

# Parental reporting of smelly urine and urinary tract infection

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**Background:** Parents often report that young children have "smelly urine" or a particular urinary odour. There is little evidence that these observations are relevant to the diagnosis of urinary tract infection (UTI).

**Aims:** To determine whether parental reporting of smelly urine is of any relevance to the diagnosis of UTI in children less than 6 years of age.

**Methods:** Parents whose children were having urine collected as part of their admission to a large district hospital were given a simple questionnaire to complete regarding the current smell of their child's urine. Parents were asked whether their child's urine smelled different from usual or had a particular smell. Microscopy and culture results of the child's urine were compared to their parent's questionnaire answers to see if there was an association between parental reporting of a different or particular urine smell and a diagnosis of UTI.

**Results:** One hundred and ten questionnaires and urine samples were obtained. Fifty two per cent of parents thought that their child's urine smelled different from usual or had a particular smell. Only 6.4% of children were diagnosed as having a UTI. There was no statistically significant association between parental reporting of abnormal urine smell and diagnosis of UTI.

**Conclusion:** In determining whether a young child has a UTI, asking parents about urine smell is unlikely to be of benefit.

The problem of urinary tract infection (UTI) in children is a large one; 3–5% of girls and 1–2% of boys will have a symptomatic UTI during childhood.<sup>1</sup>

It has been shown that early diagnosis and treatment of UTI in young children is important to avoid renal scarring, adult hypertension, and even renal failure.<sup>2</sup> In very small children, especially those under the age of 2, there is an increased incidence of vesicoureteric reflux and renal parenchymal involvement.<sup>3</sup> This particular group is at a high risk of subsequent complications.<sup>4</sup> Early and accurate diagnosis, therefore, is essential to target those children who need treatment, specific investigations, further intervention, or prolonged antibiotic prophylaxis.

Diagnosis can be difficult: signs of UTI can be very non-specific and include fever, abdominal or loin tenderness, haematuria, vomiting, screaming, general malaise, prolonged neonatal jaundice, enuresis, hypertension, and failure to thrive. Symptoms of UTI are commonly also non-specific and the diagnosis is easily missed, especially in small children who are at greatest risk of complications.<sup>5</sup> Because of these factors the Royal College of Physicians produced guidelines stating that all infants and children admitted to hospital with pyrexia, even with another diagnosis, should have a urine sample examined.<sup>6</sup>

In primary and secondary care, however, it can be difficult and time consuming to obtain good quality urine samples from small children.

Diagnosis of UTI can only be confirmed following urine culture, which takes 24–48 hours. As a result, the decision to treat young children is based on the clinical picture plus a dipstick or microscopy result. It has been shown that microscopy results, using a standard cut off of >10 white blood cells per high power field, produces a significant number of false positives,<sup>7,8</sup> especially in the febrile child. Nitrite and leucocyte dipsticks also commonly produce false positives and negatives.<sup>6,9</sup>

Many children can therefore be committed to unnecessary admission to hospital, treatment, and further investigation while waiting for definitive culture result.

In view of the difficulties in diagnosing UTIs in young children, and the importance of treating these infections, any extra pointer in either the history or examination would be useful to the clinician when deciding whether a urine sample is required and when balancing the microscopy or dipstick result with the clinical picture. Parents of sick children presenting to primary care or hospital, either spontaneously or on specific questioning, often report that their child's urine smells different from usual. Adult textbooks make regular comment on change of urine smell or particular smell being indicative of UTI,<sup>10</sup> but only the occasional paediatric texts make unreferenced mention of urine odour in relation to UTI.<sup>11</sup>

This study investigates whether parental reporting of smelly urine or a particular type of urine smell is useful for the clinician trying to make a diagnosis of urinary tract infection in the young child. To our knowledge no study of this type has been carried out.

## PATIENTS AND METHODS

This prospective study was carried out in the busy acute paediatric admissions unit of St Mary's Hospital, Portsmouth between September 2000 and May 2001. The unit receives acute secondary referral from general practitioners and a casualty department and handles about 5000 admissions per year. It is unit policy that all unwell or febrile young children should have a urine sample collected. This will include children with symptoms of UTI, such as urinary frequency, and more commonly children with non-specific signs and symptoms such as pyrexia, irritability, and abdominal pain. The method of collection is specific to the age group and follows unit guidelines. Clean catch (often with parental assistance) is the most common method, although suprapubic

The questions below concern the smell of your child's urine at the present time.  
Please ring yes or no for **all** questions

Does your child's urine smell different from usual?	<b>Yes</b>	<b>No</b>
Does it smell Mildly offensive?	<b>Yes</b>	<b>No</b>
Very offensive?	<b>Yes</b>	<b>No</b>
Strong?	<b>Yes</b>	<b>No</b>
Fishy?	<b>Yes</b>	<b>No</b>
Infected?	<b>Yes</b>	<b>No</b>
Does it smell of anything else in particular?	<b>Yes</b>	<b>No</b>
If so, then what? .....		
Child's name .....		
Child's date of birth .....		
Today's date .....		
Signature of parent .....		

Figure 1 Parental questionnaire.

aspiration, catheter ("in/out") specimen, or mid-stream catch are other methods used. "Bag" urine collection is rarely used. Urine samples are sent to the pathology laboratory for microscopy, culture, and sensitivity. Initial microscopy results are phoned back to the ward, normally within one hour.

A team of admission unit nurses were enrolled to distribute a simple information/consent sheet and questionnaire (fig 1) to parents of children aged less than 6 years whose child's urine was being collected. This was completed and returned to the nurse before the microscopy result was known. There were no exclusion groups although questionnaires were distributed only when one of the study team of nurses was on duty. For practical reasons parents of critically ill children were often not enrolled. Information was not gathered regarding clinical condition or previous diet or treatment.

At a later date, parental questionnaire answers were compared to their child's culture and sensitivity results to see if there was any correlation between reporting of different smell, or particular type of smell, and infection. The diagnosis of a UTI was defined as a pure growth of  $>10^5$  organisms/ml. Mixed growths or pure growths of  $<10^4$  were regarded as negative. Results were analysed using the Fisher exact test (two tailed) and predictive values, sensitivities, and specificities for the replies were calculated.

The study was approved by the Portsmouth Hospitals' Ethics Committee.

## RESULTS

One hundred and ten urine samples with accompanying questionnaires were collected. Seven (6.4%) of these fulfilled our criteria for UTI. All UTIs were caused by *Escherichia coli*. Three (2.7%) of the samples showed a mixed growth or growth of  $<10^4$  organisms/ml and were therefore considered negative. The methods of collection were clean catch in 105, suprapubic aspiration in three, and mid-stream in two. The mean age of the children was 23 months (range 2 days to 62 months), with 39% less than 1 year of age.

Table 1 shows parental replies to the questionnaire. More than one positive reply could be given per questionnaire. Only one parent volunteered a description of a smell not already suggested in the questionnaire ("wheaty"). Overall 52% of parents gave a positive reply to one or more of the questions. Table 2 simplifies the results to show positive and negative replies and the presence or absence UTI. This shows that 57 of the 110 parents reported that their child's urine smelt different from usual or had a specific urine smell. Of these only three had a UTI out of a total of seven. There were four UTIs in the group whose parents thought that their child's urine smelt normal ( $n = 53$ ). There was no statistically significant difference between those children with an abnormal urine smell

**Table 1** Results from 110 questionnaires and urine samples showing numbers of positive replies and UTIs for each urine smell

Urine smell	Positive replies (%)	Number of UTIs (n=7)
Different from usual	38 (35)	2
Strong	33 (30)	3
Mildly offensive	28 (26)	1
Very offensive	4 (4)	0
Infected	3 (3)	1
Fishy	1 (1)	1
Other	1 (1)	0
Any positive answer	57 (52)	3

**Table 2** Summary of all questionnaire replies comparing reported urine smell with the diagnosis of UTI

Questionnaire replies	UTI confirmed	No UTI	Total
One or more positive	3	54	57
All negative	4	49	53
Totals	7	103	110

and those without, with respect to diagnosis of UTI (5.3% v 7.5%,  $p = 0.709$ , Fisher's exact test).

For a diagnosis of UTI, a positive reply to any of the questions (that is, urine smell different or with a particular urine smell) has a positive predictive value of 5%, a negative predictive value of 93%, sensitivity of 43%, and specificity of 48%.

## DISCUSSION

The aim of the study was to determine whether parental reporting of smelly urine, or a particular urine smell, was useful in the diagnosis of a UTI in the under 6s. Children of this age were targeted as they pose the most difficulty in diagnosis, have the highest incidence of UTIs with associated immediate and long term implications, and are less able (if at all) to communicate more useful pointers such as dysuria. Parents of this age group often volunteer information regarding the odour of their child's urine and are more closely involved with the toiletting process.

When assessing the presence of a UTI, the results in table 2 show clearly that there is no association between reported abnormal or different urine smell and UTI. A large number of parents are reporting abnormal urine smell when the child's urine is sterile. Indeed more than half of the parents replied yes to one of the questions, whereas only 6% of their children actually had a UTI. The positive predictive value, sensitivity, and specificity of a positive answer (that is, different or specific urine smell) are all low, indicating that abnormal urine smell is a poor test for UTI.

All the UTIs in this study were caused by *E coli*. This is the most common organism infecting children's urine.<sup>1 12</sup> It may be that infection with certain other organisms (for example, *Proteus* spp) produces urine with characteristic smell. *Proteus* spp, however, only accounts for 1–2% of UTIs in this age group.<sup>5</sup>

A limitation of the study is that we did not use consecutive patients; this may have selected a non-representative sample of parents and/or children. We did not enrol all nurses on the admissions unit and so distribution of the questionnaires was limited to the shifts and the specific patients in which our small team of study nurses were involved. This makes a random selection of patients likely. Sicker children may occasionally not have been included or it may be that parents who report smelly urine are more or less likely to fill out questionnaires. Our positive UTI rate was, however, comparable to the rate in a previous large audit, in the same unit, that included results of all children's urine, including the sickest (Job Cyriac, personal communication, July 2001) and with larger, similar studies.<sup>6</sup> This makes serious selection bias unlikely. Information was not gathered on clinical condition, previous treatments, or diet: clearly some foodstuffs can cause urine to smell different (for example, asparagus) and abnormal urine smell can be associated with dehydration (and rarely, metabolic disease). Although these are potential confounders it is unlikely that adjustment for these factors would alter the conclusion.

This study shows that in the sick young child, parental reporting of different or abnormal smell urine is rarely of any practical value when diagnosing a UTI. In the era of evidence

based medicine perhaps the question "tell me about the smell of your child's urine" can be removed from the list of useful questions to ask parents.

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