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Adoption of Speech Recognition Technology in Community Healthcare Nursing

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Abstract. Adoption of new health information technology is shown to be challenging. However, the degree to which new technology will be adopted can be predicted by measures of usefulness and ease of use. In this work these key determining factors are focused on for design of a wound documentation tool. In the context of wound care at home, consistent with evidence in the literature from similar settings, use of Speech Recognition Technology (SRT) for patient documentation has shown promise. To achieve a user-centred design, the results from a conducted ethnographic fieldwork are used to inform SRT features; furthermore, exploratory prototyping is used to collect feedback about the wound documentation tool from home care nurses. During this study, measures developed for healthcare applications of the Technology Acceptance Model will be used, to identify SRT features that improve usefulness (e.g. increased accuracy, saving time) or ease of use (e.g. lowering mental/physical effort, easy to remember tasks). The identified features will be used to create a low fidelity prototype that will be evaluated in future experiments.

Keywords. Nursing informatics, speech-recognition, wearables, wound care, prototyping, user-centered design

1. Background

The prevalence of chronic wounds is estimated to be between 26% to 35.5% in Canada [1]. In Canada, it is estimated that 15% of all patients with diabetes will a develop foot ulcer in their lifetime; concerning as 85% of amputations are the result of a non-healing foot ulcers [2-3]. Health Information Technology (HIT) is proven to benefit and improve the nursing practice of home care nurses who visit patients with wounds [4]. However, adoption rates of HIT has varied [5]. In the province of British Columbia, Canada, a wound documentation system has been implemented and used for number of years now which makes it a fit candidate to study technology adoption [6]. However, it has been found that nurses have not fully adopted the system and developed workarounds to the system limitations.

In our initial fieldwork it was found that the main challenges are related to usefulness and ease of use; these align with our clinical experience and findings in similar settings [6, 7]. Such system issues include: inconsistent access at the patient

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bedside; mismatch of data entry requirements and data needs of the nurses; unnecessary alerts and reminders; and unclear communication methods.

Based on the initial observations, the current wound documentation system is not being fully adopted during the home visits. As such, nurses often review all patient wound records in the morning prior to leaving for home visits to get the most recent patient data. Nurses are then unable to update wound profiles until after completing all patient visits, at the end of their shift. As the system was not being accessed by nurses during home visits, there is a gap between the point of care and point of documentation, resulting in loss of information and communication breakdown, ultimately impacting quality of care. This is consistent with other findings in the acute care setting [6]. To work around these system limitations, nurses use other means and workarounds to be able to get their job done and attempt to mitigate this gap between care and documentation.

Speech recognition technology (SRT) provides a possible solution. By facilitating the automated capture of patient data and its transcription into the health information systems, SRT can change and support communication [8]. Benefits of SRT for nursing includes timely capture and accessibility of verbal data, information loss avoidance, and a decrease in misinterpreted patient information [8]. However, the full benefits of this technology may be unrealized yet as early studies have been marred with software failure, voice transcription inaccuracy, equipment variability, unstructured educational approaches, and nurse skepticism [8-10].

2. Purpose

To investigate adoption of SRT using community wound care nursing as a case study.

3. Objectives

To achieve the proposed purpose, the project team, comprised of graduate students in engineering and nursing, will work collaboratively and leverage each other's complementary technical and content expertise. Our specific objectives are as follows:

1) To use community healthcare nurses' participation in designing a wound documentation prototype that is practical for point of care use.
2) To develop a mobile prototype with SRT to support point of care wound documentation for community healthcare nurses informed by objective 1.
3) To evaluate the developed prototype in simulated experiments.

4. Participatory design and development sessions

Recruited participants would be community healthcare nurses who visit patients with wounds receiving care in their home. The authors have existing relationships among this population in Vancouver, British Columbia, which will facilitate recruitment. Our design approach will centre around eliciting the daily clinical documentation needs at the point of care. This will be coupled with rapid prototyping. In the participatory design sessions, non/minimally-functional prototypes will be designed rapidly until the

features of the prototype seems to be reasonably practical with regards to the users' perspective and in line with the design principles followed by the designer.

5. The prototype

A prototype will be developed after the participatory design to use SRT in documentation of data elements that are identified as key to the nurses' practice in the initial fieldwork. Appendix A exhibits a preliminary design for the prototype, and the developed back-end infrastructure that will be used.

6. Evaluation plan

We will conduct experiments using patient scenarios that simulate home visits by nurses. There will be two groups of patient scenarios, first is a scenario in which the nurse is expected to make changes to the wound care plan within the duration of the experiment session. The second is a scenario in which the nurse is expected to not to make changes to the wound care plan within the duration of the experiment session.

Evaluation will aim to identify the effects of SRT on adoption of wound documentation systems in home care nursing. A mix of qualitative and quantitative data will be collected. For the qualitative data the Think Aloud protocol will be used to collect verbalizations of the users while they are in the experiment session [11]. The data will be coded topically and analyzed thematically to identify issues related to usefulness and ease of use [6]. Quantitative data will be collected using the instruments developed to measure technology adoption [6].

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7. APPENDIX A.

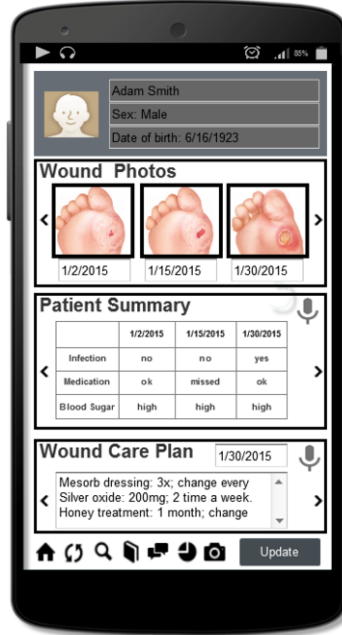Preliminary Design and the Back-End Infrastructure.
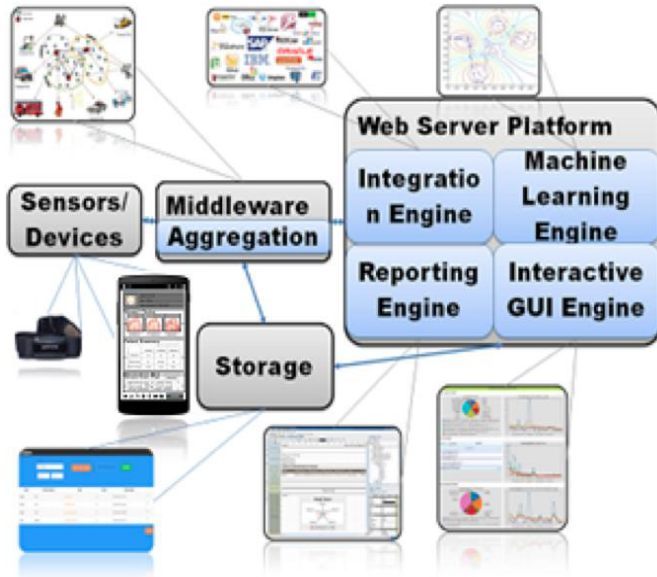

Figure 1. Preliminary design of a wound documentation prototype.

Figure 2. The developed back-end infrastructure.