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Conference Abstract

Case-load simulation using home telemonitoring data of heart failure patients to assess the impact of new sensor technologies and alerting algorithms on the decision making of healthcare professionals

Illapha G.L. Cuba Gyllensten, *Philips Research, Netherlands, The Technical University Eindhoven, Eindhoven, The Netherlands*

Kevin M. Goode, *University of Hull, Kingston-Upon-Hull, United Kingdom*

Alberto G. Bonomi, *Philips Research, The Netherlands*

Jennifer Caffarel, *Philips Research, The Netherlands*

Oliver Amft, *Technical University Eindhoven, Eindhoven, The Netherlands*

Correspondence to: ***Illapha G.L. Cuba Gyllensten,*** *Philips Research, Netherlands, The Technical University Eindhoven, Eindhoven, The Netherlands, E-mail: illapha.cuba.gyllensten@philips.com*

Abstract

Introduction: Novel physiological sensors combined with improved alerting algorithms may give more accurate and timely indications of worsening heart failure (HF) in a telehealth setting, than can be achieved with more traditional sensors and algorithms. An assessment of the benefit of introducing new sensors and algorithms on a healthcare professional's workload or indeed their willingness to alter workload patterns to accommodate them might be advantageous before evaluating end-benefits through large and costly randomized controlled trials.

Aims and Objectives: To develop experimental simulations of HF patient case-loads in a telehealth setting. To use these simulations to determine whether new sensor data and more sophisticated alerting algorithms can improve healthcare professional workload and to establish the level of confidence in the alerts generated.

Methods: (Study Design): Data collected from remotely monitored HF patients will be used to create a simulation of a telehealth user interface. The data comprises daily weight, transthoracic bioimpedance, blood pressure, heart rate and symptoms from 91 HF patients monitored for an average of 10.5 months. Three virtual patient case-loads will be generated and presented to healthcare professionals with knowledge or experience of telehealth implementation. The first case-load will be based on weight monitoring with alerts generated according to current guidelines (e.g. 3lb in one-day); the second based on weight with a more sophisticated trend alert algorithms; and the third based on additional sensor information (e.g. transthoracic bioimpedance) combined with more sophisticated algorithms. The case-load data will be presented to the participants via an emulated telehealth user interface that displays patient alerts as well as sensor data and clinical data for each patient. Each participant will be asked to review the alerts generated within each virtual case-load over a simulated number of weeks/months. For each case-load the time spent by

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the volunteer reviewing cases; how early they decide on an intervention for each patient and whether they agree with an alert will be automatically logged. The participants will be given the option to further review symptom data if there is a suspicion of deterioration in clinical status. The study aims to recruit 10 volunteers in each case-load arm and is powered to detect changes in total workload and decision accuracy.

Results: Data will be presented on the differences in time spent evaluating the patients, the difference in how early a decompensation event was indicated by the healthcare profession and the differences in the level of confidence of the alerts for each of the virtual case-loads.

Conclusion: The use of recorded data to simulate a telehealth HF patient case-load may enable the rapid testing and assessment of novel sensor data and alerting algorithms prior to deployment in a live system. The presented study design provides a tool to detect benefits and possible barriers to the deployment of new sensor technologies and an evaluation of the alarm performance in a realistic clinical setting.

Keywords:

telehealth, barriers, mainstreaming, action research

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