Case-by-case: UTIs and enuresis

Case 1

Albert is five and his parents have brought him to you, noting that his urine seems dark and smelly.

How would you ensure that an appropriate urine specimen is obtained?

Your answer

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Although this might sound extremely basic, poorly collected urine specimens are common and useless. It is important to explain to the family how a specimen should be obtained. There are a number of requirements:

- The urine should be caught as cleanly as possible. This means washing the child before collecting the specimen. Ideally, the genital area should be washed well with water – soap may contain disinfectant that can kill bacteria and give a false negative result. If the child seems very unwell then a specimen may be needed urgently, and the child and family may need to do their best in the surgery. If the sample is not urgent it may be easier to do this at home.
- Babies, and children who are still in nappies, should have their nappies removed and the parents wait by their side with a sterile pot trying to catch the urine. This can be time consuming and particularly difficult in the more mobile toddler. Urine collection bags, often used in younger children, are prone to contamination and disapproved of by purists. In reality, they may be the most practical way of collecting urine. Acknowledging their shortcomings, if the specimen is clear then an infection can be ruled out. A positive result may be harder to interpret.

Older children would be expected to provide a specimen in a more adult fashion. One of the indignities of patienthood is the inability to provide an MSU without urinating over your hand. If we had to collect the urine ourselves I suspect we would design rather bigger pot. Using a potty is not helpful. If the potty is dirty, the specimen will be contaminated, and if the potty has been sterilised then any bacteria in the urine will also be killed.

The right part of the urine should be collected. Invariably, when taking a urine specimen patients are asked for a midstream specimen. This is appropriate when the urine from the bladder is to be tested and this will be the most useful test for what is happening in the kidneys. However, in balanitis, urethritis or vulvovaginitis the initial stream may be more useful, as any infection will be washed out before the middle of the stream has been passed. Similarly, in cystitis an end-stream urine may be more helpful. If there is discolouration, such as blood, it is important to ask if the changes in colour are throughout the urinary stream, and if not to collect the specimen that contains the discolouration. I have seen one child who had been away and returned with haematuria and suspected schistosomiasis. He had been seen by numerous colleagues and repeated urine specimens had been sent, which all came back clear. Taking a more thorough history, it was clear that the child had terminal haematuria. An end-stream urine was awash with schistosomes.

The importance of a good specimen is that interpreting the results of a bad one is difficult. Generally, to confirm a UTI, there should be both leucocytes (>50wcc/ml) and a pure growth (>10^5cfu/ml). Obviously there are factors that can impact these results to give a false negative, such as recent antibiotic treatment, collecting the urine in cotton wool or using a container with steriliser in it. A false positive is more likely with a contaminated specimen.

Case 1

If the results of the specimen show significant numbers of both red and white blood cells, bacteriuria and epithelial cells, how would you interpret this?

Your answer

xx

The presence of epithelial cells confirms contamination, and means that ideally the test should be repeated. The presence of white cells and bacteria may be significant or may be due to the contamination – sometimes a judgement call is required. A useful analogy would be if a blood result came back with a sodium of 120mmol/l, with a caveat that the specimen had been contaminated with an unknown quantity of water. Given this, it would be impossible to work out what to do without repeating the sample.

As regards screening tests, there is good evidence that urine stick testing for nitrites and leucocytes is a good screening tool, even in children. If both of these are negative there is very little chance of a UTI.

Case 2

Melanie is a four-year-old girl who presents with frequent urinary infections. She has symptoms of dysuria, urgency and although normally dry, will wet herself during these episodes. She has had various urine specimens sent. These have often been inconclusive, some having white cells with sterile growth, some growing coliforms with no white cells present and some showing the presence of both white cells and coliforms.

What features of urinary infections in children suggest upper rather than lower UTI? What are the implications in terms of investigations?

Your answer

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Melanie has recurrent UTIs, a presentation that is common but whose management can be complex. This is largely due to a lack of clarity when thinking about UTIs in children. Unfortunately, the urinary tract seems to lag behind the respiratory tract in a number of ways. Nobody would treat a common cold in the same way as bronchopneumonia, but UTIs seem to be coloured by the same brush.

Slowly, too slowly, there is recognition that upper UTI, i.e. pyelonephritis, is different in presentation, implication and management from lower UTI – cystitis, vulvovaginitis, balanitis and urethritis. While pyelonephritis can be associated with long-term renal problems, lower UTIs are essentially a symptomatic nuisance rather than anything else. The clinical features are highlighted in the table below.

Symptoms that help distinguish upper from lower UTIs

Upper UTI	Lower UTI
High fever	Mild, if any fever
Loin pain (can be abdominal in younger children)	Suprapubic pain
Rigors	Dysuria
Vomiting	Wetting
Little or no dysuria	Frequency or retention

NICE guidelines on UTIs in childhood caused considerable controversy. They advocated what many would consider a rather conservative approach, limiting investigations and treatment to recurrent or complex UTI.[1] The controversy highlights the different approaches to risk in primary and secondary care. In primary care there is an acknowledgement that in order to avoid medicalisation, a balance is struck and some things will slip through the net. Secondary care is fixated with avoiding anything slipping through, even if the net has to be so tight that it becomes suffocating. Following the NICE guidelines means that some significant renal pathology is missed, which is uncomfortable in secondary care, but good studies have shown that they do provide a clinically and cost-effective method for dealing with the problem.

Upper UTI

Historically, medical teaching has focussed on upper UTI, particularly in relation to vesico-ureteric reflux (VUR), scarring and chronic renal failure (CRF). The dogma was that VUR caused infections that led to scarring, causing CRF in adulthood. A number of young adults with CRF had a history of recurrent upper UTIs in childhood. This

led to the holy grail of preventing VUR -associated infections, initially with surgery and more recently with prophylactic antibiotics. While well intentioned, these interventions have not altered the presentation of CRF. The two possibilities for this are:

- We have been less than assiduous in following the accepted advice, or
- It may not be that simple.

It seems as if the second possibility is the most likely and latest thinking proposes that a number of children have a 'dysplastic' urinary tract, which is vulnerable to 'self-destruct'. They have a lower threshold for getting infections and each infection may accelerate the destructive changes. In these children the primary aim is to have a low index of suspicion for an upper UTI and to treat infections early and well. It is possible, albeit expensive, to provide parents with nitrie/leucocyte urine test strips, so that they can collect and test a urine specimen if they are concerned. They might also have a pre-written antibiotic prescription, so that these can be started pending formal results.

Children with upper UTI are normally systemically unwell and will often be referred to hospital. Conventional thinking is that they should receive parenteral antibiotics, although there is growing evidence that in children over three months of age there is little benefit of parenteral over oral antibiotics. Most children under three months with a significant fever – defined by NICE as above 38 degrees, would in any case be referred to hospital for assessment and management. The follow up and management of these children would usually be led from secondary care, and should be informed by the NICE guidelines. Prophylactic antibiotics would not normally be advised in children presenting with a single simple upper UTI.

Lower UTI

These are much more common than upper UTI, and in many cases are probably better described as lower urinary tract irritation or inflammation rather than infection. They are particularly common in young girls where there are naturally low levels of protective oestrogens and who have responsibility with limited ability in relation to their toileting.

The well-known factors that predispose to lower UTI are:

- Constipation – this makes any urinary problem more difficult to deal with. Apart from the fact that a germ-laden stool will be near the perineum, constipation also changes bladder function.
- Poor wiping – many girls would struggle understanding back to front. Up and down in easier to understand, with the aide memoire do**w**n after a wee, u**p**after a poo.
- Bathing habits – a good daily wash without soap would be the ideal to reduce lower UTIs. Children who have showers usually do not move the shower head, and so do not wash their perineum properly. Although shampoo and bubble bath are seen as harmful, a balance needs to be struck – depriving a girl of bubble bath because she gets the occasional lower UTI seems unduly draconian.
- Drinking and passing urine – children who do not drink enough, and very few children do, and those who hold onto their urine (bladder bursters) are more prone to lower UTI.
- Abuse – although conventional teaching lists sexual abuse as a cause of urinary symptoms, this is rare in practice. Sexual abuse would normally present with a disclosure, or with obvious injury, sexually transmitted infection or pregnancy. It is admirable to be alert to the possibility of abuse, but this would apply at least as often to patients with headaches as with lower UTI.

Clearly, there must be some genetic predisposition that makes these girls susceptible to frequent urinary symptoms. It is somewhat derogatory to say that they are caused by hygiene issues. Girls that are affected probably do things no differently from their peers. It is simply that they can't get away with anything less than 100%. Also, even implementing all of the above advice, it is likely that the episodes will be reduced rather than eliminated.

Each episode of lower UTI can be treated on merit, and may benefit from antibiotics. In the case of recurrent lower UTI the NICE guidelines may be rather too aggressive, as they recommend that children who have had three or more lower UTIs should have an ultrasound and DMSA scan. The former is probably unnecessary if not unreasonable, because recurrent episodes are likely, especially in the absence of a change in behaviour. A DMSA scan is invasive and is a test to look for renal scarring. This is akin to ordering a chest CT for patients with recurrent colds. In my personal practice I would certainly not arrange a DMSA scan. NICE guidelines do not

distinguish sufficiently between upper UTI and lower UTI and mention prophylactic antibiotics in recurrent cases. These are rarely, if ever, required in lower UTI.

Case 3

Jennifer is seven years old and has been wetting for two years. She has urgency – running to the toilet – but usually has started to wet before she gets to the toilet. She is dry at night. Her parents are exasperated. She is a little drier at school, but does still have the occasional wetting there, and it is much worse at home.

How would you assess and manage her?

Your answer

xx

It is useful to think of a 'continence or incontinence hierarchy'.

1. Continence is too difficult
2. Continence is possible, desirable, but not necessarily essential
3. Incontinence is a method of communication or control.

The third category is uncommon, and children who use continence for communication or as a tool seem to use faeces rather than urine. They require specialist intervention.

In the first category, urinary continence may be impossible, for example in the presence of an anatomical abnormality, or it may be an unrealistic expectation. This latter category is broad – for example, the child's level of understanding has to be appropriate and they have to have the skills required. A child with some developmental delay may not understand the need for continence, one with dyspraxia may not be able to undo buttons and zips and one with ADHD may not be able to plan adequately ahead. Children with an overactive bladder may not get sufficient warning and if they have restricted access to acceptable toilets – invariably a school issue – do not have the facility to control continence.

The next category involves children who could be continent, but postpone urinating until the last minute. They will invariably deny feeling the need to go, even if they have been performing the 'wee wiggle' for hours beforehand. It is possible that they have become inattentive to signals, but this is probably not the case. A useful analogy is that living next to a train line one can become oblivious to the noise of the trains, but this does not mean they are not hurtling past, and a refocusing may be required.

In the absence of any obvious factor, and remember to check specifically for constipation, children who wet can usually be divided into these with an overactive bladder (OAB) and those who postpone – the 'bladder burster' (see table below). Each of them may show urgency, but for different reasons, and children with OAB may not display frequency because they control this by limiting their drinking.

The best way to make a diagnosis is with urine measurements, asking the child to urinate into a jug, over the course of a few days, and to measure the volume each time. Normal bladder volume should be at least: child's age in years x fluid oz. Or: child's age in years x 30ml

So a seven year old should have a bladder that can comfortably hold 210ml or 7floz.

If the volumes are much smaller than this then a diagnosis of OAB is highly likely.

Distinguishing between OAB and a bladder burster

OAB	**Bladder burster**
Low urinary volumes	High urinary volumes
Frequency – can be controlled by not drinking Urgency	Infrequent wees
Often diurnal	'Pseudo urgency' leaves it until the last minute

In and out of the toilet in seconds	Camel-sized wees

In children with OAB, bladder exercises have not shown to be helpful and while increasing fluid intake may help – concentrated urine could irritate the bladder – in the short term an increased intake can exacerbate symptoms and may be difficult to implement. There is often advice to avoid blackcurrant or fizzy drinks. It is difficult to understand why they should make the situation worse, and it is probably simply that children drink more of them.

Essentially, the mainstay of treatment is oxybutinin, which would normally be given for a few months and can then be weaned or stopped suddenly. But if symptoms recur it should be restarted. The OAB is sadly under recognised, and this is especially distressing as there is invariably a transformational response to treatment.

If the wetting is due to postponement, a behavioural approach is required. This should make continence the child's responsibility and may involve a combination of reward and consequence. The analogy used is that if a child was playing football by the windows and was repeatedly told to go elsewhere because the windows might get broken, if they did not listen to the advice and the window smashed, it is not intentional but is predictable and avoidable. The response to wetting should be the same as to a broken window.

Case 4

Mary is five years old and always seems to have wet pants. She passes urine normally, but her friends complain of a continuous smell. She has had various urine tests that have been clear. She is dry at night, but rarely if ever has a dry day.

What are the important questions to ask?

Your answer

Xx

- Has there ever been a period of dryness? In anatomical/physiological problems such as aberrant ureters or neuropathic bladder there should never have been a period of dryness. Even short periods of a day or so usually exclude 'anatomical causes'
- When does the wetting happen? Before urinating 'are your knickers wet before you get to the toilet' (see previous question) or after? This can be caused by getting off the toilet before finishing, urine collecting behind labial adhesions (in boys a phimosis can have the same effect) or vaginal reflux. If she does not empty properly, this can be hard to change. As always, any accompanying constipation should be treated. Advice to wait a short while and focus on emptying (count to 10 and try again) may be offered, but is unlikely to be taken. Labial adhesions should be obvious on examination. As this improves with age, no treatment is usually advised unless it is causing symptoms, in which case topical oestrogens are usually effective, although recurrence requiring retreatment is common. Vaginal reflux is best managed by sitting 'back to front' on the toilet, which is often seen as fun and therefore undertaken. If the wetting is before getting to the toilet then this is usually due to either postponement or bladder overactivity – see above.

Case 5

Jack is six years old and has never been dry at night – he has no daytime symptoms. His mother is keen for him to be dry at night.

What would you advise and what are the treatment options?

Your answer

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Historically, children with nocturnal enuresis were not considered as suitable for treatment below the age of seven years. This has changed and the NICE guidelines on bedwetting do not suggest a minimum age, although it is rare for children under five to present.[2] Essentially, nocturnal enuresis is a developmental disorder – it is not the child's fault. Treatment does require a degree of motivation to have any chance of success, and this is not likely to be forthcoming in younger children. Understanding this means that it is helpful to articulate the basic premises to the child, namely:

- You are not alone – Figures from ERIC highlight how common nocturnal enuresis is.
- It is not your fault.
- It will get better.

Nocturnal enuresis is divided into four categories. It is either:

Primary – when there has been no significant period of dryness. There are different definitions of what is considered a 'significant period', usually either three or six months.

or

Secondary – wetting following a sustained period of dryness.

And then:

Monosymptomatic – where nocturnal enuresis is the sole symptom

or

Polysymptomatic – where there are additional symptoms, such as daytime wetting.

To further add to the confusion, the definitions of nocturnal enuresis are not always clear and vary from wetting every single night to wetting once a month or even less often.

The most useful approach to thinking about nocturnal enuresis is the three systems approach, which identifies what is required for night time dryness. The bladder has to be able to hold all of the urine produced overnight, and if it cannot has to be able to wake the child to alert them to go to the toilet. Looking at these three in a little more detail:

Bladder function: This may be a problem in children with OAB, although in some instances there may be abnormal sporadic bladder contractions. In practical terms it is important to address any underlying constipation and to try and make sure that the child goes to bed with an empty bladder. Not only should they make sure they have emptied their bladder before going to bed, but if there is a significant delay between bed time and sleep time, they should go again before going to sleep.

Urine production: Some children produce excess urine at night, classically with a degree of antidiuretic hormone deficiency. Urine production will be increased if the child drinks before bedtime, and although this is somewhat controversial in the enuretic world, as the body takes about two hours to manage a fluid load, it seems sensible to stop drinking for a few hours before bedtime. As most children drink very little at school, the bulk of their drinking does occur in the afternoon/evening and trying to shift this balance is ideal, but often unrealistic. Caffeine-containing drinks are best avoided at all times, and many people report that fizzy drinks and blackcurrant drinks make wetting worse.

Reducing evening drinking is hard, especially in those children who engage in after school sports activities. This is most marked in swimmers who will inevitably swallow vast amounts of pool water during training.

Rousability/wakeabilty: Ideally children should be able to go through the night without needing to pass urine. If they do need to go, then they need to be able to rouse and take themselves to the toilet. Many children with nocturnal enuresis are extremely heavy sleepers and will sleep through wetting. Others, up to 30%, may stir but either go back to sleep or be reluctant to go to the toilet in a situation where it is dark and they are the only one awake in the house.

Treatment options

All children can benefit from basic advice, which makes it as easy as possible for their bodies to be dry. It is worth using this terminology, again reinforcing the idea that the wetting is out of their control. This includes addressing any underlying constipation, trying to increase daytime drinking and stopping drinks for a few hours before

bedtime, ensuring that they go to sleep with an empty bladder and to go to the toilet at any time in the night should they stir. Even if other treatments are tried, they should be seen as in addition to, rather than instead of, these basic measures. For some families basic advice, reassurance and an offer to return if there is no spontaneous improvement are all that is required.

There is some inconsistency in relation to rewards and incentives. NICE guidelines suggest using star charts for cooperating with basic measures and helping to manage the problem. There are some children who benefit from incentives to be dry, but this will be the small number in whom motivation has been lacking. If the condition is developmental, then rewards, or even worse punishments, will make no difference. It may be worth trying star charts or incentives for dryness, but if not successful within a few days they should be quietly abandoned. Similarly, some people suggest removing pull-ups at night to incentivise dryness. Again, if wetting is out of the child's control, this will only have the result of the child and bed being soaked. As with other incentives it can be tried briefly, but if unsuccessful should be abandoned without fanfare. An alternative to removing pull-ups is making the child wear underwear underneath the pull-up. This has the effect of making them be able to feel being wet, without wetting the whole bed.

Lifting, taking the child to the toilet during the night, has received a bad press. Clearly it will not train a child to be dry but then neither does medication. If the objective is to keep the child dry until their body is able to be dry by itself, and if lifting achieves this, then it is a reasonable option to pursue.

Enuresis alarms have been available for almost a century. Despite this it is still unclear exactly why they work. They can be very effective but need some perseverance. They may wake up other household members while the child sleeps through peacefully. Most newer alarms have a vibrate option, which means that even if the child does not wake, other family members do not need to either. It is important to ascertain that night time dryness is not an all embracing goal. Being dry at night at the cost of the child and family being too exhausted to function during the day is not a good outcome. Local enuresis clinics supply alarms and advice – the alarms themselves can be bought cheaply online.

The final option is medication, of which the two main types are desmopressin and drugs that work on the bladder, of which antimuscarinics (oxybutynin) are used most frequently. Both seem to be safe and children seem to tolerate antimuscarinics rather better than adults do. The two can be used alone or in combination. Where there are suggestions of bladder overactivity, oxybutynin may be more effective – and cheaper – as a first agent. Occasionally, higher doses of medication are required. Reasonable goals should be set. For some children this would be total dryness while for others it may be improved symptoms. For example, if a child was wetting through the pull-ups then having a pull-up being able to hold all the urine and waking with a dry bed may be life changing.

How far to proceed with medication depends on the strength of the desire to be dry. It is important to find out who is most motivated, the child or parents, with success most likely if it is child driven. Studies suggest that it is older children and adults who are most concerned about wetting that may need more heroic measures. Unfortunately, 1-3% of adults report nocturnal enuresis, but this is largely undertreated. This is a great shame as it is immensely socially debilitating – it is likely that if patients do complain of wetting at night the doctor presumes they are describing nocturia rather than nocturnal enuresis and the patient may be too embarrassed to correct this. Alternatively, they may believe that there are no effective treatments. This is unfortunate as many adults would benefit from treatment.

If dryness is attained, medication should continue for some time, usually negotiated with the child and family. Older children and teenagers may be reluctant to try withdrawing therapy. Weaning medication is only a trial and if the wetting returns the medication should be restarted. Alternatively, in any child where the medication is not successful, this does not mean it never will be. As nocturnal enuresis is developmental, interventions that do not work now may work at some time in the future. Given the nature of nocturnal enuresis, some families are simply happy to be 'reassured', that it is normal, but should be encouraged to return if the spontaneous resolution is not happening as quickly as expected or hoped for.

All families should be informed of help and support that is available, especially via ERIC, the support group for childhood continence issues.

References

1 NICE. CG54: Urinary tract infection in children: Diagnosis, treatment and long-term management. London: NICE; 2007

2 NICE. CG111: Nocturnal enuresis: the management of bedwetting in children and young people. London: NICE; 2010

Further reading

Cohn A. Constipation withholding and your child: A family guide to soiling and wetting. London: Jessica Kingsley; 2006

Reece A, Cohn A. Clinical cases in paediatrics: a trainee handbook. London: JayPee; 2014

Help and support

ERIC. Helpline 0845 370 8008. Provides support for children families and professionals dealing with childhood continence issues.

Author

Dr Anthony Cohn is a consultant paediatrician at West Hertfordshire Hospital NHS Trust.