

## Introduction

In the US, approximately 700 women die annually from pregnancy-related complications in the first year after birth; a significant number occur after hospital discharge. Although postpartum monitoring is important, the standard practice is for one health care evaluation at six weeks post-birth. Patient factors (lack of knowledge of warning signs and nonadherence to medical regimens) are contributors to maternal mortality.

**Aim:** To develop a prototype of a mobile app aimed at increasing a new mother's ability to monitor her own health after childbirth.

## Methods

The design used mixed methods and procedures from human centered design in an iterative process.

New mothers were recruited in three groups from a hospital serving primarily low-income and underserved patients. Women were eligible to participate if they had delivered a live child within the past week, were 18 years or older, and spoke English. IRB approval was obtained.

The first group (n=5) were asked open ended questions about preferences for receiving health information. The second group (n=5) provided feedback on paper mockups of a smart phone app. Next, a prototype of the app was created. The third group (n=22) were asked to navigate a series of app screens with minimal instruction. Each mother was asked to describe her thoughts using a think-aloud technique. New mothers then completed the Mobile App Rating Scale (MARS; range of scores 1(low) to 5 (high)), including predictions of how the app would change their health seeking behavior. Transcripts were reviewed for overarching themes with emphasis on suggested changes.

## Results

### Mobile Application Rating Scale (MARS) and Subscale Scores of the m0m.io App (n=22)

	Mean (SD)	Median (IQR)
Total Objective Quality	4.4 (0.31)	4.4 (4.2, 4.7)
<i>Subscales</i>		
Engagement	4.4 (0.36)	4.4 (4.2, 4.8)
Functionality	4.8 (0.39)	5.0 (4.5, 5.0)
Aesthetics	4.2 (0.50)	4.0 (4.0, 4.7)
Information	4.2 (0.44)	4.1 (3.7, 4.3)
Subjective Quality	3.9 (0.72)	8.9 (3.3, 4.5)
<i>Individual items</i>		
Recommend app to others	4.8 (0.39)	5.0 (5.0, 5.0)
How often would you use app in next 12 months	4.2 (1.01)	5.0 (3.0, 5.0)
Pay for app	2.8 (1.74)	3.0 (1.0, 5.0)
Overall star rating of app	3.8 (0.87)	3.3 (3.0, 5.0)
<i>App-specific</i>		
Awareness	4.9 (0.32)	5.0 (5.0, 5.0)
Knowledge	4.8 (0.59)	5.0 (5.0, 5.0)
Attitudes	4.8 (0.59)	5.0 (5.0, 5.0)
Intention to change	4.9 (0.43)	5.0 (5.0, 5.0)
Help seeking	4.9 (0.43)	5.0 (5.0, 5.0)
Behavior change	4.9 (0.43)	5.0 (5.0, 5.0)

Table 1

### Themes with Exemplar Quotes from Each Group of Mothers

Group 1-Preference for Receiving Health Information (N=5)	Group 2- Feedback paper mockups of smart phone app (N=5)	Group 3- Interact with prototype (N=22)
Theme 1: Women preferred electronic health education.	Theme 1: Women felt that the layout facilitated use of the app.	Theme 1: Women reported an overall positive response to the app prototype.
Theme 2: Women used mobile apps to monitor their pregnancies.	Theme 2: Women liked the everyday check in feature.	Theme 2: Women liked that they could interact with their provider through the app.
Theme 3: Online searches can provide inconsistent/unreliable information.	Theme 3: Women endorsed the feature that allowed communication with their doctor.	Theme 3: Women reported the information provided on the app was important and appropriate.
	Theme 4: Women provided some suggestions to improve the app mockup.	Theme 4: Women provided some suggestions to improve the app.

Table 2

Themes from the first qualitative interviews indicated that women preferred electronic health education, and that they used mobile apps to monitor their pregnancies. The second group of new mothers described their overall reaction to the proposed features of the app, emphasizing candid opinions about what they liked and missing features. This feedback was incorporated into the design of the prototype that was tested by the third group of new mothers who were positive about interactions with the prototype app. (Table 1)

The MARS quality score for the mobile app was 4.4 (SD=0.31) and all four subscales had mean scores greater than 4. The subjective quality mean score was 3.9 (SD=0.72). The individual subjective item with the lowest mean score was, "Would you pay for this app?" with a mean of 2.8 (SD=1.74). The average overall star rating of the app was 3.8 stars (SD=0.87). All app-specific items had mean ratings of 4.8 or higher (range 4.8 to 4.9). (Table 2)

## Conclusions

New mothers indicated that they would be willing to use a mobile app to monitor their own health after childbirth. Such an evidence-based app is currently unavailable.

Analysis of qualitative data provided features of an app that women preferred and would use.

Feedback on an initial prototype of the smart phone app was positive and provided guidance for further testing in a clinical trial.



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