Database design, game development, step counter evaluations, and integration for hematopoietic stem cell transplant patients

Shannon Cerbas, MSN, RN; Arpad Kelemen, PhD; Barbara Van de Castle, DNP; Yulan Liang, PhD; Cecilia sik-Lanyi, PhD; Gergo Laszlo Proszenyak, BS; and Adrian Arvai, BS

Fatigue is a commonly reported symptom for cancer patients receiving a hematopoietic stem cell transplant (HSCT). Physical activity (PA) has been shown to decrease fatigue in this population. Unfortunately, adherence to recommended levels of PA is low in cancer patients. A PA mobile app called Walking Warrior (WW) was designed and developed for this patient population. The use of mobile device apps promoting fitness may be helpful in increasing PA. WW was prototyped and upgraded before public release. Specific Aims: 1) ideate, design, and develop WW game; 2) design and develop a secure online mySQL relational database for gameplay and walking performance tracking; 3) open-source step counter testing and modification; 4) game evaluation, upgrades and bug fixes; 5) develop secure communication software among WW, step counter, and database; 6) obtain Institutional Review Board (IRB) approvals from Johns Hopkins University and University of Maryland; and 7) determine usability of WW with a patient sample. Methods: We designed, coded and prototyped a puzzle game in Javascript to entertain and educate patients about their condition which is playable on any modern browser. We developed MySQL relational database and stored it on a server. Authorized users can view database fields including userID, user name, tokens available to play more, total steps taken, account created date and time, last record updated date and time, total game score, and highest game level played. The database was tested and was determined that it works properly. Twelve nursing informatics professionals tested four open source step counter software and provided qualitative and quantitative reports. Aggregated responses are considered for software selection and code was modified for patient use. Nineteen nursing informatics professionals tested the WW game and provided qualitative reports on recommendations for improvement including perception on appropriate difficulty levels, perception on usability, and itemized bugs reports. Three programmers make corrections based on recommendations. Secure communication software among WW, step counter and database was completed. IRB approval was obtained from JHU and is pending with UMB. Twenty patients will play the game that will prompt them to walk and earn tokens to allow them additional game play. We will collect their game play and walking performance on the server. At the end of the study, patients will complete a usability survey about WW. Significance: Having an online database that is seamlessly integrated with a mobile health game and step counter allows future data collection that can be used for research on PA in the population of users. Integration of a step counter with WW is vital because it is the tool that tracks the user's PA. Our current efforts further improve game design and usability to better meet the needs of the HSCT patient population.