Pain experienced by infants and toddlers at urine collection bag removal: A randomized, controlled, clinical trial

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Abstract

Background

In pre-continent children, collection bags are frequently used as a first-line option to obtain a urine specimen. This practice, acknowledged by several guidelines for the step of UTI screening, is driven by a perception of the technique as being more convenient and less painful. However, our own experience led us to consider bag removal as a painful experience.

Objective

Our aim was to determine whether the use of an oleo-calcareous liniment to aid bag removal reduced the acute pain expressed by young children.

Methods

This prospective, randomized, controlled, single blind study was carried out in two emergency pediatrics departments. Pre-continent children aged 0 to 36 months admitted with an indication for urine testing were eligible for the study. Urine for dipstick test screening was obtained using a collection bag. At micturition, the patients were randomized into bag removal with (intervention group) or without (control group) liniment. Bag removal was recorded on video in such a manner as to permit independent assessments of pain by two evaluators blinded to group allocation. Pain was assessed using the FLACC scale.

Findings

135 patients were analyzed: 70 in the intervention group and 65 in the control group. The median FLACC scores [interquartile range] for the intervention and control groups, respectively 4.0 [2.0–7.0] and 4.0 [3.0–7.0], did not differ significantly (p=0.5). A FLACC score ≥ 4 was obtained for 56% of the patients and a score ≥7 for 28%.

Conclusion

Removal of urine collection bags caused moderate to severe pain in half of the children included. The use of an oleo-calcareous liniment did not reduce this induced pain.

Key words: bag collection; pain; precontinent children; urineanalysis; urinary tract infection

What is already known about the topic?

- Urine bag collection is still widely used as a first-line option for UTI screening, in accordance with several guidelines.
- This technique is perceived as being more convenient, more economical and less painful than invasive methods.

What this paper adds:

- In pre-continent children, the use of an oleo-calcareous liniment at urine bag removal does not reduce the induced pain.
- During bag removal, pain is frequently clinically significant.
- The use of bags, based on the classic perception of their innocuousness, is invalidated.

Introduction

The collection of urine specimens from non-toilet-trained infants and toddlers ("pre-continent children" hereafter) is frequently indicated in general pediatrics and family medicine settings, particularly when a urinary tract infection (UTI) is suspected. Modalities of urine collection are a major issue in the diagnosis of UTI in pre-continent children (Tullus, 2011).

Several recommendations suggest that a bagged urine sample may be used for urinalysis if the diagnosis is subsequently confirmed by urine culture on a sample obtained through urethral catheterization (UC) or suprapubic aspiration (SPA) (McTaggart et al., 2015; Subcommittee on Urinary Tract Infection, 2011). Therefore, the use of urine collection bags as a first-line option for UTI screening remains frequent in different countries due to the ease of the technique and its perception by both care providers and parents as being less painful for young children (Liaw et al., 2000).

As in other centers (Lavelle et al., 2016), when we suspect a UTI, we first use bags to enable a dipstick test. If this is positive, we obtain a specimen via UC for a urine culture (Etoubleau et al., 2009). Based on our experience, removing a bag can be as painful as UC and this observation has also been confirmed in the literature (Guinaud et al., 2010; Liaw et al., 2000). This moved us to focus on limiting the pain experienced at bag removal. Several strategies are available to limit procedure-induced pain in children (Bailey and Trottier, 2016). Among them, the only anti-adhesive product available for children aged less than 30 months is an oleo-calcareous liniment (OCL, also called oiled-limestone liniment), i.e., a mixture of olive oil and limewater mostly used to cleanse and moisturize the skin of pre-continent children at diaper changes.

Thus, our objective with the present study was to evaluate the effectiveness of this liniment in reducing the expression of pain due to the removal of urine collection bags from pre-continent children.

The secondary objectives of our study were (i) to describe the level of pain induced by the removal of urine collection bags, and (ii) to evaluate the effect of sex, age and other confounding factors on recorded pain scores.

Patients and methods

Design and setting

The present work was a prospective, randomized, controlled, single-blind, superiority study carried out between August 2012 and September 2013 in two pediatric emergency departments (EDs) (about 23,000 patient visits annually in each ED).

Participants

Inclusion criteria were age between 0 and 36 months, an indication for bag urine specimen collection (suspicion of UTI, hematuria, ketonuria, etc.), and informed written consent from the parents.

Non-inclusion criteria were any history of urine collection bag removal (to avoid bias due to any similar previous pain experience), known allergic reaction to the bag or its adhesive, current diaper rash, current diarrhea, born prematurely (i.e. gestational age <37 weeks, due to more frequent pain exposure during the neonatal period in this population) or parental refusal.

Sample size

A previous pilot study had provided a mean FLACC score of 3.39 (standard deviation [SD] =2.97) for non-liniment-assisted bag removal (Guinaud et al., 2010, not peer reviewed). Using those data as a baseline and seeking to demonstrate a reduction of 1.5 points of the FLACC score with an α-risk of 5% and a β-risk of 20% (Mann–Whitney test), we determined

that each group of the present study would need 68 assessable pre-continent children (i.e. a total recruitment of 136), calculations done with Nquery Advisor v7.0, Stat Sols, Cork, Ireland.

Randomization procedure

Using Nquery Advisor v7.0, the allocation sequence for randomization to the intervention or control group was generated with a 1:1 ratio, a block size of four and stratification for center and sex.

Concealment was ensured by using sealed, opaque envelopes, which were in turn sent to the two participating centers where they were secured in locked cabinets. Once the inclusion was formalized, the nurse went to the cabinet and retrieved the upper-most envelope on the pile corresponding to the sex of the child.

Outcome measure

The main outcome was the FLACC score, a behavior-based tool for the proxy assessment of pain in non-verbal patients (Merkel et al., 1997). This scale can be used in children aged zero to three years (Crellin et al., 2017, 2015; Manworren and Hynan, 2003; Merkel et al., 1997; Welsh, 2016) for the evaluation of procedural pain (Crellin et al., 2018) and thus was used in this work as the primary pain evaluation criterion. FLACC provides a score ranging from 0 to 10, with 0 indicating a relaxed and comfortable patient, and three pain intensity categories as follows: 1 to 3 (mild discomfort), 4 to 6 (moderate pain), and 7 to 10 (severe pain) (Voepel-Lewis et al., 2002). The mean FLACC scores were compared between the intervention and control groups.

The collected data enabled additional complementary analyses on possible confounding factors such as analgesics use, parental presence and procedure duration, which are known to potentially influence pain evaluation (Bailey and Trottier, 2016).

Study procedure

Pre-continent children meeting the patient-specific inclusion criteria were fitted with a sterile urine collection bag (Urinocol Pediatric, B. Braun Medical SAS) as per clinical guidelines for the procedure. Concurrently, the parents were provided with written information on the study. They were given the time spent waiting for the obtainment of the urine specimen to make their decision as to the inclusion of their child in the study.

When the urine specimen was obtained and parental consent given, the infant was randomized into one of two groups:

- The intervention group where a compress impregnated with the OCL was used to aid the progressive removal of the bag, rubbing gently along the edge of the adhesive band to start and continue its detachment from the skin.

- The control group where the gesture described for the intervention group was imitated using a dry compress.

The bag was removed by one nurse per procedure indicated for the group to which the infant had been randomized, while a second nurse filmed the intervention. Except for the intervention or sham intervention, the procedure followed everyday practice in the participating centers. This entailed gentle and progressive removal of the bag in an infant ressasured and installed near his/her parents, beginning with a corner of the adhesive with the

help of a compress, the surrounding skin maintained by the other hand. No other pain relieving strategies were used. The framing was centered on the infant so as to film all bodily movements and facial expressions. At the completion of the removal procedure, the infant was released from the study. Thereafter, the films were anonymized and furthermore treated digitally to blur the area where the bag was being removed so that the nurses charged with evaluating the pain could not tell whether the liniment was being used or not.

Information collection and provision, patient inclusion, interventions and filming were all performed by 11 trained ED nurses in each center.

Recruitment was strictly consecutive with no working hour/day interruptions (EDs open 24 hours a day, 7 days a week).

The anonymized and digitally-treated videos, limited to the bag removal procedures, were analyzed by two registered nurses with specialized training in infant and childhood pain. They watched each video and completed the FLACC (face, legs, activity, cry, and consolability) scale (Merkel et al., 1997) independently before comparing their scores to establish a final pain score as follows:

- If the two scores were identical, that score was retained as the final pain score.
- If the two scores differed by less than three points, the two nurses first tried to reach consensus. If the two scores differed by three points or more or the nurses could not reach consensus, a disagreement procedure with a third specialist was in place.

The raters agreed in 93.4% of cases and all disagreements were moderate (1 point). Consequently, the need for a third video expertise was never encountered.

Statistical analyses

All statistical analyses were performed using SAS Enterprise Guide V5.1 (SAS Institute, Cary, USA). Statistical significance was set at $p<0.05$ for all analyses with the biostatistician

blinded to the treatment groups. The analyses were performed and presented as per the revised CONSORT 2010 Statement (Schulz et al., 2011). The Shapiro-Wilk test was used to test the normality of quantitative variables. Non-parametric tests were used to compare the FLACC scores between the two groups because they did not follow a normal distribution.

The FLACC scores assessed at bag removal in the two groups were compared using the Mann-Whitney U test on the unpaired data. Missing data were imputed with best-worse case method. FLACC scores were grouped (0-3, no pain/mild discomfort; 4-6, moderate pain; 7-10, severe pain). Mann-Whitney U tests were used to assess FLACC scores according to sex and age in the randomization groups. Comparisons of potential confounding factors according to the randomization groups were tested using a Mann-Whitney U test for procedure duration in seconds, and Chi-2 tests for non-opioid analgesic use, time between analgesic and bag removal (< or > 1 hour) and family presence at bag removal. The possible influence of confounding factors on the obtained FLACC scores was assessed by a ranked generalized linear model. The dependent variable was the ranked FLACC score and the explanatory variables were the randomization group, the considered confounding factor (procedure duration, non-opioid analgesics, time between analgesic and bag removal, family presence) and the interaction between the two.

Ethical considerations

The present study was approved by an ethics committee on 12 July 2012 (CPP-011/2012).

Results

We enrolled 141 pre-continent children in the study of whom 51% and 49% were randomized to the intervention and control group respectively. Mean age was 15.3 months and 65% were boys (Table1).

Table 1**.** Patient characteristics

	All patients n = 141	**Intervention group n = 72**	**Control group n = 69**
Age (years) - n (%)			
0 – 12 months	55 (39)	27 (37)	28 (41)
13 – 24 months	59 (42)	30 (42)	29 (42)
25 – 36 months	27 (19)	15 (21)	12 (17)
Mean (months (standard deviation))	15.3 (8.7)	16.1 (9.0)	14.4 (8.4)
Sex - n (%)			
Male	91 (65)	47 (65)	44 (64)
Female	50 (35)	25 (35)	25 (36)
Reason for consultation – n (%)			
UTI suspicion	120 (85)	61	59
Abdominal pain (nausea, vomiting)	18 (13)	11	7
Consciousness disorder	1 (0.7)	1	0
Not available	2 (1.4)	2 (3)	0 (0)

Six participants were excluded after randomization, leaving 70 children in the intervention group and 65 in the control group (Figure 1).

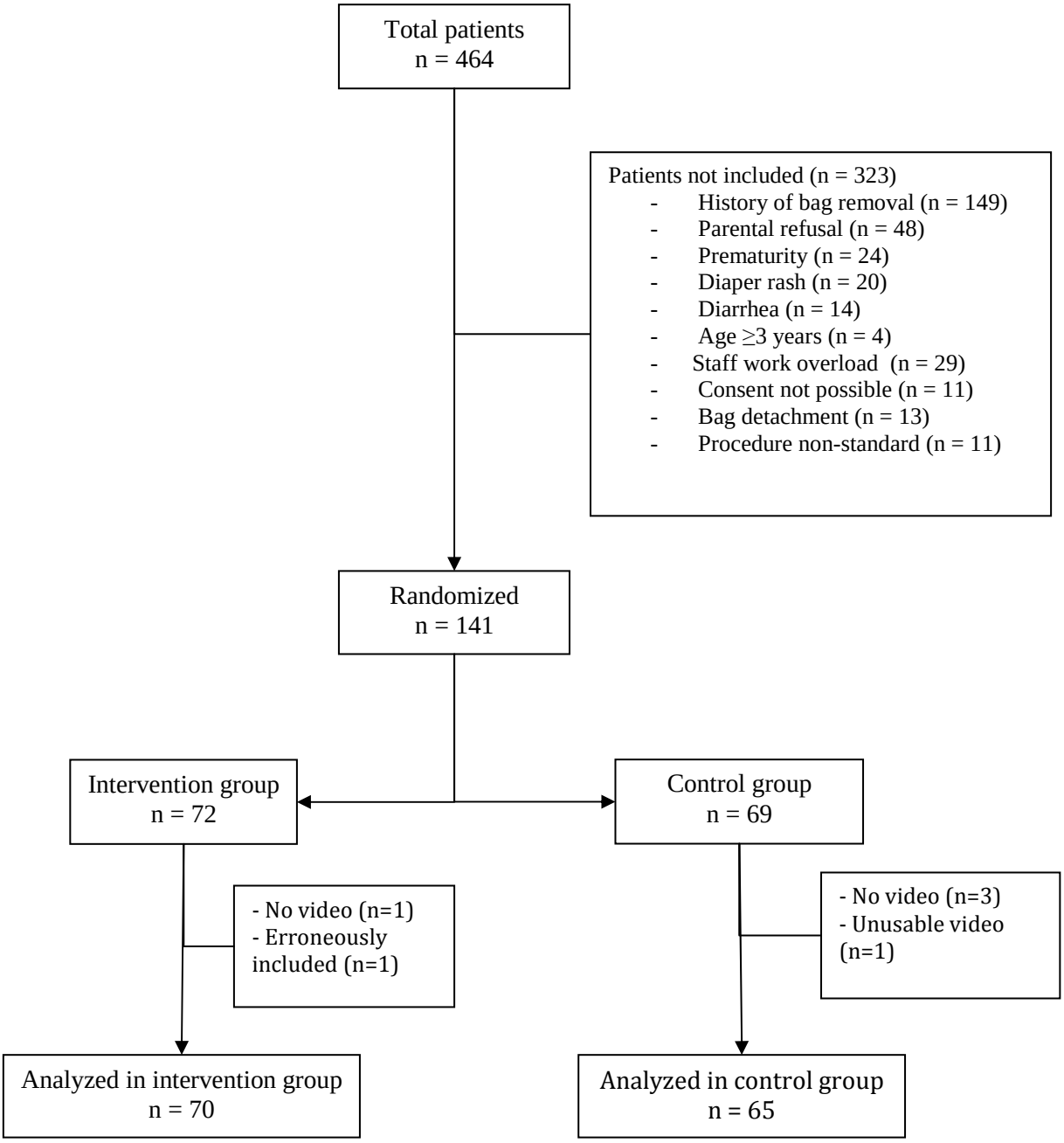

Figure 1. Flow diagram of enrollment

The median FLACC score at bag removal was 4.0 [IQR: 2.0–7.0], indicating moderate pain. For the intervention and control groups, the median FLACC scores were 4.00 [IQR: 2.0–7.0] and 4.0 [IQR: 3.0–7.0] respectively. There was no statistically significant difference between the two groups in neither per protocol or intention to treat analyses (Table 2).

Table 2**.** FLACC scores

	Intervention group G1	**Control group G2**	***P***
FLACC (median [interquartile range] (n))			
Complete cases (n=135)	4.0 [2.0 - 7.0] (70)	4.0 [3.0 - 7.0] (65)	*0.45**
Analysis with best-worst case imputation			
- G1 max, G2 min (n = 141)	4.0 [2.0 - 7.0] (72)	4.0 [1.0 - 7.0] (69)	*0.97**
- G1 min, G2 max (n = 141)	4.0 [3.0 - 8.0] (72)	4.0 [3.0 - 8.0] (69)	*0.12**

* The p-value presented is that of the Mann-Whitney U test

The distribution of FLACC scores showed that 43.7% experienced no or mild pain, 28.1% moderate pain and 28.1% severe pain. There were no significant sex (p=0.9 for male, p=0.2 for female) or age (p=0.6 for 0-12 months, p=0.2 for 13-24 months, p=0.6 for 25-36 months) differences between the groups.

Neither non-opioid analgesics, time between analgesics and bag removal, or family presence were significantly different between groups or had a significant influence on pain at bag removal. Procedure duration was significantly longer in the intervention group compared to the control group (Table 3).

Table 3. Potential effects of confounding factors on FLACC scores

	Total patients	**All patients**	**Intervention group**	**Control group**	**Comparability P-value ***	**Effect on FLACC scores P-value #**
Procedure duration (seconds) *Mean ± Sd*	**N = 135**	33.7 ± 24.4	38.5 ± 26.1	28.5 ± 21.5	0.02	0.2
Non-opioid analgesics *n (%)*	**N = 135**	81 (60.0)	43 (61.4)	38 (58.5)	0.72	0.6
Time between analgesics and bag removal > 1 hour *n (%)*	**N = 82**	62 (76.5)	31 (72.1)	31 (81.6)	0.32	0.5
Family presence *n (%)*	**N = 135**	92 (68.7)	47 (68.1)	45 (69.2)	0.89	0.2

* The p-value presented is that of the Mann-Whitney test for quantitative variables or that of the Chi^2 test for qualitative variables comparing the association between the variable and the randomization group.
# The p-value presented is the overall p-value of the glm model based on ranked FLACC scores with the randomization group, the potential confusion factor and the interaction between both variables.

No adverse events were observed during this study.

Discussion

We found that the removal of a urine collection bag from pre-continent children, aged 36 months or less, frequently causes moderate or severe pain, and that the use of OCL does not reduce that pain.

It seems unlikely to us that this negative result is related to the study design, which was conceived specifically to reduce biases due to proxy pain assessment (anonymized video recordings regionally blurred to hide the intervention, and double assessment by specialists blinded to group assignment).

In our study, the median FLACC score was 4 and the pain threshold, i.e. a score ≥4 (Voepel-Lewis et al., 2003), was crossed by more than 56% of our complete-case population. The low variability of the scores obtained in both groups further confirms the painful nature of urine collection bag removal, as does our observation that more than a fourth of our total patient

population was assessed as having "severe pain" (FLACC score ≥7). Consequently, we underline that urine collection bags should no longer be considered as pain-free for the child. Although we shed light on its existence, we did not compare the pain caused by urine bag removal to that caused by other methods used to collect urine specimens, notably the gold-standards of SPA and UC. Although pain has been reported to be higher in children undergoing SPA or UC (Kozer, 2006), a direct comparison with our results is problematic due to differences in study designs (video not always performed, variable video analysis strategies, variable pain assessment modalities).

Our study raises the question of whether or not to continue using urine collection bags in daily practice, even as a pre-testing technique before SPA or UC. Centers still using bags need to be made aware of the pain induced by their removal and other methods to reduce that pain (i.e. distraction, other local treatments) need to be proposed and assessed (Bailey and Trottier, 2016). Other anti-adhesive products do not appear to be a good option as they are not recommended for children aged less than 30 months, making them unavailable for urine bag removal.

Furthermore, urine collection bags present other limitations, the first of which is a very high rate of contaminated and false-positive results (Tullus, 2011). Thus, when the indication to use a collection bag is pre-testing before SPA or UC, it seems germane to us to consider other devices techniques. These may include urine collection pads, an easily-deployed method recommended in certain guidelines despite a high contamination rate (Mori et al., 2007), or recently described bladder stimulation techniques that enable the obtainment of a clean-catch urine specimen particularly in pre-continent children aged less than three months (Herreros Fernandez et al., 2012; Kaufman et al., 2017; Labrosse et al., 2016; Tran et al., 2016; Valleix-Leclerc et al., 2016). With the goal of reducing the overall duration and intrusiveness of urine sampling, another path to explore would be the validation of the association of

complementary pain reduction techniques with the gold-standard methods (SPA and UC) for urine sampling in pre-continent children (El-Naggar et al., 2010; Ghaffari et al., 2014; Kozer, 2006; Rogers et al., 2006). Such an approach would limit the sampling to one intervention, thus circumventing an accumulation of painful events.

There are still limits to our study. First, the lack of a placebo substance on the control group compresses could have caused operator bias, and the significantly longer procedure duration in the intervention group could have been picked up by the evaluators as an indication. Nevertheless, the "real placebo" option was not retained due to the impossibility of: (i) making a product similar to the liniment without antiadhesive properties, and (ii) performing a double-blind study with other products (such as saline). However, we did seek to minimize this bias as best we could when designing the study, notably via the use of video recording to blind the procedure before pain assessment. Secondly, the consensus method used by the two evaluators to obtain a unique FLACC score (instead of a mean score) can be considered a source of bias. However, discrepancies between the assessors were found in only 6.6% of the cases, and because they were always moderate (only one point discrepancies), they had no impact on final results. Thirdly, patients with chronic illness, therefore not naive to procedural pain, could have been included. Finally, we could not exclude that a more comprehensive pain management strategy could have led to a better pain reduction in included patients. At least, this study highlights the fact that isolated local pain relieving strategy is not effective enough when bag is removed.

Conclusion

The results of the present study showed that the use of an OCL did not reduce the pain induced by the removal of urine collection bags from pre-continent children. They did show however that the removal of the bag caused at least moderate pain in more than half of the

observed pre-continent children and severe pain more than a quarter of them. These results cast further doubt on the use of urine collection bags even as a pre-testing technique to potentially stave off suprapubic aspiration or urethral catheterization.

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References

Bailey, B., Trottier, E.D., 2016. Managing Pediatric Pain in the Emergency Department. Paediatr Drugs 18, 287–301. https://doi.org/10.1007/s40272-016-0181-5

Crellin, D.J., Harrison, D., Hutchinson, A., Schuster, T., Santamaria, N., Babl, F.E., 2017. Procedural Pain Scale Evaluation (PROPoSE) study: protocol for an evaluation of the psychometric properties of behavioural pain scales for the assessment of procedural pain in infants and children aged 6-42 months. BMJ Open 7, e016225. https://doi.org/10.1136/bmjopen-2017-016225

Crellin, D.J., Harrison, D., Santamaria, N., Babl, F.E., 2015. Systematic review of the Face, Legs, Activity, Cry and Consolability scale for assessing pain in infants and children: is it reliable, valid, and feasible for use? PAIN 156, 2132–2151. https://doi.org/10.1097/j.pain.0000000000000305

Crellin, D.J., Harrison, D., Santamaria, N., Huque, H., Babl, F.E., 2018. The Psychometric Properties of the FLACC Scale Used to Assess Procedural Pain. The Journal of Pain 19, 862–872. https://doi.org/10.1016/j.jpain.2018.02.013

El-Naggar, W., Yiu, A., Mohamed, A., Shah, V., Manley, J., McNamara, P., Taddio, A., 2010. Comparison of pain during two methods of urine collection in preterm infants. Pediatrics 125, 1224–9. https://doi.org/10.1542/peds.2009-3284

Etoubleau, C., Reveret, M., Brouet, D., Badier, I., Brosset, P., Fourcade, L., Bahans, C., Garnier, F., Blanc, P., Guigonis, V., 2009. Moving from Bag to Catheter for Urine Collection in Non-Toilet-Trained Children Suspected of Having Urinary Tract Infection: A Paired Comparison of Urine Cultures. The Journal of Pediatrics 154, 803–806.

Ghaffari, V., Fattahi, S., Taheri, M., Khademloo, M., Farhadi, R., Nakhshab, M., 2014. The comparison of pain caused by suprapubic aspiration and transurethral catheterization methods for sterile urine collection in neonates: a randomized controlled study. ScientificWorldJournal 2014, 946924. https://doi.org/10.1155/2014/946924

Guinaud, J., Lamy, C., Tahir, A., Gajdos, V., Guigonis, V., Blanc, P., 2010. Urine collection in non toilet trained children, is catheter always more painful than bag ? Pediatric Nephrology 25, 71.

Herreros Fernandez, M.L., Gonzalez Merino, N., Tagarro Garcia, A., Perez Seoane, B., de la Serna Martinez, M., Contreras Abad, M.T., Garcia-Pose, A., 2012. A new technique for fast and safe collection of urine in newborns. Archives of Disease in Childhood 98, 27–29.

Kaufman, J., Fitzpatrick, P., Tosif, S., Hopper, S.M., Donath, S.M., Bryant, P.A., Babl, F.E., 2017. Faster clean catch urine collection (Quick-Wee method) from infants: randomised controlled trial. BMJ j1341. https://doi.org/10.1136/bmj.j1341

Kozer, E., 2006. Pain in Infants Who Are Younger Than 2 Months During Suprapubic Aspiration and Transurethral Bladder Catheterization: A Randomized, Controlled Study. PEDIATRICS 118, e51–e56. https://doi.org/10.1542/peds.2005-2326

Labrosse, M., Levy, A., Autmizguine, J., Gravel, J., 2016. Evaluation of a New Strategy for Clean-Catch Urine in Infants. Pediatrics 138. https://doi.org/10.1542/peds.2016-0573

Lavelle, J.M., Blackstone, M.M., Funari, M.K., Roper, C., Lopez, P., Schast, A., Taylor, A.M., Voorhis, C.B., Henien, M., Shaw, K.N., 2016. Two-Step Process for ED UTI Screening in Febrile Young Children: Reducing Catheterization Rates. Pediatrics 138. https://doi.org/10.1542/peds.2015-3023

Liaw, L.C.., Nayar, D.M., Pedler, S.J., Coulthard, M.G., 2000. Home collection of urine for culture from infants by three methods: survey of parents' preferences and bacterial contamination rates. Bmj 320, 1312.

Manworren, R.C.B., Hynan, L.S., 2003. Clinical validation of FLACC: preverbal patient pain scale. Pediatr Nurs 29, 140–146.

McTaggart, S., Danchin, M., Ditchfield, M., Hewitt, I., Kausman, J., Kennedy, S., Trnka, P., Williams, G., Kidney Health Australia - Caring for Australasians with Renal Impairment, 2015. KHA-CARI guideline: Diagnosis and treatment of urinary tract infection in children. Nephrology (Carlton) 20, 55–60. https://doi.org/10.1111/nep.12349

Merkel, S.I., Voepel-Lewis, T., Shayevitz, J.R., Malviya, S., 1997. The FLACC: a behavioral scale for scoring postoperative pain in young children. Pediatr Nurs 23, 293–297.

Mori, R., Lakhanpaul, M., Verrier-Jones, K., 2007. Diagnosis and management of urinary tract infection in children: summary of NICE guidance. BMJ 335, 395–397. https://doi.org/10.1136/bmj.39286.700891.AD

Rogers, A.J., Greenwald, M.H., Deguzman, M.A., Kelley, M.E., Simon, H.K., 2006. A randomized, controlled trial of sucrose analgesia in infants younger than 90 days of age who require bladder catheterization in the pediatric emergency department. Acad Emerg Med 13, 617–622. https://doi.org/10.1197/j.aem.2006.01.026

Schulz, K.F., Altman, D.G., Moher, D., CONSORT Group, 2011. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. Int J Surg 9, 672–677. https://doi.org/10.1016/j.ijsu.2011.09.004

Subcommittee on Urinary Tract Infection, Steering Committee on Quality Improvement and Management, 2011. Urinary Tract Infection: Clinical Practice Guideline for the Diagnosis and Management of the Initial UTI in Febrile Infants and Children 2 to 24 Months. Pediatrics 128, 595–610.

Tran, A., Fortier, C., Giovannini-Chami, L., Demonchy, D., Caci, H., Desmontils, J., Montaudie-Dumas, I., Bensaïd, R., Haas, H., Berard, E., 2016. Evaluation of the Bladder Stimulation Technique to Collect Midstream Urine in Infants in a Pediatric Emergency Department. PloS One 11, e0152598. https://doi.org/10.1371/journal.pone.0152598

Tullus, K., 2011. Difficulties in diagnosing urinary tract infections in small children. Pediatric Nephrology 26, 1923–1926.

Valleix-Leclerc, M., Bahans, C., Tahir, A., Faubert, S., Fargeot, A., Abouchi, S., Dallocchio, A., Mussgnug, M., Guigonis, V., 2016. Prospective evaluation of a cutaneous stimulation technique to induce on-demand urination in non-toilet-trained infants. Archives de Pédiatrie 23, 815–819. https://doi.org/10.1016/j.arcped.2016.05.004

Voepel-Lewis, T., Merkel, S., Tait, A.R., Trzcinka, A., Malviya, S., 2002. The Reliability and Validity of the Face, Legs, Activity, Cry, Consolability Observational Tool as a Measure of Pain in Children with Cognitive Impairment: Anesthesia & Analgesia 95, 1224–1229. https://doi.org/10.1097/00000539-200211000-00020

Voepel-Lewis, T., Malviya S., Merkel S., Tait AR., 2003. Behavioral pain assessment and the Face, Legs, Activity, Cry and Consolability instrument. Expert Rev. Pharmacoeconomics Outcomes Res. 3(3), 317-325. https://dx.doi.org/10.1586/14737167.3.3.317

Welsh, J.T., 2016. Assessing Pain in the ED Including the Use of Pain Scales (Such as OSBD, FLACC, VRS, NRS, CRS, and Oucher). Current Emergency and Hospital Medicine Reports 4, 19–25. https://doi.org/10.1007/s40138-016-0091-4