



A prospective comparative pilot study comparing the urine collection pad with clean catch urine technique in non-toilet-trained children



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ARTICLE INFO

Article history:

Received 14 May 2013

Received in revised form 8 August 2013

Accepted 23 August 2013

Keywords:

Urinary tract infection
Urine collection method
Clean catch urine
Urine collection pad
Infant
Child
Emergency care
Emergency nursing

ABSTRACT

Introduction: There are many different methods for collecting urine from paediatric patients in emergency departments. Therefore, the aims of the study were to:

- (i) Compare the contamination rate of urine collection pad samples (UCP) and clean catch urine (CCU).
- (ii) Compare the time taken for each urine collection technique.
- (iii) Undertake a comparative cost analysis of the two urine collection techniques.
- (iv) Survey parents/carers perceptions of the two urine collection techniques.

Methods: The three month study was a prospective non-randomised comparative paediatric pilot study. A purposeful sample of children, requiring a urine microscopy for clinical management, presenting to one district emergency department was enrolled in the study to compare two non-invasive techniques of urine collection.

Results: Thirty-three patients were enrolled and satisfactory samples were obtained from 22 patients. The heavy (mixed growth) contamination rate in the UCP group ($n = 2$; 9.1%) versus the CCU group ($n = 1$; 4.5%) was not statistically significant ($p = 0.50$ by Fisher's exact test). The rate of agreement ($n = 20$; 91%) in diagnosing or excluding urinary tract infection between the two groups was high. The median time to urine collection between the two groups (UCP method 30 min; CCU 107.5 min) was statistically significant ($p < 0.002$, Mann–Whitney U test).

Conclusions: This study suggests that UCPs are practicable in Australasian Emergency Departments and may lead to faster diagnosis, disposition and reduced hospital stay.

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Introduction

Urinary tract infection (UTI) is an important cause of fever in the paediatric population and can be associated with significant morbidity (Foxman, 2002). Globally, it is particularly challenging to collect a urine sample in non-toilet-trained children. However, prompt diagnosis and treatment of UTIs is required to prevent renal involvement and other complications such as sepsis (Doganis et al., 2007).

Internationally, there are many methods used to collect urine in paediatric emergency departments (EDs). The five commonly cited urine collection techniques involve invasive (suprapubic aspirate

and catheter specimen) and non-invasive (bag specimen, clean catch urine and urine collection pads) techniques (Lewis, 1998; Long and Vince, 2007). However, the bagged urine collection method has been reported as having a high contamination rate and high false positive rate of 85–99% (Liaw et al., 2000) and hence considered least acceptable to diagnose UTI. Usually for non-septic children non-invasive methods are preferred to collect urine samples.

The National Institute for Health and Clinical Excellence (2007) recommend obtaining urine by the clean catch urine (CCU) technique from all young children with suspected UTI. A recent Australasian study (Buntsma et al., 2012) showed that CCU was the preferred technique for obtaining urine specimens in non-septic children (less than or equal to 24 months of age) by conducting a standardized electronic online survey of senior emergency physicians at the 13 Paediatric Research in Emergency Departments International Collaborative (PREDICT) EDs. However, in trying to

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obtain a CCU it can be time consuming and frustrating for both parents and clinicians. Often parents or nursing staff miss catching the urine and consequently diagnosis may be delayed (Liaw et al., 2000). In contrast, the urine collection pad (UCP) method has been reported by Liaw et al. (2000), in the United Kingdom, as an easy alternative non-invasive method with a high level of parental and nursing staff acceptance.

Therefore, the aims of the study were to:

- (i) Compare the contamination rate in UCP samples with CCU.
- (ii) Compare the time taken for UCP collection and CCU.
- (iii) Undertake a comparative cost analysis of the two urine collection techniques.
- (iv) Survey parents/carers perceptions of the two urine techniques.

Methods

Design

This was a three month prospective comparative pilot study. The study was conducted in a District Urban Hospital in Sydney. The ED is a seventeen bed unit of which there are four paediatric beds, one paediatric treatment bed and one shared resuscitation bay. The ED transfers admitted paediatric patients to a 20 bed paediatric ward for acute medical, surgical, mental health and elective surgical presentations.

Within Australasia the majority of emergency departments are mixed adult and paediatrics. There are only two dedicated paediatric EDs in New South Wales. The majority of sick children visit mixed EDs and critically ill children are transferred to the children's hospitals.

Sample

A purposeful sample of paediatric patients, requiring a urine microscopy for clinical management, was enrolled in the study. Each child enrolled in the study would have a sample of urine collected consecutively using the UCP and CCU method. Given each child was their own control the order of urine collection method was not randomised as this would not affect analysis.

Patients were recruited for the study based on the following inclusion criteria: febrile children less than 3 years old and non-toilet-trained; and or suspected of a urinary tract infection. The study excluded all children critically ill (Australasian Triage Scale Triage category 1 and 2). The Australasian Triage Scale (ATS) is a 5 point scale rating clinical urgency from 1 (most urgent) to 5 (least urgent) (ACEM, 2002). In addition, children were excluded if they were: being transferred to another hospital; had severe nappy rash; without a person with parental responsibility present; and had non-English speaking parents.

Study data tool

The data collection tool was developed based on available literature and collected patient demographics (age, gender, triage categories, hospital length of stay, main diagnoses); length of time to collect specimens; numbers of pads used; number of CCUs missed; the reason for failure to collect urine specimens; and parental preferred choice of urine collection technique.

A urine collection package was assembled for the study. The contents of the urine collection package included the: data collection tool; participant patient information and consent forms; pathology form and specimen jar; and UCP pack (two pads per pack).

Formal pathology urine specimen reports were obtained to identify the urine culture results for each urine collection method.

A minimum of 0.5 ml of urine was sent to pathology for testing. Pathology results reported bacteriological results as: no growth $<10^5$ /ml; pure growth $>10^5$ /ml; mixed growth $<10^5$ /ml; or mixed growth $>10^5$ /ml. For the purpose of this study a mixed growth of $<10^5$ /ml was considered as not indicative of a UTI. While UTIs are conventionally defined as a pure growth (single organism $>10^5$ /ml) (ClinicalKey, 2012), a UTI cannot be excluded in the presence of heavy contamination (mixed growth of $>10^5$ /ml). Both urine collection techniques were analysed for contamination rate.

Nursing and medical staff education program

Five education sessions were conducted for nursing and medical staff in the ED and Paediatric Department. The education sessions lasted 45 min and included the study inclusion and exclusion criteria; patient information and consent forms; method of urine sample collection, parents role, and simulated exercises for each urine collection technique.

The simulation exercise involved using a sterile technique, preparing the child's perineum by cleaning with chlorhexidine, followed by rinsing and drying. The cleaning of the perineum was completed between techniques. The staff were taught to apply a clean nappy with the sterile pad in place on the child. For UCPs at least 0.5 ml of urine was aspirated from the pad using a sterile 20 ml syringe on a sterile dressing pack, which was sent immediately for laboratory testing. Any sample visibly soiled with faeces was to be discarded and then replaced with a new sterile pad after re-preparing the perineum for further collection.

Nursing and medical staff were educated on how to teach parents about cleaning the perineum, minimal handling of the pad or specimen jar and hand washing. Parents were also asked to check the UCP every 10 min (without touching or contaminating the pad), and to then notify the nurse when wet. Otherwise the UCP was replaced every 30 min by nursing staff or until a sample was obtained.

Nursing and or medical staff were also to educate the parent/carer on a CCU sample. Parents/carers were to be educated to sit their child on their lap, on a clean drape without a nappy and then to catch the urine in mid-stream in the jar. Parents/carers were educated on not touching the interior surface of the sterile jar and not scooping up any urine that had spilled onto the drape. Lastly, nursing and or medical staff were to ask parents which technique (UCP or CCU) they preferred and the reasons why.

Data were analysed using IBM SPSS v17. Descriptive statistics were calculated using frequency and percentages, followed by comparisons of contamination rates between urine specimen collection methods using Fisher's exact and Mann-Whitney *U* test. Missing data were not used in the analyses.

Ethical approval

The study was approved by the Northern Sydney Central Coast Health Ethics Committee. The study conformed to the provisions of the Declaration of Helsinki. The ethical conduct of research was maintained during and after the research. A participant information leaflet was given to the parents, with clarification and explanation by staff before written consent was obtained. All data sources were de-identified for privacy and confidentiality. Data were stored in EXCEL as password protected files.

Results

The annual paediatric presentation to ED was 7023 and 18% were admitted, $n = 1264$. During the three month study the ED paediatric presentation rate was 1406 with 21.3% ($n = 299$)

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