Methodology for user and user's life centered clinical evaluation of assistive technology (ULCEAT): Evaluation with prototype Roboticbed®

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1. Introduction

Assistive technologies (ATs) have been developed and put into practical use in order to support elderly and disabled individuals to lead a better life. The evaluation of such technologies is a critical component of the AT research and development process that links engineers and clinicians to individuals with disabilities. Many methodologies, tools for evaluating existing and commercialized ATs are known to exist. However, not much evidence is available regarding clinical evaluation of prototypes and newly invented ATs. Therefore, a prior evaluation involving the identification of both target users and effectiveness-of-use environments is required.

In this paper, we propose a methodology for a user and user's life centered clinical evaluation of AT (ULCEAT). We discuss our methodology (i.e., evaluation by rehabilitation professionals and users) and demonstrate it by using it to clinically evaluate Roboticbed, which was developed by the Panasonic Corporation.

2. Purpose

The purpose of this study is to develop a new methodology for the addition of user and user's life centered clinical evaluation of assistive technologies (ULCEAT) to conventional evaluation methods. The proposed ULCEAT methodology consists of two steps: evaluation by rehabilitation professionals and evaluation by potential users. These evaluations were performed to identify target users and to ensure the effective

use of new assistive technologies (ATs); the evaluations were based primarily on qualitative research involving the rehabilitation professionals and the potential users.

3. Case study: Use of the Roboticbed for transfer and mobility

The ULCEAT was demonstrated by using it for the clinical evaluation of Roboticbed, which was developed by the Panasonic Corporation. The participants in Step1 were five rehabilitation professionals and the participants in Step2 were five potential users. The experiment in Step 1 and Step2 involved two stages: observation and interview. Analysis of the interview results was based upon the KJ method.

The experiment of Step1 revealed three potential user types, individuals hoping to enhance their autonomy, individuals who often need to move from their bed to a wheelchair, and individuals requiring functional recovery training. And the results of Step 2 pertaining to the use environment (which, participants indicated, was an indoor barrier-free environment) and the means of use for Roboticbed.

4. Validity of ULCEAT methodology

In order to validate the ULCEAT methodology discussed above, we conducted evaluations with the users identified in Step1 by using the experimental environment from Step 2. The participants were six people with disabilities. The experiment consisted of two steps: observation of actions and delivery of a questionnaire. The results of the experimental environment evaluation showed that all the participants were able to conduct each task either independently or with support. These results implied the verification of the first hypothesis about the validity of ULCEAT.

5. Discussion

The proposed ULCEAT methodology consists of two steps: evaluation by rehabilitation professionals and evaluation by potential users. The results of Step 1 suggested three types of target users, and the results of Step 2 showed the effectiveness of use and the effective use environments of Roboticbed. These findings may be used to define target users and experimental conditions for conventional AT-evaluation methodologies, including user evaluation under experimental conditions and user evaluation in a real-life environment. Because such evaluations are usually carried out by specific organizations or by AT developers, differing evaluation environments, assumptions, and evaluation batteries had been previously used. In addition, some evaluations have not ensured suitability of conditions or users. To help define appropriate target users, uses by user type, and use environments, we combine Steps 1

and 2. From step 1, we can identify target users and appropriate uses, and from Step 2, we can establish use environment. The combination of these two steps provides an evaluator-independent tool and suitable setting for the evaluation of new ATs. We therefore believe that this ULCEAT methodology is effective for clinical evaluation.

6. Conclusion

The purpose of this study was to develop the ULCEAT methodology for the clinical evaluation of novel and prototype ATs. The ULCEAT methodology we propose consists of two steps: evaluation by rehabilitation professionals and evaluation by potential users.

Evaluation is mainly based on qualitative research assisted by rehabilitation professionals and users. Our proposed methodology was confirmed through clinical evaluation of Panasonic's Roboticbed. From our results, three types of users were identified, and their ability to effectively use Roboticbed was confirmed. The results also demonstrated the utility of evaluation by rehabilitation professionals and potential users of the ULCEAT methodology. Therefore, we conclude that this evaluation method is implied for the conventional evaluation of ATs.