



Successful protocol for eliminating excessive urine microscopies: Quality improvement and cost savings with physician support



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ABSTRACT

Background: Clinical laboratories are under growing pressure to provide faster turn-around-time and maintain high quality while decreasing costs. In a setting of rising test volumes, implementation of evidence-based protocols with physician cooperation and feedback may provide frameworks and support for laboratory utilization optimization. The purpose of this study was to eliminate wasteful urine microscopy by targeting physician ordering behavior, and to ensure quality of care with physician satisfaction surveys.

Methods: We evaluated how physicians use the laboratory for routine urine testing. Urinalysis requisition was redesigned with emphasis on clinical indications for testing. In collaboration with requesting physicians, restriction in reflex microscopy testing was applied with exceptions. Cost saving analysis was conducted based on test volume. After policy change, 2 physician satisfaction surveys were conducted 5 year apart to address potential complaints.

Results: Over 47,000 urine microscopies have been eliminated annually, while the number of urine dipsticks and cultures remained stable. This translated into a 95% reduction in manual microscopy performed, and an estimated annual saving of \$200,000. In both satisfaction surveys, 9 out of 10 physicians considered the change to have “no” or “a beneficial effect” on their clinical practice. Our laboratory did not receive any formal complaints in regards to the protocol change.

Conclusion: By implementing changes to the way physicians order urinalysis, the number of tests can be substantially reduced. Satisfaction survey proved to be an effective tool for obtaining physician feedback, and support. The results of surveys indicated that new policy achieved significant savings without compromising on patient care. This experience has provided us with strategies on taking initiatives to further optimize utilization of laboratory tests.

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1. Introduction

Clinical laboratory testing is the single highest-volume medical activity, with an estimated 4–5 billion tests performed each year in the United States [1]. Although the laboratory only represents a fraction of total hospital costs, approximately 70% of medical decisions (e.g., admission, discharge, and drug therapy) are influenced by the results of laboratory tests [2].

However, approximately 20% to 50% of laboratory testing may not be appropriate such as redundant, not clinically relevant for the patient, or not ordered as per evidence-based practice [3–6]. Clinical laboratories are under growing pressure to provide faster turn-around-time and improve quality while decreasing costs. In Canada, there have been multiple initiatives and strategies aimed at optimizing laboratory utilization

such as tests changes to testosterone [7], tumor markers [8], vitamin D [9], folic acid, and aspartate aminotransferase testing [10].

Until June 2008, manual urine microscopy was performed in our laboratory on any urine specimen for which urine microscopy was requested; in addition any specimen with an abnormal dipstick reading had a reflex microscopy added. The cost effectiveness of this approach has been questioned previously in the literature [11]. A review of literature revealed a general consensus that recommends against screening the asymptomatic patients with dipstick analysis [12–14] and microscopy [15]. In an effort to eliminate wasteful microscopy, our department held educational medical grand rounds, and disseminated guidelines by memorandum. However, the outcome on physician ordering behavior was ineffective as we experienced constant increase in test volume. To cope with the surging workload, our laboratory needed to either purchase an automated analyzer with integrated urine microscopy or increase workforce by an additional 1 full-time equivalent (FTE) technologist. Consequently, a full evaluation was conducted in collaboration with clinicians to develop strategies to improve test utilization. This initiative included literature review, data mining, assessment of diagnostic properties of

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urine dipstick analysis, redesigning requisition forms, restriction in reflex microscopy testing, cost savings analysis, and 2 physician satisfaction surveys that were conducted 5 year apart.

2. Methods

2.1. Dipstick analysis

Unspun urine samples were analysed on a Roche Urysis 2400 (Laval, QC) test strip analyzer within 4 h of collection. The instrument was calibrated for red blood cells, neutrophils, nitrites and protein according to the European Guidelines [16]. Calibration was performed by a certified technologist.

2.2. Microscopy

Reflex microscopy following dipstick analysis was eliminated for all inpatient and outpatient locations except for the department of Urology, and Rheumatology. Manual microscopy was performed by certified technologists rotating through the urinalysis bench. The urine sample is concentrated by 10 prior to microscopy. Ten milliliter urine is centrifuged at $900 \times g$ for 5 min at room temperature. The supernatant (9 mL) is suctioned off and the remaining urine (1 mL) and sediment is gently mixed, applied to a slide and visualized under microscopy at $400 \times$ magnification.

2.3. Data analysis

Relevant data from 2007 to 2015 was extracted from our Laboratory Information Systems (LIS) into ACCESS database using Open Database Connection (ODBC). Data analysis was done using Microsoft ACCESS and EXCEL.

2.4. Requisitions

Outpatient requisition forms, typically used by hospital clinics and community physicians, were modified to provide clinical conditions and the appropriate tests as seen in Table 1.

New requisition form for inpatient and Emergency Department had the following statement added: "Urine will be kept in the lab for 6 hours. Please call ext 5094 if microscopy needs to be added".

2.5. Reflex rules

Reflexed microscopy examinations were eliminated for all inpatient and outpatient locations except for two clinician groups. Urine dipstick positive for hemoglobin will reflex a urine microscopic analysis if the requesting physician is a urologist. Urine dipstick positive for protein and leukocyte esterase or hemoglobin will reflex a urine microscopic analysis if the requesting physician is a rheumatologist.

2.6. Survey

Two physician surveys were conducted. The initial survey was sent out 15 months following the above changes to urinalysis testing, physicians associated with the Jewish General Hospital were surveyed.

The survey comprised five questions:

1. Regarding the way we now perform urinalysis, has there been a beneficial, detrimental or no effect on your practice?
2. Based on the way you now receive urinalysis results, has your ability to make a clinical decision been effected?
3. Do you send your patients to another laboratory due to the way we report urinalysis?
4. Over the last year did you contact the lab to report a complaint/concern with urinalysis?
5. Please indicate your department/division.

The second survey was conducted 5 years after the initial survey. The same group of physicians was surveyed, and the questions remained unchanged. The survey request was sent via email and conducted by means of an online survey program (www.zoomerang.com).

Initially, we wanted to obtain feedback from the ordering physicians regarding the changes made in requisition and reflex urine microscopy. Later, a second survey was conducted to corroborate the findings of the first survey.

2.7. Cost analysis

Daily workload (in hours) was calculated to fully staff the urinalysis bench during weekdays, weekend days, and statutory holidays. A calendar year, in our institution, consists of 249 weekdays, 104 weekend days, and 12 statutory holidays. Total daily hours worked were then multiplied to the number of corresponding days in 1 year. The results represented annual workload in hours on the urinalysis bench. Total FTE salary to fully staff the urinalysis bench was then calculated using average FTE hourly rate (\$36.5/h) and annual workload (in hours).

Two scenarios were purposed to cope with our workload assuming the volume of urinalysis remained unchanged. The first scenario involved the purchase of an automated analyzer without hiring additional staff. The second scenario required adding an extra FTE to the bench.

Supplies for manual urine microscopy costed \$0.33 per test. Cost of automated cell counters was estimated to be \$1.50 per test. Urine microscopy supply costs were calculated using cost per test and the total of 58,482 manual microscopies performed in 2007. Post-implementation of new protocol, a total of 2979 urine microscopies were performed.

The range of actual annual savings was calculated from the difference between the 2 scenarios and total annual cost after implementation of new protocol.

3. Results

The reduction in the number of manual microscopies performed; from a mean of 3278 monthly to 236 monthly. This represents a 95% reduction in the number of microscopies performed. The number of urine dipsticks and urine cultures analysed remained relatively stable; in the region of 6500 and 4000 respectively as seen in Fig. 1. The number of tests performed and their ordering locations are summarized in Table 2.

Reflex rules were developed in collaboration with the department of Urology and department of Rheumatology to meet clinical needs. Following such change, direct requests for urine microscopy by urology decreased from approximately 300 per month to almost zero within 6 months. On average, one third of the urinalysis requests from urology was positive for blood and thereby reflexed a microscopy examination. This produced a mean of 89 microscopies per month from urology. Urine microscopy add-on tests did not contribute significantly to the total number of microscopies performed. Post-implementation, the laboratory received 3–4 add-on urine microscopies per month from inpatients. Emergency Department gradually ceased adding on urine microscopy. Cost-saving analysis for urine microscopy is summarized in Table 3.

Post-implementation, we conducted 2 surveys of physicians affiliated with the Jewish General Hospital to evaluate their experiences with

Table 1
Changes to test choices on the urinalysis requisition.

Original requisition	Redesigned requisition
<input type="checkbox"/> Urine dipstick	<input type="checkbox"/> Routine screen (dipstick)
<input type="checkbox"/> Urine microscopy	<input type="checkbox"/> Rule out UTI (dipstick and culture)
<input type="checkbox"/> Urine culture	<input type="checkbox"/> Nephritis workup (casts)

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