Recap Symposium
Intelligent systems supporting decision-making

Telehealth for patients with heart failure:
A comparison between telehealth systems


April 9, 2014

© Health Technology Park
Outline

- Introduction
- Recap project - Hub 3
- Data description
- Data analysis
- Results
- Conclusions and future work
Introduction

- 26 million people with HF worldwide
- 6.5 million people with HP in Europe
- 600,000 new HF cases per year in Europe
- 1 in 5 HF patients dies within 1 year
- Increasing major risk factors:
  - Age
  - Diabetes
  - Obesity

Source: http://www.medicographia.com
The Recap Project

Initial aim
- To provide research data for developing clinical decision making software

Additional Objectives
- To monitor new and existing patients within the Heart Failure Service
- Improve understanding and management of condition
- Reduce anxiety
- Improve prioritisation / increased visibility
- Create capacity / saved visits
- More information to titrate medication
- Reduction hospital admissions
The Recap Project

Intelligent systems supporting decision-making
Hub 1

Intelligent organization of care
Hub 2

Intelligent devices
Hub 3
The Recap Project – Hub3

- Algorithm development
- Data analysis
- Recruitment of patients
- Deployment of monitoring systems
  - Docobo Unit Docobo
  - Motiva platform PHILIPS
- Follow up

- Business planning
- Commercial research

North East London NHS
KU LEUVEN
• Stand-alone unit
• No video streaming
• No educational information

✓ Blood pressure (systolic/diastolic)
✓ Pulse rate
✓ Oxygen saturation (SpO₂)
✓ Body weight

• Interactive TeleHealth platform
• Personal Healthcare Channel
• Educational information to control and understand the condition

✓ Blood pressure (systolic/diastolic)
✓ Pulse rate
✓ Oxygen saturation (SpO₂)
✓ Body weight

Is there an effect of educational information on the understanding and monitoring of patients with long term conditions?
Data Description

NELFT – UK

- 212 patients between 35 and 90 years (69yr ± 12yr)
  - 70 women
  - 142 men

- Daily measurements of physiological parameters
  - Blood pressure
  - Pulse
  - Weight
  - SpO₂

- Source
Data Description

Inclusion criteria
• Older than 18 years
• Valid diagnosis of LVSD (left ventricular systolic dysfunction) supported by a positive ECG

And must present any ONE of the following:
• Sudden increase in weight > 1.5kg in 24 hours
• Blood Pressure < 90 systolic
• Sudden increase in shortness of breath
• Episodes of palpitation/tachycardia without collapse
• Change of medication within 48 hours of discharge from acute
• High Hospital Anxiety Depression Self Assessment (HADS) score
Data Description

Exclusion criteria

If ANY of the following apply:

- Unconfirmed diagnosis (without ECG)
- Clinically Stable – NYHA I to II classification (New York Heart Association)
- Patient is normotensive (120/80)
- Patient is end of Life – NYHA > II
- Insufficient cognitive understanding to use the Telehealth equipment/complete questionnaires
Data Description

- Measurements twice a day:
  - Blood pressure
  - Pulse
  - Weight
  - SpO₂
Data Description

Initial common patient issues

Docobo

- Adherence to monitoring times
- Visual inabilities - Carers support
- Initial issues with entering data on daily basis
- Information overload
- Time

Philips

- Portability of unit
- Signal issues
- Rhythm strips
Data Analysis

Comparison between Docobo and Philips

Patient population
- Docobo – 83
- Philips – 129

Differences:
1. Slopes after linear regression
2. Number of measurements per day
3. Missing data in both systems
Results

1) Linear Regression

\[ w = md + b \]
Results

2) Days with more than two measurements

3) Days without measurements
Conclusions

Docobo

- More stable physiological parameters
- More “missing” data

PHILIPS

- Decreasing pattern in DBP
- Decreasing pattern in Pulse
- Increasing pattern in SpO₂
- Patients measure themselves more
  - BP
  - SpO₂
Conclusions

Docobo
✓ Portability
✓ Price

Less interactive

PHILIPS
✓ Positive effect of the user friendliness
  - More comfort
  - Better compliance

Over monitoring

Future work
➢ Compare interventions, e.g. medication changes
➢ Introduction of the European Heart Failure Self-Care Behaviour Scale
Future Work

European Heart Failure Self-Care Behaviour Scale
Jaarsma, Strömberg, Mårtensson, Dracup, 1999

- Currently implemented by NELFT
- Differences in well being between Docobo and Philips systems?
- How successful is a system with more interactive interfaces?

<table>
<thead>
<tr>
<th>Item</th>
<th>I completely agree</th>
<th>I don’t agree at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I weigh myself every day</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2</td>
<td>If I get short of breath, I take it easy</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3</td>
<td>If my shortness of breath increases, I contact my doctor or nurse</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4</td>
<td>If my feet/legs become more swollen than usual, I contact my doctor or nurse</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5</td>
<td>If I gain 2 kg in 1 week, I contact my doctor or nurse</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6</td>
<td>I limit the amount of fluids I drink (not more than 1.5–2 l/day)</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7</td>
<td>I take a rest during the day</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>8</td>
<td>If I experience increased fatigue, I contact my doctor or nurse</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>9</td>
<td>I eat a low salt diet</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>10</td>
<td>I take my medication as prescribed</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11</td>
<td>I get a flu shot every year</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>12</td>
<td>I exercise regularly</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Thank you very much!
Case study I

Heart Failure Telehealth Project Case Study

The Problem
48yr old Mr Heart suffers from Left Ventricular Systolic Dysfunction (Heart Failure) which is a condition where the heart can’t pump enough blood to meet the body’s needs. This results in possible symptoms of shortness of breath.

The Need
Mr Heart was recently admitted to hospital where he was diagnosed with Heart Failure, complicated by his comorbidities. These included Type 2 diabetes and impaired renal function. Part of his management plan is the control of fluid within the system, for which he had been prescribed medication requiring close monitoring.

The Answer
Mr Heart lives alone and had telehealth fitted into his home upon his discharge from hospital and referral to the Heart Failure Service. The ability to record daily weight measurement allows any fluid overload to be monitored (Fluid overload equating to an increase in weight). Monitoring of his symptoms in this way allows Mr Heart’s medication to be changed according to any increase or decrease in his symptoms.
Case study I

Heart Failure Telehealth Project Case Study

**The Method**
Using telehealth Mr Heart is able to take his blood pressure, weight, pulse and oxygen levels each day. The results of which are automatically uploaded and monitored remotely. A team of healthcare professionals will review these results daily and respond to Alerts or changes outside of any individually set parameters.

**The Outcome**
For Mr Heart, monitoring his fluid intake and any weight gain from home, has provided him with the tools to help him learn how to manage his own condition. “I am now able to understand why I have been told to restrict my fluid, I understand it is for my benefit and also helps me in getting me better”

For the healthcare professional it allows a clinical decision to be made about the need for a change in medication management and monitors the effectiveness of this change.
Case study II

Heart Failure Telehealth Project Case Study

*The Problem*
67yr old Mr Case suffers from Left Ventricular Systolic Dysfunction (Heart Failure). Which is a condition where the heart can't pump enough blood to meet the body's needs.

*The Need*
Mr Case was recently admitted to hospital where he was diagnosed with Heart Failure, complicated by Atrial Fibrillation (irregular heart beat). Part of his management plan is to monitor his physiological parameters to observe for any changes presenting in increase in symptoms.

*The Answer*
Mr Case lives alone and had telehealth fitted into his home upon his discharge from hospital and referral to the Heart Failure Service. Both BP and Pulse were being monitored remotely and any changes outside of set parameters will be picked up on the Alert system. Mr Case’s Blood pressure showed dangerously high readings, picked up on telehealth as an Alert and followed up by the Coordinator and HF team.
Case study II

Heart Failure Telehealth Project Case Study

The Method
Mr Case lives alone and had telehealth fitted into his home upon his discharge from hospital and referral to the Heart Failure Service. Both BP and Pulse were being monitored remotely and any changes outside of set parameters will be picked up on the Alert system. Mr Case’s Blood pressure showed dangerously high readings, picked up on telehealth as an Alert and followed up by the Coordinator and HF team.

The Outcome
Mr Case can monitor his BP from home. “I feel a lot more confident knowing that a healthcare professional is checking my readings daily” For the healthcare professional it allows a clinical decision to be made to increase his cardiac medication and monitor the effectiveness of this change on his blood pressure.