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### Making Both Ends Meet

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#### Telemonitoring Improves Clinical and Economical Effectiveness in Chronic Heart Failure

**Multiple hospital readmissions for acute decompensation are characteristic for CHF patients, deleteriously affecting their quality of life and imposing a major burden on national healthcare costs. The direct costs of CHF-related hospitalisations in Germany amount to 2.7 billion euro per year (Statistisches Bundesamt Deutschland). Due to the demographic evolution of westernised societies, the number of hospitalisations is likely to further increase. [Figure 1]**

Adherence to guidelines will improve survival and reduce hospitalisation rates thus lowering the socio-economic burden. However, disease management strategies should not only focus on drugs, but also comprise means to react to changes of health status and to coordinate adaptation of the individual patient to his disease and environment alike. Telemedicine could be the key to integrate these prerequisites, to facilitate communication with the patient and between caregivers, and to reduce overall hospitalisation rates and costs (Kielblock et al. 2007). Furthermore, a recent meta-analysis (Clark et al. 2007) concluded that telemonitoring may be even more effective at shortening hospital stay than reducing admissions, which would in turn have a considerable effect on hospital capacity needed, patient "turn-over" and patient costs to the hospital.

#### The Concept of Telemedical Care

Predefined vital parameters (e.g. weight, blood pressure, heart rate) are transmitted automatically via modem to the telemedical centre, which is available 24 hours a day ("24/7/365"-concept). In case individual limits for vital parameters are exceeded, an alarm is triggered, allowing for immediate therapeutic action. Furthermore, to enhance medical compliance and to detect changes of the individual health status, all patients could be pro-actively contacted alongside with counselling on nutrition, exercise and drug therapy in adjustment with the primary care physician. [Figure 2]

#### The Concept of Clinical and Economical Effectiveness of Telemonitoring

Prospectively, 478 patients were included in the protocol, 270 (men: 85.5%; mean age 62.5 + 10 years; NYHA II, III, IV: 80 vs. 17 vs. 3%; main diagnosis: coronary heart disease, hypertension, cardiomyopathy) were monitored via telemedical care and analysed in comparison to a matched control collective.

During an observation period of 3 months, the following rates were significantly reduced in the group of patients with telemedical care: In addition, increased compliance with a more appropriate adaptation of medication could be clearly demonstrated by standardised questionnaires. Furthermore, an independent economic analysis (Clark et al. 2007; Rychlik 1999) demonstrated a significant decrease of CHF related costs (about 3000€ per patient per year) in patients monitored via telemedical care, predominantly due to a reduction of hospital days. Results can be seen in Table 1.

## **Impact of Telemedicine on Hospital Management**

Since 2004, the German Diagnosis-Related- Groups system (G-DRG) has made a prospective payment system an obligation in the budget determination and thus hospital financing in Germany (Statistisches Bundesamt Deutschland). Meanwhile, based on the Australian Refined DRGs (AR-DRG) more than 1,000 different DRGs allow the categorisation of medical cases in homogeneous groups of the same economic expenditure. The sum of all casemix values (Statistisches Bundesamt Deutschland) per year corresponds to the budget of a hospital granted by the German health insurance companies. Therefore a clinic, specialised in heart failure treatment might worry about losses by the decrease of the gained casemix points as in-hospital days could be reduced by application of telemonitoring systems.

However, two aspects ensure for the fact that telemonitoring leads, apart from the improved medical patient's care, also to an improvement in the economic situation of a hospital. If a patient is hospitalised with the same DRG (due to repeated cardiac decompensations) within a defined time interval to the same hospital, the hospital must connect both hospital stays to one case. Thus, the high costs of the individual cases are no longer covered by the DRG-reimbursement system. Therefore reduction of hospital readmission in patients monitored via telemedical care reduces the danger of uneconomical unification of the individual heart failure cases.

The second aspect is the clear decrease of lengthof- stay (LOS) in hospital due telemedical care. Since the LOS is insignificant for the hospital's reimbursement [Figure 3], a shortened stay only leads to reduced costs for the individual case.

Thus, use of telemonitoring by reduction of readmissions and length of stay in heart failure patients could improve the net yield in patients, as reimbursement per case remains on casemix points and not on hospital days.

## **Implications**

Following this analysis, telemedicine appears reasonable both on economic and medical grounds. Intelligent algorithms for vital parameters allow efficient monitoring of multiple patients. More importantly, doctors can contact their patients earlier to prevent hospitalisations or to individually adjust medication. After a given hospitalisation and during titration of medication a concept of technical de-escalation on a modular basis alongside with counselling measures appears possible to improve both patient awareness and CHF management. Finally, this implementation of telemedical care can work cost efficiently.

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