patient's testicle being saved. While the study concluded that survival percentages are significant, beyond the widely accepted time-period of six-eight hours, the salvage rates decreased, the longer that surgical intervention was delayed.[2]

The operation involves two possible procedures: either testicular fixation, when the testicle can be saved and fixed to prevent recurrent torsion (this is called orchidopexy), or removal or the testicle (orchidectomy), where it is not salvageable. In either case it is also standard practice to fix the other testicle at the same time.

A range of specialties and health services are involved in the care of patients with testicular torsion, including NHS 111, ambulance, primary care, and secondary care, and with the potential for delay in diagnosis and treatment to occur at any point of the pathway, these are the main factors that lead to poorer outcomes.

Initial delays on the part of adolescent males to seek medical assistance may be due to a 'watch and wait ' approach by them and their parents/carers; a lack of public awareness about the pathology of testicular torsion, and an unwillingness to trouble healthcare services for fear of embarrassment or raising a false alarm.[3]

In 2019 the Healthcare Safety Investigation Branch (HSIB) report reviewed the diagnostic and treatment pathway and identified 'system-wide 'delays.[4] The report found that the accuracy, accessibility, and variability of national guidance on the diagnosis and treatment of testicular torsion was leading to delays in treatment.

When patients with suspected testicular torsion present to hospital there are many factors that can contribute to delay in diagnosis and treatment. Commissioning guidelines state that assessment and surgical intervention should be performed locally, and that the transfer of a patient with suspected testicular torsion to a tertiary centre should only occur in exceptional circumstances.[5] Despite this, the Getting It Right First Time (GIRFT) paediatric surgery and urology report found that in some specialist trusts one in four patients had been transferred from another organisation.[6]

This NCEPOD study was developed with wide multidisciplinary input to review the care of patients with testicular torsion. It identifies several areas of care that require improvement.

WHAT PATIENTS AND PARENTS/CARERS SAID

Young people and parents/carers were asked about their experience of care following admission to hospital and an operation for testicular torsion. The age of children and young people at the time of their operation ranged between 3-24 years with a median age of 14 years.

WHAT IS THE ONE THING YOU THINK COULD CHANGE TO IMPROVE CARE FOR FUTURE PATIENTS WHO HAVE TESTICULAR TORSION?

Only 3/17 young people were taught about testicular torsion at school or college.

12/17 young people felt that their symptoms were an emergency… HOWEVER, four of them delayed telling anyone about their symptoms and two of them said they experienced a delay before going to hospital.

Better public information - it's a surgical emergency and not a lot of people know it's a thing!!

Education for boys at school about symptoms to be aware of, how important it is to seek urgent assessment in hospital and not to be embarrassed to tell someone

Education for emergency department triage staff

Giving patients information about possible outcomes

GPs to ask the question so preventative surgery could be done

CHAPTER 1: METHOD AND DATA RETURNS

Study Advisory Group

A multidisciplinary group was convened to define the objectives of the study and advise on the key questions. The Study Advisory Group (SAG) comprised healthcare professionals in urology, paediatric surgery, general surgery, anaesthetics, emergency medicine, paediatrics, radiology, nursing, commissioning representation and lay representation. This group steered the study from design to completion.

Study aim

To review the complete pathway and quality of care provided to children and young people aged 2 to 24 years who presented to hospital with testicular torsion

Objectives

The SAG identified several objectives that would address the primary aim of the study:

- Patient and parent/carer knowledge of torsion prior to the clinical episode and the availability of information for patients and parents/carers
- Pre-hospital care
- The admission process, including assessment and decision-making
- The use of accurate diagnostic tools
- Protocols for the management of testicular torsion and scrotal pain suggestive of torsion
- Staffing availability, training, and use of networks of care
- The timeliness of surgery including emergency surgery access
- The appropriateness of transfer arrangements
- The consent process
- Surgical practice in respect of fixing testicles at the time of orchidectomy/exploration
- Post-operative complications and follow-up of the patient
- Audit of services

Study population and case ascertainment

Inclusion criteria

Patients aged 2 to 24 years, inclusive, admitted to hospital who had a diagnosis of testicular torsion (ICD10 code N44), and who underwent a non-elective operation for testicular torsion (OPCS codes N03.4; N05; N06; N08; N09; N13.2; N13.3 and N13.5) between 1st April 2021 and 31st March 2022. Patients admitted with scrotal pain (ICD10 codes N45 and N508) were also identified for context but were not sampled for inclusion in the clinical peer review process.

Exclusion criteria

Patients who did not undergo a procedure for testicular torsion, and patients who were subsequently identified as being admitted on an elective basis.

Hospital participation

Data were included from hospitals in England, Wales, and Northern Ireland.

Data collection – peer review

Identification of a sample population

A pre-set spreadsheet was provided to every local reporter to identify all patients meeting the study criteria during the defined time period. From this initial cohort, up to eight patients per hospital were sampled for inclusion in the study.

Questionnaires

Two questionnaires were used to collect data for this study:

Clinician questionnaire

This questionnaire was sent electronically to the surgeon responsible for the care of the patient at the time of their procedure.

Organisational questionnaire

This questionnaire was sent electronically to the local reporter to pass on to the relevant people who could provide information on protocols, resources, network arrangements, training, information for patients and parents/carers, follow-up arrangements, and audit.

Case notes

Copies of the case notes relating to the index admission were requested for peer review, including:

- NHS 111 pathways notes
- All primary care notes that could relate to the testicular torsion, including GP consultations
- Out of hours or emergency department attendances
- Ambulance patient report form
- Medical and nursing notes from the emergency department clerking to discharge
- Imaging reports
- Operation notes
- Anaesthetic charts
- Consent forms
- Discharge summaries and follow-up letters

Peer review of the case notes and questionnaire data

A multidisciplinary group of case reviewers comprising consultants, trainees, advanced clinical practitioners, and clinical nurse specialists from: urology, general surgery, paediatric surgery, emergency medicine, paediatrics, anaesthetics, radiology, and general practice were recruited to peer review the case notes and associated clinician questionnaires.

All patient identifiers were removed by the non-clinical staff at NCEPOD before the case notes or questionnaires were presented to the group. Using a semi-structured electronic questionnaire, each set of case notes was reviewed by at least one reviewer within a multidisciplinary meeting. At regular intervals discussion took place, allowing each reviewer to summarise their cases and ask for opinions from other specialties or raise aspects of the case for further discussion.

Data collection – patient and parent/carer survey

An open-access anonymous online survey was developed to collect the views of patients and parents/carers of patients who had undergone surgery for testicular torsion on the care they had received. The data were not linked to any other aspect of clinical data collection.

Data collection – clinician survey

An open-access anonymous online survey was developed to collect the views of clinicians who provide care for this group of patients on the services they can provide. The data were not linked to any other aspect of clinical data collection.

Information governance

All data received and handled by NCEPOD complied with all relevant national requirements, including the General Data Protection Regulation 2016 (Z5442652), Section 251 of the NHS Act 2006 (21/CAG/0085, App No 1019), and the Code of Practice on Confidential Information. Each young person was given a unique NCEPOD number. All electronic questionnaires were submitted through a dedicated online application.

Data analysis

Following cleaning of the quantitative data, descriptive data summaries were produced. Qualitative data collected from the case reviewers' opinions and free text answers in the clinician questionnaires were coded, where applicable, according to content to allow quantitative analysis. As the methodology provides a snapshot of care over a set point in time, with data collected from several sources to build a national picture, denominators will change depending on the data source, but each source is referenced throughout the document. This deep dive uses a qualitative method of peer review, and anonymised case studies have been used throughout this report to illustrate themes. The sampling method of this enquiry, unlike an audit, means that data cannot be displayed at a hospital/trust/health board/regional level.

Data analysis rules

- Small numbers have been suppressed if they risk identifying an individual
- Any percentage under 1% has been presented in the report as <1%
- Percentages were not calculated if the denominator was less than 100 so as not to inflate the findings
- There is variation in the denominator for different data sources and for each individual question as it is based on the number of answers given

The findings of the report were reviewed prior to publication by the SAG, case reviewers and the NCEPOD Steering Group, which included clinical co-ordinators, trustees, and lay representatives.

Data returns

Clinical data

In total, 8,583 patients were initially identified between 1st April 2021 – 31st March 2022 as meeting the study criteria. This included patients who were admitted with testicular torsion; orchitis and epididymitis, and 'other' specified disorders of male genital organs, according to the coding. Figure 1.1 summarises the data included. Of the 1,091 patients initially sampled for inclusion, 264 were subsequently excluded. The main reasons for exclusion were that the patient was found not to have torsion during their procedure (n=219), or the operation was undertaken on an elective basis (n=40). A sample of hydatid of Morgagni cases was assessed separately and is presented in Appendix 1.

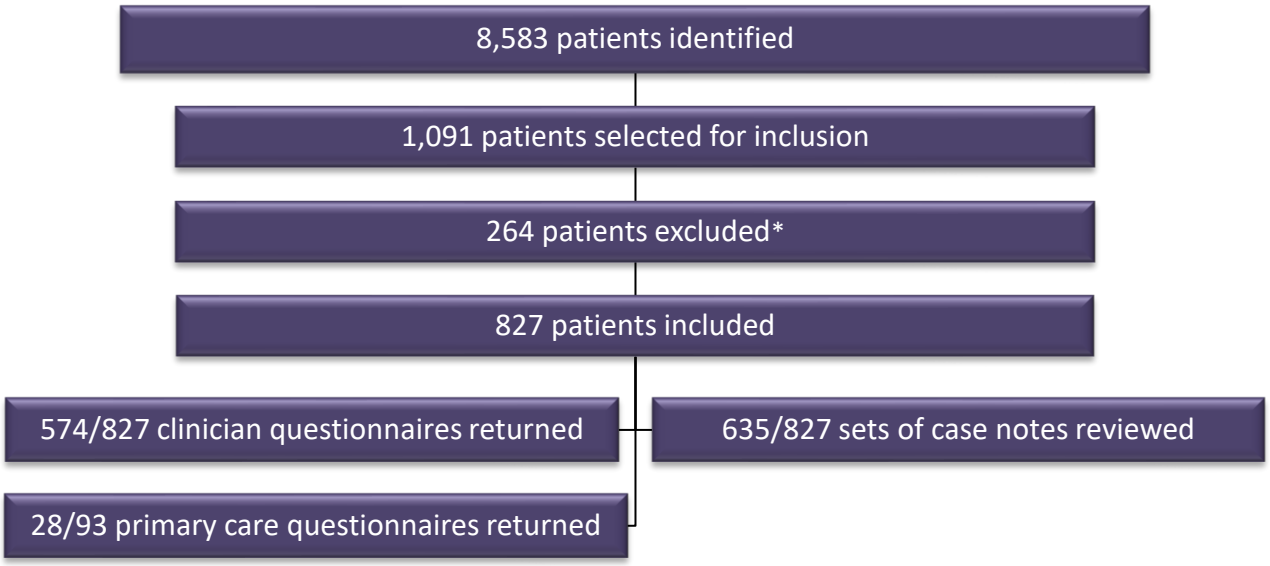


Figure 1.1 Population sampled
**Patients did not meet the study inclusion criteria*

Organisational data

Organisational questionnaires were returned from 143/207 (69.1%) hospitals.

Survey data

The patient and parent/carer survey was completed by 17 respondents.

The clinician survey was completed by 580 respondents (surgery n=379 (including 318 urologists); emergency medicine n=78; anaesthetics n=64; paediatrics n=42; primary care n=6; other n=11).

CHAPTER 2: SAMPLE POPULATION

Total population

Table 2.1 shows the number of patients in the total sample population with each of the identified codes.

Table 2.1 Diagnosis code for inclusion in the study (ICD10 codes)

	Number of patients
N44 - torsion of testis	3,461
N45 - orchitis and epididymitis	1,835
N508 - other specified disorders of male genital organs	3,023
Total	**8,319**

Whole study population data

In total, 2,529/3,461 (73.1%) patients who were admitted with an ICD10 code for torsion (N44) underwent one of the included procedure codes (OPCS) during their admission (Table 2.2).

Table 2.2 Operation undertaken defined by the diagnosis code

	N44 Torsion of testis		N45 Orchitis and epididymitis		N508 Other specified disorders of male genital organs		Total
	Number of patients	%	Number of patients	%	Number of patients	%	Number of patients
N05 or N06 (orchidectomy)	461	18.2	32	5.7	41	4.0	**534**
N08 or N09 (orchidopexy)	1,116	44.1	98	17.6	349	34.5	**1,563**
N13 (fixation of testis, reduction of torsion of testis or exploration of testis)	788	31.2	149	26.7	343	33.9	**1,280**
N034 (exploration of scrotum)	164	6.5	279	50.0	280	27.6	**723**
Subtotal	**2,529**		**558**		**1,013**		**4,100**
Other OPCS code	498		188		371		**1,057**
No OPCS code given	434		1,089		1,639		**3,162**
Total	**3,461**		**1,835**		**3,023**		**8,319**

Whole study population data

Sample population

The majority of patients included in the peer review process were aged between 13 and 16 years (305/573; 53.2%) with a median age of 15 years (Figure 2.1). When compared with the population of all patients identified to NCEPOD with an ICD10 code of N44 (torsion of testis), the group included in the peer review process were skewed towards the older age groups.

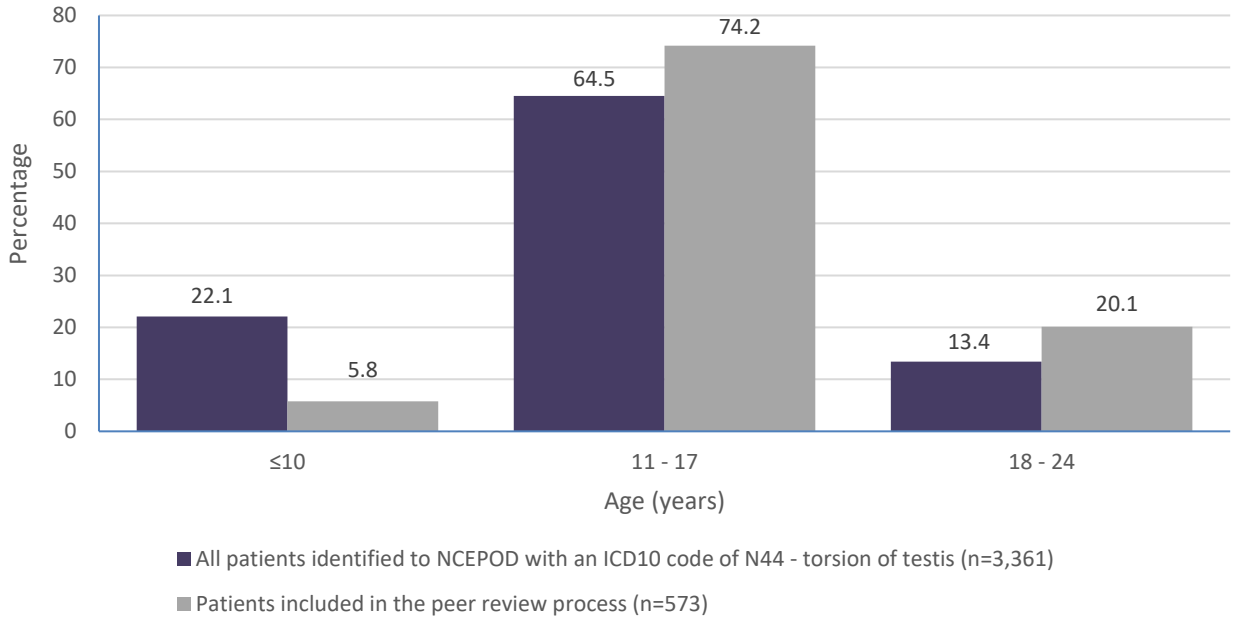


Figure 2.1 Age bands of the patients included in the sample population
Clinician questionnaire data

In the sample, 45/536 (8.4%) patients were identified as having a communication difficulty, and 24/536 (4.5%) as having learning disability. Of the patients with a communication difficulty, 32/45 (71.1%) underwent an orchidectomy compared with 167/491 (34.0%) patients with no communication difficulties. Of the patients with a learning disability, 13/24 (54.2%) underwent an orchidectomy compared to 186/510 (36.5%) patients with no learning disability. Previous work has identified that patients with a learning disability may be more at risk of a delay to diagnosis because of difficulties in communicating symptoms effectively.[7] In this study the time from arrival to decision to operate took longer than six hours for those with a communication difficulty (18/45; 40.0%) compared with no communication difficulty (138/491; 28.1%). There were 131/499 (26.3%) patients who did not have the mental capacity to consent to treatment. Of those patients who did not have the capacity to consent, 118/131 (90.1%) were under the age of 16 years.

Left testicular torsion (252/574; 43.9%) was less common than right testicular torsion (316/574; 55.1%) in our sample (Table 2.3).

Table 2.3 Side of testicular torsion of the sample population

	Number of patients	%
Left testicular torsion	252	43.9
Right testicular torsion	316	55.1
Bilateral testicular torsion	6	1.0
Total	**574**	

Clinician questionnaire data

Most patients (538/547; 98.4%) had their operation on an immediate or urgent basis (Table 2.4).

Table 2.4 The category of urgency of the surgery

	Number of patients	%
Immediate	417	76.2
Urgent	121	22.1
Expedited	9	1.6
Subtotal	**547**	
Unknown	27	
Total	**574**	

Clinician questionnaire data

As the number of patients who undergo orchidectomy was smaller than those undergoing orchidopexy, our sampling was biased towards those patients to make sure we collected enough data in each group (orchidectomy and orchidopexy). Within the sampled population, 214/573 (37.3%) patients underwent an orchidectomy and 358/573 (62.5%) underwent an orchidopexy (Table 2.5). Where a unilateral orchidopexy was undertaken, the reason for this was a previous orchidopexy on the opposite side for three patients, with other reasons given for four patients; and unknown for three patients.

Table 2.5 The operation undertaken

	Number of patients	%
Orchidectomy	13	2.3
Orchidectomy and opposite orchidopexy	201	35.1
One side orchidopexy	10	1.7
Both sides orchidopexy	348	60.7
Other	1	0.2
Subtotal	**573**	
Unknown	1	
Total	**574**	

Clinician questionnaire data

CHAPTER 3: PUBLIC AWARENESS AND PRE-HOSPITAL CARE

Time is of the essence in cases of testicular torsion. One key component of the timeline from first symptom to surgery is the time taken for a patient to seek medical attention. Previous work has shown that patients, parents/carers do not always fully appreciate the implications of acute scrotal pain and that there should be increased public awareness of the condition.[8,9] This has led to initiatives to increase public knowledge about testicular torsion. One such initiative from Canada, 'Teste Talk', developed a targeted social media campaign.[10] In the UK, a module has been developed for secondary schools as part of the personal, social, health and economic (PSHE) education programme and is being tested using quality improvement methodology.[11]

Time from first symptom to contact with medical care

Throughout this report, a vertical line on the horizontal axis of the cumulative percentage figures denotes a time of six hours, which is the generally accepted time frame for intervention.[2] Figure 3.1 shows that it took over six hours for 27/209 (12.9%) patients to tell anyone about their symptoms.

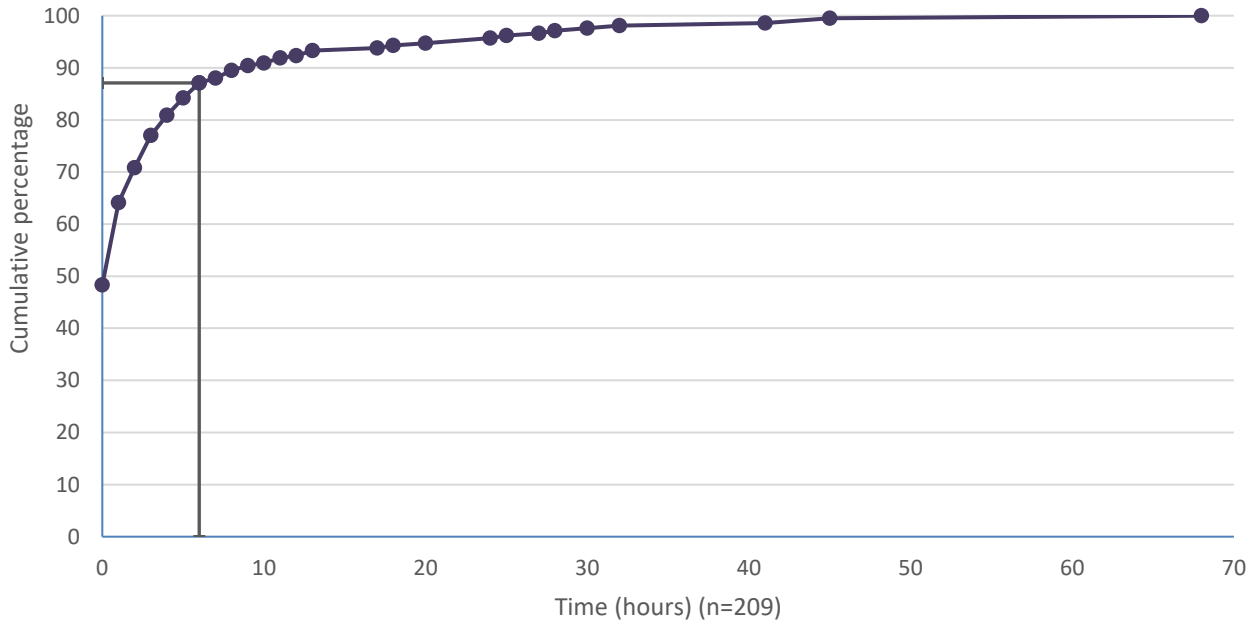


Figure 3.1 Time from symptoms starting to first reporting them to someone
Reviewer assessment form data

This delay mattered as the longer it took, the more likely it was that the testicle would not be salvageable and that an orchidectomy would need to be performed (Figure 3.2).

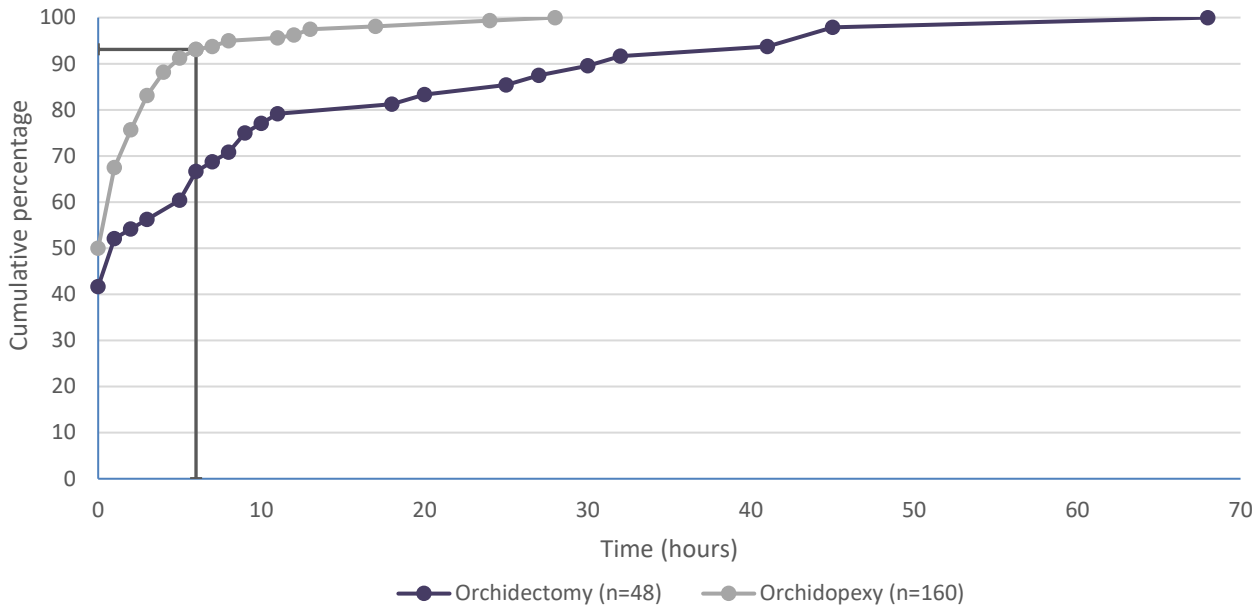


Figure 3.2 Operation undertaken by time from start of symptoms to first reporting them
Reviewer assessment form data

In the majority of cases reviewed (305/414; 73.7%), patients first reported their symptoms to family members with 35/414 (8.5%) reporting them to a medical professional outside the hospital as the first contact (Table 3.1).

Table 3.1 Who the patient first report symptoms to

	Number of patients	%
Parent/ carer	301	72.7
Emergency department clinician	44	10.6
General practitioner	24	5.8
School/college staff	12	2.9
NHS 111	11	2.7
Other relative	4	1.0
Friend	3	0.7
Other	15	3.6
Subtotal	**414**	
Unknown	221	
Total	**635**	

Reviewer assessment form data

Not appreciating the urgency of referral was not only due to lack of knowledge by the patient; there was also a delay in the parent/carer or family member then telling a health professional (Figure 3.3).

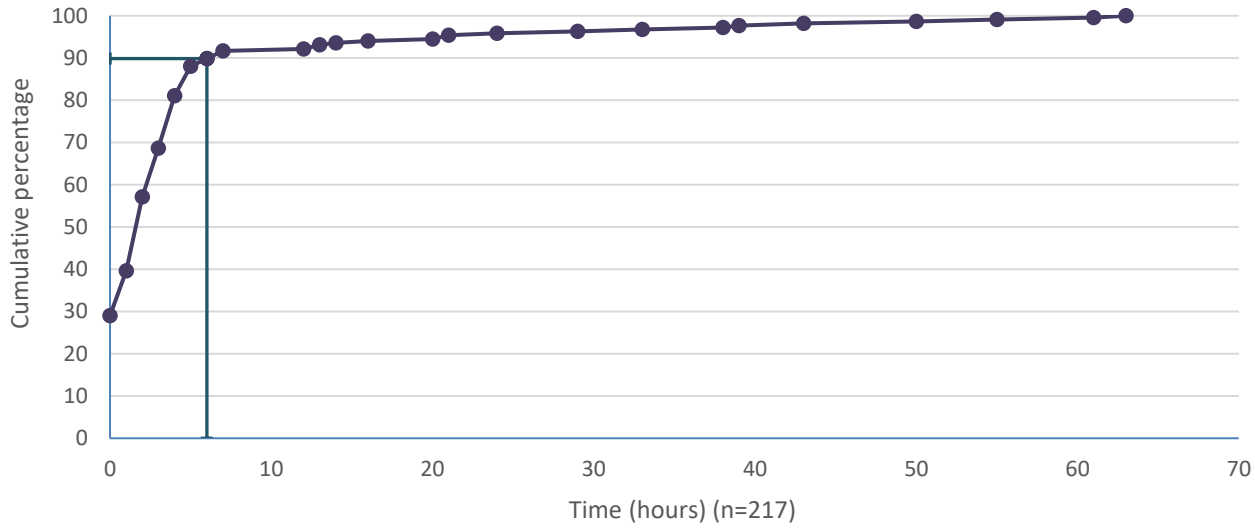


Figure 3.3 Time from telling anyone about symptoms to telling a healthcare professional
Reviewer assessment form data

These delays become cumulative. Looking at the time from symptoms starting to telling a health care professional, only 294/403 (73.0%) patients had contacted a healthcare professional within six hours of developing symptoms (Figure 3.4). On analysis of the data by the age of the patient (2-19 years vs. ≥20 years) there were no differences in the time it took from first symptom to telling a healthcare professional, implying that parents/carers and young people were equally unaware of the urgency of seeking medical attention.

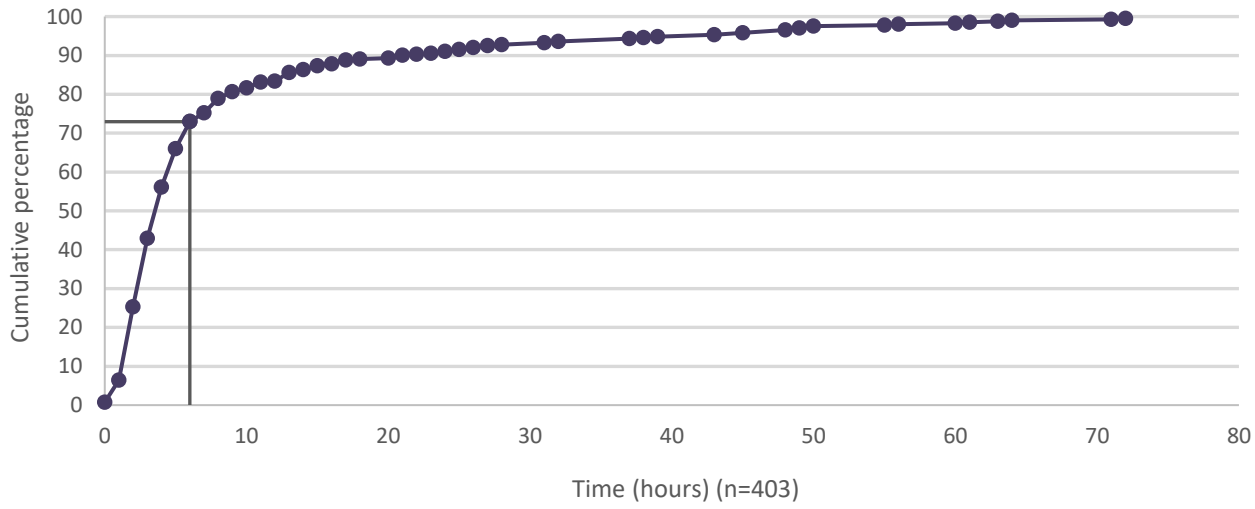


Figure 3.4 Time from symptoms starting to telling a healthcare professional
Reviewer assessment form data

CASE STUDY 1

A 12-year-old boy with autism presented to the emergency department (ED) after 36 hours of being in pain. Once in the ED he was seen quickly and operated on within four hours. However, the testicle could not be saved, and he had it removed.

Reviewers were of the opinion that this was an example of the difficulty of diagnosing pain in children with communication problems and also showed the lack of public awareness of how to manage testicular pain.

Healthcare professionals that were contacted

The majority of patients presented directly to the emergency department (339/475; 71.4%). Of the remaining patients, 60/475 (12.6%) presented to their GP, 34/475 (7.2%) to an urgent treatment centre and 25/475 (5.3%) used NHS 111. The remaining 17 patients accessed other forms of health care support (Table 3.2).

Table 3.2 Who the patient sought advice from prior to the hospital admission

	Number of patients	%
Presented directly to the emergency department	339	71.4
GP	60	12.6
Urgent treatment centre	34	7.2
NHS 111	25	5.3
Other	17	3.6
Subtotal	**475**	
Unknown	106	
Total	**574**	

Clinician questionnaire data

Answers may be multiple; n=475 (unknown for 106)

The decision regarding where to seek medical advice had a substantial impact on the time to arrival in hospital with only 36/66 (54.5%) patients who sought advice elsewhere arriving in hospital within six hours of symptoms starting versus 178/251 (70.9%) patients who went to an ED (Figure 3.5).

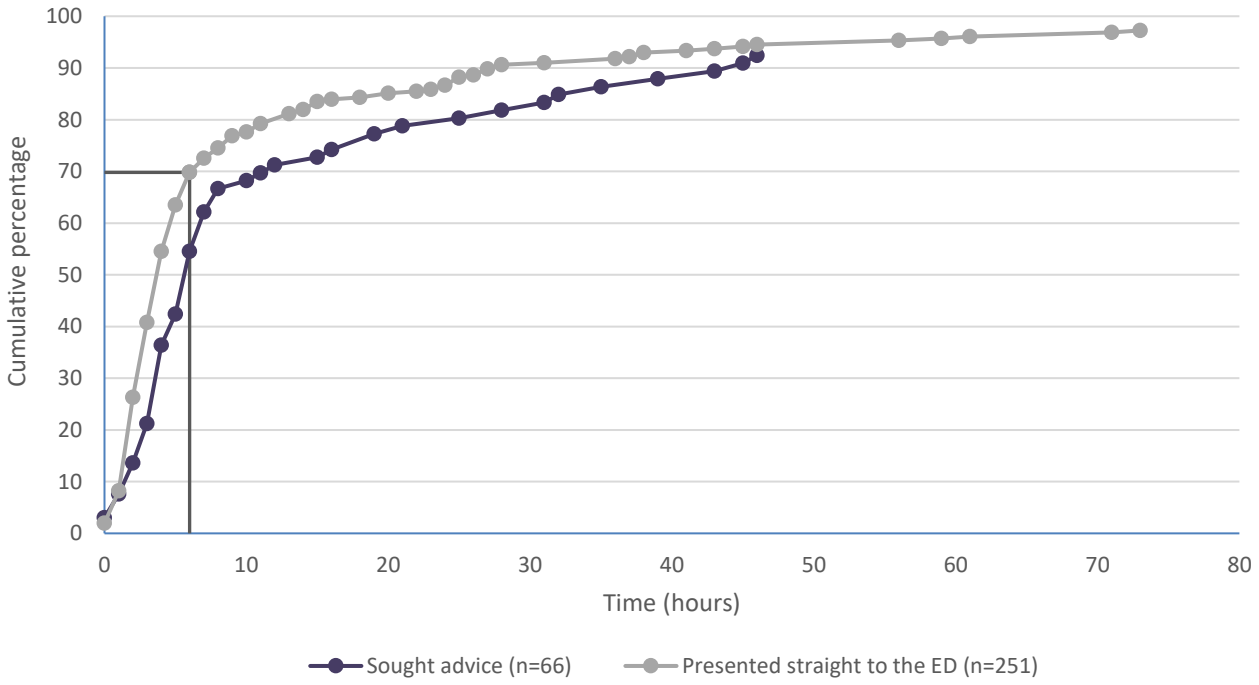


Figure 3.5 Time from symptoms starting to arrival in hospital by seeking advice prior to admission

Clinician questionnaire data

This also affected outcomes with only around a third of patients who presented directly to an ED having an orchidectomy compared with half of the patients who sought advice from other medical sources before going to hospital (Table 3.3).

Table 3.3 Who the patient sought advice from prior to admission compared with the operation undertaken

	Sought advice		Presented directly to the ED		Subtotal	Other/ Unknown	Total
	Number of patients	%	Number of patients	%	Number of patients	Number of patients	Number of patients
Orchidectomy	62	53.9	112	33.0	**174**	40	**214**
Orchidopexy	53	46.1	227	67.0	**280**	78	**358**
Subtotal	**115**		**339**		**454**	**118**	**572**
Other/unknown	1		0		**1**	1	**2**
Total	**116**		**339**		**455**	**119**	**574**

Clinician questionnaire data

Reviewers indicated there was a delay in arrival for 132/635 (20.8%) patients. Where there was a delay, this ranged between one and 500 hours with an average delay of 49.4 hours, and the most frequent delay being recorded as 48 hours.

The patient had presented to healthcare services before with the same complaint

A total of 88/574 (15.3%) patients had presented to healthcare services in the previous week. The majority of patients presented to the ED (59/88), with 24/88 presenting to the GP (Table 3.4). The majority of patients for whom we had data (59/64) had their testicles examined at the time of the attendance. There was a delay in referral by the previous clinician for 16/65 patients. Where there was a delay, this occurred at the GP surgery for 11/16 patients and at the ED for 6/16 patients. Where there had been a previous presentation, 54/87 patients underwent an orchidectomy as opposed to 139/418 patients who had not had previous contact.

Table 3.4 The patient had sought medical advice in the week prior to the admission, with symptoms which could have indicated testicular torsion (e.g. testicular or abdominal pain)

	Number of patients
Yes - emergency department	59
Yes - general practitioner	24
Yes - paediatric assessment unit	5
Yes - surgical assessment unit	2
Other	4
Subtotal	**88**
Unknown	68
No	418
Total	**574**

Clinician questionnaire data

Answers may be multiple; n=88

Missed opportunities for earlier diagnosis

Reviewers were of the opinion that there were missed opportunities for 239/589 (40.6%) patients.

As seen in Table 3.5, the vast majority of these were due to testicular torsion not being recognised by the patient (157/239; 65.7%) and/or their parent/carer (83/239; 34.7%). Table 3.6 shows that the person responsible for this lack of recognition varied depending on the age of the patient. For those under 12 years it was mostly the parent/carer, between 12-16 years it was split between the patient and the parent/carer, and over 17 years it was largely the patient.

Table 3.5 Missed opportunities to recognise testicular torsion prior to admission

	Number of patients	%
From the patient	157	65.7
From the parent/carers	83	34.7
From the GP	23	9.6
From the school	3	1.3
Other	47	19.7
Subtotal	**239**	
No	350	
Unable to answer	46	
Total	**635**	

Reviewer assessment form data

Answers may be multiple; n=239

Table 3.6 Missed opportunities to recognise testicular torsion prior to admission by age group

	<12 years	12 to 16 years	≥17 years	Total
	Number of patients	Number of patients	Number of patients	Number of patients
From the patient	9	102	46	**157**
From the parent/carers	19	61	3	**83**
From the GP	3	14	6	**23**
From the school	0	2	1	**3**
Other	3	28	16	**47**
Subtotal	**27**	**149**	**63**	**239**
No	28	216	106	**350**
Unable to answer	4	30	12	**46**
Total	**59**	**394**	**180**	**635**

Reviewer assessment form data

Answers may be multiple; <12 years n=27; 12-16 years n=149; ≥17 years n=63

CASE STUDY 2

A 16-year-old boy presented with new onset testicular pain at school at 10am. The school nurse contacted his father who took him to the emergency department, and he had an orchidopexy within three hours of the start of symptoms.

Reviewers said that that this was an example of excellent joined-up care.

Public health education is clearly necessary to try to improve recognition of testicular torsion. Education of secondary school pupils as part of the PHSE (personal, social, health and economic) curriculum is being implemented in many UK regions and its further rollout should be encouraged.[11]

There are also on-line resources directed at young men to aid early recognition.[12] The education of parents/carers at all stages of a child's development should be considered and models such as the one used by Head Smart which provided age-specific symptom checkers have been successful in raising awareness in other conditions.[13]

CHAPTER 4: TRANSFERS

The 2021 Paediatric Surgery and Urology report from the Getting It Right First Time (GIRFT) programme reported that there was considerable variation between trusts in England in transferring patients with testicular torsion for surgery.[6] They reported that in some specialist trusts one in four patients had been transferred for surgery, although the average transfer rate was around one in ten. Transfers from one hospital to another lead to delays in surgery and there is published evidence that this in turn leads to a higher rate of orchidectomy.[14,15]

Organisation of surgical care

It was reported from 113/143 (79.0%) hospitals that children and young people with suspected testicular torsion were operated on there, but 91/143 (63.6%) also reported that patients were transferred out of the hospital for treatment on occasions (Table 4.1).

Table 4.1 Patient groups who were transferred for treatment

	Number of organisations
Paediatrics	87
Adolescents	18
Adults	21
Total	**91**

Organisational questionnaire data

Data from the clinician survey indicated that surgeons most commonly transferred patients out for surgery because of the patient's age (216/349; 61.9%), but, as seen in Table 4.1, it was not only children who were transferred out, adolescents and adults were also transferred for surgery. The ages quoted as cut-offs are presented in Table 4.2.

Table 4.2 The age cut-off of paediatric patients transferred for treatment

	Number of organisations
≤16 (all paediatric patients)	18
≤12	1
≤11	1
≤5	30
≤4	3
≤3	12
≤2	16
≤1	3
Varies by patient	3
Total	**87**

Organisational questionnaire data

Patients transferred for surgery

Aligning with the GIRFT data, reviewers found that 44/628 (7.0%) (GIRFT data were 10%) patients in this report were transferred to another hospital for surgery.[6] In the clinician's questionnaire the figure was 27/526 (5.1%) (Table 4.3).

Hospital transfer was not exclusively a result of the patient being seen out of hours; of 44 transferred patients, 15 were transferred out of hours (18:00-07:59) and 14 during work hours (08:00-17:59) (unknown for 15).

Table 4.3 Mode of referral to hospital

	Number of patients	%
Self-referral	419	79.7
GP referral	44	8.4
Transfer from another hospital	27	5.1
NHS 111 referral	24	4.6
Other	12	2.3
Subtotal	**526**	
Unknown	48	
Total	**574**	

Clinician questionnaire data

The mode of transfer to another hospital was ambulance for 11/22 patients, and own or parent/carer transport in 11/22.

The reasons given for the transfer are shown in Table 4.4. The availability of emergency surgical services at the site, or of a surgeon competent in torsion management, were the most common reasons.

Table 4.4 Reason for the transfer from the hospital the patient first arrived at

	Number of patients
No surgeon competent in torsion management	10
No emergency surgical services on this site	9
No anaesthetist competent to anaesthetise patient	3
Other	9
Subtotal	**25**
Unknown	2
Total	**27**

Clinician questionnaire data

Answers may be multiple; n=25 (unable to answer for 2)

CASE STUDY 3

A 12-year-old boy with acute onset of testicular pain presented to the emergency department at 00:40 but the hospital did not have the resources available to operate. The hospital had good transfer arrangements and he was transferred by ambulance to another hospital by 02:00 and had successful salvage of his testicle at 04:30.

The reviewers were of the opinion that although any transfer does lead to delays this was a good example of how a clear transfer arrangement led to a successful outcome.

Transfers resulted in a delay in arrival at the hospital in which the operation was performed as shown in Figure 4.1. In total, 277/418 (66.3%) patients who had not been transferred arrived in hospital within six hours of symptoms starting, compared with 14/23 patients who had been transferred.

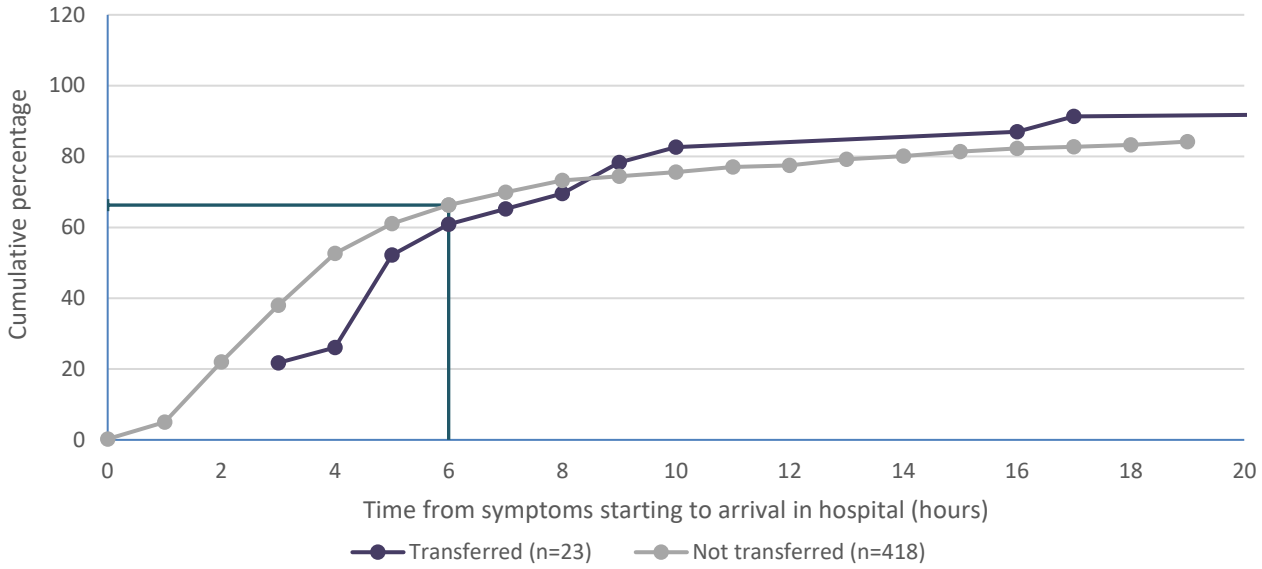


Figure 4.1 Time from symptoms starting to arrival in hospital by whether the patient had been transferred
Reviewer assessment form data

Transfer also affected the time from symptom onset to surgery as shown in Figure 4.2. Of the patients who had not been transferred, 159/423 (37.6%) had surgery within six hours of symptom onset compared with 7/34 patients who had been transferred.

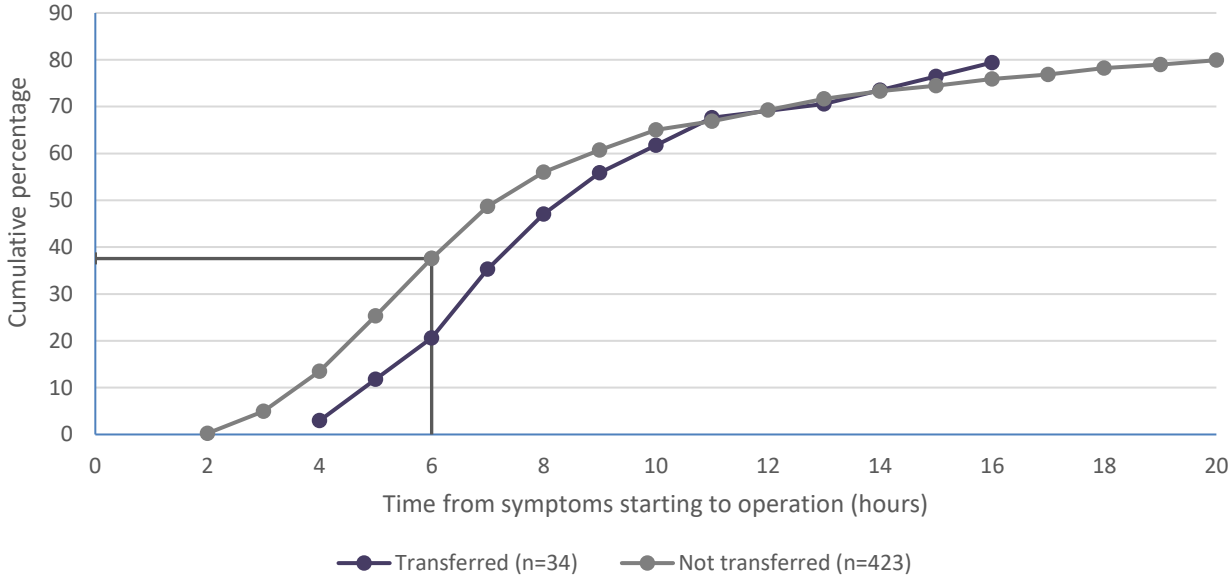


Figure 4.2 Time from symptoms starting to operation by whether the patient had been transferred
Reviewer assessment form data

CASE STUDY 4

A 4-year-old boy whose family spoke English as a second language presented to his GP after he had experienced pain for 20 hours. There was a further 12-hour delay while a transfer to hospital was organised. The testicle was not able to be saved.

Reviewers said that the transfer was one of an accumulation of factors that led to the poor outcome in this case.

CHAPTER 5: SENIOR DECISION-MAKING

Delays in the hospital assessment, diagnosis and management of testicular torsion can contribute to the risk of orchidectomy because of testicular necrosis or delayed testicular atrophy with the potential for reduced fertility.[4] Pre-hospital delays are one aspect of this, but speedy hospital treatment can avoid the need for an orchidectomy and its potentially significant effects. Ideally patients should undergo an operation to correct the torsion with both testicles fixed (orchidopexy) within six hours of onset of symptoms. Although salvage of the testicle is still possible in patients who have waited more than 14 hours from onset of symptoms to surgery, every additional hour of delay results in a 4% increase in the risk of orchidectomy.[16] Every stage of the pathway from presentation to a healthcare professional to surgery can significantly impact on the outcome for the patient.[17] Good practice would include early assessment by the most appropriate clinician who could make a decision to operate on the patient.

Initial assessment

Reviewers reported that 90/514 (17.5%) patients with testicular torsion waited more than one hour from arrival in hospital to first review (Figure 5.1). There were 424/514 (82.5%) patients who were first reviewed within one hour while 491/514 (95.5%) were reviewed within two hours of arrival. Just 23/514 (4.5%) patients waited more than two hours from arrival to first review (unknown for 60).

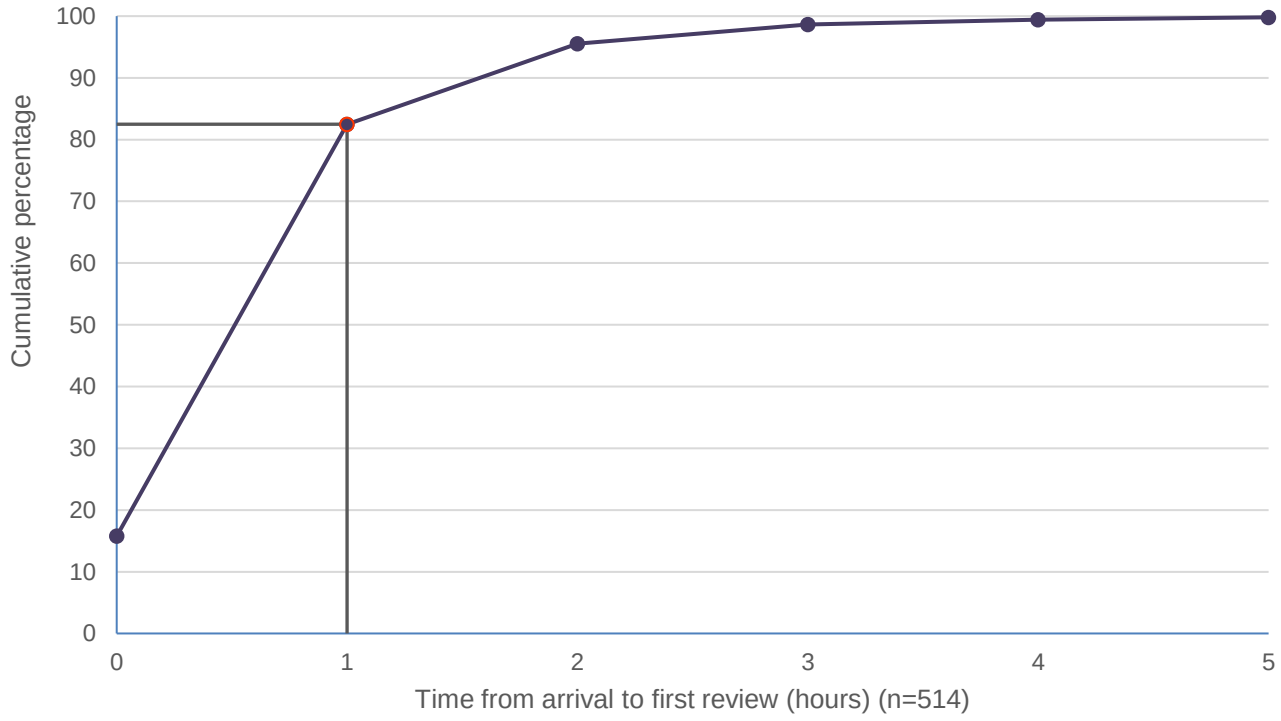


Figure 5.1 Time from arrival in hospital to first review
Reviewer assessment form data

CASE STUDY 5

A 15-year-old boy presented to the local emergency department having experienced pain in his left testicle for six hours since he woke from sleep at 03:00. He was immediately reviewed by the triage nurse, who contacted the urology registrar. He was assessed by the urology registrar within five minutes, who also notified the operating theatre team and anaesthetist on her way to assess the patient. The patient was taken to theatre within one hour of presentation to hospital. The testicle was saved, and both testicles were fixed.

Reviewers commented on the excellent multidisciplinary approach to care, including the direct referral to the most appropriate decision-maker for the patient to avoid delay.

The reviewers noted that 277/456 (60.7%) patients had their first review within six hours of symptoms starting and 365/456 (80.0%) patients had their first review within 14 hours of symptoms starting (Figure 5.2). This means that 179/456 (39.3%) patients were not reviewed within six hours of symptoms starting and were therefore already at high risk of irreversible ischaemic damage and orchidectomy when first reviewed.

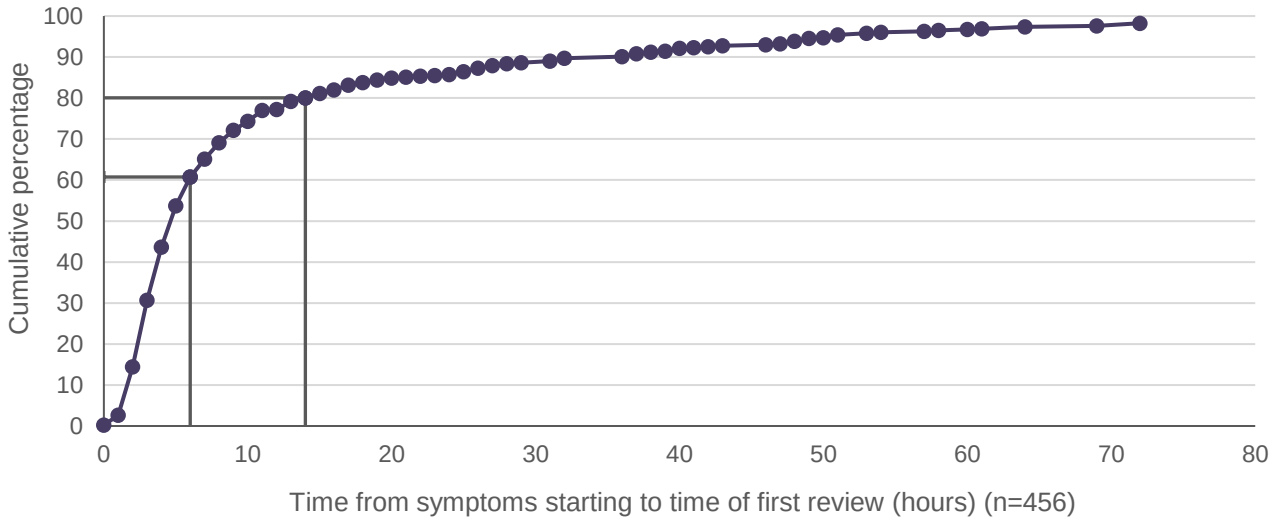


Figure 5.2 Time from symptoms starting to time of first review
Reviewer assessment form data

Clinicians looking after patients reported that the majority presented to the emergency department (ED) (500/562; 89.0%) with 311/562 (55.3%) presenting to the paediatric ED and 189/562 (33.6%) to the adult ED (Table 5.1).

Table 5.1 Location the initial assessment was undertaken on arrival

	Number of patients	%
Paediatric emergency department	311	55.3
Adult emergency department	189	33.6
Surgical admissions unit (SAU)	23	4.1
Paediatric admissions unit (PAU)	19	3.4
Surgical ward	4	0.7
Paediatric ward	4	0.7
Other	12	2.1
Subtotal	**562**	
Unknown	12	
Total	**574**	

Clinician questionnaire data

Reviewers reported that 136/435 (31.3%) patients had their first assessment on arrival performed by a junior specialist trainee. The assessment was carried out by a senior specialist trainee (ST3+ or equivalent) for 114/435 (26.2%) patients and only 38/435 (8.7%) patients were seen by a consultant (Table 5.2).

Table 5.2 Grade of clinician who undertook the first assessment on arrival

	Number of patients	%
Junior specialist trainee (ST1 and ST2 or CT equivalent)	136	31.3
Senior specialist trainee (ST3+ or equivalent)	114	26.2
Senior staff nurse, enrolled nurse	89	20.5
Consultant	38	8.7
Nurse consultant, nurse practitioner, clinical nurse specialist	27	6.2
Specialty and associate specialist (SAS)	16	3.7
Trainee with CCT	2	<1
Other	13	3.0
Subtotal	**435**	
Unknown	200	
Total	**635**	

Reviewer assessment form data

In 365/549 (66.5%) patients, the specialty of the clinician undertaking the first assessment was an emergency medicine specialist. Reviewers noted that 98/549 (17.9%) patients were seen by urology specialists and the remainder by general surgery, paediatric surgery, and paediatrics (Table 5.3).

Table 5.3 Specialty of clinician who undertook the first assessment on arrival

	Number of patients	%
Emergency medicine	365	66.5
Urology	98	17.9
General surgery	41	7.5
Paediatric surgery	26	4.7
Paediatrics	12	2.2
Other	7	1.3
Subtotal	**549**	
Unknown	86	
Total	**635**	

Reviewer assessment form data

Reviewers indicated that the initial assessment was performed by the most appropriate clinician for 492/543 (90.6%) patients (unknown for 92). Where the reviewers indicated that the initial assessment was not appropriate, the main reasons for this were that the assessor was not senior enough (23/51), or that the patient should have been streamed directly to urology (10/51). For 75/635 (11.8%) patients, reviewers reported that there was a delay in recognising testicular torsion at the time of the initial assessment.

First ST3+ review (by any specialty)

We used ST3+ (trainee doctors in their third year of specialty training and above) as a marker of seniority for first specialist review, although other staff with appropriate training may make these decisions and this will vary by hospital.

When the reviewers looked at the time to first ST3+ review, there was evidence in the notes that only 210/420 (50.0%) patients were reviewed by an ST3+ doctor in any specialty within one hour of arrival in hospital, 94/420 (22.4%) patients had not been seen by an ST3+ doctor within two hours of arrival and 32/420 (7.6%) waited more than four hours (Figure 5.3) (unknown for 215). Reviewers reported that there was a delay in the

first ST3+ or equivalent review in 80/533 (15.0%) patients (unknown for 102) and that this impacted on the care of the patient in 24/80 patients.

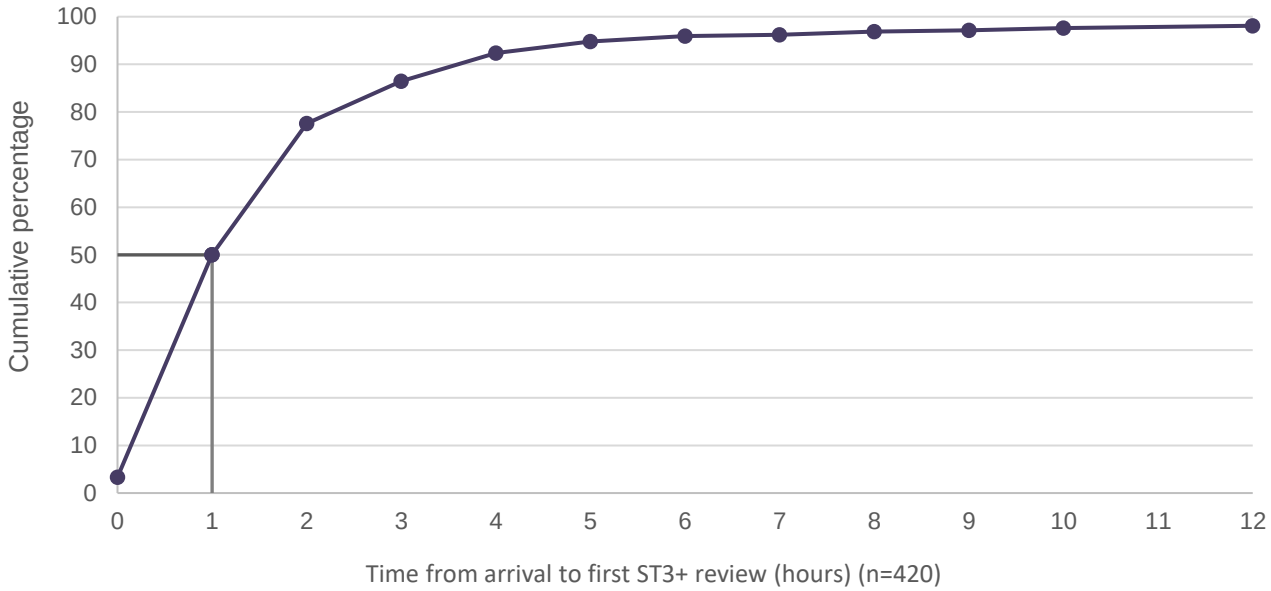


Figure 5.3 Time from arrival to first ST3+ review in any specialty
Reviewer assessment form data

First ST3+ surgical review

As the critical element of the pathway for testicular torsion is time to operation from onset of symptoms, the earlier the patient is seen by a senior surgical decision-maker, the greater the chance of salvaging the testicle. Reviewers noted that 165/422 (39.1%) patients received their first ST3+ surgical review within one hour of arrival in hospital, while 113/422 (26.8%) patients had not had their first ST3+ surgical review within two hours of arrival in hospital. A total of 40/422 (9.5%) patients waited more than four hours for ST3+ surgical review (Figure 5.4). Table 5.4 shows the specialties responsible for the first ST3+ surgical reviews which was most commonly the urology team.

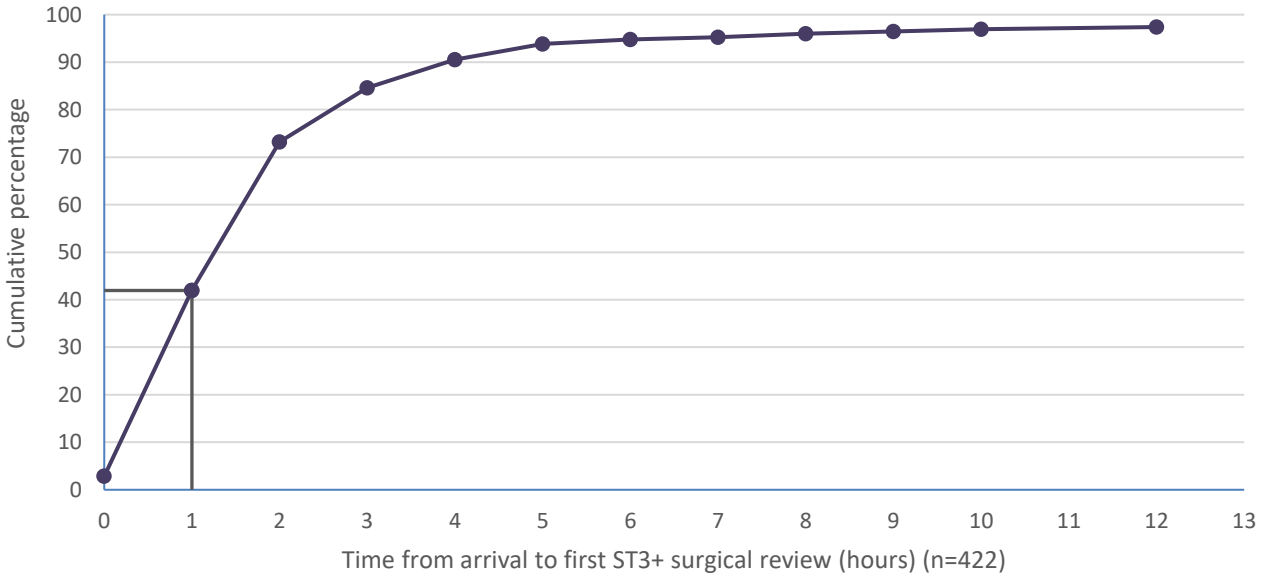


Figure 5.4 Time from arrival to first ST3+ surgical review
Reviewer assessment form data

Table 5.4 Specialty who undertook the first surgical review

	Number of patients	%
Urology	391	71.1
General surgery	100	18.2
Paediatric surgery	59	10.7
Subtotal	**550**	
Not reviewed by ST3+ or equivalent	85	
Total	**635**	

Reviewer assessment form data

When pre-hospital delays are combined with delays in-hospital it can compound delays to surgical assessment and time to theatre. This can lead to an increased risk of testicular necrosis and delayed atrophy.[3] Overall, 168/361 (46.5%) patients did not have their first ST3+ surgical review within six hours of symptoms starting and 61/361 (16.9%) patients did not have their first ST3+ surgical review within 24 hours of symptom onset (Figure 5.5). Reviewers believed there was a delay in surgical assessment in 86/635 (13.5%) patients.

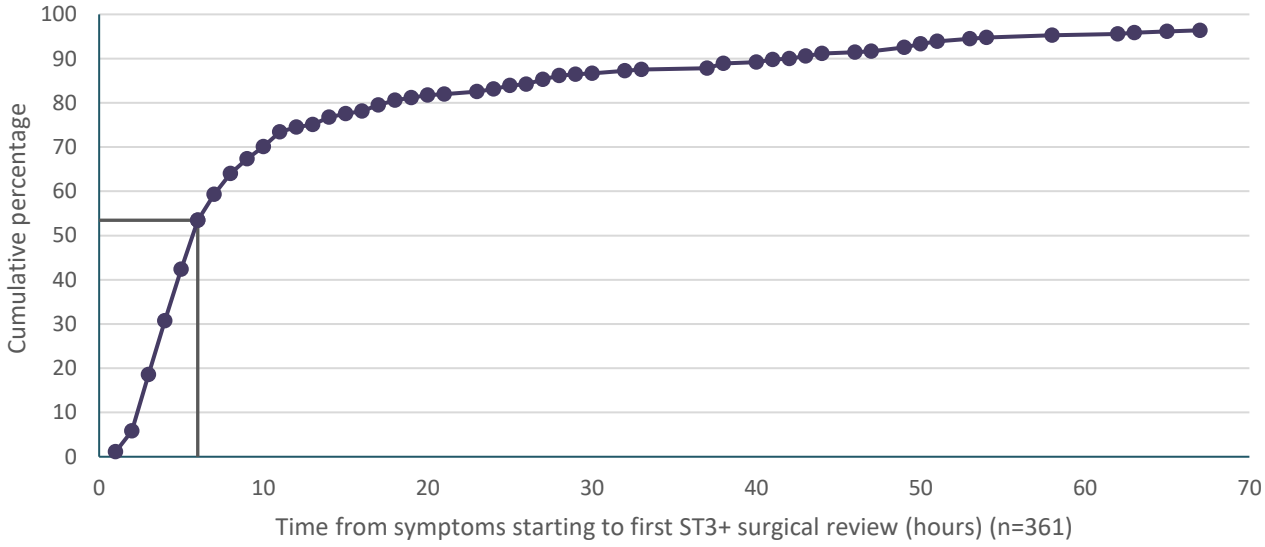


Figure 5.5 Time from symptoms starting to first ST3+ surgical review
Reviewer assessment form data

Consultant review

Patients with testicular torsion present as acute emergencies and because of the urgent need for surgery may not be seen by a consultant before being taken to theatre. There were 440/574 (76.7%) patients who were taken directly from the emergency department to theatre. However, all patients should be seen by a consultant or equivalent at some time during their admission and within 14 hours of admission if they remain in hospital.[18] In some circumstances it may be appropriate for patients to be treated and discharged before a consultant can review the patient.

Consultants or equivalent senior staff can ensure further care, information delivery and appropriate follow-up are arranged. Only 195/506 (38.5%) patients in this study were seen by a consultant (unknown for 129). Reviewers were of the opinion that 19/311 (6.1%) patients who were not seen by a consultant should have been. If patients were seen by a consultant, they were more likely to be offered a follow-up appointment (108/195; 55.4%) compared with those who were not seen by a consultant (117/311; 37.6%).
Reviewers reported that there was a delay in making a diagnosis in 116/635 (18.3%) patients and that this delay impacted on the care of 69/116 (59.5%) of those patients (Table 5.5).

Table 5.5 Delay in making a diagnosis and whether the patient was seen by a consultant

	Consultant review		No consultant review	Subtotal	Date or time missing	Total
	≤4 hours	>4 hours				
	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients
Yes	12	19	68	**99**	17	**116**
No	84	22	356	**462**	35	**497**
Total	**96**	**41**	**424**	**561**	**52**	**613**
Unable to answer	2	2	16	**20**	2	**22**
Total	**98**	**43**	**440**	**581**	**54**	**635**

Reviewer assessment form data

A decision to operate was made within six hours of symptoms starting for 215/424 (50.7%) patients and within 14 hours for 318/424 (75.0%) patients. In 78/424 (18.4%) patients the decision to operate was made over 24 hours from symptoms starting (Figure 5.6).

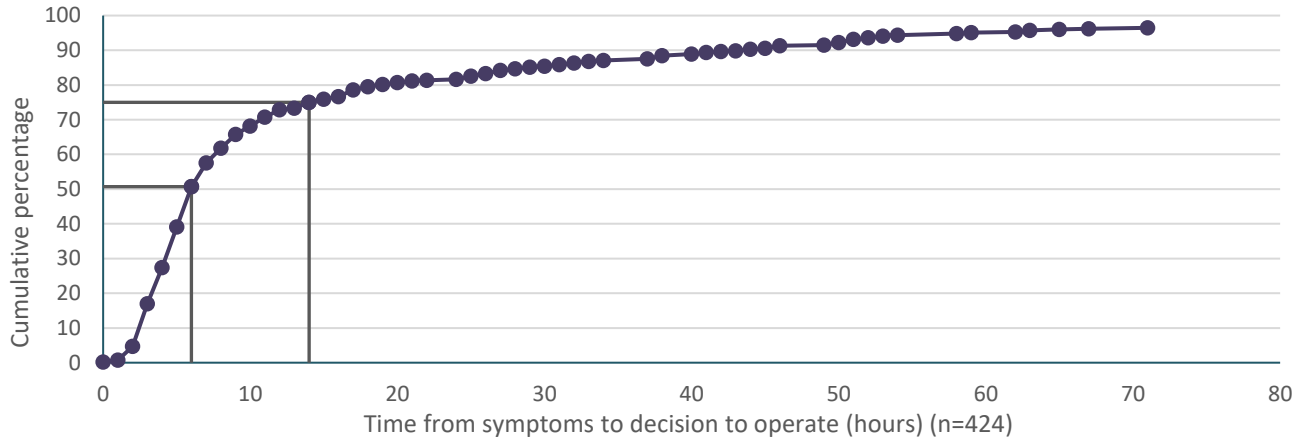


Figure 5.6 Time from symptoms starting to a decision to operate

Clinician questionnaire data

Only 122/488 (25.0%) patients had their operation within one hour of the decision to operate, while 339/488 (69.5%) had it within two hours, and 29/488 (5.9%) waited more than four hours from decision to operate until their operation started (Figure 5.7). Reviewers reported that there was a delay in decision-making in 82/635 (12.9%) patients and in 48/82 of those patients this delay impacted on their care.

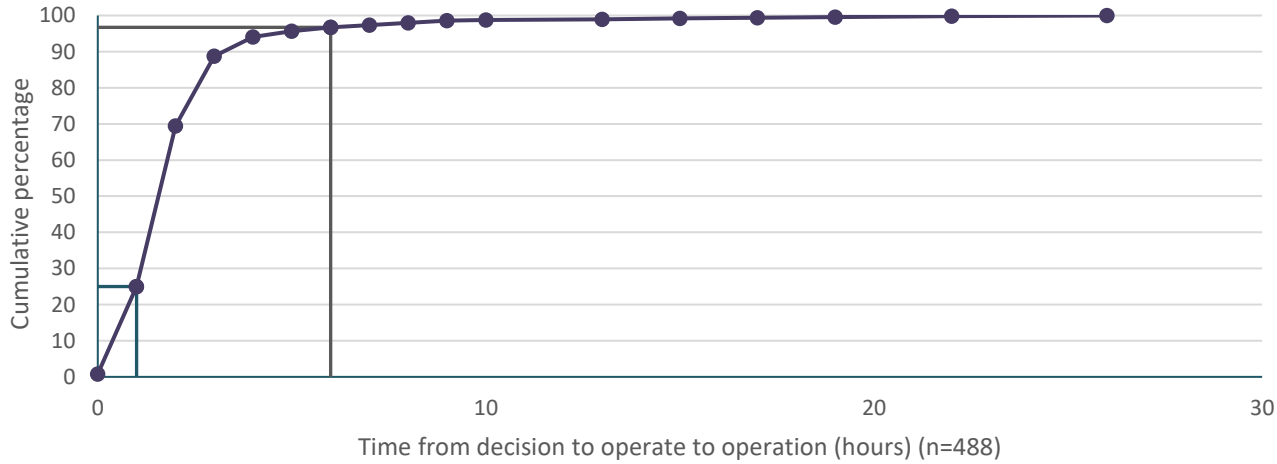


Figure 5.7 Time from a decision to operate to the operation being started

Reviewer assessment form data

Over half of operations were performed by a senior specialist trainee (288/569; 50.6%) with 17/569 (22.3%) performed by consultants, and 120/569 (21.1%) by SAS doctors (Table 5.6). A small number of procedures were performed by more junior surgeons.

There were 445/570 (78.1%) operations undertaken by urologists, 64/570 (11.2%) by paediatric surgeons, and 61/570 (10.7%) by general surgeons. The rate of orchidectomy was similar whether the operation was performed by consultant (51/126; 40.5%), SAS doctor (39/120; 32.5%) or senior specialist trainee (113/298; 37.9%) (Table 5.7).

Table 5.6 Grade of the clinician who performed the operation

	Number of patients	%
Senior specialist trainee (ST3+ or equivalent)	288	50.6
Consultant	127	22.3
Specialty and associate specialist (SAS)	120	21.1
Junior specialist trainee (ST1 and ST2 or CT equivalent)	20	3.5
Trainee with certificate of completion of training (CCT)	10	1.8
Other	4	0.7
Subtotal	**569**	
Unknown	5	
Total	**574**	

Clinician questionnaire data

Table 5.7 Grade of the clinician who performed the operation by operation undertaken.

	Consultant		Specialty and associate specialist		Senior specialist trainee		Junior specialist trainee	Other	Subtotal
	n	%	n	%	n	%	n	n	n
Orchidectomy	51	40.5	39	32.5	113	37.9	6	2	**211**
Orchidopexy	75	59.5	81	67.5	185	62.1	14	2	**357**
Subtotal	**126**		**120**		**298**		**20**	**4**	**568**

Clinician questionnaire data
(n=number of patients)

Table 5.8 shows the grade of the anaesthetist. Reviewers were of the opinion that the grade of anaesthetist was not appropriate in 25/407 (6.1%) patients, while the grade of surgeon was not appropriate in 3/570 (0.5%) patients (Table 5.9).

Reviewers reported that in the 25 cases where the grade of anaesthetist was not appropriate, the main reasons were no record or documentation of supervision (12 patients) and trainee too junior (23 patients)(answers may be multiple). Where the grade of the anaesthetist was not thought to be appropriate, the patients ages ranged between 13-24 years.

Table 5.8 Grade of the anaesthetist

	Number of patients	%
Consultant	229	55.3
Senior specialist trainee (ST3+ or equivalent)	104	25.1
Specialty and associate specialist (SAS)	53	12.8
Junior specialist trainee (ST1& ST2 or CT equivalent)	19	4.6
Trainee with CCT	8	1.9
Other	1	<1
Subtotal	**414**	
Unknown	160	
Total	**574**	

Clinician questionnaire data

Table 5.9 Appropriateness of the grade of surgeon or anaesthetist

	Grade of operating surgeon appropriate		Grade of anaesthetist appropriate	
	Number of patients	%	Number of patients	%
Yes	567	99.5	382	93.9
No	3	<1	25	6.1
Subtotal	**570**		**407**	
Unable to answer	65		228	
Total	**635**		**635**	

Reviewer assessment form data

The timing of surgery, including the timing from decision to operate to time of operation, was not appropriate in 74/635 (11.7%) cases reviewed. Reviewers believed this impacted on the care of 21/48 patients where there was a delay (unknown for 26).

Figure 5.8 shows that only 168/466 (36.1%) patients had their operation started within six hours of the onset of symptoms. Furthermore, 125/466 (26.8%) had not commenced surgery within 14 hours of symptom onset. The later the patients had an operation after onset of symptoms, the more likely they were to need an orchidectomy (Figure 5.9). Existing evidence shows that there is an increased risk of orchidectomy for each hour beyond six hours.[16]

However, it should be noted that there were 46 patients who had surgery ≥15 hours after onset of symptoms who underwent orchidopexy, so exploration can still result in testicular salvage beyond 14 hours.

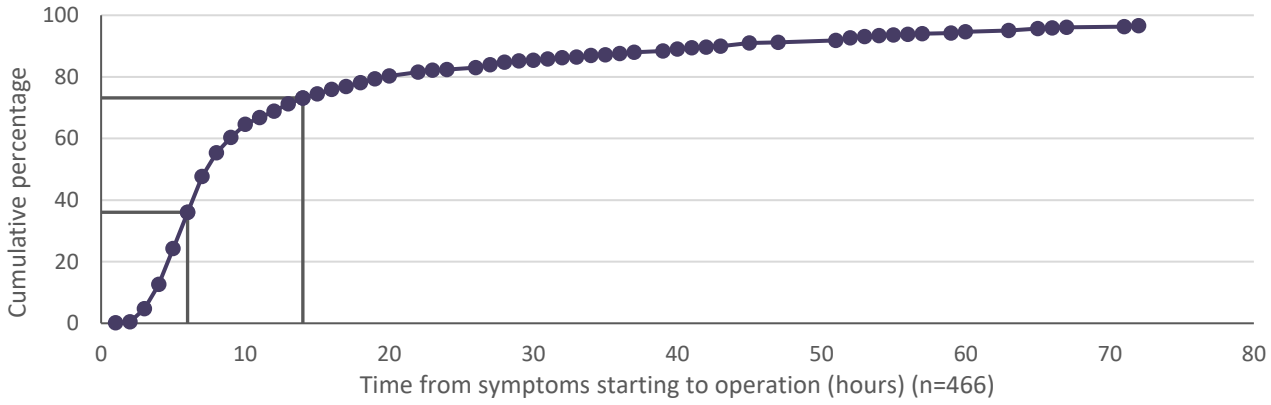


Figure 5.8 Time from symptoms starting to the operation being started

Reviewer assessment form data

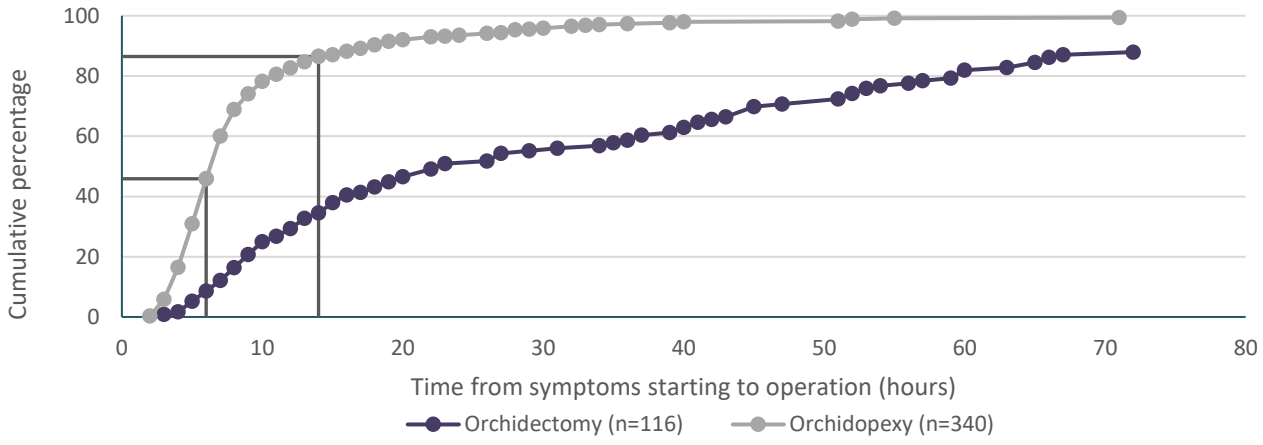


Figure 5.9 Time from symptoms starting to the type of operation undertaken

Reviewer assessment form data

In total, 156/340 (45.9%) patients who underwent orchidopexy had surgery within six hours of symptom onset compared with 10/116 (8.6%) of those who underwent orchidectomy. A much higher proportion of patients (294/340; 86.5%) who underwent orchidopexy had surgery within 14 hours of symptom onset compared with 40/116 (34.5%) of those who had an orchidectomy (Table 5.10).

Table 5.10 Time to surgery by type of surgery

	<6 hours		7-14 hours		≥15 hours		Subtotal	Unable to answer	Total
	n	%	n	%	n	%	n	n	n
Orchidectomy	10	6.0	30	17.9	76	62.3	**116**	115	**231**
Orchidopexy	156	94.0	138	82.1	46	37.7	**340**	61	**401**
Subtotal	**166**		**168**		**122**		**456**	**176**	**632**
Unknown	0		1		0		**1**	2	**3**
Total	**166**		**169**		**122**		**457**	**178**	**635**

Reviewer assessment form data
(n=number of patients)

Clinicians looking after patients reported delays that were outside of their control for 72/574 (12.5%) patients. The cause of the delay is presented in Table 5.11. Clinicians indicated that such delays could have been avoided in 41/72 patients.

Table 5.11 Cause of delays to surgery

	Number of patients
Awaiting hospital transfer	15
Theatre availability	10
Review by inexperienced staff	9
Delays in imaging	9
Multiple handovers of care	7
Hospital transfer discussions	6
Too many clinical reviews	5
Other staffing delays	5
Emergency department delays	4
Lack of clinical review	3
Other	15

Clinician questionnaire data
Answers may be multiple; n=69 (unable to answer for 3)

CASE STUDY 6

A 21-year-old man presented to the emergency department with a four-hour history of pain in his right testicle, which woke him at 8am. After checking in at reception he waited for two hours to be assessed. He was seen by a triage nurse and marked for review by the medical team. A junior trainee reviewed him two hours later and diagnosed epididymo-orchitis. He was discharged home with antibiotics. The pain did not settle, and he reattended the ED four hours later, reviewed by a senior ED doctor who contacted the urology registrar. Who diagnosed testicular torsion one hour later. There was a further two-hour delay before surgery was commenced due to another emergency in theatre. During the operation the testicle was found to be dead and an orchidectomy was performed. The other testicle was fixed to prevent recurrence on the other side.

Reviewers commented on the multiple avoidable delays, which they felt contributed to the loss of the patient's testicle.

Reviewers believed that there were avoidable delays in treatment in 232/635 (36.5%) patients and in 114/232 (49.1%) instances these delays impacted on the care of the patient. The reasons for these delays in treatment are presented in Table 5.12. Overall, orchidectomy patients had more delays (101/145; 69.7%) than orchidopexy patients (82/263; 31.2%) (Figure 5.10).

Table 5.12 Reasons for avoidable delays

	Number of patients
Delay in presentation	55
Delay in/because of Doppler ultrasound	33
Delay in surgical review and/or referral to surgery	28
Delay to theatre (including theatre availability)	26
Previous admission/emergency department attendance	16
Delay in emergency department	15
Delay in GP referral	12
Transfer arrangements	11
Delay in diagnosis	8
Lack of public awareness	6
Delay in other reviews	6
Additional reviews requested/too many reviews	3
Delay in decision to operate	3
Availability of staff	1
Delay in decision-making	1
Delay in referral process	1
Other	52
Total	**232**

Reviewer assessment form data
Answers may be multiple; n=232

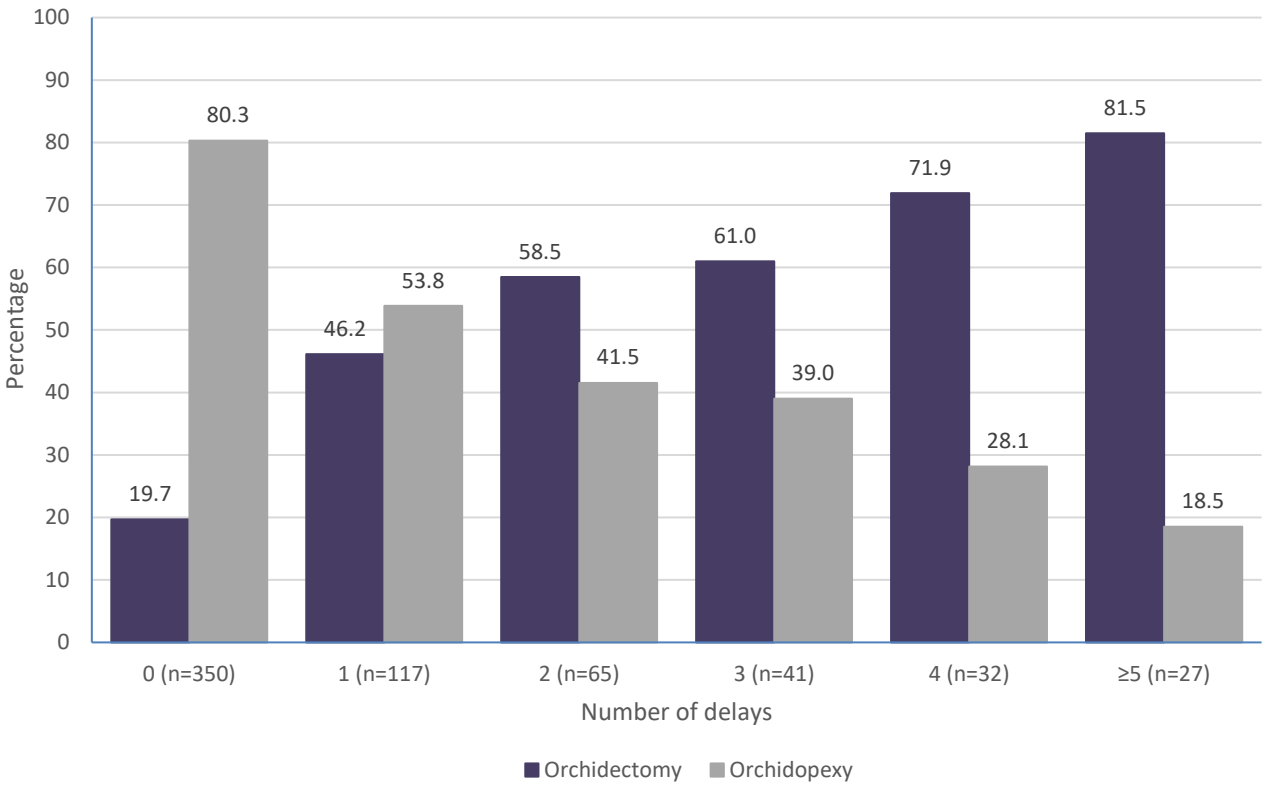


Figure 5.10 Delays by type of operation undertaken
Reviewer assessment form data

CHAPTER 6: INVESTIGATIONS AND DOPPLER ULTRASOUND

Both the NHS commissioning guide for testicular torsion and the European Association of Urology (EAU) recommend early testicular exploration to avoid delay and prolonged time without blood flow to the testicle in patients with testicular torsion.[5,19] Decisions regarding exploration should be based on history and physical examination.

While Doppler ultrasound can help diagnose torsion by identifying an absence or reduction in blood flow (when compared to the other healthy testicle), its use in this situation remains a topic of much discussion. Its use is dependent on the operator's experience. Complete torsion usually stops blood flow but may sometimes only reduce blood flow, similar to incomplete torsion.[20] Furthermore, intermittent torsion can occasionally occur, which resolves itself very quickly. Therefore, false negative results (people who had a torsion, but it was not identified) may delay surgical exploration and false positive results (patients identified as having a torsion when they do not) may lead to unnecessary explorations.

Current NHS commissioning guidance on the management of testicular torsion states that "*In patients with a history and physical examination suggestive of torsion, imaging studies should NOT be performed.*"[5] However, a paper from Sweden demonstrated diagnostic benefits to patients.[21] In a study of four specialist paediatric surgical centres in the UK the introduction of a clinical risk score (TWIST) and Doppler ultrasound led to a significant increase in finding testicular torsion at exploration for testicular pain (from 18% to 53%) without an increase in the rate of orchidectomy.[22]

Investigations performed and diagnostic utility

Table 6.1 shows the investigations performed in patients following the initial assessment. There were 73/402 (18.2%) patients who underwent Doppler ultrasound of the testicles, and torsion of the testicle was reported in 57/73 patients.

Clinicians reported that Doppler ultrasound helped with diagnosis and plan for 66/73 patients. Although it was of note that those who had a Doppler ultrasound presented later (mean 38.7 hours; median 24 hours) following the onset of symptoms than those who did not have a Doppler ultrasound (mean 10.8 hours; median 4 hours).

The reviewers reported that most patients (472/580; 81.4%) did not have any unnecessary investigations (unknown for 53). However, they were of the opinion that Doppler ultrasound was performed unnecessarily in 56/580 (9.7%) patients. In 10/56 patients who had an unnecessary Doppler ultrasound, reviewers stated that timing of surgery was delayed. Unnecessary Doppler ultrasound was more likely to be performed in patients under 12 years of age (10/56)(Table 6.2).

Table 6.1 Investigations undertaken following the initial assessment and age group

	<12 years		12 - 16 years		≥17 years		Total
	Number of patients	%	Number of patients	%	Number of patients	%	Number of patients
Full blood count	10	37.0	125	51.2	101	77.1	**236**
Urea and electrolytes	10	37.0	118	48.4	100	76.3	**228**
C-reactive protein	9	33.3	95	38.9	76	58.0	**180**
Urinalysis	17	77.3	117	48.0	57	43.5	**191**
Midstream urine	1	3.7	8	3.3	17	13.0	**26**
Doppler ultrasound	8	29.6	38	15.6	27	20.6	**73**
Other	4	14.8	36	14.8	21	16.0	**61**
COVID swab only	2	7.4	14	5.7	2	1.5	**18**
Subtotal	**27**		**244**		**131**		**402**
None	14		56		13		**83**
Unknown	12		61		15		**88**
Total	**53**		**361**		**159**		**573**

Clinician questionnaire data

Answers may be multiple; <12 years n=27 (unknown for 12); 12-16 years n=244 (unknown for 61); ≥17 years *n=131 (unknown for 15)*

Table 6.2 Investigations that were undertaken unnecessarily by age group

	<12 years		12 - 16 years		≥17 years		Total
	Number of patients	%	Number of patients	%	Number of patients	%	Number of patients
Doppler ultrasound	10	17.9	26	7.3	20	11.8	56
Urinalysis	4	7.1	12	3.4	10	5.9	26
Other	1	1.8	25	7.1	14	8.2	40
No unnecessary investigations	42	75.0	293	82.8	131	77.1	466
Subtotal	**56**		**354**		**170**		**580**
Unable to answer	3		40		10		53
Total	**59**		**394**		**180**		**633**

Reviewer assessment form data

Answers may be multiple; <12 years n=56 (unknown for 3); 12-16 years n=354 (unknown for 40); ≥17 years *n=170 (unknown for 10)*

All necessary investigations were performed in 554/569 (97.4%) patients (unknown for 66). Doppler ultrasound (3/15) and urinalysis (11/15) should have been performed in those patients where reviewers indicated further investigations were necessary.

Doppler ultrasound use

The Royal College of Radiologists curriculum expects all trainees to have an imaging strategy for testicular pain and at the time of qualification all radiologists will have the ability to perform testicular Doppler ultrasound.[23] However, because national guidance says it should not be performed, radiologists outside of higher volume centres will not perform testicular Doppler ultrasound for scrotal pain sufficiently frequently to maintain that skill. An alternative strategy might be for urologists or paediatric surgeons to train to do testicular Doppler ultrasound as a point of care test. However, this is not currently part of the curriculum for trainees in these specialities.

Most organisations (119/143; 83.2%) in which patients with testicular torsion were cared for reported access to Doppler ultrasound to assess testicular blood flow. However, this was only available 24 hours a day in 23/119 (19.3%) hospitals. Hospitals had variable provision, with 25/119 (21.0%) reporting a Doppler ultrasound service during normal working hours seven days a week and 57/119 (47.9%) reporting a Monday-

Friday daytime service. Most hospitals (91/119; 76.5%) could not access Doppler ultrasound of the testicles for all patients presenting as an emergency.

Organisational data showed that Doppler ultrasound was performed by a radiologist in 62/119 (52.1%) hospitals (unknown for 24). Table 6.3 shows that 15/105 (14.3%) hospitals reported its use in all patients, while 86/105 (81.9%) reported its use only in some patients with suspected testicular torsion.

Table 6.3 Which patients with suspected testicular torsion Doppler ultrasound is used on

	Number of organisations	%
All patients	15	14.3
Some patients	86	81.9
Other	4	3.8
Subtotal	**105**	
Unknown	14	
Total	**119**	

Organisational questionnaire data

The most common reasons given for the use in some patients were diagnostic uncertainty (34/86) and delayed presentation with likely necrosis (24/86) (Table 6.4).

Table 6.4 Details for when Doppler ultrasound was used in some patients (Table 6.3)

	Number of organisations
Diagnostic uncertainty / other diagnosis suspected	34
Delayed presentation likely necrosis	24
Low suspicion of torsion	15
Clinician preference	14
Unusual history	9
To aid transfer	1
Other	21
Total	**86**

Organisational questionnaire data

Answers may be multiple; n=86

Data from the clinician survey indicated that 6/352 (1.7%) clinicians would always perform Doppler ultrasound, 179/352 (50.9%) sometimes and 167/352 (47.4%) would never perform Doppler ultrasound in patients with suspected testicular torsion (Table 6.5).

Table 6.5 When clinicians would use Doppler ultrasound in the investigation of patients with suspected testicular torsion

	Number of respondents	%
Always	6	1.7
Sometimes	179	50.9
Never	167	47.4
Subtotal	**352**	
Not answered	27	
Total	**379**	

Clinician survey data

CASE STUDY 7

An 18-year-old boy presented with a two-hour history of left testicular pain. Urinalysis was negative and he had no history of sexual contact. On examination his testicle was mildly tender and there was diagnostic uncertainty. He was assessed by the urology registrar within one hour of presentation and a Doppler ultrasound of the testicles was arranged immediately with the urology registrar accompanying the patient to the scan. The Doppler ultrasound showed a 180-degree twist of the testicle with reduced perfusion. The patient was taken immediately to theatre for exploration and untwisting of the testicle. The testicle was viable, and both testicles were fixed.

Reviewers commented that rapid Doppler ultrasound can be useful in confirming a diagnosis of testicular torsion.

CASE STUDY 8

A 14-year-old boy saw his GP with a 36-hour history of continuous right testicular pain. He was referred to the urology team who saw him after two hours as the family decided to delay travelling by bus to the hospital. His testicle was swollen, tender and fixed. Irreversible ischaemia of the testicle was suspected, and an urgent Doppler ultrasound was performed, which confirmed that there was no blood flow to the testicle. This allowed discussion with the patient and family and consent was obtained for orchidectomy and fixation of the other testicle. On discharge, information was provided regarding follow-up and the possibility of a prosthesis at a later date.

Reviewers commented on the excellent communication and reassurance provided by the team, including the follow-up information.

CHAPTER 7: FOLLOW-UP ARRANGEMENTS

Follow-up for patients who have been treated for testicular torsion is variable. Orchidectomy may lead to problems with fertility or psychosexual function and patients may choose to have testicular implants when they are older. The incidence of late testicular atrophy is uncertain, but some studies have put it as high as 47%-60%.[1,24] Patients need clear information about their condition and the opportunity to discuss their concerns.

Organisational data showed that 64/143 (44.8%) hospitals reported a system for follow-up of patients with testicular torsion, and the reviewers found that a similar percentage (268/581; 46.1%) of patients were offered a follow-up appointment within six-months of surgery. Where the patient was not offered a follow-up appointment (313/581; 53.9%), in the opinion of the reviewers, just over half should have been (157/313; 50.2%).

The younger a patient was at the time of surgery the more likely they were to have been offered a follow-up appointment (Table 7.1).

Table 7.1 The patient was offered a follow-up appointment within six-months of surgery, by age group

	<12 years		12 - 16 years		≥17 years		Total	
	Number of patients	%	Number of patients	%	Number of patients	%	Number of patients	%
Yes	36	63.2	171	47.0	61	38.1	268	46.1
No	21	36.8	193	53.0	99	61.9	313	53.9
Subtotal	**57**		**364**		**160**		**581**	

Reviewer assessment form data (unknown for 54)

Reviewers reported that discharge summaries produced were adequate for 490/568 (86.3%) patients (unknown for 67), and that adequate information was given to patients and their families regarding fertility in 151/284 (53.2%) cases reviewed and where the information was available.

According to the reviewers, the option of prosthetic replacement could only be found in the notes of 139/534 (26.0%) patients who had an orchidectomy, and in these, it was explained to 83/139 (59.7%) patients, and adequate written information given to the patient and family at discharge could only be found in the case notes of 123/233 (52.8%) patients.

In general, it was thought that patients and their families had appropriate advice about surgery, its effects and future care in 286/403 (71.0%) cases reviewed.

The support offered to patients who had had an orchidectomy or an orchidopexy as well as their families is shown in Figure 7.1. It was not relevant to discuss prosthetic replacement in the orchidopexy group, but it was notable that patients who had had an orchidopexy were both less likely to be offered any information and less likely to have fertility discussed with them.

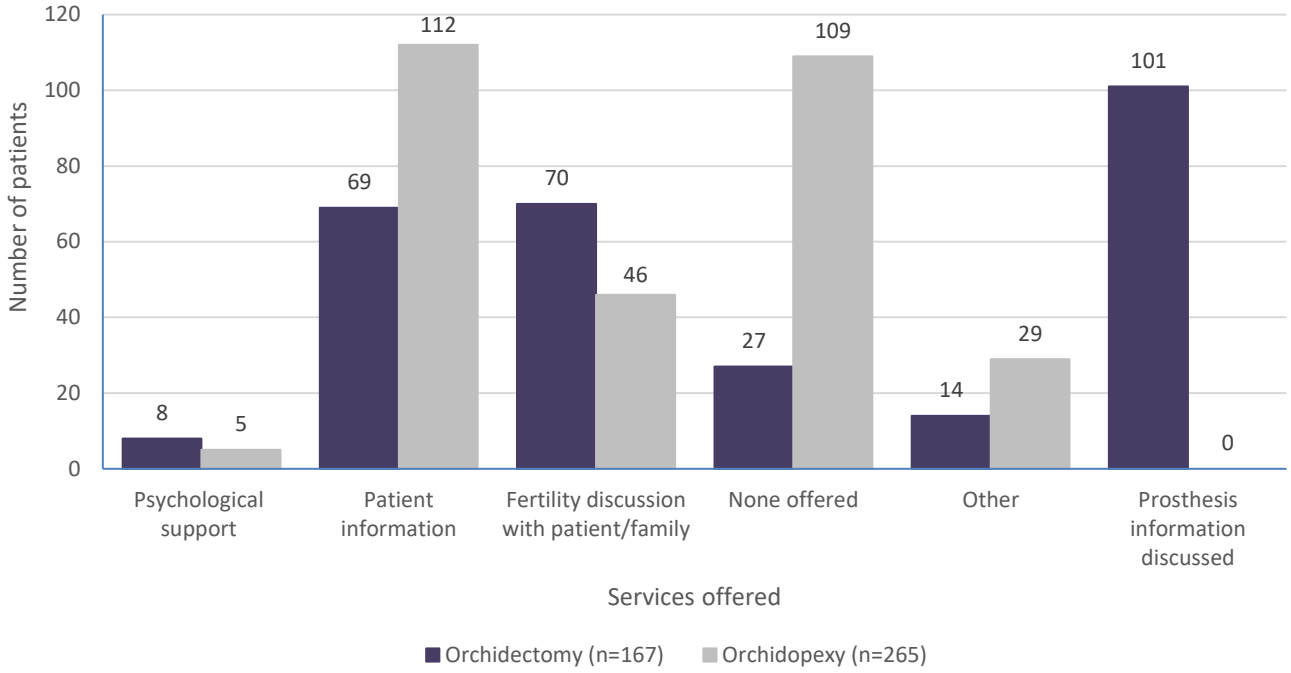


Figure 7.1 Support offered to patients/their families following an operation

Clinician questionnaire data

Answers may be multiple; orchidectomy n=167 (unknown for 47); orchidopexy n=265 (unknown for 75; not applicable for 18)

Reviewers stated that the level of postoperative psychological support offered was appropriate for 62/174 (35.6%) patients undergoing orchidectomy or orchidopexy (Table 7.2). This also included instances when it was agreed that psychological support was not needed.

Table 7.2. Appropriate psychological support was offered for the type of operation undertaken

	Orchidectomy		Orchidopexy	
	Number of patients	%	Number of patients	%
Yes	40	44.9	22	25.9
No	49	55.1	63	74.1
Subtotal	**89**		**85**	
Unable to answer	135		148	
Not applicable - not needed	7		168	
Total	**231**		**401**	

Reviewer assessment form data

CASE STUDY 9

A 14-year-old boy underwent an orchidectomy. Prior to his discharge from hospital the family were counselled on the availability of a prosthesis and access to psychological support. At a follow-up appointment six months later, the boy had the opportunity to ask questions and discuss his concerns.

The reviewers were of the opinion that this was an excellent example of patient-centred care.

CHAPTER 8: PATHWAYS AND PROTOCOLS

The NHS commissioning guide recommends that all hospitals in which patients with testicular torsion are treated should have local guidelines for testicular pain/torsion in place.[5] There should also be a clinical network of secondary/tertiary care providers which should have guidelines for the management of testicular pain/torsion and transfer. In England, Operational Delivery Networks for surgery in children have asked centres to demonstrate compliance with regional best practice guidelines.[6] Pathways can reduce the transfer time from the emergency department (ED) to the operating theatre, however this does not always reduce testicular loss.[26,27]

There are no current recommendations that a specific guideline, protocol, or pathway should be in place for patients presenting with testicular torsion. There are examples of pathways available online.[28] These highlight that a diagnosis of testicular torsion should be suspected in any person presenting with acute scrotal pain and/or swelling before other causes are considered and early review by a urology specialist should be arranged.[29,30]

In 72/143 (50.3%) hospitals there was a specific protocol for the management of testicular pain in children/adolescents, while 53/120 (37.1%) hospitals had a protocol for adults. Protocols varied as seen in Table 8.1. Where a scoring system was used, the TWIST (Testicular Workup for Ischaemia and Suspected Torsion) score was used for both children and adults in only three hospitals.

Table 8.1 What the hospital protocol for testicular pain stated

	Children/adolescents	Adults
	Number of organisations	Number of organisations
The specialty of surgeon who undertakes the operation	46	32
Access to operating theatres is an emergency for patients with testicular torsion	44	27
Patients who present with suspected testicular torsion are routinely fasted to allow rapid access to surgery	39	29
The grade of surgeon responsible for making the decision to operate	39	26
Transfer arrangements should a theatre or suitably qualified surgeon or anaesthetist not be present	27	8
The grade of surgeon who undertakes the operation	21	16
What to do if no emergency operating theatre is available	16	12
The time at which a follow-up appointment is offered	16	7
The use of a specific clinical risk score for all patients with suspected testicular torsion	5	3
That Doppler ultrasound is routinely requested in patients with suspected testicular torsion	4	4
None of the above	8	10
Total	**72**	**53**

Organisational questionnaire data

Answers may be multiple; children/adolescents n=72; Adults n=53

Clinicians looking after patients reported that 264/496 (53.2%) patients were commenced on a dedicated pathway for testicular torsion following the initial assessment (unknown for 78).

A further 33/70 patients were started on a pathway following admission to the ward. However, reviewers reported that only 67/457 (14.7%) patients were commenced on a dedicated pathway for testicular torsion (Table 8.2) as evidenced from the notes, and in a further 90/390 (23.1%) patients reviewers were of the opinion that a pathway should have been commenced.

Table 8.2 The patient was started on a dedicated pathway for testicular torsion

	Number of patients	%
Yes	67	14.7
No	390	85.3
Subtotal	**457**	
Unable to answer	178	
Total	**635**	

Reviewer assessment form data

Patients who were not on a pathway were more likely to undergo an orchidectomy (154/389;39.6%) compared with those who were on a pathway (16/67) (Table 8.3) and in addition had a delayed operation after arrival compared with those not on a pathway (Figure 8.1).

Table 8.3 Operation undertaken and whether the patient was commenced on a dedicated pathway

	Pathway		No pathway		Subtotal	Unable to answer	Total
	Number of patients	%	Number of patients	%	Number of patients	Number of patients	Number of patients
Orchidectomy	16	23.9	154	39.6	**170**	61	**231**
Orchidopexy	51	76.1	235	60.4	**286**	115	**401**
Subtotal	**67**		**389**		**456**	**176**	**632**
Unable to answer	0		1		**1**	2	**3**
Total	**67**		**390**		**457**	**178**	**635**

Reviewer assessment form data

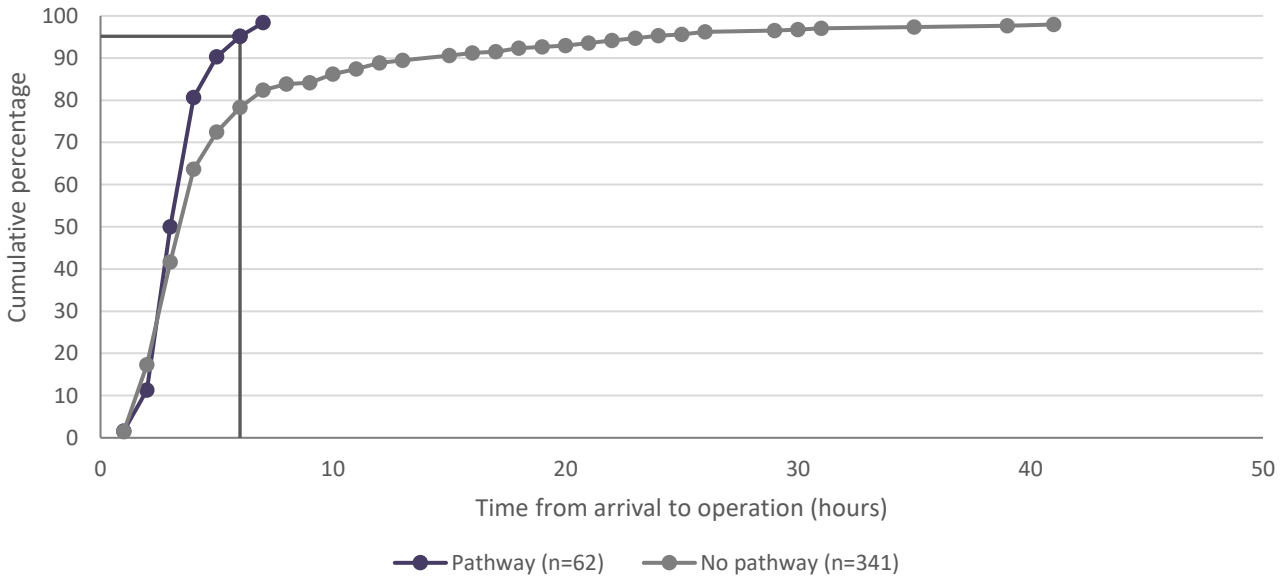


Figure 8.1 Time from arrival to operation and whether a pathway for testicular torsion was used

Reviewer assessment form data

In hospitals with a protocol for managing testicular torsion, reviewers reported lower rates of orchidectomy for both adults and children/adolescents (Tables 8.4 and 8.5).

Table 8.4 Protocols in place by operation undertaken for children/adolescents

	Protocol in place for children/adolescents						
	Yes		No		Subtotal	Unknown	Total
	Number of patients	%	Number of patients	%	Number of patients	Number of patients	Number of patients
Orchidectomy	95	35.3	82	42.5	**177**	6	**183**
Orchidopexy	174	64.7	111	57.5	**285**	22	**307**
Subtotal	**269**		**193**		**462**	**28**	**490**
Unknown	3		0		**3**	0	**3**
Total	**272**		**193**		**465**	**28**	**493**

Reviewer assessment form and organisational questionnaire data

Table 8.5 Protocols in place by operation undertaken for adults

	Protocol in place for adults						
	Yes		No		Subtotal	Unknown	Total
	Number of patients	%	Number of patients	%	Number of patients	Number of patients	Number of patients
Orchidectomy	57	33.9	91	40.3	**148**	35	**183**
Orchidopexy	111	66.1	135	59.7	**246**	61	**307**
Subtotal	**168**		**226**		**394**	**96**	**490**
Unknown	1		2		**3**	0	**3**
Total	**169**		**228**		**397**	**96**	**493**

Reviewer assessment form and organisational questionnaire data

GP protocols

Only 4/28 GP practices had a protocol for the management of testicular pain in children or adolescents while 3/28 had one for adults.

CASE STUDY 10

A 17-year-old patient presented to the emergency department (ED) with a three-hour history of left testicular pain. The hospital had a testicular torsion pathway which included direct referral to urology by the triage nurse for all patients presenting with testicular pain. The triage nurse telephoned the urology registrar who saw the patient in ED within five minutes and arranged theatre immediately. Surgery commenced 45 minutes after the patient presented and the testicle was saved.

Reviewers commented on the simplicity of the pathway for patients with testicular pain and the clarity of responsibility for patients depending on age. Escalation processes in the pathway were also clear.

Multidisciplinary team review

Clinicians reported that 45/514 (8.8%) patients were discussed at a multidisciplinary review, audit, or mortality meeting (unknown for 60). Remediable factors were identified in 20/45 patients and are shown in Table 8.6. Reviewers reported that 39/350 (11.1%) patients who were not discussed in a multidisciplinary review, audit or mortality meeting should have been.

A review of patient care was more likely to have occurred if the patient had undergone an orchidectomy (34/175 (19.4%) compared with an orchidopexy (11/338; 3.3%) (Table 8.7).

Table 8.6 Action taken following identification of remediable factors in care following a multidisciplinary review

	Number of patients
Pathway review	4
Medical education (including review of atypical symptoms)	5
Review of transfer arrangements	2
Patient education	2
Case review (including single case review, and review of all orchidectomies)	6
Subtotal	**19**
Unknown	1
Total	**20**

Clinician questionnaire data

Table 8.7 Multidisciplinary team meeting by operation undertaken by type of procedure

	Orchidectomy		Orchidopexy		Subtotal	Unknown	Total
	Number of patients	%	Number of patients	%	Number of patients	Number of patients	Number of patients
Yes	34	19.4	11	3.3	**45**	0	**45**
No	141	80.6	327	96.7	**468**	1	**469**
Subtotal	**175**		**338**		**513**	**1**	**514**
Unknown	39		20		**59**	1	**60**
Total	**214**		**358**		**572**	**2**	**574**

Clinician questionnaire data

A serious incident was declared for 5/635 (<1.0%) patients in this study, and reviewers reported that a further 17/635 (2.7%) patients should have been reviewed as a serious incident.

A total of 61/143 (42.7%) hospitals reported at least one serious incident relating to testicular torsion in the two years prior to our data collection. The reasons are shown in Table 8.8.

Only one GP reported that there had been a significant incident related to testicular torsion in their organisation in the previous two years, and one reported that they audit outcomes for patients presenting with acute surgical problems in terms of timeliness of referral.

Table 8.8 Issues identified during previous serious incident reviews

	Number of patients
Missed diagnosis	43
Transfer delays	12
Delayed assessment/diagnosis/operation	8
Other	8
Total	**61**

Organisational questionnaire data

Answers may be multiple; n=61

Overall (48/109; 44.0%) organisations reported that an audit of patients diagnosed with testicular torsion had been carried out in the previous five years (unknown for 34). In 23/48 the audit included data on transfer of patients while in 35/48 it included data on time from presentation to operation.

CHAPTER 9: OVERALL QUALITY OF CARE

Reviewers were of the opinion that there was good practice in the care of 355/610 (58.2%) patients (Figure 9.1). Care was less than satisfactory for 46/610 (7.5%) patients. There was room for improvement in either the clinical or organisational aspects of care, or clinical and organisational aspect of care in 209/610 (34.3%) patients.

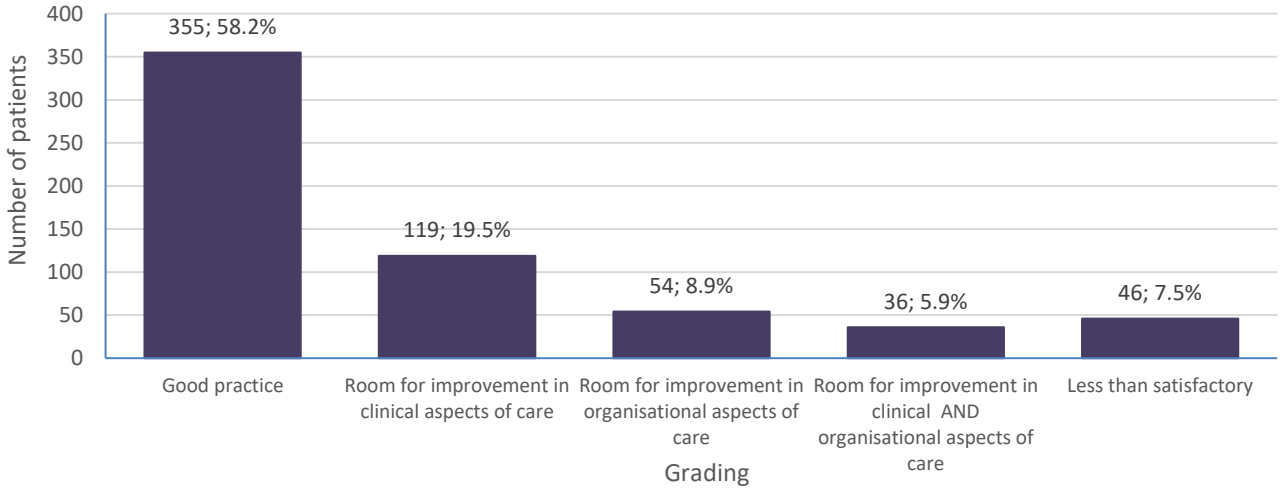


Figure 9.1 Overall quality of care
Reviewer assessment form data

Good practice was found in only 83/221 (37.6%) patients who underwent orchidectomy, with less than satisfactory care found in 39/221 (17.6%). There was room for improvement in either clinical or organisational, or clinical and organisational aspects of care in 99/221 (44.8%) patients who underwent orchidectomy and in 109/386 (28.2%) patients who underwent orchidopexy (Figure 9.2).

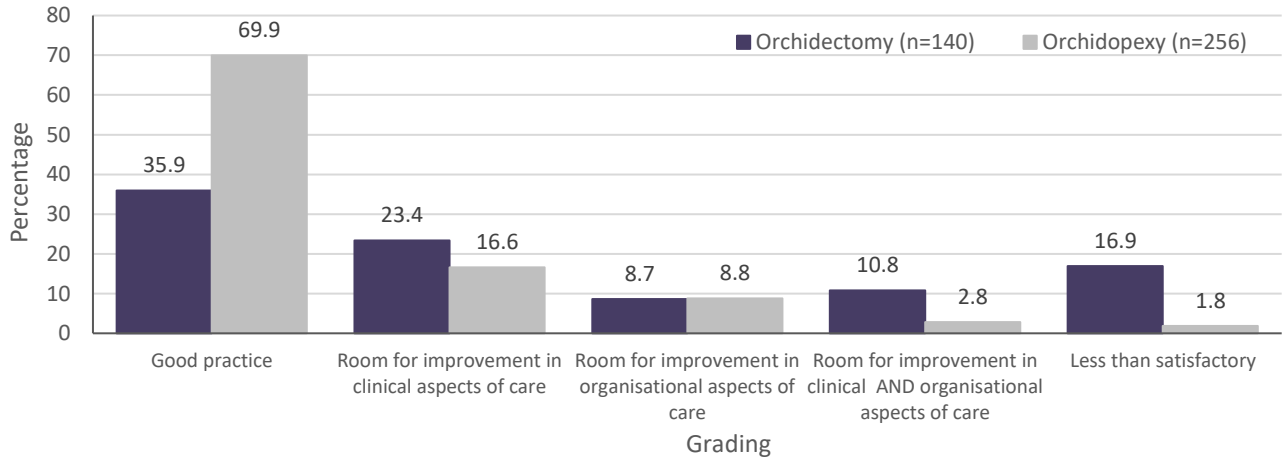


Figure 9.2 Overall quality of care by type of operation undertaken
Reviewer assessment form data

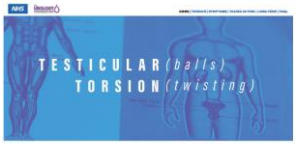
REFERENCES

1. MacDonald C, Kronfli R, Carachi R, et al. 2018. Systematic review and meta-analysis revealing realistic outcomes following paediatric torsion of testes. *Journal of Paediatric Urology*. 14(6):503-509.
2. Mellick LB, Sinex JE, Gibson RW, et al. 2019. Systematic Review of Testicle Survival Time after a Torsion Event. *Paediatric Emergency Care*. 35(12):821-825.
3. MacDonald , Burton M, Carachi R, et al. 2021. Why adolescents delay with presentation to hospital with acute testicular pain: A qualitative study, 56(3):614-619.
4. Healthcare Safety Investigation Branch. 2019. Management of Acute Onset Testicular Pain.
5. NHS East Midlands Clinical Networks 2016. Commissioning guide: Management of Paediatric Torsion.
6. Getting It Right First Time. 2021. Paediatric General Surgery and Urology. GIRFT Programme National Specialty report.
7. Shields LBE, Daniels MW and Rosenberg E. Testicular Torsion in Patients with Intellectual and Developmental Disabilities. *Global Pediatric Health*. 2021;8.
8. Ubee SS, Hopkinson V and Srirangham SJ. 2015. Parental perception of acute scrotal pain in children. *The Annals of the Royal College of Surgeons of England*. Vol 96, No. 8.
9. Burnand K, Featherstone N and Tsang T. 2011. Acute scrotal pain in boys at a single paediatric centre with a questionnaire to assess awareness of the acute scrotum. *Journal of Child Health Care*. 15(4):329-333.
10. Sawchuk T, and Metcalfe P. 2023. Teste Talk: A trial social media campaign to improve awareness of testicular torsion. *Canadian Urological Association Journal*, 17(5), E110–5.
11. Green C, Stubbs V, Green JS. 2020.Public health education initiatives for testicular torsion. *Trends in Urology & Men's Health*. 11:14–16.
12. Testicular Health Education Resources. Approved by the PSHE Association.
13. HeadSmart: Know the signs and symptoms.
14. Peeraully R, John M, Ellis R et al. 2022. Does decentralisation of surgical management improve outcomes for paediatric testicular torsion? *Journal of Pediatric Urology*. 18(3): 302.
15. Preece J, Ching C, Yackey K et al. 2017. Indicators and outcomes of transfer to tertiary pediatric hospitals for patients with testicular torsion. *Journal of Pediatric Urology*. 13 (4),388.e1e388.e6.
16. Steeman A, Ngatchou W, Ramadam AS et al. 2022. Impact of treatment delays on outcome of acute testicular torsion: a 15-year retrospective study. *Acta Chir Belg*. 122(2):116-122.
17. Storey B, Shugg N and Blatt A, et al. 2021. Causes of delayed exploration of the acute scrotum in a regional tertiary centre. *Journal of Clinical Urology*.14(6):470-474.
18. NHS England. NHS standard. 2022. Seven day services clinical standards.
19. European Society for Paediatric Urology, European Association of Urology. 2020. Guidelines on Paediatric Urology.
20. Bandarkar AN, Blask AR. 2018. Testicular torsion with preserved flow: key sonographic features and value-added approach to diagnosis. *Pediatr Radiol*. May;48(5):735-744.
21. Teurneau-Hermansson K, Zindovic I, Jakobsson J, et al.Doppler ultrasound improves diagnostic accuracy for testicular torsion. 2021. *Scandinavian Journal of Urology*. Dec;55(6):461-465.
22. Gopal M, O'Connor E, McDonald L, et al. 2021. Emergency scrotal exploration in children: Is it time for a change in mindset in the UK? *J Pediatr Urol*. Apr-Jun;38(2):135-139. Apr;17(2):190.e1-190.e7.
23. The Royal College of Radiologists. 2023. Clinical Radiology Specialty Training Curriculum.
24. Dharmender A, Parmar K, Sharma AP, et al. 2022. Long-term impact of testicular torsion and its salvage on semen parameters and gonadal function. *Indian J Urol.* Apr-Jun;38(2):135-139.
25. Zee RS, Bayne CE, Gomella PT, et al. 2019. Implementation of the accelerated care of torsion pathway: a quality improvement initiative for testicular torsion. *J Pediatr Urol*. Oct;15(5):473-479.
26. Arevalo MK, Sheth KR, Menon VS, et al. 2018. Straight to the Operating Room: An Emergent Surgery Track for Acute Testicular Torsion Transfers. *J Pediatr*.Jan;192:178-183.
27. Children's Hospital of Philadelphia. Emergency Department Clinical Pathway for Children with Acute Non-traumatic Scrotal/Testicular Pain.
28. National Institute for Health and Care Excellence: Clinical Knowledge Summaries. 2023. Scrotal pain and swelling: How should I assess a person with a scrotal swelling and/or pain?
29. National Institute for Health and Care Excellence: Clinical Knowledge Summaries: Clinical Knowledge Summaries. 2023. Scrotal pain and swelling: Scenario: Testicular torsion

GLOSSARY

Doppler ultrasound	Doppler ultrasound assessment of testicular blood flow uses the Doppler effect in three different ways. In colour Doppler the sound waves are converted to different colours which show the speed and direction of blood flow in real time. Power Doppler is a more sensitive technique for blood flow detection but shows flow as single colour with no information on speed or direction of flow. In spectral Doppler, flow speed is shown graphically against time meaning subtle variations in flow between a normal and a torted testicle can be detected. Colour Doppler is the first-line Doppler modality to assess testicular blood flow, but the other techniques may be used as additional problem-solving strategies.
Epididymo-orchitis	This is an inflammation of the epididymis (the tube which stores and transports sperm) and/or testicle (testis).
Fixation (testicle) – see orchidopexy	The testicle is fixed in the scrotum with stitches to prevent it from twisting.
General surgeons	Surgeons who are trained to perform a broad range of surgical procedures.
Hydatid of Morgagni	This is a small piece of normal tissue attached to the upper portion of one or both testicles. As an embryo grows into a baby, it has a Müllerian duct. In female reproductive organs that duct develops into the female reproductive tract. It does not develop in the male reproductive system. The hydatid of Morgagni is a remnant of the Müllerian duct, meaning that it is a leftover part of something that previously existed.
ICD-10	International Classification of Diseases – version 10. These codes were used to identify patients for this study N44 Torsion of testis N45 Orchitis and epididymitis N508 Other specified disorders of male genital organs
Orchidectomy	Surgical removal of a testicle.
Orchidopexy	The testicle is fixed in the scrotum with stitches to prevent it from twisting.
Paediatric surgeons	Surgeons who are trained to perform a broad range of surgical procedures in children.
Testicular torsion	Testicular torsion is an emergency condition. It happens when the spermatic cord, which provides blood flow to the testicle, rotates, and becomes twisted. The twisting cuts off the testicle's blood supply and causes sudden pain and swelling.
TWIST score	The Testicular Workup for Ischaemia and Suspected Torsion (TWIST) score is a clinical decision tool used for the workup and management of acute scrotal emergencies where torsion is suspected. It uses history and examination to estimate the likelihood of torsion.
Urologists/urological surgeons	They treat problems of the female urinary system and the male genitourinary tract. They diagnose and treat disorders of the kidneys, ureters, bladder, prostate, and male reproductive organs.

USEFUL LINKS

NHS THE UROLOGY FOUNDATION BAPU The British Association of Paediatric Urologists HIGHGATE	Testicular Health Information
GIRFT GETTING IT RIGHT FIRST TIME	Paediatric General Surgery and Urology
NICE National Institute for Health and Care Excellence	Scrotal Pain and Swelling
THE UROLOGY FOUNDATION	Testicular Torsion
NHS	Testicle Pain
Patient	Testicular Torsion
THE BRAIN TUMOUR CHARITY	Clinical Decision Tool
	Testicular Torsion Educational Information

APPENDIX 1 – Hydatid of Morgagni

The hydatid of Morgagni is a small embryological remnant at the upper pole of the testis. Occasionally, this can become torted and it may be palpable or be visible through the scrotal wall as a "blue dot" on the scrotum. Scrotal ultrasound may be able to show the enlarged appendage and a normal testis. If in doubt, the scrotum is explored to rule out testicular torsion and remove the infarcted hydatid. Hydatid of Morgagni can be treated with non-operative measures such as pain relief and anti-inflammatory drugs.

Of the 1,091 patients initially sampled for inclusion in this study, 264 patients were subsequently excluded. The main reasons for exclusion were that the patient was found not to have torsion during their procedure (n=219). This appendix summaries the findings from a review of 97 sets of case notes where the patient underwent an operation for hydatid of Morgagni torsion.

Demographic data

The majority of patients in this subgroup were between 11-17 years of age (53/95) with a median age of 11 years (Figure A1).

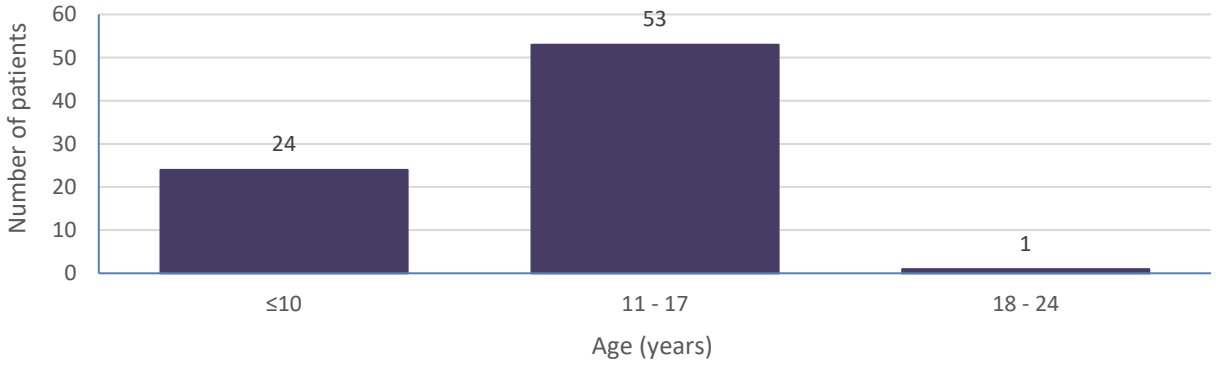


Figure A1. Age at admission

Patient assessment

Reviewers reported that the initial assessment of patients was satisfactory in 89/97 patients The most common reason noted for unsatisfactory assessment was lack of urology documentation (5/6) and delay in review (1/6).

Doppler ultrasound use

There were 3/97 patients who underwent a Doppler ultrasound during the admission. Where this was performed reviewers reported that this was appropriate in all but one of the three patients and in those who did not have a scan, reviewers believed that two patients should have. The reasons reviewers reported that patients should have had a scan were likely alternative diagnoses undergoing unnecessary exploration.

Table A1 shows that the reasons for Doppler ultrasound not being used (appropriately) were because it was not clinically indicated in 47 patients, there was a high index of suspicion of testicular torsion for 25 patients and for eight patients it would have resulted in a delay to theatre.

Table A1 Reasons why it was appropriate not to undertake a Doppler ultrasound

	Number of patients
Not clinically indicated	47
Clinical suspicion of torsion/Appropriate scrotal exploration	25
Would have delayed time to theatre	8
Previous ultrasound	1
No reason	11
Total	**92**

Reviewer assessment form data

Review and operation

Reviewers reported that 26/74 patients were seen by a consultant (Table A2), and that 2/46 patients who were not seen by a consultant should have been.

Table A2 The patient was seen by a consultant

	Number of patients
Yes	26
No	48
Subtotal	**74**
Unable to answer	23
Total	**97**

Reviewers were of the opinion that 10/97 patients who went to theatre for exploration did not need to and in 8/10 the reason given was that clinically the patient had a hydatid of Morgagni torsion and was not offered conservative treatment.

Table A3 shows the reasons why 46/87 patients did undergo appropriate surgical exploration. In the remaining 41 patients the reasons were inability to rule out torsion (23), clinical suspicion of torsion (7) and other reasons (11). The correct operation was carried out in the majority of patients (94/97) with only one patient having unilateral testicular fixation which reviewers believed was inappropriate.

Table A3 Reasons why it was appropriate for the patient to undergo surgery

	Number of patients
Required exploration	44
Unable to rule out torsion	23
Clinical suspicion/indication of torsion	9
Other	11
Total	**87**

Reviewer comments

Where further information was given, the most frequent comments from reviewers regarding the overall care of patients operated on for hydatid of Morgagni torsion were lack of discussion of non-operative treatment (7), poor surgical documentation (6) and unilateral testicular fixation (6).

ACKNOWLEDGEMENTS

This report could not have been achieved without the involvement of a wide range of individuals who have contributed to this study and without whom this report would not have been possible.

Our particular thanks go to:

The Study Advisory Group (SAG) who advised NCEPOD on the design of the study

Katie Bagstaff	Senior Sister, Recovery (Royal College of Nursing)
Lucy Beales	General Practitioner
Jane Beyreuther	Consultant in Paediatric Emergency Medicine (Royal College of Paediatrics and Child Health Association of Paediatric Emergency Medicine)
John Butler	Consultant in Emergency Medicine and Critical Care
Helen Collins	Registrant Adult Nurse, Independent Safety Investigator and Learning from lives and deaths (LeDeR) Reviewer
Simon Courtman	Consultant Paediatric Anaesthetist (Association of Paediatric Anaesthetist)
Andrew Dickinson	Consultant Urologist
James Green	Consultant Urologist (The Urology Foundation)
Alice Joy	Lay Adviser
David Macafee	Consultant Colorectal and General Surgeon of Childhood (Association of Surgeons of Great Britain and Ireland)
Caroline MacDonald	Consultant Paediatric Surgeon (British Association of Paediatric Surgeons)
Melanie Mavers	Head of Patient Safety and Experience
Eric Nicholls	Consultant Paediatric Surgeon (Royal College of Surgeons)
Tharani Nitkunan	Consultant Urologist (British Association of Urological Surgeons)
Russell Perkins	Consultant Paediatric Anaesthetist (Royal College of Anaesthetists)
Divya Raviraj	Consultant Paediatric Anaesthetist (Association of Anaesthetists)
Constantinos Regas	Lay Adviser/Foundation Doctor
Jonathan Richenberg	Consultant Radiologist (Royal College of Radiologists)
Manoj Shenoy	Consultant Paediatric Urologist (British Association of Paediatric Urologists)
Simon Smith	Consultant in Emergency Medicine (Royal College of Emergency Medicine)
Mark Thomas	Consultant Paediatric Anaesthetist (Association of Paediatric Anaesthetists)
Shabnam Undre	Consultant Urologist
Liz Wigley	Senior Pathway Integration manager - Children and Maternity

The case reviewers who undertook the peer review

Amanda Rea	General Practitioner
Andrew Cliff	Consultant Urologist
Angela Cottrell	Consultant Urologist
Annalie Baker	Surgical Advanced Clinical Practitioner
Anthony El-Kheir	Anaesthetic Fellow
Charlotte Clements	Consultant in Paediatric Emergency Medicine
Christopher Luscombe	Consultant Urologist
Colin Kelman	General Practitioner
Craig Renfrew	Consultant Anaesthetist

Debora Morgante	Consultant Paediatric Surgeon
Donna Tadly	Advance Nurse Practitioner - General Surgery
Gergana Racheva	Specialty Doctor - Paediatric Surgery
Gordon Muir	Consultant Urologist
Graham Johnson	Consultant in Emergency & Paediatric Emergency Medicine
Hannah Smyth	ST6 in Anaesthesia
Holly Ni Raghallaigh	ST6 in Urology
Hussain Alnajjar	Consultant Uro-Andrologist
Johanna Thomas	Consultant Urologist
Kathy Smith	General Practitioner
Mariam Karimi	ST6 in Anaesthesia
Milan Gopal	Consultant Paediatric Surgeon and Urologist
Mo Sahu	Consultant Urologist
Nargis Ahmad	Consultant Anaesthetist
Neil Featherstone	Consultant Paediatric Surgeon & Urologist
Paul Hunt	Consultant in Emergency Medicine
Rachel Hubbard	Consultant Uroradiologist
Raveen Sandher	Consultant Urologist
Ray Hsu	ST7 in Urology
Riyad Peeraully	ST8 in Paediatric Surgery
Sarah McNicol	ST7 in Anaesthesia
Sarah Prattley	ST6 in Urology
Sarah Wheatstone	Consultant in Emergency General Surgery
Simon Evans	Consultant Urologist
Tharani Mahesan	Consultant Urologist
Thomas Gill	ST7 in Anaesthesia
Timothy O'Brien	Consultant Urologist
Tristan Boam	ST6 in Paediatric Surgery
Emma Redfern	Consultant in Emergency Medicine

Thanks also go to

The NCEPOD local reporters who facilitated data collection and return at their hospital(s).

The NCEPOD ambassadors – senior clinicians who championed the study locally.

The clinicians who completed questionnaires.

Sue Jelley and Karen Porter for their editorial expertise.