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Brief Report

THE EFFECT OF WRITTEN POSTED INSTRUCTIONS ON COLLECTION OF CLEAN-CATCH URINE SPECIMENS IN THE EMERGENCY DEPARTMENT

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☐ **Abstract—Background: Urinalysis testing is frequently ordered in the emergency department (ED), but contamination of urine specimens limits the interpretation of results. The mid-stream, clean-catch (MSCC) procedure for urine specimen collection is recommended to decrease contamination rates, but without instructions this procedure has poor compliance. Objective: To evaluate the effectiveness of written instructions alone, we analyzed the rate of specimen contamination, defined by presence of squamous epithelial cells (SECs) and culture results, in the ED after posting information on the MSCC procedure. Methods: Instructions in simple English for the MSCC procedure were posted in all patient-accessible restrooms in the ED. Frequency of contamination, defined microscopically as > 5 SECs per high-powered field or through growth of mixed or non-pathologic flora on urine culture, was determined over a 3-month period for comparison to historical controls from the previous year. Results: During the intervention period, 754 urinalyses were sent, with 392 contaminated specimens (51.98%), and 193 urine cultures were sent, with 77 contaminated results (39.8%). Historical controls from the previous year yielded 827 urinalyses sent, with 430 contaminated (51.99%), and 251 urine cultures, with 125 contaminated results (49.8%). The difference between groups was not significant for urinalysis ($p = 0.99$) or urine culture ($p = 0.13$). Conclusions: A poster-based educational intervention with instructions on MSCC procedure failed to decrease contamination rates in this ED-based study. Possible explanations include poor compliance with MSCC technique in the ED, or poor efficacy of this technique at decreasing contamination rates. These results may indicate that other efforts are necessary to improve urine collection methods.**

☐ **Keywords—infectious disease; urinalysis; urine culture; patient instructions; contamination**

INTRODUCTION

Urinalysis testing is frequently ordered during evaluation of patients in the emergency department (ED), but contamination of urine specimens limits the interpretation of results. The typical source of contamination of urinalysis specimens is assumed to be squamous epithelial cells (SECs) from the genital surface (1). Urogenital colonizing flora adherent to these epithelial cells contribute to false-positive samples. The mid-stream, clean-catch (MSCC) procedure for urine specimen collection is currently recommended to decrease contamination of samples, but this procedure is difficult for patients to perform without instructions (2,3). Although verbal instructions from staff have been shown to increase adherence, they are resource-intensive compared to an alternative of simple written instructions, which are easily implemented in most departments (4). To evaluate the effectiveness of written instructions alone, we analyzed the rate of contamination on urinalysis and urine cultures in the ED after posting information on the MSCC procedure. We hypothesized that posting instructions for urine collection

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would decrease contamination rates in comparison to a historical control period.

MATERIALS AND METHODS

Study Design

This was a quasi-experimental, single-center cohort study. The University of Washington Institutional Review Board approved the study protocol, including a waiver of informed consent from participants.

Study Setting and Population

The study was based in the ED of Harborview Medical Center, a large urban medical center in Seattle, WA. All clean-catch urine specimens sent for urinalysis or culture testing from adult patients over 18 years of age presenting to the ED in ambulatory fashion were included in our analysis. Urine samples were only tested if necessitated by the patient's clinical complaint, as determined by their care providers. Exclusion criteria removed patients unable to use ED restrooms, including nonambulatory patients; those with abnormal urinary drainage systems, including Foley catheters; and patients transported via ambulance, because they were less likely to use restrooms secondary to recent trauma or severity of medical illness. Additionally, as our instructions were only available in English, we chose to exclude patients who had listed a primary language other than English from our study population.

Study Protocol

Instructions in simple English (Flesch-Kincaid grade level 4.6) for the procedure of cleansing the genitals with a sanitary cloth and providing a clean-catch urine specimen were posted in all patient-accessible restrooms in the ED (Figure 1). Posters were 28 × 44 cm in size and included four diagrammatic black and white illustrations. The instructions included a full description of the MSCC procedure, including male and female differences in genital cleansing using sanitary cloths. Posters were maintained during a 3-month study period. Sterile urine cups were provided to each patient using existing protocols for urine collection. Patients were not observed during provision of urine samples, and restroom access by patients was not tracked. Providers were instructed not to change their practice regarding urinalysis-ordering patterns or provision of any verbal instructions during the protocol. Notifying patients about the posters was permitted, but not required.

Measures

During the study, the central hospital laboratory performed all urine testing. Frequency of contamination was determined in urine samples over a 3-month period in ED patients as defined here. To control for seasonal effects, historical controls of the same 3 months in the previous year, using the same inclusion and exclusion criteria, were used for comparison. For urinalysis specimens, contamination was defined by a microscopy standard as the presence of SECs, reported by our laboratory semi-quantitatively as being present at > 5 cells per high-powered field using existing equipment (iQ 200 Elite; Beckman Coulter, Pasadena, CA). For urine culture data, we defined contamination by a culture standard as growth of pathogenic bacteria (gram-negative bacilli, *Staphylococcus aureus* or *Staphylococcus saprophyticus*) at < 10,000 colony-forming units (CFU) or growth of a nonpathogenic organism (e.g., *Lactobacillus*) at any CFU based on comparison with definitions used in other studies (5,6).

Data Analysis

Rates of contamination for both the microscopy and culture standards were calculated from patient data available through our electronic medical record, and data analysis was performed with Microsoft Excel 2011 (Microsoft, Redmond, WA) using Pearson's χ^2 test for independence with categorical data. Frequencies of contaminated vs. uncontaminated samples for urinalysis and urine culture were analyzed separately, each as a 2 × 2 table with degrees of freedom = 1.

RESULTS

During the intervention period, 16,237 patients were evaluated in the ED, compared with 16,957 patients evaluated during the historical control period. Exclusion criteria were used as mentioned, with most common reasons for exclusion being transport to ED via ambulance, followed by primary language other than English. Patients excluded for language reasons included 24.6% of total patients, with Spanish-speakers constituting the largest group. Demographic data for the groups, abstracted from the culture data, showed a mean age of 44.9 years with 40.9% males for the intervention year, compared to 44.9 years and 39.0% male for the historical controls.

From the intervention group, out of 16,237 patients evaluated, 5,343 patients met eligibility criteria. This group had 754 urinalyses sent, with 392 specimens contaminated by our microscopy standard (51.98%). During the same time, 193 urine cultures were sent, with 77 results contaminated by our culture standard (39.8%).

From the 16,957 patients examined in the historical control cohort, 6,028 met eligibility after exclusion criteria. From this group, 827 urinalyses were sent, with