



# Development of a Proof-of-Concept Mobile Pain Assessment Application for En Route Patient Care



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## INTRODUCTION

Throughout en route care (ERC), pain may become an issue during packing of the patient, ground transport, patient on- and off-loading, and in flight, where the stresses of flight may intensify an existing injury (Figure 1). The austerity of ERC limits opportunities to assess and provide adequate interventions for acute pain relief. Missed periods of elevated patient pain and a lack of standard mechanisms for electronic medical documentation are detrimental to astute decision support during ERC.



Figure 1: ERC patient care (photo taken by FHE team member)

A mobile pain application (app) for ERC would enable electronic documentation of acute pain scores, location, and history; allow patients to record their own pain data, and to partially self-manage their plan of care; promote opportunities for the providers to focus on other mission priorities; provide pain education to the user; and incorporate additional functionality, such as multimodal pain interventions, both non-pharmacological and supplementation to their existing pharmacological plan. The aims of this study are: 1) create an app capable of routinely tracking patient acute pain data, provide patients with pain management education, and identify evidence-based recommendations for pain management interventions; and 2) validate app by designing for specific human factors requirements, obtain expert feedback using the Delphi method, and perform system usability testing.

## CURRENT PRACTICE

Currently, patients do not self-document pain scores. Clinicians are to use the DoD and U.S. Department of Veterans Affairs (VA) Pain Rating Scale (Figure 2) (AFI 48-307, Volume 3) and document on the 3899 Patient Movement Record (Figure 3).

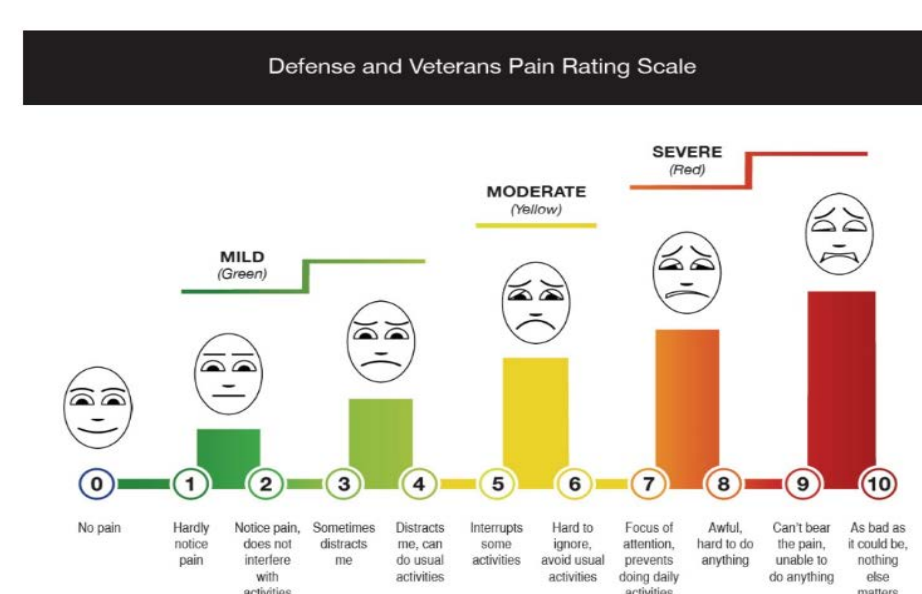


Figure 2: Defense and Veterans Pain Rating Scale (AFI48-307V3)

Figure 3: 3899 Patient Movement Record

## METHODOLOGY

A multi-phased approach was used to develop an interactive, mobile pain assessment app for ERC. Following a market review of current pain management apps, feedback was garnered from subject matter experts (SMEs) to assess user requirements and influence the development of graphical user interface (GUI) templates in Excel to establish the baseline content and flow of the app. The Delphi method was used to provide structured feedback on the various aspects of the app from an interdisciplinary team of five SMEs encompassing anesthesiology, industrial and human factors engineering, flight nursing, patient staging, and bioinformatics. The Delphi method provides structured, anonymous consultations from a panel of SMEs using a series of 3-5 iterative rounds, with 5 rounds being targeted for this study. Round 1 consisted of a questionnaire providing background information about the study and broad questions about the storyboard design. Each round thereafter will be built off previous questions and responses.

## RESULTS

Using the GUI templates in Excel (Figure 4), the National Center for Telehealth & Technology (T2) Defense Health Agency developed a proof-of-concept web-based app which was demonstrated on both iOS and Android products. Round 1 of SME feedback has been completed and findings from round 1 were submitted to T2 for additional updates to the app. Round 1 SME feedback included information about the following aspects of the app: essential components and features, recommended improvements, and implementing the app in an ERC environment.

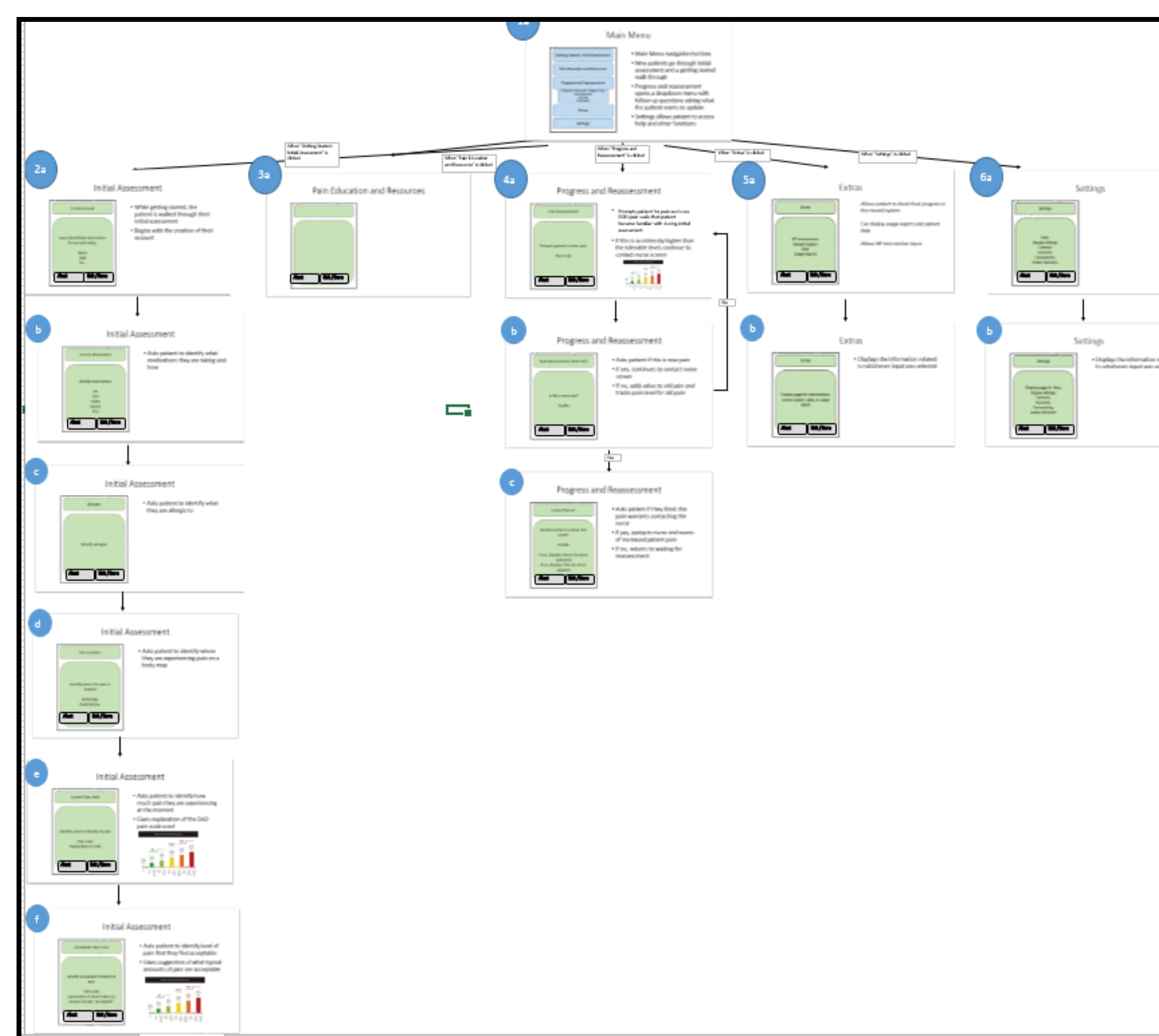


Figure 4: Storyboard of app (developed by FHE research team)

## FUTURE PRACTICE

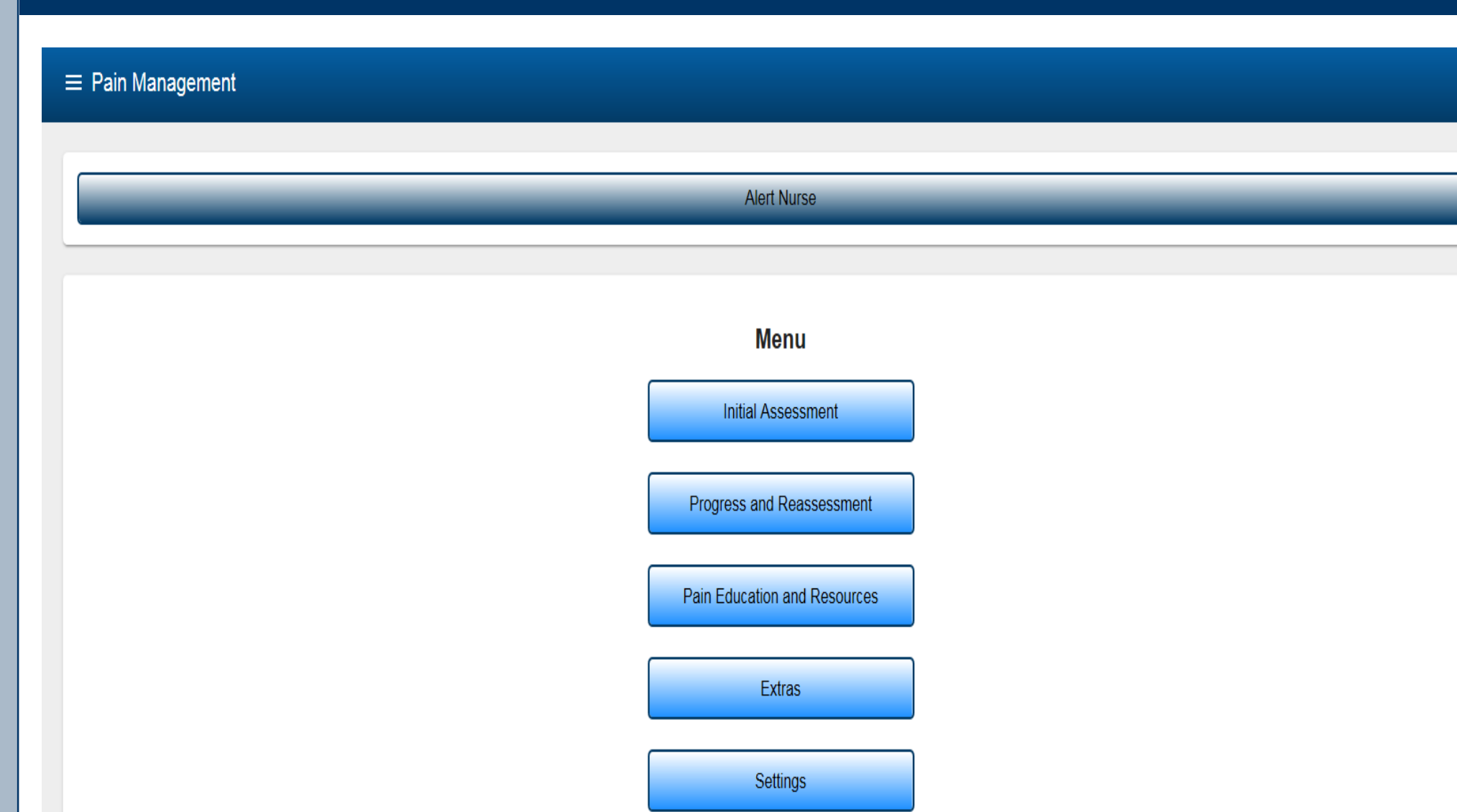


Figure 5: Main menu of app

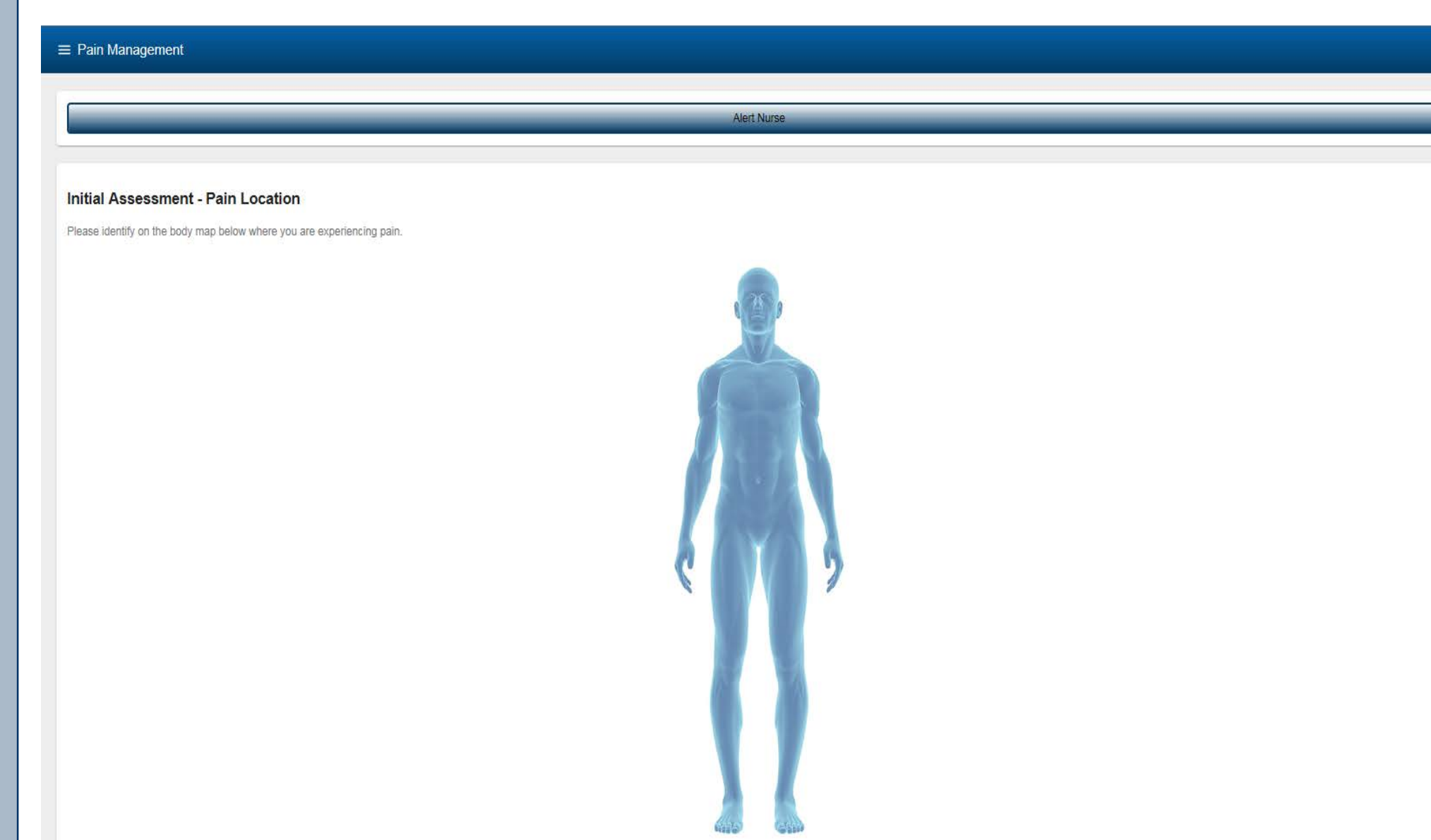


Figure 6: Initial pain assessment body man



Figure 7: Settings page in app

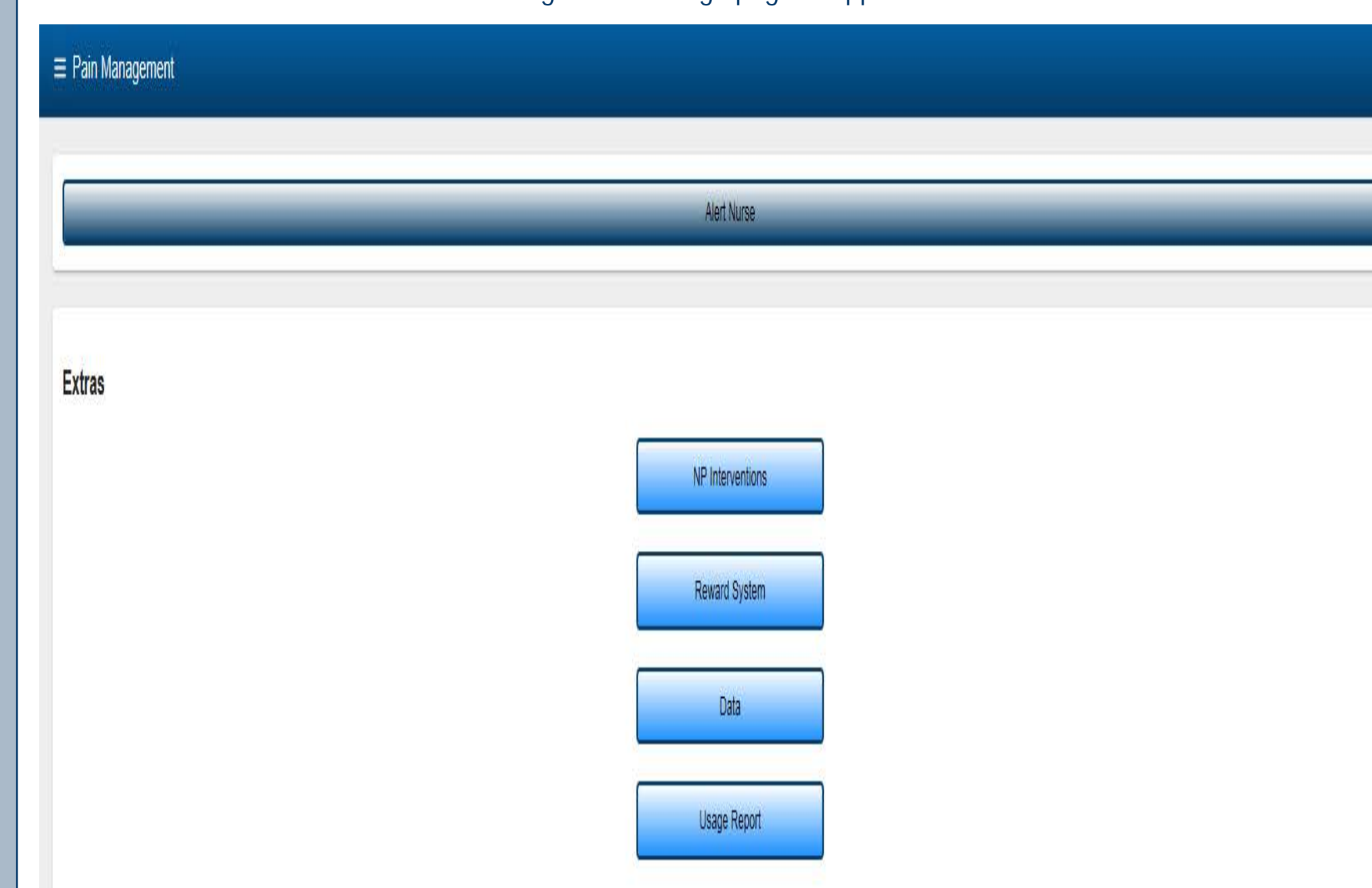


Figure 8: Extras page in app

## DISCUSSION

The creation of this proof-of-concept app provides the foundation for a finalized acute pain app capable of providing ERC patients pain management education and recommendations for how they can self-manage pain while enabling electronic documentation. An interactive and user-friendly app will enable patients to self-assess their pain and have an active role in their pain management while promoting non-pharmacological pain interventions. Enabling self-assessment and documentation will help providers more effectively manage pain in the ERC environment.

## FUTURE WORK

Future rounds of questionnaires will continue to be distributed to the SMEs. The Delphi panel will provide all applicable feedback, ensuring the app meets or exceeds current standard criteria set for this technology and is as informative and beneficial to the user as possible. The proof-of-concept will later be converted into a fully functioning valid application using mobile devices such as tablets or smartphones. In the future, further iterations and changes to the application will be made to provide improved and up-to-date care for the wounded traveling through this system. However, before the utilization of the pain app in-flight and in the whole ERC process, preliminary simulation and in-flight testing will need to take place. Future research investigating non-pharmacologic interventions, education for patients, and reward systems for users is needed to improve the usability and functionality of the app for ERC.

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