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### Reduction of Readmissions and Length-of-Stay:

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Table 1: Economic analysis of hospitalisation-related costs after 180 days.

#### Use of Telemonitoring in Chronic Heart Failure Improves Clinical and Economic Effectiveness

Multiple hospital (re-)admissions for acute decompensation are characteristic of CHF patients, deleteriously affecting their quality of life and imposing a major burden on national healthcare costs. The direct costs of CHF-related hospitalisations amount to 2.7 billion euros per year. Due to the demographic evolution of European 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 comprise means to react to changes of health status and to coordinate adaptation of the individual patient to his disease and environment alike.

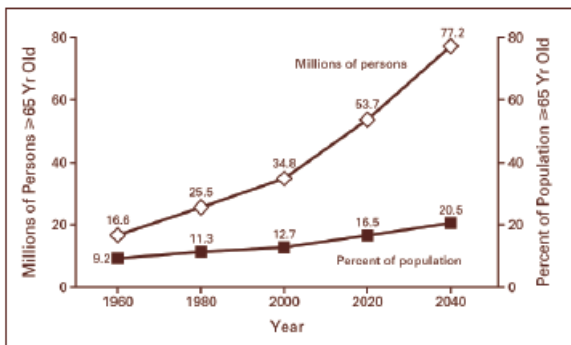


Figure 1: Projected Increases in the U.S. Population 65 Years of Age or Older; Data are from the U.S. Census Bureau; accessed on <http://www.census.gov>.

Telemedicine could be the key to integrate these prerequisites, to facilitate communication with the patient and between care-givers to reduce overall hospitalisation rates and costs. Furthermore, a recent meta-analysis 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, that can be contacted 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 consultation with the primary care physician [Figure 2].

**The Concept of Clinical and Economic 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, hospitalisation (NYHA II, III, IV: 5,2 vs. 2,4; 8,1 vs. 3,0; and 2,4 vs. 1,2), length of stay (NYHA II, III, IV: 50,7 vs. 21,9; 78,4 vs. 27,5; and 23,0 vs. 10,9 days) and number of contacts with the GP (303,7 vs. 83,2), as well as with the cardiologist (105,3 vs. 30,4) were significantly reduced in the group of patients with telemedical care.

Furthermore, increased compliance with a more appropriate adaptation of medication could be clearly demonstrated by standardised questionnaires.

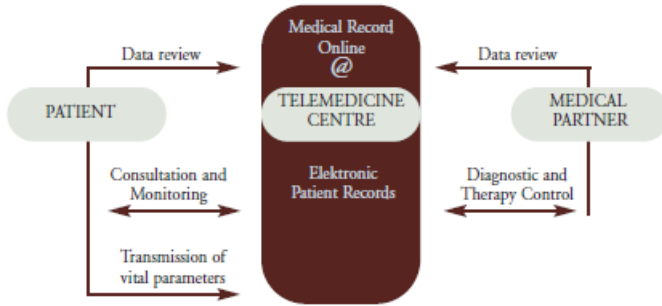


Figure 2: The concepts of telemedical care.

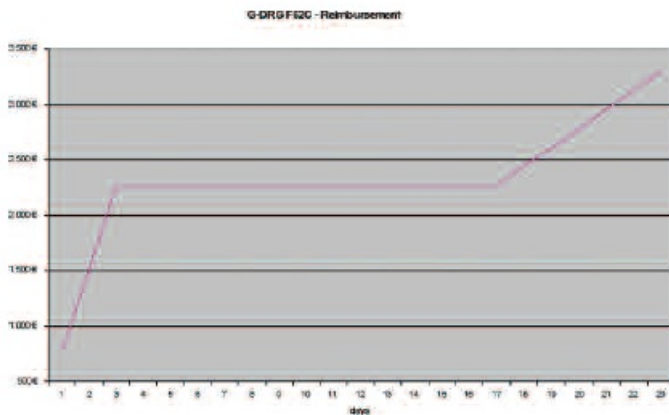


Figure 3: The average length-of-stay for the DRG: F62C (heart insufficiency) is 9 days in Germany. Since the reimbursement per case remains on casemix points and not on hospital days, reduction in length-of-stay by telemedical care could improve the net yield in patients. (Reimbursement for the G-DRG calculated at a rate of 2,800€).

Also, an independent economic analysis demonstrated a significant decrease of CHF-related costs (about 3,000 € per patient per year) in patients monitored via telemedical care, predominantly due to a reduction of hospital days. The results can be seen in Table 1.

**What Impact has Telemedicine on Hospital Management?**

Since 2004, the German Diagnosis-Related-Groups system (G-DRG) is making a prospective payment system an obligation in the budget determination and thus hospital financing in Germany.

Meanwhile, based on the Australian Refined DRGs (ARDRG), 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 per year corresponds to the budget of a hospital granted by the German health insurance companies.

Therefore a clinic specialising 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 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 in 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 length-of-stay (LOS) in hospital due to 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.

	Cohort with Standard Care	Cohort with Telemedic Care
Number	111	111
Mean days of inability to work	6.46	2.91
Number of referrals	63	37
Hospitalisations per patient	0.5676	0.3333
Hospitalised patients	46	28
Number of days in hospital	754	196
Mean number of days in hospital per case	11.97	5.3
In-hospital rehabilitations	28	3
Days of inhospital rehabilitation	660	65
Mean duration of inhospital rehabilitation	5.95	0.59
Costs of hospitalisation (DRG)	304,897 €	94,725 €
Costs of hospitalisation incl. rehabilitation	370,031 €	101,329 €
Costs of rehabilitation	65,134 €	6,604 €
Costs of rehabilitation per case	2,326 €	2,201 €
Costs of rehabilitation per patient	587 €	59 €
Mean total costs	5,873.50 €	2,739 €

Table 1: Economic analysis of hospitalisation-related costs after 180 days.

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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