Usability Evaluation of Panda, a Smartphone Application Designed to Support Pediatric Post-Operative Pain Management at Home

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Introduction: The growing trend towards ambulatory surgery has shifted the burden of post-operative pain management from health care providers to families [1]. However, studies suggest that a child’s pain is often poorly managed at home [2-4]. Inadequate acute pain control can lead to slower functional recovery, poor oral intake, sleep disturbances and behavioural changes. It can contribute to post-traumatic stress disorder and chronic pain [5-7]. Support for parental decision-making, in the form of an accessible and user-friendly smartphone app, has the potential to reduce unnecessary and severe post-operative pain experienced by children: Panda is such an app, designed to aid parents in 1) the assessment of their child’s pain, 2) administering pain medications at appropriate times, and 3) tracking pain and medications given. The purpose of this study was to assess the usability of Panda with potential users to evaluate its ease of use and display of information.

Methods: With REB approval and informed consent, parents, nurses and adolescents were enrolled into the study. After watching a 2-minute tutorial video on how to use the app, the user was given a simulated scenario of managing a child’s post-operative pain. Usability issues were identified from observations while each user performed 4 tasks. Users were encouraged to ‘think aloud’ [8]. Written feedback and a Computer Systems Usability Questionnaire (CSUQ) [9] were completed. The Usability Problem Taxonomy (UPT) [10] was used to structure and code errors. Severity of each problem was graded on a 1 (low) to 4 (critical) scale.

Results: Twelve nurses, 13 parents, and 5 adolescents were recruited for 3 rounds of usability (n=30, 10 per round). The design team modified Panda, based on usability data, after each round. A total of 103 problems were identified and organized into 19 discrete usability issues, with a median (range) severity rating of 3 (1-3), or “serious”. These problems occurred mostly during the setup of medication alerts (33%), editing a given medication (16%), adding a new medication (13%), and safety checks for medication administration (10%). Most problems were classified as artifact issues (19 total) within the visual (53%), language (16%) and manipulation (16%) categories. Overall, users felt the app was usable, as shown by CSUQ median (range) score of 2 (1-4). Overall 67% (20) of users indicated that they would use Panda for management of their child’s post-operative pain.
Conclusion: Initial usability testing of the Panda app yielded usability issues mostly related to medication scheduling, recording and editing. The majority of these usability issues pertain to visual presentation, language within the app, and user manipulation of the interface. A feasibility trial in hospital is currently underway to assess how parents and their child interact with the app in a supervised, but safe, setting, in order to identify further usability issues and barriers that may hinder safe and effective use at home.


Figure 1: Flowchart of Panda App Pain Assessment and Medication Administration Functions. It illustrates the flow of a user’s response to an alert to perform a pain check and give medication through to their completion with a review of the documented values.