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Abstract

This document outlines guidelines for the selection of patients who are most likely to benefit from U4H services, including those patients who appear unlikely to benefit.

Executive Summary

United4Health has implemented a long-term management telehealth service for patients living with Congestive Heart Failure (CHF) in four regions across Europe; Basque Country, Scotland, Slovenia and Northwest Moravia.

Based on the deployment regions' individual qualitative experiences with the service, and the quantitative and qualitative findings, this report identifies the particular themes that have an impact on selection of future patients for CHF from the organisational assessment and patient perception information provided by the deployment sites. The selection of patients is divided into the following different perspectives:

- Clinical.
- Patient characteristics / profile.
- Telehealth solution and ICT infrastructure / technical.

The selection of patients for future deployment from the three perspectives varies in each site due to both the local experiences, but also the differences in the implementation and processes of the CHF service between the deployment sites.

Basque Country

- Deployed in three distinct geographical areas within the Basque Country for patients with frequent re-admissions, patients with a first episode of CHF, and patients with acute coronary syndrome or recent heart surgery.
- The age of the patients recruited is significantly high. Older peoples' capability to use the devices is low, so they need support to cope effectively with the telehealth technologies. To ensure older patients are able to follow their care plan, consideration should be given to patients having informal caregiver support, or otherwise propose another simpler type of monitoring service such as a regular telephone call.
- Most of the patients have been recruited whilst they were hospitalised, as it is during the first month after hospital discharge that a patient has the highest probability of readmission. Nevertheless, once the telehealth service is expanded to the whole Basque Country, it will also be offered to suitable patients when they attend cardiac outpatient clinics within one month following hospital discharge, as well as GPs offering the service to patients who require a less intensive level of telemonitoring.

Scotland

- Patients have been recruited during hospitalisation. All deployment areas in Scotland plan to continue to deploy telehealth, but will be expanding the U4H criteria to include community-based referrals as a means to prevent admission to hospital.
- Some patients are not considered suitable for telehealth, such as patients with cognitive impairment, severe memory impairment, patients who live alone with no support available to reassure them, and some patients who are at the end stage of their disease.

- In terms of a scalable service model, a six month monitoring period, with the opportunity to continue or discontinue monitoring dependent on clinical and patient needs, is considered to be more appropriate.
- A better understanding of what factors influence a patient's acceptance of the service is needed. The deployment of telehealth which can be better tailored to meet the needs of each individual patient may improve the take up of the service.

Slovenia

- The clinicians in Slovenia are planning to target their telehealth service to patients whose CHF is consistently unstable when they are reviewed in clinic. The introduction of telehealth into a patient's care plan will be integrated into the workflow and discussion of clinic consultations.

Northwest Moravia

- The U4H telehealth service will be targeted at patients living with a more advanced stage of CHF. If further funds become available to expand the service, consideration will be given to which other patient cohorts could benefit.

Change History

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0.4	Introduction and conclusions added
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Outstanding Issues

None.

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1. Introduction

1.1 Purpose of this document

This document reports on the experience of patients and workforce in relation to the patients who have received the telehealth service as part of their CHF care management, and how this will help inform each deployment site's future telehealth deployment work.

1.2 Glossary

BNP	B-type natriuretic peptide
CHF	Congestive Heart Failure
LVEF	Left-Ventricular Ejection Fraction
U4H	United4Health

2. Background and methodology

2.1 Background

Deployment sites are seeing increases in the number of people living longer with chronic conditions, so they are looking at ways to shift the balance of care towards the home and out-of-hospital environments by investing in 'upstream' interventions which focus on self-management at the patient level.

In addition, the current context of economic pressures is requiring care systems to achieve better value from their resources while improving the quality and reducing usage of health services, particularly for those living with long term conditions, through the use of technology, including telehealth, which is seen as one of the key enablers for the transformation of healthcare delivery.

Congestive heart failure (CHF) has trackable vital signs that are indicative of a deterioration in a patient's health. For example, patients having a heart failure decompensation usually have an increase in weight through fluid accumulation. Such 'trackable' physiological measurements can be remotely monitored using telehealth, which often includes a number of health and wellbeing related symptom management questions.

Patients invited to participate in U4H were required to have had an emergency hospital admission or Emergency Department visit for decompensated heart failure (with the need for and administration of diuretics) in the previous six months, together with at least one of the following criteria:

- LVEF < 45% (at least once during the last year or in the last echocardiogram if older).
- LVEF > 45% but BNP > 400 (or plus NT-proBNP>1500) (at least once during the last year).
- Confirmed diagnosis of CHF by a cardiologist.

2.2 Methodology

United4Health (U4H) has had strong emphasis on organisational assessment, including the views and experiences of healthcare professionals, patients and carers.

The overall methodology of the organisational assessment is based on MAST (Kidholm et al. 2012) and follows the guidelines for analysis and reporting of results developed under the Renewing Health project to support the application of MAST (Kidholm et al. 2013). Specifically, evaluation of organisational impact corresponds to Domain 6 of MAST in terms of changes in three aspects: structure, process and culture, while Domain 4 focuses on patient perception.

For U4H, a common template based on open-ended questions was provided to all deployment sites along with detailed background information and guidance. Data collection was carried out in each deployment site, and subsequently reported back to the central evaluation team.

Section 3 of this report draws on the particular themes that have an impact on selection of future patients for CHF from the organisational assessment and patient perception information from the deployment sites. This information has been derived from a range of activities undertaken in the sites, including focus groups with patients and workforce members, individual interviews conducted by an external university researcher, either face-to-face, or by telephone or video conference, and semi-structured interviews carried out by a member of the project team or telehealth service delivery team, again either face-to-face, or by phone or video conference.

3. Guidance on selection of patients for future deployment of telehealth

3.1 Selection of patients from a clinical perspective

3.1.1 Basque Country

The telehealth service for patients with CHF has been deployed in three distinct geographical areas within the Basque Country. Each of them has its own characteristics in terms of population profile, urban or rural areas, etc. However, based on our experience, all clinicians have agreed on the patient's clinical profile that might benefit most from the telehealth service:

- Patients with frequent re-admissions due to a decompensated congestive heart failure (at least two readmissions during the last year).
- Patients with a first episode of CHF but due to their specific characteristics, comorbidities or the severity of the episode show a high risk of readmissions (need for admission to intensive care, mechanical ventilation, and inotropic support, high doses of furosemide, severe ventricular dysfunction, and severe arrhythmias).
- Patients with acute coronary syndrome, or recent heart surgery.

Clinicians have also identified the need for a caregiver in most of the cases. The mean age of the patients recruited and telemonitored in the Basque Country is significantly high (around 78-80 years). These patients are willing to use telehealth solutions if their informal caregivers support them in the transmission of measurements. Some of the patients do not show any cognitive impairment, and they are able to perform their daily tasks; however, they do not feel confident enough to use the devices on their own. The main barrier to accepting to use the telehealth service is that the age of their caregivers is also high, so both of them (patient and carer) do not feel comfortable; and deny getting involved in the project. There is a clear need to solve this issue in order to engage more patients in the use of telehealth services. Most clinicians suggest providing another type of monitoring service to these patients, such as regular telephone calls to ask them about their health status, instead of using telemonitoring devices.

During the project, most of the patients have been recruited during the hospitalisation, since the first month after hospital discharge is the most critical one from the clinical perspective (high probability for readmissions). However, once the telehealth service is expanded to the whole Basque Country, the recruitment criteria will be changed, allowing patient engagement in the out-patient consultation with the cardiologist one month after hospital discharge, or in the GP office. These patients might be more stable than those recruited in the hospital, so the telemonitoring frequency might be lower.

3.1.2 Scotland

In Scotland, the implementation of telehealth for CHF patients through U4H has been seen to be highly effective in supporting this group of patients immediately post discharge from hospital, and has already been recognised by a number of different clinicians working with this patient group. Our experiences suggest that telehealth has had a positive impact on self-confidence for the majority of patients recruited, and has enabled patients to develop a better routine of self-management which has improved treatment compliance. Clinicians believe that telehealth has assisted CHF patients by enabling them to recognise the importance of self-care, understand changes in their symptoms, and how to best manage these. For the majority of patients, technology has also had a positive impact on the relationships and interactions between them and their clinician.

All deployment areas in Scotland plan to continue to deploy telehealth, but will be expanding the U4H criteria to include community-based referrals as a means to prevent admission to hospital. Patients who experience HF decompensation and are managed by Heart Failure Nurses, but not necessarily hospitalised, are ideally suited to telehealth. Prevention of hospital admissions and use of anticipatory care approaches in long term conditions management remains a key strategic and local policy driver in Scotland. To support this, all sites will now receive referrals from outpatient services, and GP practices for patients who are being managed in the community as an admission avoidance. Some sites have been using risk stratification & predictive modelling tools to target suitable patients to prevent readmission. It is likely that this approach will continue to be developed in Scotland.

One deployment area, Greater Glasgow & Clyde (Renfrewshire) has, based on U4H, made the decision to reconfigure the telehealth service into the community as part of the local Community Rehabilitation & Enablement Team. This provides much needed additional capacity for the Telemonitoring Service, and increases the scope and reach of the service, as referrals can now be received from primary care, community services and acute teams based in the hospital. This demonstrates commitment from the local health provider to the increased use of telemonitoring; this move has resulted directly from impact of learning from U4H. All sites will continue to build on experiences and learning from U4H service implementation and ongoing feedback from clinicians, staff and patients as part of an integrated approach to continuous service improvement.

In Lanarkshire, there are plans to expand the use of Simple Telehealth System with GP practices and Practice Nurses to provide remote monitoring of hypertension. Both Ayrshire & Arran & GGC are exploring the application and integrated use of SMS system to complement their existing telehealth devices. This decision has been based on the positive experiences of Lanarkshire through U4H. For these sites, SMS based texting system will now be explored as a step down option for CHF patients who require low level monitoring.

Whilst most patients have benefited from telehealth, there is a sub group of patients who are not considered to be suitable. These include patients with cognitive impairment, severe memory impairment, and patients who live alone with no support available to reassure them. Some clinicians also felt that some patients who are at end stage of their disease are not suitable for telehealth.

Clinicians report that in terms of a scalable service model, asking CHF patients to provide measurements using three different peripherals (as per protocol) is not

sustainable, nor always clinically necessary, and have found that this was a contributing factor to many patients discontinuing the study. The optimum monitoring period for patients with CHF has also been much discussed. A 12 month monitoring period was considered to be too long; many clinicians preferred to opt for a six month monitoring period, with the opportunity to continue or discontinue monitoring dependent on clinical and patient needs.

Deployment areas in Scotland experienced a significantly high number of patients who did not want to take part in U4H, or did not feel that they would be able to use or benefit from the technology. A better understanding of what factors influence patients and staff adoption would be an important area for further investigation. It is also clear that the technology chosen for telehealth needs to have the correct “fit” for a patient, and that a “one size fits all” approach to at-scale telehealth is no longer appropriate. To achieve this, we have learned that it is important to redesign the right parts of care processes, get the right staff on board, target the right patients, and choose the right technology which offers flexibility and is easy to use by clinicians and patients.

3.1.3 Slovenia

Telemonitoring of CHF patients using U4H telehealth service model proved to have statistically significant changes on the patients’ health indicators: LVEF, proBNP, blood pressure and heart rate.

In the cohort of 64 supported patients using telehealth service for a minimum nine months, the average LVEF increased from 41.3 to 44.9 (9% improvement).

In the cohort of 23 supported patients, the average proBNP dropped from 2538.87 to 1751.00, which represents a 31% improvement.

A preliminary analysis also demonstrates improvements in lowering blood pressure and heart rate. We compared a group of measurements from patients having both values above the desired level (systolic pressure >140mmHg, heart rate <90/min). Improvements in blood pressure were recorded in 36% (131 patients) and in heart rate 64% (41 patients).

Positive clinical outcomes of the telehealth service encourage clinical specialists to call patients with high variations of indicators earlier for face-to-face examination and discussion. This imposes additional work for clinical staff at the SB-SG hospital, but has secondary positive effects in prevention of further complications and consequences resulting from long-term high blood pressure and/or heart-rate.

3.1.4 Northwest Moravia

Grounds for continuing the service lie with the very good experience of effects of CHF telemedicine service and the smooth acceptance of the intervention by physicians and nurses, who see its clear benefits. The service primarily facilitates early detection of deterioration of patients’ status, reduction of unplanned visits to hospital, and basic patient empowerment thanks to positive health related impact of the service. This was enabled especially by: additional training (for the intervention); bi-directional electronic communication tool with the hospital staff; everyday regular measurements; availability of the values to the patients for self-test; reminders; and remote phone support from the telemedicine centre.

Further deployment will depend on the economic outcomes and further discussions with clinicians and other stakeholders, including healthcare funders, as there is currently no reimbursement system for telehealth activity.

3.2 Selection of patients from a patient characteristics / profile perspective

3.2.1 Basque Country

- The average age of the CHF patients in the Basque Country is high, as mentioned before. The distribution is:
 - < 65 years: 5.1%
 - 65-75 years: 19.1%
 - > 75 years: 75.8%
- Most of the patients recruited (95.5%) are assisted at home by informal or formal caregivers.
- Most of the patients are not familiar with the technology (PC, tablet, internet) even though they use mobile phones. This confirms the need for support to carry out the telemonitoring measurements.
- Patients who agreed to participate in the study complied with the request to send telehealth data; they are aware of the importance of measuring and transmitting the information on a regular basis.
- There is a difference with respect to the phone calls made by the telecare centre and the eHealth centre. While some patients feel more comfortable and safe receiving calls from the professionals, others feel anxious and nervous. In general, most patients prefer to talk to their known healthcare professionals rather than the staff of the call centre. This aspect has to be analysed in order to meet all patients' preferences.

3.2.2 Scotland

- The median/average age for CHF patients involved in telehealth was 64 years old, with an age range of 19-85. (Awaiting statistical analysis.)
- More male than female patients were accounted for in the Scottish cohort. (Awaiting statistical analysis.)
- General motivation and interest in self-management of their disease was a key driver, but a deciding factor was frequently the level of support available or lack of family / carers
- As a significant number of patients were already asked to monitor weight as part of their existing care plan, the use of telehealth to prompt readings was seen as a positive step towards supporting long term behaviour change. Recognition that some categories of patients benefit from prompting and reminders to complete these tasks daily.
- The existence of some basic modern technology at any age was seen as a crucial factor for participation and adoption. Staff reported that where patients did not already use mobile phones or tablets, there was limited interest shown in any telehealth participation.

- Patients living in the more rural areas in Scotland reported a greater sense of reassurance in the remote monitoring of their condition by their specialist nurse; the reduced need for travel in adverse conditions was noticeable over the winter.
- Participants with CHF who were able to continue to work found a particular benefit in telehealth monitoring, avoiding the need for disruptive clinical visits. With this group of patients, staff reported a greater confidence in using the remote technology to manage and giving advice on medication changes and symptom alerts.
- All deployment sites found it interesting that older client groups and carers definitely embraced the technology, and it was well received. Patients benefit from the monitoring approach, and were more confident as someone was viewing their symptoms daily, and they had timely access to specialist nurses and “didn’t need to trouble their GP”. In contrast, the younger CHF patients were generally seen to be more haphazard, and needed more support. We were surprised to find that some of the younger CHF patients were not interested in technology and refused to take part. This may be partly to do with a patient’s readiness to accept their diagnosis, rather than the technology or service available.
- By expanding the CHF eligibility criteria, there will be an opportunity to target patients who are at a high risk of admission through risk stratification.

3.2.3 Slovenia

The group of CHF patients which benefits the most are patients who do not adhere to the clinical recommendations regarding food intake and necessary physical activity.

We have not yet analysed data in relation to having a carer or not, smokers vs. non-smokers, or patient’s geographic location etc. Changes are not age or sex related.

A detailed statistical analysis will be carried out at the end of 2015.

3.2.4 Northwest Moravia

Patients must be capable of using the technology, considering the relatively complex set of devices including mobile device and using the android application. Patients with previous experience with using smartphones or tablets are more compliant and acceptable for using these technologies.

Patients with more advanced stages of CHF will be the first candidates for the service. The main clinical target is not reducing outpatient visits, but reducing the number of re-admissions to hospital because of relapses due to heart failure.

3.3 Selection of patients from a telehealth solution and ICT infrastructure / technical perspective

3.3.1 Basque Country

In general, the patients' capability to use the devices is low, so they need support to handle the telehealth devices (mainly from informal caregivers). This situation confirms that a great effort has to be made in terms of training to use devices.

In addition, we have seen that some patients leave their home at some time during the year, since they go to their summer house or to their relatives' houses. Therefore, the telehealth solutions offered have to meet these needs.

- Patients are provided with either the non-mobile (fixed gateway) or mobile (smartphone) solution depending on their preferences and needs; if the patient leaves his/her home for a certain period, he/she can bring the telehealth devices and transmit from the new destination.
- The non-mobile solution needs a phone line, while the mobile solution requires an internet connection. So the patient does not need to have internet at home.
- All devices transmit measurements via Bluetooth to the gateway in order to avoid any typing by the patient.
- A phone line is required to install the panic button.
- Patients and caregivers are trained at least twice. A hospital nurse demonstrates the telehealth solution the first time, and gives the patient the opportunity to use it. Once the patient agrees to participate, technical staff are responsible for device installation at home, and reinforcing the training provided in the hospital. In addition, patients can call the telecare centre at any time if there is any doubt about using the device.

3.3.2 Scotland

Simple Telehealth Solution

- Use of mobile phone / carer access to a mobile phone.
- Ability to understand instructions and follow guidance safely and competently.
- Adequate mobile signal.
- Use peripherals devices appropriately and safely.
- Ability to use text messaging or have a carer willing to support.
- Remote devices so community staff can monitor when out in the community, not only back at base – mobile workforce.

High Tech Solutions

- Monitoring systems used need to be easy to use; very few patients have had problems following the touch screen pad.
- Patients need to be aware of how often to change batteries and how often and when to charge equipment.
- Robust training programme for patients with ad hoc support as needed.

- Equipment installed and reinstalled within 24 hours, and problems fixed within 24 hours.
- Patients do need to be able to follow the manual and understand the training, and also written information.
- Need as a minimal 4G connection or broadband.
- Basic skills to be able to use a touch screen.
- Remote devices so community staff can monitor when out in the community, not only back at base – mobile workforce.
- Use peripherals appropriately and safely.
- Staff and clinicians have good general competency in use of technology solutions.

3.3.3 Slovenia

All patients participating in the CHF intervention group were capable of measuring their own blood pressure, heart rate and body weight even before recruitment into the study.

The devices provided within U4H to take their vital signs did not differ in function from those that patients used before, apart from the oxygen saturation meter which was added, but which the patients were familiar with from their regular visits to the CHF clinic. From this point of view, almost no patients had any difficulties with the telehealth solution. A smartphone was given to each patient, and was used as a gateway. The patients were asked to keep them switched on and linked to a power supply. No action was required from them when taking measurements. The results passed automatically from the measuring equipment to the phone and then to the hospital.

A support system was implemented for the telehealth service users:

- Carers were also trained in using the system, so were able to advise patients on how to take measurements.
- A primary help desk was available at the Telehealth Centre each morning, and help was provided by phone. The Centre also provided first level technical support.
- A secondary help desk was provided by the sub-contractor for the Telehealth Centre staff, and if needed also for those patients having technical difficulties.
- A field nurse was available to visit the patient having difficulties in using the system or experiencing technical difficulties at home.

Some patients (3%) had difficulties in keeping their mobile phone charged. They had forgotten to charge the battery, and later did not switch the phone on to start the mobile app.

In the study two different type and models of mobile phones have been used (HTC Desire 500, Samsung Galaxy Core II). The models are not designed adequately for use by elderly people. Some of them had difficulties when handling their phone, e.g. an action with side buttons pressed at the same time when turning off the screen resulted in entering the phone set-up, from where the patients experienced this type

of difficulties. They resolved the problems with help from the primary help desk at the Telehealth Centre. Around 2% of patients experienced this difficulty.

Some 3% of patients were not recruited into the U4H due to poor coverage of the 3/4G signal in the geographically rough terrain of the Koroška region covered by the SB-SG. Occasionally, poor signal coverage was overcome with the technical solution embedded in the mobile phone app that sends the measured data when an adequate network signal is available.

3.3.4 Northwest Moravia

Infrastructure including central database and portal built in U4H project is capable of supporting larger number of patients (lower nr. of 100s in parallel). CHF service does not require high speed data transmission and 3G/4G coverage is good enough to operate service as designed for U4H project in the Czech Republic, even in rural areas. The service will continue in operation for the recruited patients with long term conditions. It will be further promoted as good practice.

Other hospitals providing care of patients with CHF (Prague, IKEM) are already exploring the benefits of the service by using the service and providing support to patients over larger distances (250km on average). IKEM acts as a reference hospital and pioneer in new clinical practices. The experience of other hospitals with the service is important to promote the service in the medical community, and in negotiation with authorities regarding sustainability of the service.

4. Conclusions

The implementation of telehealth for CHF patients through U4H has had a positive impact on self-confidence and self-care management for the majority of patients recruited. It has been seen to be highly effective in supporting this group of patients immediately post discharge from hospital. In addition, for most of the patients, the technology has also had a positive impact on the relationships and interactions between them and their clinicians.

There are some differences in the factors influencing the selection of future patients for CHF telehealth service. Some sites have found age to be an indicator of adoption and compliance to using the technology, whereas in other sites this was not the case. Patients who have previous experience of using smartphones or tablets seem to be more compliant in using these technologies. For other patients, at least one deployment site would consider offering an alternative, simpler type of monitoring service better suited to their capabilities.

Overall, it is important to redesign the relevant parts of the work flow and care pathways; key to the successful implementation of the telehealth service is to involve all the appropriate staff, patients and carer representatives in the redesign process. Such an approach is far more likely to result in the most appropriate technological solutions being specified, developed and / or procured, implemented and used by patients and clinicians alike.