

Improving the quality of mid-stream urine samples with a collection device

Matthew Dryden, Royal Hampshire County Hospital, Winchester, UK; Heather Gentry, Theresa Merreday, Worcestershire Acute Hospitals (Alexandra Hospital), NHS Trust, Redditch; Pauline Westbrook, Dept of Microbiology, Trafford General Hospital, Manchester; Karen Almond, Leylands Medical Centre, North Bradford PCT, UK

Study aim

To determine whether use of the Whiz urine collection device reduced the contamination rate of urine sampling in family practice and improved the quality of the diagnostic test.

Introduction

Infections of the urinary tract and symptoms mimicking urinary tract infection are common in women. The diagnosis of urinary tract infections is based on urine sampling and testing with reagents sticks and/ or laboratory culture, both of which require a high quality specimen free of perineal, faecal or vaginal contaminating organisms and epithelial cells. Midstream urine sampling is the most commonly employed sampling method, but has a high inherent contamination rate, defined by mixed growth cultures and commensal growths of saprophytic organisms (1). Contamination rates as high as 30% of samples tested have been reported (1). Such contamination obscures interpretation of the urine culture and may mask underlying bacteriuria. The importance of reducing contamination levels in midstream urine samples is not limited to possible cost savings to health services. Contamination can lead to delays in diagnosis, misdiagnosis or inappropriate use of broad spectrum antibiotics.

We have previously shown that a standardised method of urine collection using an UCD removes dependence on patients to produce an adequate specimen, simplifies the compliance required of patients and the need for time-consuming instruction by clinical staff (2). The device automatically, that is independent of user intervention, collects a mid-stream sample by excluding the initial low-flow portion of the urine stream and without interruption of urine flow (Figure 1). In this study, a number of family care centres have evaluated the device in their patient populations.

Methods

Five family care surgeries compared conventional collection of MSU's with collection of urine through the Whiz UCD device (Whiz® Cleancatch® Midstream, JBOL Ltd, Oxford UK) by women complaining of urinary symptoms.

In Sites 1-3 sampling was carried out in a population of predominately young women. While a minority of these presented to the clinic with symptoms of urinary tract infection, the majority were asymptomatic and were being screened for bacteriuria during pregnancy.

In site 4 the population sampled were elderly patients. Allocation of conventional system sampling or Whiz device sampling was randomised.

In site 5 testing methods were changed from conventional sampling to the Whiz UCD. Screening the sample with a reagent stick for leucocytes and nitrites was followed by microbiology testing the positive screens. In this family practice the aim of the change was to see if a reduction in repeat testing could be made. Site 6 was a family medicine centre associated with Site 2 and provided audit data of urine collection methods and contamination rates over a two year period.

Materials

The midstream urine collection devices (Whiz Cleancatch® Midstream, JBOL Ltd., Oxford, UK) were donated at sites 4 & 5 by the manufacturer. The disposable device is illustrated in Figure 2, with the method of collection in Figure 1. Conventional midstream urines were collected using sterile universal pots, usually available in the participating centres.

Interpretation of urine results was carried out as in Table 1. Samples with results compatible with those in rows 1 and 4 were unequivocal negative and positive respectively. The other rows were interpreted as contaminants and would normally require retesting.

Table 1: Interpretation of and clinical response for semi-quantitative mid-stream urine culture.

Growth	Number of different organisms	Clinical interpretation	Action
<10 000 CFU/ ml	Any number	Not significant	No further action if asymptomatic
10 000 to 100 000 CFU/ ml	1 – 2 different organisms	Equivocal growth. Possible early infection or contamination.	Retest
10 000 to 100 000 CFU/ ml	>2 different organisms	Equivocal growth. Probable contamination.	Retest
>100 000 CFU/ ml	1 – 2 different organisms	Significant growth indicating urinary tract infection.	Treat if clinically indicated
>100 000 CFU/ ml	>2 different organisms	Heavy mixed growth. Frankly contaminated sample.	Retest

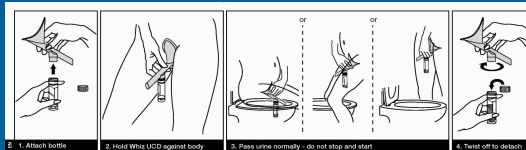


Fig 1 Above: Method of urine collection - the Whiz Urine Collection Device.

Fig 2 Left: Illustration of the device

Results

	Conventional collection	Contaminated	Whiz Cleancatch® Midstream System	Contaminated
Site 1	230	28 (12%)	576	25 (4.3%)
Site 2	400	118 (30%)	400	21 (5.25%)
Site 3	50	6 (12%)	44	2 (4.5%)
Site 4	19	9 (47%)	17	2 (11.7%)
Site 5	N/A	N/A	N/A	N/A
Site 6	6000	1800 (30%)	6000	240 (4%)

Table 2: Comparison of conventional versus Whiz Cleancatch® Midstream system at 6 sites

Sites 1, 2 and 3 in Table 2 were family care sites with a mixed group of mostly young female patients including a number undergoing antenatal screening. Site 4 represented an elderly population in family care. Taking together Sites 1,2 and 3 which represented a young female population, the combined results are shown in Table 3. Use of the Whiz UCD showed a significant reduction in contaminated urine. (p<0.001)

Site 5 did not compare conventional versus Whiz UCD in a randomised fashion. They changed their sampling practice from conventional to Whiz UCD. With conventional sampling, the family care practice had been sending an average of 300 MSU's a month to the laboratory. By screening urine with a dipstick, and for those positive for leucocytes or nitrites, collecting a urine by Whiz UCD, they reduced the number of urine tests sent to the microbiology laboratory to 111 per month for the same patient population, making a substantial saving in time and cost for the practice.

Site 6 was a clinic associated with Site 2 and, although not part of this study for statistical purposes, was able to provide audit data over a 2 year period comparing the two methods of urine collection.

	Unequivocal result (pos or neg)	Contaminated (result not possible to interpret)	Total
Whiz Cleancatch® Midstream System	972	48 (4.7%)	1020
Conventional sample	528	152 (22.35%)	680

Table 3: Combined results – Sites 1-3. (chi-squared test = 125.8, df=1, P<0.001)

Conclusions

- The Whiz urine collection device significantly reduced contamination rates in urine samples in women in family care, confirming previous results in hospital clinics (2).
- It improved the predictive value of the urine culture in a manner acceptable to patients and staff. This is valuable both clinically and economically to family practices
- Changing the urine testing method to a Whiz UCD with a dipstick screen followed by microbiology testing of a screen-positive samples made substantial reductions in the number of retests and costs in family practice.

References:

1. Lifshitz, E. and L. Kramer, Outpatient urine culture: does collection technique matter? Arch Intern Med, 2000. 160(16): p. 2537-40.
2. S. Jackson, M. Dryden, P. Gillett, P. Kearney and R. Weatherall A novel midstream urine collection device improves contamination rates in urine cultures. British Journal of Urology 2005 96:360-364

* The abstract has been selected to receive an ICAAC Program Committee Award