



A two-day bladder diary for children: Is it enough?



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Summary

Introduction

A bladder diary (BD) is a simple and non-invasive method of evaluating people with lower urinary tract symptoms (LUTS). Recently, the ICCS recommended a 48-h daytime frequency and volume chart (which does not need to be recorded on 2 consecutive days) to evaluate lower urinary tract (LUT) dysfunction. However, some studies on adults have demonstrated that a minimum of 3 days is required. It is believed that, to date, there are no studies in the literature that compare a 2-day BD with a 3-day BD. The advantages of a BD over a shorter period of time are the simplicity and possible better parent compliance.

Objective

The aim of this study was to evaluate if a 2-day BD is statistically and clinically comparable to a 3-day BD.

Study design

A voiding diary was filled in over a 3-day period for 92 children (ages ranged from to 3–16 years, mean 7.9 ± 3.07) attending the present institution. By using the voiding diary, the following parameters were calculated: urination frequency, maximum and average volumes of urine (MVV and AVV) and fluid

intake. The diary considered the 2 days as the first and second days of the 3-day diary.

Results

Out of the 92 children, eight (8.7%) did not properly complete the diary. The sample predominantly comprised females ($n = 55$, 59.8%). No differences were seen between 2-day and 3-day bladder diaries regarding fluid intake, maximum and average voided volume. The sensitivity, specificity, positive and negative predictive values of the 2-day bladder diary for detecting frequency were 83.4%, 91.7%, 80% and 93.2%, and for low bladder capacity they were 97.2%, 90.9%, 99% and 88%, respectively (Table).

Discussion

In a 2006 document, the ICCS recommended that a bladder diary be kept for 3 days, but in new documentation (2014) there is a reference stating that 2 days are enough. Bladder capacity is an important parameter in evaluating LUTS. Using a 2-day BD, the data showed that only a small percentage of reduced bladder capacity diagnosis would be lost.

Conclusion

When using the 2-day diary, a 16% false negative rate for frequency should be expected. A 2-day bladder diary is sufficient to evaluate bladder capacity and fluid intake.

Table Comparison of 2-day and 3-day voiding diaries for the number of voids and low bladder capacity.

2-day voiding diary	3-day voiding diary					
	Higher number of voids (≥ 8 voids/day)			Low bladder capacity ($< 65\%$ of the expected bladder capacity)		
	Yes	No	Total	Yes	No	Total
Yes	20 (83.4%)	5 (8.3%)	25	70 (97.2%)	1 (9.1%)	71
No	4 (16.6%)	55 (91.7%)	59	2 (2.8%)	10 (90.9%)	12
Total	24	60	84	72	11	83

*Sample of 92 children. Missing value for number of voids, eight (8.7%); for bladder capacity, nine (9.7%).

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Introduction

A bladder diary (BD) is simple and non-invasive method of evaluating people with lower urinary tract symptoms (LUTS). It logs the time and volume of fluid intake (in ml) and the time and volume of urine output (in ml) [1]. Bladder diaries have evolved over time and address many issues that are important for the clinical evaluation of people with LUTS. According to the International Continence Society standardization: micturition charts register only urination times during the day; frequency volume (FV) charts log the time and volume of each urination; and bladder diaries register the time and volume of fluid intake, the time and volume of each urination, the presence of incontinence, and the time of LUTS [2]. Although the clinical history is of great importance when evaluating and managing children with LUTS, questionnaires are very subjective and are associated with memory bias; therefore, the symptoms may be under or overestimated [3,4]. Furthermore, there is a weak correlation between the diary and questionnaire data, which means that the symptoms should not be relied on when evaluating children with LUTS [4–7].

Despite diaries being routinely recommended, it is surprising that there are few publications regarding this subject for adults and even fewer for children. Recently, the International Children's Continence Society recommended a 48-h daytime frequency and volume chart (which does not need to be recorded on 2 consecutive days) to evaluate lower urinary tract (LUT) dysfunction [8]. Studies on adults that have evaluated a BD period ranging from 1 to 14 days [3,6,9–11] have demonstrated that a minimum of 3 days is required [12–16]. It is believed that, to date, there are no studies in the literature that compare a 2-day BD with a 3-day BD. The advantages of a BD over a shorter period of time are the simplicity and possible better parent compliance. The aim of the present study was to evaluate if a 2-day BD is statistically and clinically comparable to a 3-day BD.

Material and methods

Over a 3-day period, a voiding diary was completed for 92 children attending the present institution for lower urinary tract symptoms (LUTS). The population comprised children who were referred to the incontinence clinic and presented with daytime urinary symptoms and no neurological or anatomical alterations of the lower urinary tract. Exclusion criteria were diary illegibility and non-compliance over the 3-day period. The children's ages ranged from 3–16 years (mean 7.9 ± 3.07). By using the voiding diary, the following parameters were calculated: urination frequency, maximum and average volumes of urine (MVV and AVV, respectively) and fluid intake (in ml).

The diary was completed over 3 consecutive days, usually at weekends because all the children were of school age. At the first visit, all of the parents/guardians were instructed on how to complete the diary. Records had to be kept over 24 h for 3 sequential days, noting times and volume of urine for all urinations, and recording fluid intake (time, amount and type of fluid consumed). The 2-day diary resulted from

the first and second days of the 3-day diary. An increased urination frequency was considered to be an average of more than or equal to eight urinations. For the calculation of the expected bladder capacity (EBC) the formula $\text{Age} + 1 \times 30$ was used. A reduced bladder capacity was regarded to be any value $<65\%$ of the expected bladder capacity (not considering the first morning urine) [8].

Statistical analyses

All the statistical analyses were performed using a commercially available statistics program (SPSS Statistics for Windows, Version 17.0. Chicago: SPSS Inc). Probability values of <0.05 were considered statistically significant, and presented as mean \pm SD. To compare the averages between 2-day and 3-day BD the Wilcoxon test was used. Considering the 3-day diary as standard, the sensitivity, specificity, negative and positive predictive values of a 2-day diary were calculated for detecting low bladder capacity and increased voiding frequency.

Results

Out of 92 children, eight (8.7%) did not properly complete the diary. These children were excluded from the analysis, which compares the 2-day and 3-day BD. The sample predominantly comprised females ($n = 55, 59.8\%$). As shown in Table 1, there were no differences between 2-day and 3-day BD regarding fluid intake, MVV and AVV. However, there were a higher average number of urinations per day in the 2-day diary when compared to the 3-day diary (Table 1).

The comparison of clinical parameters that are diagnosed by the diary, such as frequency and low bladder capacity, are demonstrated in Table 2. Regarding the number of urinations, the 2-day BD was unable to detect 16.6% of the frequency and 2.8% of the low bladder capacity; this gave a false positive diagnosis of 8.3% and 9.1%, respectively. The sensitivity, specificity, positive and negative predictive values of the 2-day BD for detecting frequency were 83.4%, 91.7%, 80% and 93.2%, and for low bladder capacity they were 97.2%, 90.9%, 99% and 88%, respectively.

Table 1 Comparison of data between 2-day and 3-day bladder diary.

	2 days	3 days	P-value
	Mean \pm SD	Mean \pm SD	(first + second vs 3 days)
Number of voids/day	7.05 \pm 3.83	6.87 \pm 3.85	0.007
AVV (in ml) ^a	103.7 \pm 63.3	103.7 \pm 57.3	0.989
MVV (in ml) ^b	192.7 \pm 110.8	196.3 \pm 100.7	0.306
Fluid intake (in ml)	1233.4 \pm 511.7	1221.6 \pm 500.2	0.234

^a AVV = average voiding volume in ml.

^b MVV = maximum voided volume in ml (or maximum bladder capacity).

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