When do general practitioners request urine specimens for microbiology analysis? The applicability of antibiotic resistance surveillance based on routinely collected data

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Objectives: We do not know how representative reported levels of resistance to antibiotics in urinary tract infections (UTIs) are as there is wide variation in the rate of urine specimens submitted to microbiology laboratories by general practices. We used a questionnaire to investigate variation in sampling for patients with suspected UTI to explore any systematic bias that may influence interpretation of surveillance data based on routine data.

Methods: We sent a questionnaire to a stratified random sample of general practitioners (GPs) in Wales for self-completion. The GPs were presented with six clinical scenarios and asked about their proposed clinical management.

Results: We found that nearly all of the GPs indicated they would request a specimen for scenarios representing a probable UTI in a female child and a probable asymptomatic UTI in pregnancy. There was some variation between the GPs about sampling in a situation of treatment failure in an older woman and recurrent UTI in a male diabetic, with 90% and 81%, respectively, indicating they would request a specimen for these scenarios. The greatest variation was in relation to scenarios concerning the management of a probable uncomplicated UTI, and early patient symptoms with pressure to prescribe, with 56% and 33% of GPs, respectively, indicating they would request a urine specimen for laboratory analysis.

Conclusions: In the light of this reported sampling behaviour, it is likely that there is a systematic bias in surveillance data based on routinely collected data, with samples from cases of uncomplicated UTI being under represented, potentially leading to an overestimation of true resistance rates.

Keywords: urinary tract infections, UTIs, community, survey, questionnaire

Introduction

There is a wide variation in the rate of urine specimens submitted by general practices to microbiology laboratories. The range for Wales is from 0.6 to 237.2 specimens per year, per 1000 registered patients.¹ Reported levels of resistance to antibiotics are generally based on this routine data but we do not know how representative these data are of the general population of patients consulting with symptoms of urinary tract infections (UTIs). This routine data may contain high numbers of specimens from patients with recurrent UTIs and treatment failures, possibly with higher levels of resistant organisms compared to data derived from systematic sampling.²,³ We therefore designed a questionnaire to investigate variation in sampling for patients with
of antibiotic for general empirical therapy of UTIs. However, laboratory test results ‘always or often’ influenced their choice of antibiotics

Two hundred and twenty-four (76%) of the GPs indicated that two-thirds of GPs were male. There were no statistical differences with respect to age or gender between respondents and all GPs in Wales. However, fewer GPs ‘over 55 years of age’ responded [36 (12.4%) versus 324 (18.2%)]. Twenty-seven per cent of responding GPs (78/293) had been qualified for <10 years, 43% were qualified between 10 and 19 years, and 30% had been qualified at least 20 years. Seventy-three per cent (215/293) had achieved post-graduation diplomas or degrees, with 19% stating that they had received some post-graduate or continuing medical education on UTI management and 22% on antibiotic resistance.

Investigating the reasons why a GP requests a specimen

Table 2 shows the percentage of GPs who indicated that they would request a urine specimen for each clinical scenario.

Fifty-three per cent of GPs indicated that they would have a low threshold and send urine specimens for at least five of these clinical scenarios, 35% were classified as having a moderate threshold indicating that they would send for four of the scenarios and 12% of GPs had a high threshold as they would request a specimen for less than four scenarios.

Table 3 shows the GPs own estimate of the proportion of patients with clinically suspected UTIs from whom they requested a urine specimen.

Thirty-eight (13%) of the GPs stated that there was a practice policy for requesting urine specimens.

How GPs thought that the laboratory results influenced their choice of antibiotics

Two hundred and twenty-four (76%) of the GPs indicated that laboratory test results ‘always or often’ influenced their choice of antibiotic for general empirical therapy of UTIs. However,

| Case 1. Probable UTI in a female child: You are seeing patients in your surgery on a Monday morning. A 3-year-old girl presents with symptoms suggestive of a UTI. This is the second time she has presented with a suspected UTI (the first one was 6 months previously and a urine sample was not requested at that time). She tells you that it hurts when she passes urine and you find she has a raised temperature (38°C) but appears otherwise well |
| Case 2. Probable uncomplicated UTI: Later that morning, a 22-year-old woman complains of burning pain on passing urine with frequency. She is not pregnant and has not been treated for a UTI before |
| Case 3. Treatment failure in an older woman: On Wednesday you are asked to make a house call to an 80-year-old lady who complains of loin pain, frequent urination and of feeling generally unwell. She attended your clinic the previous Friday with similar, but less severe symptoms and was prescribed amoxicillin for 5 days. She reports taking the full course of amoxicillin |
| Case 4. Recurrent UTI in a male diabetic: On Thursday evening clinic a 45-year-old man with diabetes presents with dysuria, fever and frequency. He has had three laboratory confirmed UTIs in the previous 6 months and each time an E. coli was isolated. The last time the E. coli was reported to be resistant to amoxicillin |
| Case 5. Asymptomatic possible UTI in pregnancy: During a lunchtime antenatal clinic on Friday, a 29-year-old woman who is 25 weeks pregnant provides a cloudy urine specimen. It is positive for protein, nitrite and leukocytes on dipstick test. She does not have any symptoms of UTI and feels generally well |
| Case 6. Early patient symptoms, pressure to prescribe: A 40-year-old women requests antibiotics during a Friday evening clinic. She had UTI symptoms 5 months ago and was treated with antibiotics (no urine specimen was sent for analysis). She thinks she is starting to develop similar symptoms and does not want her weekend to be spoilt |
Applicability of routine urine specimens

Table 2. Percentage of GPs who indicated that they would request a urine specimen for each clinical scenario

<table>
<thead>
<tr>
<th>Clinical scenarios</th>
<th>Number of GPs who would request specimen</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1—probable UTI in a female child</td>
<td>292/292</td>
<td>100</td>
</tr>
<tr>
<td>Case 2—probable uncomplicated UTI</td>
<td>165/278</td>
<td>59</td>
</tr>
<tr>
<td>Case 3—treatment failure in an older woman</td>
<td>262/291</td>
<td>90</td>
</tr>
<tr>
<td>Case 4—recurrent UTI in a male diabetic</td>
<td>236/292</td>
<td>81</td>
</tr>
<tr>
<td>Case 5—asymptomatic possible UTI in pregnancy</td>
<td>286/293</td>
<td>98</td>
</tr>
<tr>
<td>Case 6—early patient symptoms, pressure to prescribe</td>
<td>94/286</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 3. GPs own estimate of the proportion of patients with clinically suspected UTIs from whom they requested a urine specimen

<table>
<thead>
<tr>
<th>Percentage of patients with clinically suspected UTI that you request specimen (%)</th>
<th>Number of GP responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–24</td>
<td>34</td>
<td>11.6</td>
</tr>
<tr>
<td>25–49</td>
<td>81</td>
<td>27.6</td>
</tr>
<tr>
<td>50–74</td>
<td>98</td>
<td>33.4</td>
</tr>
<tr>
<td>75–100</td>
<td>80</td>
<td>27.3</td>
</tr>
<tr>
<td>Total</td>
<td>293</td>
<td>100</td>
</tr>
</tbody>
</table>

113 GPs (41%) would treat Case 2—‘the probable uncomplicated UTI’ without requesting a specimen.

Two hundred and eighty-five (97%) of the GPs indicated that results ‘always or often’ influenced their change in therapy in treatment failure, although 29 (10%) indicated they would not send in a specimen but would prescribe for Case 3—‘treatment failure in an older woman’.

Two hundred and eighty-six (98%) of the GPs stated that laboratory results ‘always or often’ influenced their change in therapy when resistance was reported to the initial agent. However, 56 (19%) would not send in a specimen but would prescribe for Case 4—‘recurrent UTI in a male diabetic’.

Discussion

For the purpose of surveillance of antibiotic-resistant bacteria, it would be ideal if GPs could request urine specimens for all patients presenting with suspected UTI. Cost, organizational factors and potentially unnecessary burden on patients makes this approach unfeasible. However, understanding the sampling variation between GPs will aid interpreting the applicability of routinely collected data to everyday practice.

We presented six clinical scenarios to a stratified random sample of GPs, and found that nearly all of the GPs indicated they would request a specimen for scenarios representing a probable UTI in a female child (Case 1) and a probable asymptomatic UTI in pregnancy (Case 5). Children do have slightly higher antibiotic resistance rates than young adults but it is unlikely that pregnant women have higher rates. There was some variation between the GPs about sampling in a situation of treatment failure in an older woman (Case 3) and recurrent UTI in a male diabetic, with 90% and 81%, respectively, indicating they would request a specimen for these scenarios. However, the high percentage suggests a low probability of surveillance data being biased regarding this type of patient. The greatest variation was in relation to the management of a probable uncomplicated UTI (Case 2), and early patient symptoms with pressure to prescribe (Case 6), with 56% and 33% of GPs respectively indicating they would request a specimen. If this were extrapolated to surveillance data it is likely therefore that samples from patients with suspected uncomplicated UTIs are underrepresented as might be expected taking into account current practice of empirical treatment of uncomplicated UTIs.

A systematic review by Hummers-Pradier et al.4 concluded that for most people managed in general practice with uncomplicated UTI, urine culture was not necessary. They based this conclusion on Grade B evidence (clinical trial with non-randomized controlled design). However, a prospective cohort study of 160 patients consulting their GP with symptoms of UTI in eight general practices in Avon, UK, concluded that antibiotic treatment decisions should not be based on UTI symptoms alone.5 The authors proposed that current clinical practice resulted in a large proportion of patients receiving unnecessary antibiotic treatment.

It is worth noting that over half of the GPs responding to our questionnaire indicated they would request specimens for the young woman with suspected uncomplicated UTI (Case 2). This is probably the most common presentation of suspected UTI although good evidence on consultation rates by clinical subgroups is lacking. A sentinel practice study in England and Wales found that the mean weekly incidence of patients consulting with UTI in the community was ~65 per 100 000 patients.6 Fifty-three per cent of GPs indicated that they would send urine specimens for at least five of these clinical scenarios which would provide a good basis for surveillance. Eighty-eight per cent of GPs had a moderate or low threshold for requesting urine microbiology analysis, indicating they would do so for at least four of the clinical cases.

Interestingly GPs estimates of the percentage of their own patients with clinically suspected UTI from whom they would request a specimen were more broadly distributed than the response to the clinical cases suggested. It is therefore helpful to ask specific clinical questions to focus response as opposed to asking respondents about their impressions of overall sampling behaviour. GPs estimates of the proportion of patients for whom they requested a urine specimen varied considerably within practices and only 38 (13%) GPs stated that they had a practice policy.

Of interest was GPs perceptions of the influence of laboratory results on their choice of antibiotics. Many GPs stated that
laboratory results influenced their choice of antibiotic, but that they often treated patients without requesting a urine specimen. Presumably, the laboratory results for patients for whom they did request a sample influenced their choice of antibiotic for those patients who were managed empirically.

We were disappointed that we received responses from only 49.5% of practices. Indeed, this response rate was reached after initially phoning the GP practices to recruit them, offering a financial incentive and following up with additional telephone calls. Reassuringly, however, the age and gender of responding GPs were broadly similar to all GPs in Wales, and we did receive responses from 20% of GP practices in Wales.

Acquiescence bias, where respondents provide answers which they assume the questioner will approve of, may have led to an overestimation of specimen submissions. However, clinical scenarios were used to help to combat this bias and to focus the responder to their usual clinical practice.

We were not able to consider actual presentation rates of suspected UTI at the level of practices. It is possible that some practice populations are more likely to self-treat while others will present to their GPs, and some practice populations will have a higher incidence of UTI than others. Different rates of actual presentation may have influenced GPs’ responses.

There is a limited research on GPs’ decision to request urine specimens for culture and susceptibility. A Norwegian study presented a single case history of a 65-year-old woman with possible UTI to 1171 GPs and received 909 responses. Eighty-six per cent of those indicating they would request further investigations (n=895) stated they would request a bacteriological culture.

Ludlam and colleagues compared the susceptibilities of uropathogens isolated from routine urine samples submitted by 80 general practices served by a single laboratory to susceptibilities submitted by five sentinel practices in the same locality that had agreed to submit urine samples on all patients presenting with a clinical diagnosis of UTI during a 3 month period. Resistance rates to cefalexin, norfloxacin and gentamicin were marginally lower and resistance to ampicillin, trimethoprim and co-amoxiclav was slightly higher in isolates from the sentinel practices. However, only the resistance rate for co-amoxiclav was significantly different between the two groups of isolates.

Richards undertook a sentinel study where clinicians from three practices were asked to submit all urine specimens from patients who they intended to treat for UTI over a 12 month period. He found that resistance to ampicillin and trimethoprim was lower during systematic sampling, although only trimethoprim reached statistical significance. However, whether this difference reached clinical significance is uncertain. Baerheim et al. reported statistically significantly lower resistance to all antibiotics tested in consecutive female patients with suspected lower UTI presenting in general practice compared with samples that were routinely sent to the laboratory. Once again the clinical significance of this difference is uncertain. Of more concern is interpreting the data and understanding the source of data. Batchelor et al. highlighted the problem when guideline changes to submission of urine specimens resulted in apparent large changes in resistance rate. Guidelines were disseminated advocating submitting urine specimens only for recurrent, relapsing and complicated UTIs which was followed by a 6.9% increase in ampicillin resistance and a 34.4% increase in trimethoprim resistance.

In summary, our study shows that when GPs were presented with clinical scenarios, there was excellent agreement in reported sampling practice for some scenarios (e.g. a child with suspected UTI and a pregnant woman with suspected UTIs). The responses were also in broad agreement on the sampling of recurrent UTI and treatment failure. There was most disagreement for the scenario representing uncomplicated UTI. Since this is the commonest type of UTI managed in general practice, it is likely that there is a systematic bias in surveillance data based on routinely collected data, with samples from cases of uncomplicated UTI being under represented, potentially leading to an overestimation of true resistance rates.

Currently, we are not able to link accurate clinical information to microbiology results for large numbers of patients managed in routine care in general practice. If this could be done, then antibiotic susceptibility data could be more meaningfully interpreted. Attempting this, perhaps initially in sentinel practices, could improve our understanding and interpretation of the antibiotic susceptibility data.

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Transparency declarations

None to declare.

References