



Investigation report

Management of acute onset testicular pain

Date Published:

16/06/2021

Theme:

Emergency care, Access to care

This PDF was downloaded from the Health Services Safety Investigations Body (HSSIB) website. To make sure you are reading the latest version, and for accessible reports, please visit <https://www.hssib.org.uk>

Contents

[Show subheadings](#)

[A note of acknowledgement](#)

[Executive summary](#)

[1. Background and context](#)

[2. The reference event](#)

[3. Involvement of the Healthcare Safety Investigation Branch](#)

[4. Findings and analysis from the reference event](#)

[5. Findings and analysis from the wider investigation](#)

[6. Summary of HSIB findings, safety recommendations, safety observation and safety action](#)

[7. Appendices](#)

[8. Endnotes](#)

[9. References](#)

A note of acknowledgement

HSIB would like to thank Ryan and his mother for raising their concerns about the diagnosis and treatment of testicular torsion, and for sharing their experiences with the investigation.

Executive summary

The reference event

Ryan, a 20-year-old university student, woke in the early hours of a Friday with intense pain in his right testicle and lower abdomen. Later on that morning (approximately 07:00 hours), he rang his mother, who suggested that he should contact the NHS 111 service.

He did this just before 08:00 hours. The NHS 111 service call handler advised him to contact his general practitioner (GP), and to do this within two hours.

From 08:00 hours, Ryan made five calls to his local GP surgery. After the first call, a call handler from the GP surgery arranged for the duty doctor (GP1) to ring him back. GP1 was informed about Ryan's subsequent calls via electronic message updates. GP1 returned Ryan's call at 11:02 hours. The delay was caused by an incorrect telephone number being held for Ryan on his electronic patient record, and an appointment with another patient that took longer than expected. Ryan described his symptoms and GP1 immediately suspected a testicular torsion [1]. GP1 told him to attend the local emergency department (ED) as quickly as possible and reportedly informed Ryan that he "may have twisted his testicle".

Ryan arrived at his local ED at 11:30 hours. He described his symptoms to a navigation nurse, whose role is to stream patients to the correct area of the ED (majors, minors [2] or urgent care). She asked him to wait in the minors waiting area, where he would be seen by a GP (GP2).

Ryan was seen by GP2 at 14:04 hours. GP2 made a diagnosis of orchitis (inflammation of the testis). Ryan was advised to attend a sexual health clinic to rule out a sexually transmitted infection and was also prescribed antibiotics.

The following day, Ryan travelled by train to his family home. Due to the severity of pain, he spent the rest of the weekend in bed. Two days later, due to continued and severe pain, he rang the GP surgery where his mother was registered. A GP (GP3) advised him to continue with the antibiotics prescribed by the hospital.

A further two days later, on Wednesday, whilst still at his mother's house, Ryan continued to experience pain. He rang the surgery again, and a different GP (GP4) rang him back and arranged for him to see another GP (GP5) in the afternoon.

On examining Ryan, GP5 noted that he had an 'apple-sized swelling in his testicle'. GP5 organised an appointment at the urology [3] emergency clinic at a local hospital. Later that day, Ryan attended the clinic and a urological surgeon diagnosed a suspected testicular torsion.

In the early hours of the following morning, six days after the onset of symptoms, Ryan underwent emergency surgery, under anaesthetic, to examine his testicle. The surgeon performed a right orchidectomy (removal of the right testicle). This was necessary because the loss of blood supply had caused tissue death. The surgeon also performed an orchidopexy (fixation of the testicle to prevent twisting) to prevent a possible future torsion on the left side.

The national investigation

The Healthcare Safety Investigation Branch (HSIB) investigation reviewed the diagnostic and treatment pathway for testicular torsion. There was a predominant focus on delays and the human factors [4] associated with the pathway. The investigation identified system-wide recommendations designed to prevent delays to the identification and treatment of testicular torsion happening in the future.

Findings

1. There is a risk of incorrect interpretation of the symptoms, diagnosis and treatment of testicular torsion due to issues relating to the accuracy and accessibility of national guidance on the condition.
2. There are multiple sources of guidance for GPs on testicular torsion, which do not all state the same information.
3. The arrangement of urological surgical services in relation to acute testicular pain had not been considered in the NHS England/Improvement 'Getting It Right First Time' programme for Urology Area Networks, which are voluntary agreements between trusts in the same geographical area establishing comprehensive urology services.
4. The NHS 111 service genital problems clinical pathway had been amended to upgrade the default urgency for treatment advice given to patients with acute testicular pain within the 16-25 age group.

5. The lack of principles or guidance for GP services setting up and running primary care advice/triage by telephone consultation is likely to be contributing to variation in the quality and safety of these services across the country.

HSIB makes the following safety recommendations

Recommendation 2019/43:

It is recommended that the National Institute for Health and Care Excellence revises the content and accessibility of its Clinical Knowledge Summary on testicular torsion.

Recommendation 2019/44:

It is recommended that the NHS England/Improvement 'Getting It Right First Time' programme ensures that testicular torsion/acute testicular pain is included on the checklist of emergency pathways to be considered by the newly established Urology Area Networks across England.

Recommendation 2019/45:

It is recommended that NHS England/Improvement works with relevant stakeholders to develop guidance for handling telephone advice/triage in primary medical care settings.

HSIB makes the following safety observation

There are multiple sources of guidance for General Practitioners on testicular torsion. It would be beneficial to review whether this guidance is accurate and whether it reflects the information contained in the revised Clinical Knowledge Summary to be issued by the National Institute for Health and Care Excellence.

HSIB identified the following safety action

NHS Digital has amended all clinical pathways where testicular pain is assessed in Version 16 of NHS Pathways, to increase the detection of testicular torsion in people over the age of 16 and up to 25.

1. Background and context

1.1 Acute onset testicular pain

1.1.1 'Testicular pain and scrotal pain is a frequent urological complaint in emergency care settings' (Gordhan et al, 2015). Patients who are experiencing symptoms may enter the healthcare system through a number of different routes, including NHS 111 services, emergency departments, minor injuries units, urgent care centres and GP practices.

1.1.2 There are several potential diagnoses that could be considered from the symptom of testicular pain. These include testicular torsion, cancer, trauma (injury), inflammation, and infections such as epididymo-orchitis [5].

1.1.3 Testicular torsion is considered a urological emergency. Torsion occurs because the testicle is not adequately attached to the inner lining of the scrotum, which is known as the bell clapper deformity, allowing the testicle to rotate twisting the spermatic cord (Figure 1). The twisting of the spermatic cord cuts off the blood supply to the testicle and causes the onset of sudden pain. 'The number of twists of the spermatic cord and the duration of the blood supply loss determines the degree of testicular viability, and whether the testicle can be saved' (Marcozzi et al, 2001).

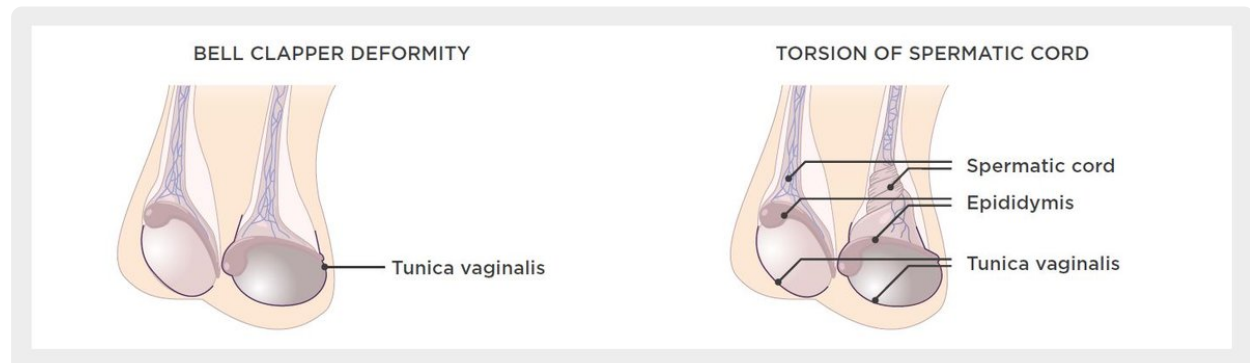


Figure 1: Illustrations showing testicular torsion

1.1.4 Where a testicle is fully twisted, if treatment is started within four to six hours after the onset of pain, then the testicle will most likely remain viable. However, if twisting remains for more than 10 to 12 hours irreversible testicle damage is likely.

1.1.5 The challenge for healthcare professionals who are diagnosing patients with testicular pain is to differentiate accurately between cases of torsion and other conditions that have similar symptoms. In torsion cases, treatment then needs to be started before irreversible damage to the testicle occurs.

1.2 Incidence of torsion

1.2.1 There is little data on the number and frequency of testicular torsion cases. However, a 2001 study showed that each year, one in 4,000 men under 25 years of age will experience torsion (Marcozzi et al, 2001). 'For the year 2009-10 there were 2213 hospital admissions in males of all ages where testicular torsion was coded as the admission diagnosis in England' (NHS Information Centre, 2011).

1.2.2 In a number of small studies, it appears that the incidence of orchidectomy [6] resulting from missed/delayed torsion diagnosis is approximately 17% (Somani et al, 2010; Peeraully et al, 2017).

1.3 Diagnosis of testicular torsion

1.3.1 The British Medical Journal Best Practice guide on testicular torsion (British Medical Journal, 2018) states there is usually a history of sudden-onset severe scrotal pain and there is often no relief of pain upon elevation of the scrotum. A history of intermittent pain may indicate periods of torsion and spontaneous de-torsion (untwisting).

1.3.2 The guidance highlights a range of potential diagnostic tests, such as ultrasound. However, it also states that if the history of the onset of pain and physical examination suggest testicular torsion, immediate surgical consultation and exploration should take precedence over diagnostic testing.

1.4 Treatment of testicular torsion

1.4.1 Testicular torsion does not necessarily cause the circulation of blood to stop immediately. If surgical intervention to untwist the spermatic cord and restore the full blood supply to the testicle is performed within four to six hours the testicle is likely to remain viable. Where the blood supply has been compromised for more than 12 hours necrosis (death) of the testicle will occur and it is likely that the testicle will require surgical removal. Following untwisting or removal of the testicle it is usual to perform a procedure to fix the remaining testicle to prevent further twisting (known as an orchidopexy).

1.5 Risk factors for testicular torsion

1.5.1 Testicular torsion can affect males at any age, but young adults aged between 12 and 18 years are at greater risk of torsion than other age groups. Physical injury accounts for only a small proportion of torsion cases.

1.6 Impact of delayed treatment of testicular torsion

1.6.1 The impacts of a delay in the treatment of testicular torsion include:

- chronic pain syndrome – ongoing pain resulting from surgical removal of the testicle and/or insertion of a prosthetic
- psychological effects (such as depression, anxiety, concerns over body image and/or masculinity)
- possible reduced fertility.

1.6.2 Other post-operative complications (such as infection or bleeding) may arise regardless of how quickly the surgery is carried out.

1.7 NHS 111 service

1.7.1 NHS 111 services were introduced in 2013 and 2014 for patients with urgent medical concerns. They are staffed by trained advisors who use the NHS Pathways triage system to direct patients to the most appropriate available service. The advisors are supported by qualified medical professionals. NHS England/Improvement describes the purpose of the NHS 111 service as:

- giving advice on self-care
- connecting patients to a nurse, emergency dentist or GP
- booking patients a face-to-face appointment
- sending an ambulance straight away, if necessary
- directing patients to local services.

1.7.2 NHS 111 services can be provided by ambulance services, non-NHS bodies and other NHS trusts.

1.8 NHS Pathways

1.8.1 NHS Pathways is a work programme that provides the Clinical Decision Support System (CDSS), which is used by NHS 111 services and half of English ambulance services (NHS Digital, 2019). The CDSS is a triage system that supports the remote assessment of over 16.5 million callers a year. The calls are managed by non-clinical, specially trained call handlers who refer the patient on to suitable services based on the patient's health needs at the time of the call. The call handlers are supported by clinicians who are able to provide advice and guidance or who can take over the call if the situation requires it. CDSS is built around a clinical hierarchy, which means that life-threatening problems assessed at the start of the call trigger ambulance responses, progressing through to less urgent conditions which require a less

urgent response (or disposition [7]). All NHS 111 service call handlers undergo training by clinicians, and by educational and information technology (IT) specialists, to ensure they use the system safely and effectively. NHS Pathways uses up-to-date clinical evidence to design the triage questions, and these are reviewed regularly by clinical experts.

1.8.2 The safety of the outcome of the clinical triage process resulting from an NHS 111 service or 999 assessment using NHS Pathways is overseen by the National Clinical Governance Group (NCGG), which is hosted by the Royal College of General Practitioners. The NCGG is made up of representatives from the relevant medical royal colleges. Senior clinicians from the colleges provide independent oversight and scrutiny of the NHS Pathways clinical content.

1.8.3 Alongside this independent oversight, NHS Pathways ensures the clinical information and processes it uses to assess patients are consistent with the latest advice from the bodies that provide evidence and guidance for medical practice in the UK.

2. The reference event

2.1 The onset of symptoms [8]

2.1.1 At approximately 02:00 hours on a Friday morning, Ryan, a 20-year-old university student, woke with intense pain in his right testicle and lower abdomen. He told the investigation, *“I literally could not move...I was pretty distressed at the time.”*

2.1.2 Ryan waited until later in the morning to seek advice. At 07:00 hours he rang his mother, who suggested that he contact NHS 111 service.

2.2 NHS 111 service

2.2.1. At 07:49 hours, Ryan rang the NHS 111 service and described his symptoms to a non-clinical call handler (CH1). The call lasted 09:41 minutes, and an extract of the call is below:

Call handler (CH1): Right, and any pain in your penis?

Ryan: No

CH1: But there is in the testicle?

Ryan: Oh yes

CH1: Just the right testicle?

Ryan: Yeah, just the right one. I don't know if I have slept on it...I just don't even know

CH1: Did the pain come on suddenly or gradually?

Ryan: I woke up to it...I don't know

CH1: Ok, so we're not sure...and any...can you still urinate?

Ryan: Yeah, I can

CH1 used Version 14 of NHS Pathways to triage the call. CH1 asked Ryan the questions on the pathway either as they were written on the computer screen, or slightly modified in CH1's own words. CH1 then matched the responses to the questions against the clinical pathway and entered them into the system.

2.2.2 After Ryan provided responses to a number of general questions, the pathway directed CH1 onto a specific area within the programme called the Genital Problems Pathway. After further condition-specific questions, the pathway reached the disposition: '*Contact a primary care service within two hours.*' CH1 also advised Ryan to "take some pain-killers other than anti-inflammatories because these may irritate your stomach. Also, place a heat pad or hot water bottle on your abdomen to alleviate the pain".

2.3 Local GP surgery

2.3.1 At 08:00 hours, Ryan made the first call to the local GP surgery. He described his symptoms to a non-clinical call handler (CH2) in a centralised call handling service. They arranged for a GP (GP1), who was functioning as the duty doctor, whose role was to take telephone triage calls from patients in the community, to call him back. On the GP electronic patient record, CH2 documented that Ryan had 'tummy pain, just spoken to 111'.

2.3.2 GP1 initially rang Ryan at 09:02 hours but did not speak to him until 11:02 hours. This was because the telephone number on Ryan's electronic patient record was incorrect. Ryan had changed his mobile number, and his contact details were not checked during the first call. GP1 also had two face-to-face appointments, one of which took longer than expected.

2.3.3 Between 08:00 hours and 11:02 hours, Ryan rang the surgery a further four times due to a lack of contact. After one of these calls, a call handler recorded 'testicular pain two hr advice from 111'. GP1 saw this through a computerised screen messaging service.

2.3.4 During the telephone consultation at 11:02 hours, Ryan described his symptoms to GP1, who documented them in the electronic patient record. From the history provided, GP1 immediately suspected testicular torsion and advised Ryan to attend the local emergency department (ED) 'as quickly as possible'. GP1 remembered explaining to Ryan that "he may have twisted his testicle". Ryan did not recall being told that.

2.3.5 GP1 also advised Ryan not to wait for an ambulance and to get a taxi. In the electronic patient record, GP1 documented the suspected diagnosis and the advice given.

2.4 Emergency department

2.4.1 At approximately 11:30 hours, Ryan arrived at the ED by taxi. He waited for a few minutes until a navigation nurse, whose role is to stream patients to the correct area of the ED (majors, minors or urgent care), assessed the reason for his attendance. The assessment was performed using an Immediate Care Needs and Unified Prescription Chart (ICN).

2.4.2 The navigation nurse decided Ryan was to be seen by a GP (GP2) working in the ED. At 12:02 hours the navigation nurse then prescribed and administered 400 milligrams of Ibuprofen – a pain killing and anti-inflammatory medication.

2.4.3 Once the navigation nurse had completed the assessment, he booked himself in to the ED at 12:11 hours, at the main reception desk and handed the ICN form to a receptionist. Ryan was then asked to wait in the minors waiting area near GP2's consultation room.

2.4.4 At 14:04 hours GP2 began the consultation with Ryan. GP2 told the investigation, "I asked about his symptoms and I performed a brief examination of his testicle." Ryan did not fully remember that examination.

2.4.5 After the examination, GP2 entered the following in the electronic patient record: 'Scrotum normal. Right testis enlarged and tender. Firm to touch.' GP2 also entered Ryan's temperature, pulse rate, blood pressure, respiratory rate and how much oxygen was in his blood. These were all within normal limits apart from a slightly raised heart rate and blood pressure. A urine test conducted to identify infection was also documented as negative. In two separate entries, there was a record of 'no discharge', referring to discharge from the penis. GP2 also documented that 'Ryan is with a long-term partner of two years', although Ryan since recalled that this was likely to have been closer to 12 months.

2.4.6 There was no documentation by GP2 of the severity of Ryan's pain. However, the navigation nurse had previously recorded the pain as 'severe', with a pain score of 7 out of 10, which GP2 could see.

2.4.7 GP2 documented his clinical impression as 'orchitis' (inflammation of the testicle caused by an infection) occurring on the 'right'. He advised Ryan 'to attend a GU clinic [9] to rule out a sexually transmitted infection', and this advice was documented. GP2 then prescribed an antibiotic called Ciprofloxacin, at a dose of 500mg to be taken twice a day for 10 days. He concluded that Ryan should 'return if worsening/discharge or becoming unwell'.

2.5 The second GP surgery

2.5.1 The following day (Saturday) Ryan travelled by train (which he ran to catch) to his family home, where his pain continued. He and his mother both reported that he felt so unwell that he was not able to attend a birthday celebration in the evening and stayed in bed for most of the weekend. Over this two-day period, he did not seek further health advice.

2.5.2 On the Monday, Ryan's mother advised him to ring the GP surgery where she was registered, to seek further help. Ryan called the GP surgery at 09:32 hours, when the receptionist organised for a duty doctor (GP3) to call Ryan back. The receptionist documented 'testicular infection' on the electronic patient record. GP3 stated this entry was seen on the electronic screen messaging system.

2.5.3 At 12:32 hours, GP3 spoke to Ryan and listened to his symptoms and information relating to his ED attendance. GP3 concluded that the diagnosis of orchitis was 'probably correct' and documented that Ryan was 'to rest, wear firm underwear for pain relief, and continue with the antibiotics'.

2.5.4 GP3 thought the antibiotics prescribed to Ryan were a 'good strength', and documented the advice given as, 'to ring again if not settling'.

2.5.5 Ryan continued to experience pain, and at 08:38 hours on the following Wednesday he contacted the GP surgery again. A receptionist arranged a call back by another duty doctor (GP4).

2.5.6 GP4 returned Ryan's call 11 minutes later, at 08:49 hours, and documented in the electronic patient record that Ryan 'had been to ED and that his swelling was not improving... Had been in bed for five days. Rv [review]'. GP4 then organised a face-to-face appointment for Ryan with another GP (GP5) for later in the day.

2.5.7 During the afternoon, GP5 saw Ryan and documented that he was 'seen in...A&E on Friday (no record available), urine test done...Been lying in bed, unwell, discomfort...no discharge, right testicular pain episode October 2015'. GP5 examined Ryan and noted 'an apple sized testicular swelling'. GP5 told the investigation that they sought advice from a urology registrar at the local hospital. After receiving this advice an appointment was made for Ryan to be assessed at the local urology emergency clinic.

2.6 Urology emergency clinic

2.6.1 At 14:00 hours, Ryan attended the appointment at the urology emergency clinic with his mother. He was seen by a urological surgeon. Following a description of his symptoms and a physical examination, the surgeon diagnosed a suspected testicular torsion. Ryan was admitted

to hospital immediately, and the surgeon arranged for an emergency scrotal surgical exploration with a possible right orchidectomy (removal of the right testicle) and left orchidopexy (fixing the left testicle to reduce the risk of a future torsion). Ryan's mother told the investigation that this diagnosis "was not what they expected".

2.6.2 At approximately 23:00 hours, Ryan went to the operating theatre for the surgical procedure, but it was cancelled. Ryan was told it was because a young man had been admitted with the same condition as him but who had been experiencing symptoms for a shorter amount of time. The surgeon felt there was a greater chance of saving the other young man's testicle.

2.6.3 At 02:00 hours the following morning, almost exactly six days after the onset of his symptoms, Ryan received an emergency operation to examine his scrotum. The surgeon identified that Ryan had experienced a right-sided testicular torsion and this had led to necrosis (tissue death) of the testicle. The surgeon performed a right-sided orchidectomy and a left-sided orchidopexy, to prevent a future torsion. Ryan was sent home the next day. For the next three weeks, he experienced a problematic recovery with bleeding and infection.

3. Involvement of the Healthcare Safety Investigation Branch

3.1 Referral of reference incident

3.1.1 In December 2017, the NHS England/Improvement Patient Safety Team contacted the Healthcare Safety Investigation Branch (HSIB) regarding concerns about the volume of missed and delayed diagnoses relating to testicular torsion reported on the National Reporting and Learning System (NRLS) [10] incident reporting system. The Patient Safety Team asked HSIB to consider the topic as a focus for an investigation.

3.1.2 On 23 February 2018, Ryan's mother submitted a patient safety concern through HSIB's website. She expressed discontent about the diagnosis and treatment of her son's testicular torsion. She advised that formal complaints had been made to some of the organisations involved in his care and she was dissatisfied with the responses.

3.2 Decision to investigate

3.2.1 Following a scoping investigation, HSIB's Chief Investigator authorised a national investigation. This was because the incident met HSIB's criteria:

Outcome impact – What was, or is, the impact of the safety issue on people and services across the healthcare system?

The scoping investigation identified many physical, psychological and financial impacts resulting from delays to the diagnosis and treatment of testicular torsion.

Systemic risk – How widespread and common a safety issue is this across the healthcare system?

The scoping investigation discovered general concern about the management of the condition. This view was held by a number of senior clinicians working across surgical and urological specialties and in primary care.

Learning potential – What is the potential for an HSIB investigation to lead to positive changes and improvements to patient safety across the healthcare system?

The scoping investigation concluded there was an opportunity to provide a greater understanding of the impact a missed testicular torsion has on patients, their family and carers, and on the clinicians involved in diagnosis and treatment.

3.3 Evidence

The investigation used a range of evidence sources including:

- patient clinical records held in two GP surgeries and two hospitals
- the electronic summary care record held by the NHS 111 service provider
- data from the Strategic Executive Information System (StEIS), NRLS, and Hospital Episode Statistics (HES)
- published academic literature
- national published guidance on testicular torsion
- national and international social media
- qualitative analysis of interviews held with: GPs, nurses and consultants at the organisations Ryan contacted for medical advice or treatment
- subject matter advisors (SMAs) including representatives from the British Association of Urological Surgeons, British Association of Paediatric Urologists, British Association of Paediatric Surgeons, Paediatric Surgical Forum of the Royal College of Surgeons, the GP Committee of the British Medical Association, NHS England/Improvement and the Royal College of General Practitioners
- clinicians unrelated to the incident but who have had regular exposure to the condition and the clinical care pathway
- a human factors analysis of the reference event.

4. Findings and analysis from the reference event

4.1 Analysis structure

4.1.1 The analysis of the reference event is detailed in the order in which the events took place. Each interaction is analysed and the issues examined through the patient's pathway.

4.2 Diagnosis and treatment delays

4.2.1 The investigation identified 15 delays in the reference event, which resulted in a six-day time period from the onset of symptoms to a correct diagnosis and treatment for testicular torsion (Figure 2).



Figure 2: Points of delay that occurred in the reference event

4.2.2 The delays occurred across two geographical regions, five different organisations and 13 clinical and non-clinical staff.

4.2.3 The complexity of healthcare services (in number and variety of services/staff) used by Ryan exists for a number of reasons including: the need to manage demand for primary and urgent care services; matching patients to the correct service; and providing patient choice.

4.2.4 The number of services Ryan had contact with and the complicated communication lines between them created delays in the treatment of his time-critical condition. In addition, many of the services were not optimally placed to quickly enable access to expert advice or provide the surgical intervention for testicular torsion within the optimum window of six hours.

4.2.5 The investigation identified two different types of delay in the reference event. They were 'care pathway' and 'diagnostic' delays and are defined below:

- Care pathway delays were defined as delays in accessing appropriate health services after the onset of symptoms.
- Diagnostic delays were defined as delays in identification and treatment after the onset of symptoms.

4.3 Onset of symptoms

Day 1, 02:00 hours

4.3.1 Ryan woke due to the pain he was experiencing and sought advice from his mother five hours later, at 07:00 hours. He told the investigation, "I did think about getting medical help but didn't want to wake my mum and I wasn't sure about where to go for help. I decided to take some painkillers and wait till the morning to get my mother's advice."

4.3.2 Ryan's response revealed a lack of knowledge about what was potentially wrong with him and the time-critical nature of his symptoms. This was confirmed when his mother told the investigation that the diagnosis of testicular torsion and its consequences were completely unexpected when they met the urological surgeon. At the point when Ryan had sought health advice, the optimum time period during which his testicle may have been saved had almost been reached.

4.4 The use of NHS 111 service

Day 1, 07:00 hours

4.4.1. Ryan phoned his mother and she recommended he ring the NHS 111 service. She told the investigation, “Because I have worked my whole life for the NHS, I have a clear idea about not using resource, I said, ‘What you should do is call 111’...I felt like that is what we should do...to follow the pathway.” The second GP Ryan was in contact with (GP2) reflected a similar perspective when he told the investigation, “You could end up investigating and sending a hundred cases [to the emergency department] and not finding anything. It is always a balance. That is where the problem lies. How do you use resources well? Otherwise I could send all 20-year-olds, which we see frequently, with painful testicles.”

It is likely that different levels of knowledge about the symptoms and time-critical nature of testicular torsion, plus concern about levels of demand on urgent and emergency services, influenced decision-making by Ryan, his mother and GP2. Ryan’s mother and GP2 reflected the current expectation and behaviour within the NHS to try to avoid unnecessary attendance at the ED with the use of NHS 111 services to filter and triage demand.

4.5 NHS Pathways – disposition of the NHS 111 service call

Day 1, 07:49 hours

Ryan’s phone call to NHS 111 service was the ninth call answered by the call handler (CH1) in the early part of a shift that started at 06:00 hours. This was CH1’s first shift following a four-day rest break. A training supervisor from the organisation said the shift was not particularly busy.

4.5.1 In the audio recording of the NHS 111 service call, Ryan sounded to be in severe pain when talking to CH1. His breathing sounded laboured and he occasionally groaned. The investigation noted that CH1 did not appear to verbally acknowledge Ryan’s description of pain.

4.5.2 A comparison of the words spoken by CH1 and those visible on Version 14 of NHS Pathways showed that CH1 either read directly or slightly modified the questions he asked Ryan. Every time Ryan responded, CH1 then selected the answer that best matched the pathway.

4.5.3 CH1 and his training supervisor told the investigation that partway through the call, and using the ‘genital problem’ part of the clinical pathway, CH1 read directly from the screen, ‘Did the pain come on gradually or suddenly?’ He then selected the answer ‘not sure’ in response to Ryan’s answer.

4.5.4 An independent NHS 111 service provider simulated the call, before the investigation had confirmed which answer CH1 had selected. The simulation predicted that ‘not sure’ would be the answer selected. CH1 told the investigation, “Ryan told me that ‘he did not know’, so I thought he was unsure.” A pathway developer told the investigation that the official definition of ‘not sure’ is when “the call handler, not the patient, is not sure”.

4.5.5 'Not sure' was one of three available answers; the other two were 'gradually' and 'suddenly'. Unlike the 'not sure' category, additional sentences were visible under the 'gradually' and 'suddenly' categories. The NHS 111 service staff interviewed by the investigation said they used these sentences as prompts.

4.5.6 Under the 'suddenly' answer, the following sentence was visible as a prompt in the 'genital problems' clinical pathway: 'This means pain in a testicle that comes on without warning, or over a short period of time, for example, minutes. This also means pain that woke the person from sleep.'

4.5.7 The clinical subject matter advisor (SMA) confirmed that the information contained in this prompt was of 'critical importance for accurate detection of a time-critical condition/testicular torsion'.

4.5.8 A training supervisor at CH1's employing organisation emphasised that prompts were very important for call handlers. Call handlers were encouraged to use the prompts and there was significant coverage of this in their training.

4.5.9 CH1's training supervisor stated that "if the 'suddenly' answer had been selected, there would be an automatic disposition of 'ED within one hour' for some men". This disposition would have been of a higher urgency and addressed the time-critical nature of the condition.

4.5.10 If Ryan had been aged 16 or under, and the pain had occurred within the previous 24 hours, he would have received the higher urgency disposition.

4.5.11 Based on the answers CH1 entered during the call, the 'genital problems' clinical pathway automatically generated a final disposition, which CH1 communicated to Ryan as follows: "Just going through this, we would want you to make contact with a primary care service, a doctor, fairly quickly, within the next two hours." This disposition was the third highest category of urgency.

4.6 The time to access the local GP

Day 1, 08:00 hours

4.6.1 Ryan followed the advice given to him by CH1 and called his local GP surgery. The call was received by a second call handler (CH2). CH2 was working in a newly established centralised call handling service that served several GP surgeries.

4.6.2 CH2 processed the call on an electronic booking system referred to as the 'triage list'. The booking system informed the GP fulfilling the role of duty doctor (GP1) that a call to Ryan was required. GP1 was aware of the booking but for several reasons (these are detailed in paragraphs 4.9.2 and 4.9.4) was unable to talk to Ryan until 11:02 hours.

4.7 Clinical prioritisation of calls

4.7.1 The clinical prioritisation of call-backs used by the GP surgery was based upon GP1 reading the reason for the call and making an assessment. She triaged Ryan above other calls on the list and attempted to make contact one hour after Ryan's call, at 09:02 hours. This attempt was unsuccessful because the contact telephone number on Ryan's electronic patient record was incorrect.

4.8 Call handling processes

4.8.1 Ryan had replaced his mobile phone since registering with the surgery but had not informed them of his new number. This meant that the telephone number registered on the electronic patient record held by the GP surgery was not correct. GP1 documented the following after the first attempted call:

Consultation

tummy pain, just spoke to 111

mob not connecting

trying later

4.8.2 Before and just after this initial call by GP1, Ryan made a further four calls to the surgery at 08:05, 08:10, 09:50 and 10:50 hours.

4.8.3 CH2 retrieved and entered Ryan's correct number on the electronic patient record and updated GP1 through an electronic messaging system at 09:38 hours.

4.8.4 The call centre did not electronically record telephone calls, so it was not possible to find out if any questions were asked to ascertain Ryan's correct telephone number. However, with regards to telephone number checking processes, the call handling service's operations manager emailed the investigation and explained, 'Generally, the number is displayed on the phone and we ask, 'Is this the best number to contact you on?' The registered telephone number comes up on the appointment booking screen so if it was different, at that point we would expect call handlers to query this by saying something along the lines of, 'It's a different number to the one we have for you'...''

4.8.5 Most of Ryan's calls occurred in the first 90 minutes of the day. The operations manager stated that during this time 'calls were coming through thick and fast, I'm sure some changes are forgotten or overlooked, or noted down for later action'.

4.8.6 As the call handling service was new, a formalised operational process for call handling was not available but was being developed.

4.9 Demand on duty doctor function

Day 1, 11:02 hours

4.9.1 GP1 spoke to Ryan, and documented the following:

‘(R) testicular pain’ – Initially wrong phone number – explained, he apologised ~ no apology needed, apologising myself, and explaining. Screen message just through – testicular pain, 2 hr advice from 111.

Sudden onset 2am, pain woke him

Swelling, hard tubes in, very tender to touch, 3rd time it has happened

No dysuria

Voice sounded close to tears

Diagnosis - ? Torsion

Plan

Straight to ED @ [local ED] in taxi

He will do – getting straight on the phone to taxi firm

4.9.2 GP1 did not call Ryan until 11:02 hours due to the volume of calls that morning. After the first call made to Ryan, GP1 conducted a further 14 calls. In total she answered 48 calls during the morning shift, which finished at 13:00 hours. This level of demand was considered typical for that time of year and was described as ‘winter pressures’. GP1 said that telephone consultation was the only way to manage demand.

4.9.3 The surgery was also moving towards a more centralised service, allowing other GPs in the surgery to help out if they have a smaller patient list. GP1 was answering queries from reception, her trainee, nurses and managing her triage list.

4.9.4 Before making the 11:02 hours call to Ryan, GP1 was required to undertake two face-to-face consultations alongside the telephone consultation duties. She considered this unusual for a duty doctor function. One of the consultations was particularly complicated and took longer than a normal consultation.

4.10 The selection of the local ED

4.10.1 GP1 listened to Ryan's symptoms and made an accurate suspected diagnosis of testicular torsion. She advised Ryan to go to the ED as soon as possible, and to go by taxi as it would probably be quicker than waiting for an ambulance.

4.11 Referral to hospital specialists

4.11.1 When Ryan attended the ED, he was not referred to a urological or surgical specialist. Instead he saw another GP (GP2) who was working in the ED. GP1 was aware that GPs worked in the ED setting, and told the investigation that GPs there "are much closer to the urologists...if [a patient] came here, he would have to wait to be seen, assessed, then an ambulance. It would all add a few hours".

4.11.2 GP1 did not consider the likelihood that Ryan could be seen by an ED GP only. GP1 did not refer Ryan to the hospital specialists directly, which would have avoided going to the ED. She said, "They [urologists or surgeons] would have wanted the patient to be seen by a primary care practitioner before they accept them...it depends on their pressures, and it does vary."

4.11.3 GP1 told the investigation that she perceived the ED as a route through to the urologists or surgeons, and therefore that "the patient would have to give their own history". GP1 felt her role would be to help the patient do this effectively. She said that "you [the GP] will tell them [patients] to say all the right things so they don't get pushed away".

4.11.4 GP2 experienced a similar situation when he described the referral of a 40-year-old male with a suspected torsion to the local urology team, who saw him reluctantly after GP2 had asked them to. GP5 reported a similar experience and described it as "not an open door".

4.12 The forwarding of clinical information from the GP

Day 1, 11:30 hours

4.12.1 Ryan arrived at the ED by taxi. At a desk in the ED waiting area, he explained the reason for his attendance to a navigation nurse.

4.12.2 Ryan did not tell the navigation nurse about the suspected diagnosis. He told the investigation that GP1 "did not tell him what it was". This contradicts GP1, who told the investigation, "I did explain to him that I thought there was a twisting of his testicle, and he needed to get up to ED as quick as he could."

4.12.3 The documentation in Ryan's electronic patient record supported the suspected diagnosis made by GP1, but not whether Ryan was informed about it.

4.12.4 Because his consultation with GP1 took place on the phone, Ryan was not able to provide the navigation nurse with any written documentation of GP1's suspected diagnosis. In addition, the ED did not receive anything directly from GP1, who said that "the absence of written clinical information from urgent primary care advice/triage by telephone was considered routine – especially if referring to ED." This practice was described as routine by the GPs Ryan was in touch with later (GP3, GP4 and GP5), all of whom worked in a different surgery in a different part of England. GP1 and the surgery manager told the investigation that in contrast, the forwarding of clinical information following face-to-face consultation, especially if direct to hospital specialists, was a routine activity.

4.12.5 The lack of written clinical information was identified by the investigation as problematic. A clinical director in the reference event ED told the investigation, "I have to say it is frustrating when patients say, 'My GP has said I need to come up to the ED', and either a call has not been made to the [ED] team, or there is no indication why they have been sent up...if they had a GP note which said, 'Dear Urology Team' we could contact the urology team, and ask them to come down to the department."

4.12.6 GP1, GP3, GP4 and GP5 described difficulties in communicating directly to their local ED. They cited problems with getting through on the telephone and the absence of a central point of contact where they could send written communication before the patient arrived.

4.12.7 The NHS 111 service sent a post-event message (PEM) to the health provider that Ryan was advised to attend, which was routine practise. The message contained a summary of the answers provided by the caller, the disposition and the health advice provided. An NHS 111 service training supervisor told the investigation that "it [the PEM] was not always received and was dependent on the technology of the organisation...most GP practices were able to receive them, but not all EDs".

4.13 The navigation nurse's decision for Ryan to see the GP

4.13.1 Within a few minutes of Ryan's arrival, the navigation nurse recorded Ryan's symptoms, some clinical observations (which were all within normal limits, apart from a slightly raised heart rate and blood pressure), a pain score of 7 out of 10, with 10 being the worst pain he had experienced. These details were recorded on an Immediate Care Needs (ICN) form. The amount of time the navigation nurse spent assessing Ryan was considered normal.

4.13.2 A senior nurse within the ED, who was experienced in performing the navigation nurse role, retrospectively examined the documentation of Ryan's symptoms on the ICN. The senior nurse concluded that the order of symptoms documented may give insight into how Ryan described them, plus the dominant symptom experienced by him. On the ICN, the symptom of abdominal pain was documented first and possibly represented the dominant symptom. This

was supported by Ryan who said, “I was pretty distressed at the time...I had really bad abdominal pain.” Other sources of evidence confirmed that abdominal pain was likely to be the dominant symptom. These included Ryan’s mother’s recollection of his symptoms, the recording of the NHS 111 service call, and the electronic patient record at his GP surgery. It is not uncommon for patients with testicular torsion to present with pain that is predominantly felt in the abdomen.

4.13.3 All the sources of evidence relating to Ryan’s description of his symptoms mentioned testicular pain. Despite this inclusion, a testicular pain complaint would not necessarily alert a clinician to testicular torsion. A senior nurse told the investigation, “In my experience if [a patient says], ‘I have this sudden onset of pain in my testicle, pain down there,’ then that is when your red flags are going [for testicular torsion]...If someone comes in saying, ‘I got this lower abdominal pain and going into my testicle’...[I would ask myself] is that referred pain [from something in the abdomen]?”

4.13.4 A human factors SMA noted that the navigation nurse’s documentation did not include the NHS 111 service advice about contacting the GP within two hours, or GP1’s suspected diagnosis. When asked what her reaction would be if she was aware of GP1’s advice or suspected diagnosis, a senior nurse told the investigation, “I have to take what the GP says, I have to respect my peers. I would 100 percent at least get one of my colleagues [an urgent care doctor] to check that.”

4.13.5 The human factors SMA regarded the navigation nurse’s decision for Ryan to be seen by the ED GP (GP2) as being largely determined by the reported abdominal pain rather than testicular pain.

4.13.6 The navigation nurse was halfway through a shift when she assessed Ryan. The department’s senior clinician said that at the time of Ryan’s arrival, the demand on the ED was not excessive.

4.13.7 The human factors SMA concluded that in the absence of other factors, it was possible that the navigation nurse’s decision making ‘could be consistent with anchoring bias, or ‘jumping to conclusions’ based on System 1 reasoning’ (McLeod, 2018a).

4.14 System 1 reasoning and bias

4.14.1 System 1 reasoning is a description of a way of thinking when making decisions and judgements. McLeod (2018a), quoting Kahneman (2011), describes it as follows: ‘When people believe a conclusion is true, they are very likely to believe arguments that appear to support it, even when these arguments are unsound. If System 1 is involved, the conclusion comes first, and the arguments follow...a decision is likely to be ‘biased’ if there are clear indications that

the data gathering process was flawed through being overly driven or focused around features or conclusions arrived at quickly in the first instances based on little objective evidence, or without giving adequate account of information that was also available at the time.'

4.14.2 The investigation identified the importance of cognitive bias [11] not being perceived as an entirely negative process. Lieberman reinforced this, stating that 'unconscious cognition is essential to human functioning; it helps us to be efficient and responsive to the world around us. However, unconscious processes are also prone to errors; errors that remain unrecognised and uncorrected which can lead to flawed decision-making, significant bias and blinkered thinking'.

4.15 Awareness of the correct pathway for diagnosis of testicular torsion

4.15.1 A clinical SMA, and the senior nurse at the ED Ryan visited, both told the investigation that abdominal pain is common in testicular torsion. If torsion is suspected and the patient is in the ED and had been physically assessed by the GP, they would normally be transferred to the 'majors' area for review by ED doctors, then hospital specialists as required. Alternatively, to see the specialists, they would be transferred to a surgical assessment unit in another part of the hospital. The senior nurse stated, "Our doctors are very receptive to that...If there was a suspected torsion, they would see straight away."

4.15.2 The clinical director of the ED said, "All testicle pain would be referred to the GP." The basis of this pathway was the view that "GPs would have a greater experience in the diagnosis of torsion than many junior doctors working in ED". This supports the investigation's view that there was a discrepancy in the understanding of the testicular torsion pathway. The clinical SMA, the senior nurse and the clinical director all described different pathways. The finding was reinforced during interviews conducted with those involved in the reference event and with a range of clinicians. No-one described the same clinical pathway for the management of suspected testicular torsion. Some said it should be via the ED, others directly to urologists, or a combination of both. A paediatric surgeon explained, "A few years ago, a national pathway was proposed where all testicular pain presenting to ED was to have a senior urological or surgical review before they were discharged."

4.16 Levels of GPs' exposure to testicular torsion

4.16.1 It was the clinical director's view that GPs were more experienced in diagnosing cases of testicular torsion. The clinical SMA told the investigation that this would be influenced, in part, by GPs' level of exposure to the condition.

4.16.2 The investigation was told that the ED treated approximately one or two torsions a month. However, this was many more than the number of cases GP1 and GP2 reported seeing in primary care. Both said they had each seen three cases in all their time as GPs. GP5 also confirmed the low levels of exposure to this condition, as testicular torsion is not common.

4.17 GPs working in the ED

4.17.1 When making the decision for Ryan to see GP2, the navigation nurse had filtered his condition as 'non-urgent'. Staff told the investigation that the GPs within the ED commonly treated chronic and non-urgent conditions.

4.17.2 The ED GP service to which Ryan was referred was described as 'the GP stream' and had been in operation for several years. The service was provided by GPs employed by a separate organisation, commissioned to provide a primary care service for the ED to help manage the demand on the ED.

4.18 Clinical prioritisation by GP2 in the ED

Day 1, 14:04 hours

4.18.1 GP2 saw patients in the ED in the order of their arrival. This was different to the process adopted by GP1 at the surgery, who prioritised patients according to clinical need.

4.19 Capacity, capability and demand on ED

4.19.1 There were 12 patients waiting in the 'minors' waiting area at the time of Ryan's arrival. Some of these would have been there to see GP2. This was regarded as a relatively light workload, but contradicted Ryan's observation of the area – he said, "There was a lot going on." GP2 was the only GP working in the ED, which was a normal arrangement.

4.19.2 GP2 had worked in the ED for several years and was also a GP at a local surgery. He worked one morning per week in the ED. Ryan arrived at the latter end of the shift he was working that day.

4.20 Clinical decision by GP2

4.20.1 GP2 diagnosed Ryan with right-sided orchitis (inflammation of the right testicle caused by an infection). On Ryan's record there were four clinical assessments for infection recorded as normal: temperature, a urine sample and two separate notations of 'no discharge' [12].

4.20.2 Ryan was advised to attend a GU clinic to eliminate the possibility that he had acquired a sexually transmitted infection. Ryan had told GP2 that he had only one partner for two years, although later he recalled that this was likely to have been closer to 12 months.

4.20.3 GP2 documented the following:

Examination

Bright alert and well

Temp 36.1 RR 18 SPO2 98% BP 155/85 Pulse 96

Scrotum normal

Right testis enlarged and tender. Firm to touch

Left scrotum and testis normal

No discharge at urethral meatus

Urine dip negative

4.21 Diagnostic bias and experience in the management of testicular torsion

4.21.1 GP2 explained the processes behind Ryan's diagnosis, saying, "They [the navigation nurse], decide what patients we see." This step may have led GP2 to expect patients with non-urgent conditions. The human factors SMA observed that contextual factors may have also influenced this expectation. Those factors were: Ryan arriving on his own and being referred to as a self-referral, the fact that he travelled by private transport, and the fact that he had waited for over two hours to be seen.

4.21.2 The human factors SMA felt these were important contextual factors in the diagnostic process, coupled with GP2's low exposure to cases of testicular torsion. GP2 stated, "I have only ever seen three cases [of torsion] in my lifetime, and they have all been 12 or 13 [years old], and I have been a GP for 12 years...The three cases I have seen were exceedingly painful, they do not walk normally...he [Ryan] had a normal gait, he was walking normally...In two previous cases, the scrotum was swollen. In his case, the scrotum was normal – there was no swelling whatsoever...He said the pain woke him...he was not bent over. When the torsion presents, they normally have tummy pain...and pain down thighs."

4.21.3 The contextual factor of how Ryan walked was considered by the human factors SMA to be suggestive of anchoring or confirmation bias. This is defined as, 'The tendency to search for, interpret, favour, and recall information in a way that confirms one's pre-existing beliefs or hypotheses' (McLeod, 2018).

4.21.4 This bias may have been enhanced by Ryan telling GP2 that he had “a similar situation a few years ago...fixed by antibiotics”. GP3 may have also experienced the same confirmation bias, highlighted when he investigation was told, “I had Ryan’s previous history and know on two occasions he had testicular pain and torsion had been excluded. On the balance of probability...it was another episode of what he had before...”

4.21.5 It is possible that the previous episodes of testicular pain were in fact episodes of torsion that resolved themselves on their own, but which gave the false impression that antibiotic treatment had been effective.

4.21.6 The medical director of the primary care service provider that employed GP2, told the investigation that there were no specific training requirements in the contract with the hospital. GP2 would have been required to undergo an annual appraisal and revalidation process, as well as undertaking 50 hours of continuous professional development. No additional training on top of the annual mandatory training was required prior to working in the ED. GP2 was up to date with all his training requirements; he had not undertaken any specific training about testicular torsion.

4.22 Assessment of pain

4.22.1 In GP2’s explanation of the diagnostic process there was no reference to Ryan’s pain. It is not known why this was not explicitly mentioned, but there was a strong likelihood that the medication given a few hours earlier may have taken effect.

4.22.2 GP2 told the investigation, “I always thought it had to be severe pain. I always thought the scrotum had to be swollen.” Guidance available to primary care clinicians states that testicular torsion commonly presents with severe pain, and that occasionally the symptoms may be milder or less acute.

4.23 Age and testicular torsion

4.23.1 Age was an important clinical discriminator of testicular torsion for GP1, GP2 and GP3; they all thought that the condition is much rarer in the older age groups. For example, GP2 said, “You see a child aged twelve to fourteen in pain, your first thought is, ‘Is it a torsion of the testes?’. You are taught that.”

4.23.2 The clinical SMA and another urologist confirmed that testicular torsion can occur in any age group, whilst another urologist said, “Ryan’s age was still in the high-risk group.”

4.23.3 Age was also identified by the clinical director in the ED, who thought Ryan fell outside of the expected testicular torsion cohort of patients and into those more at risk of sexually transmitted infections. This statement provided insight into the contextual factors and potential biases that may have occurred in GP2's decision to advise Ryan to attend a GU clinic.

4.24 The time to access to GP3

Day 4

4.24.1 After a weekend of being bed-ridden in continuous pain, and in response to concern and recommendations by his mother and grandmother, Ryan called the family's GP surgery. A call-back was arranged by GP3, who was fulfilling the role of duty doctor, which took place three hours after Ryan's call.

4.24.2 GP3 returned Ryan's call in the chronological order it was logged onto the electronic system. This was different to GP1's call handling process, which prioritised calls by perceived clinical need.

4.24.3 In common with the experiences of GP1, GP3 told the investigation that there was high demand on the duty doctor function that morning; Ryan was the 83rd of 130 patients to be called by one of two doctors.

4.25 Clinical decision by GP3

4.25.1 After hearing from Ryan about his symptoms, and about the clinical decision made at the hospital on day one, GP3 felt that Ryan's condition was a continuation of the orchitis diagnosed by GP2. GP3 advised Ryan it was likely to be an infection; this advice was based on the false understanding that Ryan had seen specialists in a hospital setting and already had a diagnosis. GP3 was also aware of Ryan's history and knew of the two occasions he had had testicular pain which had been treated with antibiotics.

4.25.2 GP3 may have experienced similar forms of cognitive bias to that of GP2, indicated by his reference to Ryan seeing specialists at the hospital and his knowledge of Ryan's previous history. The fact that GP3 described the causation of pain and correlated it with Ryan's information about running for a train could also indicate bias.

4.25.3 The significant workload placed on the duty doctor may have increased the likelihood of cognitive bias.

4.25.4 Ryan was advised to continue with the antibiotics, to rest and to make contact again if things were not settling.

4.26 Contact with GP4

Day 5

4.26.1 Ryan rang the family's GP surgery a second time. His call was returned by GP4, 11 minutes later.

4.26.2 GP4 said, "I would expect some improvement in the patient after 48 hours of treatment with antibiotics. With no improvement after this time this would raise the concern and the patient would require a review, it does not mean, however, that the patient has a torsion."

4.26.3 GP4 made a face-to-face appointment for Ryan with another GP (GP5) later that day to perform a review.

4.27 Contact with GP5

4.27.1 GP5 examined Ryan and then rang a urology surgery registrar at the local hospital. The registrar agreed to see Ryan as an outpatient in a 'hot clinic' (urology emergency clinic).

4.27.2 GP5 recalled having to insist two or three times that Ryan should be seen. This was because the surgeon did not initially accept the referral, as he thought Ryan had already been seen by urology specialists at another hospital.

4.27.3 It is possible that the surgeon was experiencing similar cognitive bias to that of GP1 and GP3 because of his assumption that Ryan had already been seen by hospital specialists. The levels of demand on hospital specialists, as described by GP1 in paragraph 4.11.1, may have also been an influential factor.

4.28 The cancellation of the operation

4.28.1 In the afternoon following his appointment with GP5, Ryan was seen by a urological surgeon who suspected testicular torsion. Ryan and his mother stated that "it was the first time they had heard this diagnosis". The surgeon decided to admit Ryan to the hospital immediately and arranged for him to have an emergency surgical procedure. This procedure would involve examining and possibly removing Ryan's right testicle, and performing a fixation of the left one to prevent further torsion.

4.28.2 Ryan was booked on the emergency theatre list and at 23:00 hours that day he went to the operating theatre for his procedure. At that point the procedure was cancelled in order to operate on a patient who had symptoms of testicular torsion of shorter duration. The surgeon felt there was more chance of salvaging the other patient's testicle. Ryan reported that the surgeon was regretful of this situation and stayed beyond his shift to perform Ryan's operation at 02:00 hours on day six.

4.29 The psychological impact of testicular torsion

4.29.1 Ryan stated that during the experience he “felt worried as the pain was getting worse and I called the GP repeatedly while watching the clock”. He also said, “It was the fertility...[he was] most worried about.” With regards to his mother, he told the investigation, “She found it harder than I did.”

4.29.2 With regards to the professionals involved in Ryan’s care, GP2 said, “When something like this happens, you feel very upset.” GP3 also told the investigation, “I was devastated to hear what happened...I was upset about it.”

4.29.3 Ryan had a problematic recovery with bleeding and infection. He told the investigation, “I was in bed for about a month.”

4.29.4 Ryan has received no further treatment following the removal of his testicle, however, future treatment might include the fitting of an artificial testicle and fertility treatment. His mother and GP5 told the investigation that they had experienced great difficulty obtaining financial support for these procedures on the NHS.

4.30 Impact on Ryan

4.30.1 Ryan missed a significant portion of his university studies. This was reported to have affected his predicted level of academic achievement at the end of the first year.

5. Findings and analysis from the wider investigation

5.1 Hospital Episode Statistics

5.1.1 Hospital Episode Statistics (HES) [13] recorded testicular torsion as a primary diagnosis for hospital admission an average of 3,630 times per year between 2013 and 2018. This represents around 10 hospital admissions per day in England. The data does not show how many of these admissions originated from primary care.

5.2 Missed or delayed diagnosis of testicular torsion

5.2.1 The investigation reviewed incidents relating to delayed diagnosis or misdiagnosis of testicular torsion reported to the national Strategic Executive Information System (StEIS). There were 36 identified incidents reported as occurring between 14 May 2017 and 13 May 2018. Fourteen out of 36 of the reported incidents were in patients over the age of 17 (39% of the total). Appendix A shows the search criteria used for the review.

5.2.2 The investigation considered information from two reviews conducted by the NHS Improvement Patient Safety Team relating to incidents reported to the National Reporting and Learning System (NRLS). The first review was conducted in 2014 and looked specifically at the use of ultrasound scanning as a diagnostic tool (not specific to testicular torsion). The second review was conducted in 2016 and was a general clinical review of 535 incidents reported to the NRLS.

5.2.3 The first review covered the period from 1 April 2012 to 31 March 2014 and generated a total of 289 incident reports, all of which were reviewed. Ninety-five incidents were identified to be associated with delay in treatment for patients with suspected testicular torsion. Themes identified included: delay in review by appropriate specialist (44 incidents), missed diagnosis (28), delay in undergoing surgery when need identified (10), delayed diagnosis (8), delayed treatment (2) and two incidents that were reported as 'other'.

5.2.4 The second review covered incidents reported to NRLS on or after 1 April 2014 to 12 September 2016 and generated 535 incident reports. Of these, 296 received a clinical review. The number of reports relating to misdiagnosis or delayed diagnosis of testicular torsion totalled 166. Themes identified included: diagnostic error/delay (56 incidents), access to senior/specialist advice (36), surgery delay (28), assessment delay (18), referral delay (9), transfer delay (8), surgical procedure issue (4) and seven that were reported as 'other'.

5.2.5 Clinicians' level of knowledge of the condition was identified as an important human factor within the reference event.

5.2.6 GPs who were interviewed told the investigation that testicular torsion is a very rare presentation, with most testicular torsion cases presenting to the emergency department (ED) rather than primary care. This was also the view held by surgeons who spoke to the investigation team.

5.2.7 Testicular torsion was described by experts as easily confused with other conditions if clinicians have had limited exposure to the condition. The experts also stated that with increased exposure and the development of expertise in asking probing questions to the patient to ascertain the manner of the onset of pain, there is a greater likelihood of correct detection of the condition.

Table 1: HES Testicular torsion rates by financial years 2013-2018

Year	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	Total
Total Number	3,304	3,396	3,701	3,816	3,933	18,150

5.3 National guidance on testicular pain

5.3.1 The investigation into the reference event identified a lack of accurate, standardised, national guidance for the management of acute testicular pain. It is likely that this is influential in the misdiagnosis of testicular torsion.

5.3.2 The investigation observed that there were different understandings of the presenting features of testicular torsion. Several different national guidance publications were named, including:

- British Medical Journal, Best Practice, Testicular torsion (2018).
- British Medical Journal, Best Practice, Testicular torsion (2016). Accessible via the National Institute for Health and Care Excellence (NICE) Clinical Knowledge Summary.
- NHS East Midlands Clinical Network, Commissioning Guide: Management of Paediatric Torsion (2016).
- Guidance on the 'Patient' website entitled Torsion of the Testis (2016).

5.3.3 NICE issued a Clinical Knowledge Summary (CKS) in 2017, which contained statements that differed from the opinions of senior urology clinicians and a senior ED consultant. The statements were:

- 'If pain is present, ask about its duration, and severity (usually severe in testicular torsion).'
- 'An ultrasound scan and/or surgical exploration may be necessary.'
- 'Previous episodes of severe, self-limiting pain and swelling (described by some men and boys with testicular torsion).'
- 'Cremasteric reflex[14] (if there is acute scrotal pain or swelling, suspect testicular torsion if the cremasteric reflex is absent).'

5.3.4 The clinicians indicated that in their opinion:

- The most obvious diagnostic indicators are symptoms of unilateral (one-sided), sudden onset testicular pain, irrespective of severity and association with other symptoms (dominant or not) such as abdominal pain or nausea and vomiting.
- There must be a high index of suspicion for testicular torsion, and this must be ruled out before other diagnoses are considered.
- The most effective diagnostic procedure is not a scan or cremasteric reflex, but an emergency scrotal exploration.

5.3.5 It was also observed that the CKS:

- referenced the British Medical Journal's Best Practice from 2016, which is an outdated version. The latest version was published by the organisation in 2018 (British Medical Journal, 2018)
- excluded the NICE-commissioned document produced by the NHS East Midlands Clinical Network (2016); this was formally endorsed by three royal colleges and is regarded as important national guidance by many urologists and surgeons interviewed during the investigation
- had its testicular torsion focus situated online within a sub-category of 'scrotal swelling', yet scrotal swelling is not always present
- was aimed at primary care practitioners, but testicular torsion predominantly presents to urgent care services such as the NHS 111 service, EDs and acute surgery or urology
- was not referred to by some GPs, who instead discussed guidance they could access through their electronic patient system, EMIS™. This guidance was situated on the following website: www.patient.info/doctor/torsion-of-the-testis-pro

5.3.6 The investigation concluded that there is still a risk of incorrect interpretations about the symptoms, diagnosis and treatment of testicular torsion because of issues relating to the accuracy and accessibility of national guidance.

HSIB makes the following safety recommendation

Recommendation 2019/043:

It is recommended that the National Institute for Health and Care Excellence revises the content and accessibility of its Clinical Knowledge Summary on testicular torsion.

HSIB makes the following safety observation

There are multiple sources of guidance for General Practitioners on testicular torsion. It would be beneficial to review whether this guidance is accurate and whether it reflects the information contained in the revised Clinical Knowledge Summary to be issued by the National Institute for Health and Care Excellence.

5.4 Care pathway delays within and across different health organisations

5.4.1 The investigation into the reference event identified 11 care pathway delays in and across healthcare organisations.

5.4.2 The NHS Improvement Patient Safety Team raised concerns about the arrangement of surgical services after it performed a review of incident reports submitted to the NRLS between 2014 and 2016. In January 2018, it reported its results in the published Patient Safety Rapid Review and Response Report (NHS Improvement, 2018). It also detailed the action taken, which was a request to the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) organisation to conduct an in-depth review of testicular torsion.

5.4.3 In October 2018, and in part, due to HSIB's additional interest in the topic, NCEPOD added testicular torsion to the list of topics to be considered by the Health Quality Improvement Partnership for an in-depth review. The investigation has subsequently learnt that testicular torsion has not been selected for this year's programme but could be reconsidered in 2020 for the subsequent year's programme.

5.5 Arrangement of surgical services

5.5.1 The arrangement of surgical services for urological conditions was identified as a focus of the new NHS England/Improvement Getting It Right First Time (GIRFT) programme. The programme, which is led by frontline clinicians, was created to help improve the quality of medical and clinical care within the NHS, by identifying and reducing unwarranted variations in service and practice [15].

5.5.2 One focus of GIRFT was the arrangement of urological surgical services through the development of Urology Area Networks (UANs). UANs are a voluntary, collaborative arrangement between trusts within the same geographical area that establish a co-ordinated and comprehensive urology service. The GIRFT urology clinical lead told the investigation that 'it is hoped that there will be some standardisation of pathways within UANs, but there is no mechanism at present to produce a national template or guide for how urology services and pathways should be set up'. Testicular torsion/acute testicular pain has been included in the guidance for setting up UANs, which has been circulated to areas forming these networks. Discussions between clinicians involved in establishing UANs have included the issues surrounding testicular torsion.

5.5.3 Further guidance has been produced by the GIRFT urology team. The guidance advises UANs that they should be able to provide, 'A specific description of arrangements for managing patients with testicular torsion. Such provisions should cover all age groups and ensure that surgical exploration of the scrotum can be performed with no appropriate delays.' The GIRFT

programme also supported the British Association of Urological Surgeons in developing its publication Provision of out of hours and emergency care: guiding principles for clinicians, which was published in May 2019.

5.5.4 The investigation concluded that testicular torsion/acute testicular pain emergency pathways should be included in UAN considerations.

HSIB makes the following safety recommendation

Recommendation 2019/044:

It is recommended that the NHS England/Improvement 'Getting It Right First Time' programme ensures that testicular torsion/acute testicular pain is included on the checklist of emergency pathways to be considered by the newly established Urology Area Networks across England.

5.6 Automatic disposition of 'ED within 1 hour' for patients 25 years old and under

5.6.1 Version 14 of the NHS Pathway automatically gave a higher urgency disposition (going to the ED within one hour) for people aged 16 and under who had testicular pain for less than 24 hours.

5.6.2 In October 2018, Version 16 of NHS Pathways was introduced. It included changes to the genital and related pathways. The key changes were that all males 25 and under (including infants, toddlers and children) get an 'ED within 1 hour' disposition if they report acute testicular pain of less than 24 hours' duration, and the referral is labelled as a possible testicular torsion. Those aged over 25 with sudden onset testicular pain still get an 'ED within 1 hour' disposition. Males aged 25 or over are referred urgently to primary care for further assessment if they report pain that has lasted more than 24 hours, or symptoms that are not usually typical of testicular torsion, such as gradual onset of pain or pain in both testicles.

5.6.3 The amendment was made in response to feedback received from NHS 111 service providers. The alteration was formally evaluated, then rolled out nationally to NHS 111 service providers.

HSIB identified the following safety action

Safety action: NHS Digital has amended all clinical pathways where testicular pain is assessed in Version 16 of NHS Pathways, to increase the detection of testicular torsion in people over the age of 16 and up to 25.

5.7 Urgent primary care advice/triage by telephone consultation

5.7.1 Urgent primary care advice/triage by telephone consultation is a routine activity performed either by a duty doctor or a multidisciplinary duty team. The practice of telephone consultation has increased over the last decade. The service is considered by many to be a core element of the emergency and urgent care system, and '*digital first*' (including telephone and web-based consultations) has been promoted within the NHS long-term plan as an alternative to face-to-face appointments. Whilst there are local processes to allow GP practices to arrange their services to meet their populations' requirements, there is no national guidance or principles on which to base these services.

5.7.2 The provision, standardisation and governance of these services is not as well developed as other services provided in healthcare, such as, NHS 111 services and GP out-of-hours services. The investigation recognises that the latter are commissioned by clinical commissioning groups to a national specification, whereas GP services are configured on a local basis to meet the needs of the local population. However, all the other services have formal national operational processes and standards to assist them in running their services. There is currently no guidance or any principles to assist the GP services in setting up and running telephone-based care.

5.7.3 There is no routine way of forwarding information about a suspected diagnosis made following a telephone consultation to the healthcare provider a patient is being referred to. There is no means of sending this information from GP surgeries to the ED. The NHS 111 service has this functionality through the Interoperability Toolkit (ITK), which enables clinical information and advice resulting from a call to be forwarded to the patient's GP surgery and to those EDs that have the capability. However, not all EDs have this capability.

5.7.4 Currently, forwarding of clinical information from a face-to-face consultation is far simpler, as GPs can provide it directly to the patient to pass on to the ED. There is no universal functionality to share clinical information across all providers from a telephone consultation.

5.7.5 The investigation observed the electronic forwarding of clinical information to a patient in one GP practice. Information was sent directly to the patient's mobile phone and the text was then documented in the patient record. The GP described it as an efficient, quick and safe practice.

5.7.6 The investigation observed a workload for duty doctors of between 30 and 130 patients per session, with an expectation of between two and five minutes per call. GP3, GP4 and GP5 told the investigation that they deal with an average of between 50 and 70 patient calls in a session.

5.7.7 The duty doctor function varied between GP surgeries. Some solely conducted a telephone triage/advice service, whilst others also performed some emergency face-to-face consultations. Additionally, the way calls were prioritised varied from answering in the order in which the calls were placed to triaging from the description of the complaint.

5.7.8 The investigation was informed that call handlers/receptionists were trained to ask for the correct patient telephone number rather than there being an automated checking process. There were no consistent practices across GP surgeries for recording telephone consultations, however, those surgeries that did, found them useful for quality assurance, and for incident and complaint investigations. This differed from the NHS 111 service where there are operational processes for telephone number checking, the forwarding of clinical information to healthcare provider recipients (via a '*post-event message*'), and all calls being recorded for quality activities such as clinical audit, training, investigations and complaints.

5.7.9 The lack of principles or guidance for GP services setting up and running primary care advice/triage services by telephone consultation is likely to be contributing to variation in the quality and safety of these services across the country.

HSIB makes the following safety recommendation

Recommendation 2019/045:

It is recommended that NHS England/Improvement works with relevant stakeholders to develop guidance for handling telephone advice/triage in primary medical care settings.

6. Summary of HSIB findings, safety recommendations, safety observation and safety action

6.1 Findings

6.1.1 There is a risk of incorrect interpretation of the symptoms, diagnosis and treatment of testicular torsion due to issues relating to the accuracy and accessibility of national guidance on the condition.

6.1.2 There are multiple sources of guidance for GPs on testicular torsion, which do not all state the same information.

6.1.3 The arrangement of urological surgical services in relation to acute testicular pain had not been considered in the NHS England/Improvement '*Getting It Right First Time*' programme for Urology Area Networks, which are voluntary agreements between trusts in the same geographical area establishing comprehensive urology services.

6.1.4 The NHS 111 service genital problems clinical pathway had been amended to upgrade the default urgency of patients with acute testicular pain within the 16-25 age group.

6.1.5 The lack of principles or guidance for GP services setting up and running primary care advice/triage by telephone consultation is likely to be contributing to variation in the quality and safety of these services across the country.

6.2 Safety recommendations

HSIB makes the following safety recommendations

Recommendation 2019/43:

It is recommended that the National Institute for Health and Care Excellence revises the content and accessibility of its Clinical Knowledge Summary on testicular torsion.

Recommendation 2019/44:

It is recommended that the NHS England/Improvement '*Getting It Right First Time*' programme ensures that testicular torsion/acute testicular pain is included on the checklist of emergency pathways to be considered by the newly established Urology Area Networks across England.

Recommendation 2019/45:

It is recommended that NHS England/Improvement works with relevant stakeholders to develop guidance for handling telephone advice/triage in primary medical care settings.

HSIB makes the following safety observation

There are multiple sources of guidance for General Practitioners on testicular torsion. It would be beneficial to review whether this guidance is accurate and whether it reflects the information contained in the revised Clinical Knowledge Summary to be issued by the National Institute for Health and Care Excellence.

HSIB identified the following safety action

NHS Digital has amended all clinical pathways where testicular pain is assessed in Version 16 of NHS Pathways, to increase the detection of testicular torsion in people over the age of 16 and up to 25.

7. Appendices

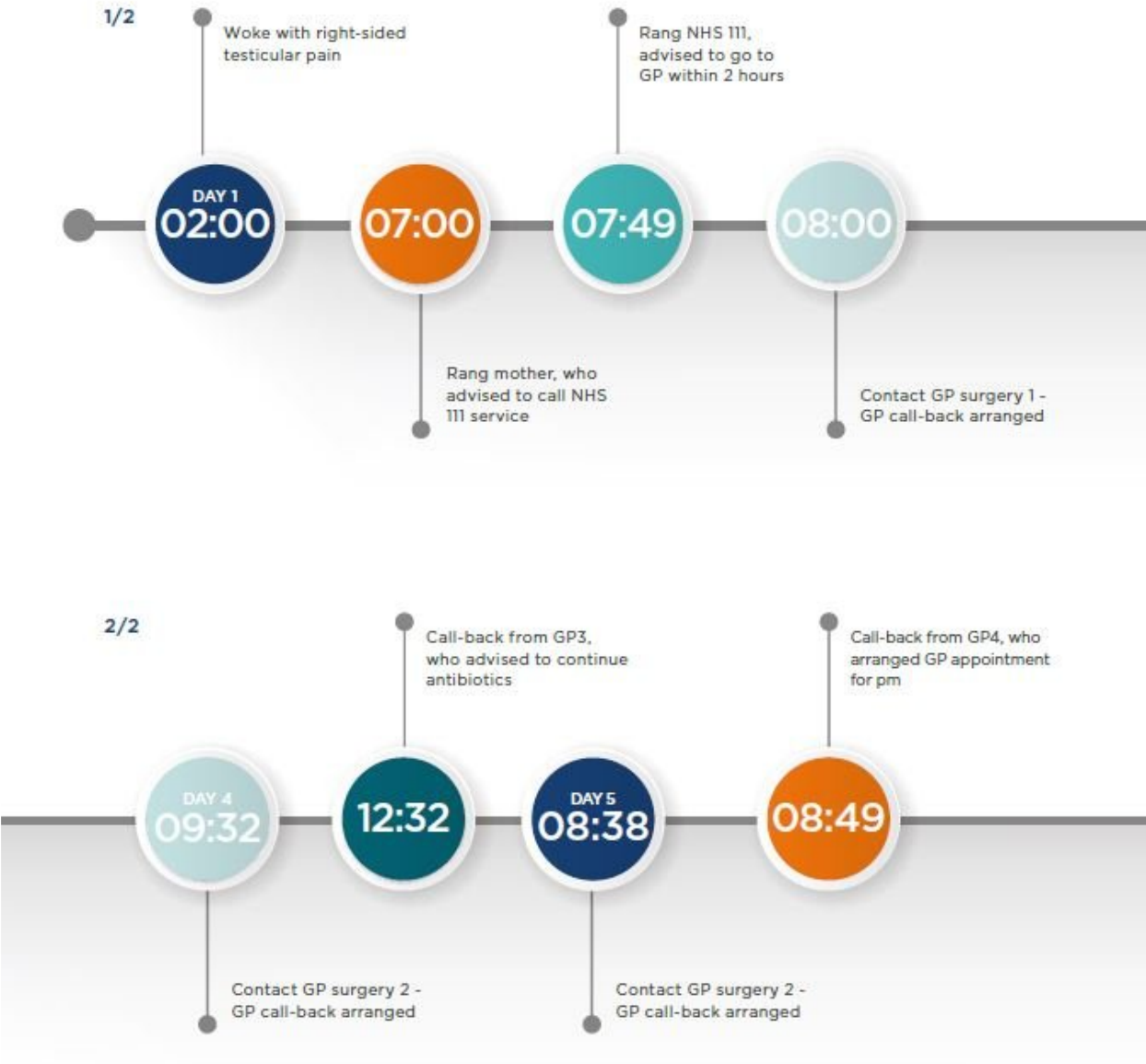
Appendix A: Strategic Executive Information System search criteria

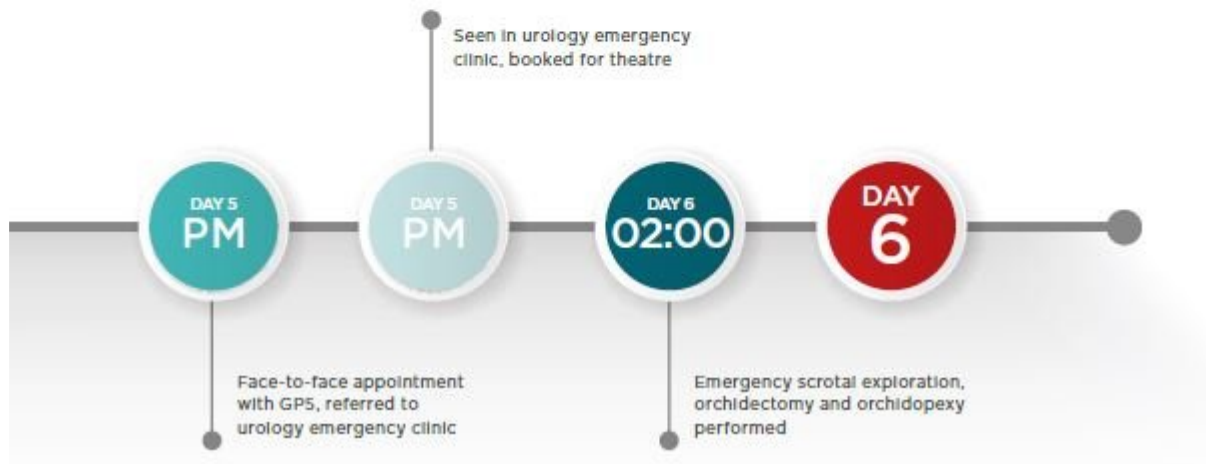
7.1.1 The investigation reviewed incidents relating to delayed or misdiagnosis of testicular torsion reported to the national Strategic Executive Information System (StEIS). Thirty-six identified incidents were reported as occurring between 14 May 2017 and 13 May 2018. Fourteen out of 36 of the reported incidents were in patients over the age of 17 (39% of the total).

7.1.2 The search criteria for the StEIS data used in the report can be found below:

System	StEIS	
Dates	Date incident occurred	
Search criteria	Field	Search terms
	Diagnostic incident including delay meeting SI criteria (including failure to act on test results) Treatment delay meeting SI criteria	tort* OR testic*
Filter(s) applied	Field	Term
	Diagnostic incident including delay meeting SI criteria (including failure to act on test results) Treatment delay meeting SI criteria	-ovarian

Appendix B: Timeline





8. Endnotes

[1] Testicular torsion happens when the spermatic cord, which supplies blood to the testicle, becomes twisted. This cuts off the blood supply to the testicle and causes the onset of sudden pain.

[2] Minor injuries and illnesses are treated in the minors area and more serious complaints are treated in the majors area of the ED.

[3] Urology is the branch of medicine that focuses on the kidneys, bladder, genitals and urinary tract as well as male reproductive and sexual health. A urologist is a clinician with specialist knowledge of this field.

- [4] Human factors are those things that affect an individual's performance.
- [5] Inflammation of the testicle and surrounding tissue usually caused by infection.
- [6] Removal of the testicle due to necrosis (tissue death).
- [7] Disposition is the word used to describe the outcome or course of action that is recommended to a patient following an NHS 111 service call.
- [8] See Appendix B for a diagram showing a summarised version of the timeline.
- [9] A genitourinary clinic, sometimes called a sexual health clinic.
- [10] A central database of patient safety incident reports.
- [11] A cognitive bias is a systematic error in thinking that affects the decisions and judgments that people make.
- [12] Discharge from the penis is a sign of a sexually transmitted disease that can lead to orchitis.
- [13] Hospital Episode Statistics (HES) is a database containing details of all admissions, ED attendances and outpatient appointments at NHS hospitals in England.
- [14] A reflex found in males that occurs when the inner part of the thigh is stroked causing the cremaster muscle to contract and pull up the testicle on the side of the thigh stroked.
- [15] More information about Getting It Right First Time is available at <https://gettingitrightfirsttime.co.uk>

9. References

British Medical Journal. (2018) Best Practice. Testicular Torsion. [Online] Available at: www.bestpractice.bmj.com/topics/en-gb/506

Gordhan, C G and Sadeghi-Nejad, H. (2015) Scrotal pain: Evaluation and management. Korean Journal of Urology 2015; 56(1): 3-11.

Lieberman, M, Rock, D, Cox, D. (2014) Breaking Bias. NeuroLeadership Journal 2014; Volume 5.

Marcozzi, D and Suner, S. (2001) The nontraumatic, acute scrotum. Emergency Medicine Clinician of North America 2001; 19(3): 547-68.

Lieberman. How do cognitive biases impact the workplace. Blue Sky <https://blue-sky.co.uk/blog/how-do-cognitive-biases-impact-the-workplace/>

McLeod, R. (2018) Technical note in support of HSIB Investigation: 'Management of Acute Onset Testicular Pain.' Report commissioned by HSIB.

NHS Digital. (2019) NHS Pathways. Reasons for using NHS Pathways. [Online] Available at: <https://digital.nhs.uk/services/nhs-pathways>

NHS East Midlands Clinical Network. (2016) Commissioning guide: Management of Paediatric Torsion. [Online] Available at: <https://www.england.nhs.uk/mids-east/wp-content/uploads/sites/7/2018/03/torsion-commissioning-guide.pdf>

NHS Improvement. (2018) Rapid Response and Review Report October 2016 to March 2017. [Online] Available at: https://improvement.nhs.uk/documents/2269/RR_Report_Oct_2016_-_Mar_2017_Final_for_web_v3.pdf

NHS Information Centre. (2011) HES online: hospital episode statistics. [Online] Available at: <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics>

Patient. (2016) Torsion of the testis. [Online] Available at: www.patient.info/doctor/torsion-of-the-testis-pro

Peeraully, R, Dawes, S, Green, J, Jancauskaite, M and Fraser N. (2017) Does the source of referral affect the findings in emergency scrotal explorations? Abstract presented to the British Association of Paediatric Surgeons International Congress.

Somani, K, Watson, G and Townell, N. (2010) Easily Missed? Testicular Torsion. BMJ Clinical Research 2010; 341(7766): 249-250.