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Diagnostic regimes for urinary tract infection – are research results applied to practice?

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SUMMARY

A clinical audit of ward practice for diagnosing and treating urinary tract infection was carried out to assess the impact on clinical practice four years after publicaton of a working protocol. Data were collected from all medical, surgical, gynaecology and geriatric wards in 25 hospitals in Northern Ireland. All wards made use of urinary dipsticks for ward testing, as recommended by the protocol. However many negative samples were still forwarded for laboratory analysis. The potential financial savings which would result from effective ward screening were not being realised and the publication appeared to have minimal impact on clinical practice. Advice on an improved diagnostic protocol for urinary tract infection may not have been disseminated to the nursing staff whose role was pivotal in the screening process.

INTRODUCTION

Urinary tract infections are among the most common infections.[1] They account for more than seven million doctor visits and necessitate or complicate more than one million hospital admissions in the United States annually.[2,3] In the United Kingdom this would correspond to about 1.5 million visits and 200,000 admissions. A rate of 14 hospital-acquired urinary tract infections per 1,000 admissions has been calculated for persons under 15 years,[4] while the average prevalence of asymptomatic bacteriuria during pregnancy is 6%.[5] In addition, urinary tract infections occur more commonly in elderly people,[6,7] with a prevalence of asymptomatic bacteriuria of 12% in elderly men, increasing with age.[8] Symptomatic and asymptomatic bacteriuria presents a risk factor for bacteraemia, sepsis and an increase in mortality, especially for elderly females.[9]

Urinary tract infection (UTI) is therefore responsible for a significant amount of morbidity in both young and elderly populations, and consequently a major part of the workload of bacteriology laboratories involves the processing of urine samples. There is a need for cost-effective testing at ward level to screen out negative samples.[10] Such screening tests are available and have been assessed by a number of investigators.[11-14] In 1989, an evaluation of four UTI screening tests in an elderly population produced a working protocol based on both visual appearance and dipstick testing at ward level.[13] In this system, the visual appearance of the urine sample is first tested, and only if it is cloudy is dipstick testing for nitrites and leucocytes performed. The dipstick test is positive if either the nitrite is positive

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or if the leucocyte esterase shows more than a trace positive. Only if a positive result is obtained from dipstick testing is the sample forwarded to the laboratory for bacteriological testing. This protocol has a sensitivity of 96.1% and a specificity of 50.6%. These recommendations were published and presented at national and local meetings. The current investigation aims to assess ward practice for diagnosing and treating urinary tract infections and in particular, to monitor the effective use of urinary dipsticks, four years after publication of the working protocol. Although information on practice before publication of these recommendations is not available, the current study provides information on how clinical practice relates to the recommendations.

METHODS

The study was carried out in 25 hospitals throughout Northern Ireland. Permission was obtained discreetly from the management of the hospitals involved so that the audit itself would not alter clinical practice. A questionnaire was designed to record current ward practice for diagnosing and treating urinary tract infections together with details relating to sample collection, number of samples, action on test results, staff involvement, and protocols. The hospital, ward and ward type were recorded. An audit form was also designed to record all sample details over a period of one week. Each time a urine sample was handled, a tick was placed in the appropriate box on the form which was to be displayed in the sluice room on each ward studied.

All medical, surgical, gynaecology and geriatric wards in the 25 participating hospitals were visited by a research nurse (BMcP). The questionnaire was administered and the audit form was left behind to be returned in the sae provided at the end of the one week audit period. Wards not returning their form were sent a second if three or more weeks had elapsed from the time of visit.

Statistical analysis was by SPSS.[15] Descriptive statistics were employed and the Pearson Chi-square (X^2) test for analysis of categorical data.

RESULTS

A total of 25 hospitals (194 wards) were visited throughout Northern Ireland. These comprised 67 geriatric (35%), 58 surgical (30%), 53 medical (27%) and 16 gynaecology wards (8%).

Questionnaire

The visual appearance test was used by 40 wards and always in combination with dipstick (Table I). A significantly greater proportion of the geriatric wards utilised visual appearance as a ward test (geriatric 46%; gynaecology 12%; surgical 7%; medical 6%; $p < 0.0001$). All wards used dipstick to test for UTI. 181 wards used Multistix 10 (132 exclusively; 31 in combination with visual test, 11 with other dipstick and 7 with both visual and other dipstick). Thirty-one wards utilised other dipsticks such as BM7 (22 wards), BM5 (5 wards), Nephur-Test & Leuco (2 wards), and Leuco/Nitrate Test Stix (2 wards) (11 exclusively, 2 in combination with visual test, 11 with Multistix 10 and 7 with both Multistix 10 and visual). (Details of the most commonly used dipsticks are shown in Table II).

6% of wards had no instructions or protocol. A protocol is defined as written instructions displayed visibly on the ward while 'other' instructions may be verbal. A total of 46 wards tested urine as a routine procedure on admission and 193 wards tested when symptoms were present. 97% of wards used the 'clean catch' method to obtain urine for testing. A significant difference was found in the number of samples collected by each speciality

($p < 0.0001$; Table II). 69% of geriatric wards collected < 10 samples per week while 66% of surgical wards collected > 20 samples per week.

In 66% of wards the UTI ward test was always performed by nursing staff. In one ward a nursing auxiliary performed the task, with the duty being carried out either by nurse or nursing auxiliary in 33% of wards. The decision on whether or not to request laboratory analysis when a positive result was obtained by ward test was taken by nursing staff in 143 wards (74%). Nursing or medical staff made the decision in 48 wards (25%) and in only three wards (1%) was the action decided exclusively by medical staff.

TABLE I
Questionnaire Results

	Medical	*Surgical*	*Gynae*	*Geriatric*	*Total*
Number of wards	53	58	16	67	194
Ward tests					
Dipstick only	50	54	14	36	154
Visual + Dipstick *	3	4	2	31	40
Instructions					
Protocol only	37	36	13	46	132
Other instructions only	8	14	3	12	37
Protocol + instructions	4	5	0	4	13
None	4	3	0	5	12
Action					
Treat all positives	30	42	11	34	117
Repeat all positives	6	5	1	11	23
Treat repeat all positives	17	9	3	19	48
No action on positive	0	2	1	3	6
Test as routine	8	16	3	19	46
Test if symptoms present	53	58	16	66	193
Use clean catch method	53	58	16	62	189

* $p < 0.001$ for difference between different types of wards.

TABLE II

Details of urinary dipsticks

Multistix 10SG 100 sticks £21.	Tests for specific gravity, pH, protein, glucose, ketones, bilirubin, blood, nitrite, urobilinogen, leucocytes.
BM test 5L 100 strips £12.	Tests for pH, protein, glucose, kentones, blood, bilirubin, urobilinogen.
BM test 7 100 strips £15.	Tests for pH, protein, glucose, ketones, blood, bilirubin, urobilinogen.
Nephur-test & Leucocytes 100 strips £20.	Tests for pH, protein, glucose, blood, nitrite, leucocytes.

TABLE III
Details of Weekly Sampling and Testing

	Medical			*Surgical*			*Gynae*			*Geriatric*			*Total*		
Number of Wards	53			58			16			67			194		
Number of Samples	<10	10-20	>20	<10	10-20	>20	<10	10-20	>20	<10	10-20	>20	<10	10-20	>20
Wards Collecting Samples*	4	18	31	5	16	38	0	3	13	46	16	5	54	53	87
Wards Using Ward Testa	6	16	31	5	17	36	0	4	12	47	15	5	58	52	84
Wards Sending MSU's	38	12	3	29	23	6	11	2	3	64	3	0	142	40	12

* $p < 0.0001$ for difference between types of wards.

Audit forms

156 audit forms were returned from the 194 wards tested. A total of 1957 urine samples were ward tested during an audit period of one week, of which 48% were negative (Table IV). The same 156 wards forwarded 740 samples for laboratory testing of which 44% were negative. It is not clear if all these samples were ward tested positive and sent for confirmation, or if they were not tested at ward level. Both possibilities would in fact be present in the wards returning audit details. Treatment was initiated in 184 patients; that is, 9.4% of samples tested led to treatment.

TABLE IV
Audit Results

	Medical	*Surgical*	*Gynae*	*Geriatric*	*Total*
Number of Wards	38	49	11	58	156
Ward tests positive	277	406	83	257	1023
Ward tests negative	305	379	135	115	934
Laboratory tested	177	49	62	183	740
Not laboratory tested	240	222	39	118	619
Returned positive	37	72	14	115	238
Returned negative	74	170	25	54	323
Treated	27	60	12	85	184
Not treated	74	141	19	81	315

DISCUSSION

The current investigation documents and quantifies the diagnostic testing regimes for urinary tract infection in 25 hospitals in Northern Ireland. The results of the study indicate universal usage of dipsticks as a ward test for the detection of UTI, irrespective of hospital or ward classification. Our results show that geriatric wards more frequently used dipstick screening in combination with the visual appearance test. This may suggest that the recommendations made by Flanagan,[13] who carried out his research in elderly patients, may have been adopted by geriatric wards. However not one of the 194 wards had a copy of Flanagan's protocol. The recommendation of screening with urinary dipsticks is supported by further studies in geriatric medicine [16] and in other specialties such as paediatrics [17] and surgical/medical units.[18] Most of the dipsticks used are also screening tests for renal disease and diabetes and this might partially explain why they are in such common use.

Diagnosis of the presence of UTI was sought either as routine or where symptoms indicated possible infection. The number of samples collected for diagnosis was related to the type of ward. This result is not surprising since the number of samples is dependent upon a

number of factors, for example, throughput of patients, and whether or not admissions are tested routinely. Our results show that geriatric wards performed the lowest number of weekly tests despite the fact that these patients are most at risk from UTI.[19] This discrepancy may be largely explained by the lower throughput in geriatric beds. In contrast, surgical wards, where a high throughput is expected, carried out the highest number of weekly tests. Screening for hospital – acquired infections may also have contributed to the increased number of samples. Interestingly, the rate of routine testing of all admissions varied little between ward categories.

Some form of protocol or other instructions were widely available and yet when the MSU results are examined, the instructions appear to have been ineffective. The audit returns showed two important findings. First, that 48% of ward tests were negative and should therefore have been 'screened out'; and second, that 44% of MSU tests were also negative suggesting ineffective screening. Although these figures include routine samples, where negative results would be expected, the potential to make significant financial savings by adopting the use of an effective protocol as a screening test remains. A typical hospital bacteriology laboratory may process on average 300 samples each day, at an annual cost of approximately £109,200 (assuming a cost of £10 per test). By following a protocol of visual appearance and dipstick testing, 96% of infected urine samples would be detected at ward level and the number of samples requiring processing by the laboratory reduced by 30%.[13] Using these estimates, a hospital could save approximately £327,600 per year, with the cost of dipsticks being negligible (£2,340 per annum). Levy et al [14] calculated a potential reduction of 60% in laboratory urinalysis in their hospital suggesting even greater potential savings. Tuel et al [18] suggest the use of a protocol advising laboratory culture only when dipstick test is positive; this is estimated to reduce the number of cultures by 83%. They add that use of dipstick screening methods by nursing staff can reduce the cost of weekly urine screening by 73%.

Where ward or MSU tests returned a positive result, only 8% of wards did not initiate treatment. This 'treat if positive' policy requires further investigation. If we examine the literature, Breitenbucher [20] suggests that even with a positive culture, elderly patients should not generally be treated unless other evidence supports a diagnosis of symptomatic UTI. Zhanel et al,[21] advocate treatment of asymptomatic bacteriuria only for neonates and pre-school children, pregnant women and men under 60 years.

The current results indicate that both testing and action on the test result were almost always performed by nursing staff. This is an important finding in terms of targeting education. Recommendations for altering clinical practice presented at medical meetings or published in the medical literature may be noted by doctors, but unless such information is disseminated to nursing staff there will be little change in clinical management. In the case of UTI, such changes are essential for the realisation of the potential financial savings associated with UTI diagnosis.

In conclusion, this investigation has shown that while dipstick testing at ward level is commonly used, its use as a screening tool has not been effectively implemented, resulting in unnecessary laboratory testing and financial expenditure. Nursing staff are pivotal in the clinical management of UTI and a possible flaw in the dissemination of the information recorded in medical publications from medical personnel to nursing staff has been identified. This study indicates the need for change in practice with respect to UTI diagnosis, both in terms of targeting information together with more effective screening at ward level. It also illustrates the difficulty of introducing research findings into clinical practice.

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