

Evaluation of a Mobile Voiding Diary for Pediatric Patients with Voiding Dysfunction: A Prospective Comparative Study

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Abbreviations and Acronyms

LUT = lower urinary tract

mVD = mobile voiding diary

pVD = paper voiding diary

VD = voiding diary

VIP = voiding improvement program

Webapp = Web based software application

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Purpose: One potential strategy for improving voiding diary completion rates and data quality is use of a mobile electronic format. We evaluated the acceptability and feasibility of mobile voiding diaries for patients with nonneurogenic lower urinary tract dysfunction, and compared mobile and paper voiding diaries.

Materials and Methods: We prospectively enrolled children presenting with daytime symptoms of lower urinary tract dysfunction between July 2012 and April 2013. We enrolled an initial cohort of patients who were provided a paper voiding diary and a subsequent cohort who were provided a mobile voiding diary. We conducted in person interviews and assessed completion rates and quality, comparing paper and mobile voiding diary groups.

Results: We enrolled 45 patients who received a paper voiding diary and 38 who received a mobile voiding diary. Completion rates were 78% for paper voiding diaries and 61% for mobile voiding diaries ($p = 0.10$). Data quality measures for patients completing paper vs mobile voiding diaries revealed a larger proportion (63% vs 52%) providing a full 5 days of data and a smaller proportion (20% vs 65%) with data gaps. However, the paper voiding diary also demonstrated a lower proportion (80% vs 100%) that was completely legible and a lower proportion (40% vs 65%) with completely prospective data entry.

Conclusions: The use of a mobile voiding diary was acceptable and feasible for our patients with lower urinary tract dysfunction, although completion rates were somewhat lower compared to paper voiding diaries. Data quality was not clearly better for either version. The mobile voiding diary format may offer data quality advantages for select groups but it did not display significant superiority when provided universally.

Key Words: defecation, lower urinary tract symptoms, mobile applications, urination

LOWER urinary tract dysfunction is one of the most common conditions seen at pediatric urology clinics. Although the exact prevalence of lower urinary tract dysfunction is difficult to determine, the prevalence of associated conditions including urinary incontinence and urgency ranges from 7.8% to 21.8% in school-age children.^{1–3}

Furthermore, urinary incontinence represents 40% of pediatric urology outpatient referrals.⁴ The treatments for patients with lower urinary tract dysfunction are largely behavioral, with standard recommendations involving assessment of elimination patterns via a combined bladder and bowel voiding diary. The voiding diary

has traditionally been viewed as an integral component of the evaluation and management of pediatric voiding issues.^{5–7} Data are usually recorded in a paper voiding diary format and are often incomplete, and the quality is usually poor.⁸

One potential method to achieve the goal of a complete, high quality VD for each patient is to incorporate the use of a software application to collect the data via a mobile device. Previous research regarding mobile technology for patient data tracking suggests it is a viable tool for influencing behavior change in conditions such as obesity.^{9,10} However, there have been no previous rigorous investigations evaluating the development and use of such tools for recording voiding habits in children. The aims of our study were to 1) develop a mobile voiding diary Web based software application, 2) evaluate the acceptability and feasibility of the mobile voiding diary for patients with nonneurogenic voiding dysfunction, and 3) compare the mobile voiding diary and the standard paper voiding diary.

METHODS

We conducted an institutional review board approved study of pediatric patients with nonneurogenic LUT dysfunction who were asked to fill out a VD as part of the initial evaluation. Using a pre/post design, we compared a cohort of patients who were provided a standard pVD before the clinic visit with a subsequent cohort who were provided a link to a mVD Webapp. Our primary outcome was diary completion rate. A power calculation revealed that we needed to enroll 38 patients in each group to detect a 30% difference in completion rates between the groups.

Development of mVD Webapp

In conjunction with software developers at our institution we designed a mVD Webapp for recording urinary and bowel habits (fig. 1). The application was programmed on a flexible software platform that allowed for use on any

mobile device with an Internet browser. After loading the Webapp onto a mobile device patients entered their voiding inputs in real time. These inputs were then automatically uploaded and stored on a secure research server in real time, and could be downloaded into a PDF file that was structurally similar to the pVD that clinicians at our institution are accustomed to reviewing.

Patient Population

Patients with nonneurogenic LUT dysfunction who are referred to the urology department at our institution are generally treated at the VIP clinic. More than 3,000 patients are evaluated yearly at the clinic, and each patient undergoes a standardized evaluation protocol that includes renal ultrasound, abdominal x-ray, measurement of urinary flow rate, measurement of post-void residual, and recording of bowel and bladder elimination habits in a pVD. The pVD is provided in a new patient packet that we ask families to complete before their visit. Families are specifically asked to fill out the pVD for a total of 5 days.

For this study we prospectively enrolled pediatric patients 4 to 17 years old presenting to the VIP clinic for the initial visit between July 2012 and April 2013. We excluded patients who were nonEnglish speaking, had no mobile Internet access, had a neurogenic cause of LUT dysfunction, were on intermittent catheterization, had an active urinary tract infection, had nighttime symptoms only or were never asked to fill out a diary. Families were provided with a parking coupon and a \$10 gift card for participation in the study.

Prospective Data Collection

We recruited patients and families who received a pVD and who met eligibility criteria by approaching them in person at their clinic visit. For those patients who provided consent to participate, we conducted in person interviews assessing the domains of VD completion rates, data quality, patient/parent attitudes toward the diary and access to the Internet at home. For a qualitative assessment we asked all participants open-ended questions, including, “How could we have made it easier for you and your family to fill out the voiding diary?” For this

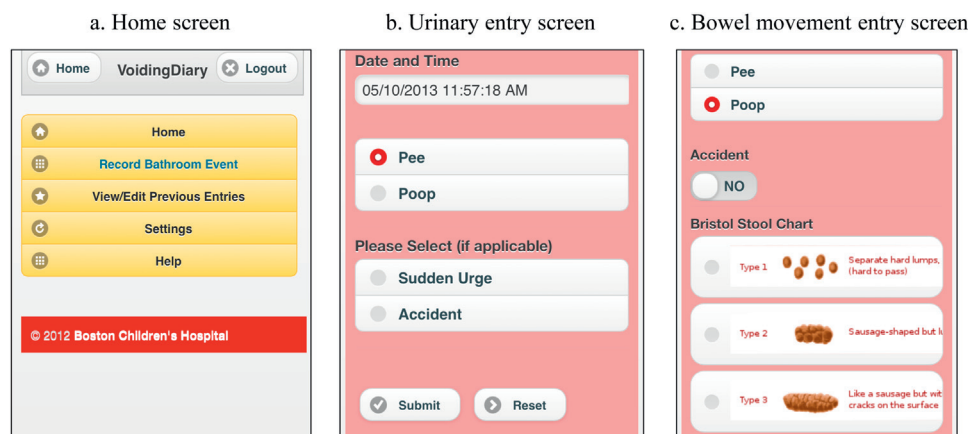


Figure 1. Mobile voiding diary

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