BUDGET IMPACT OF A VIRTUAL HOSPITAL

Peters GM[1,2], Doggen CJM[1,2], Van Harten WH[1,2]

[1]Department of Health Technology and Services Research, TechMed Centre, University of Twente, Enschede, The Netherlands, [2]Rijnstate Hospital, Arnhem, The Netherlands

INTRODUCTION

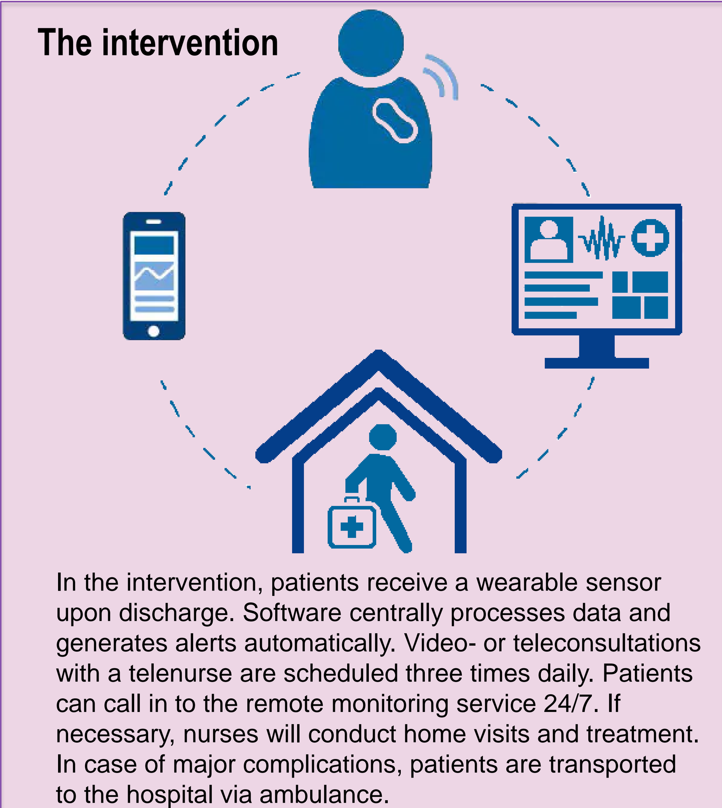
- Hospital costs account for more than a third of total healthcare expenditure in the US[1] and most EU member states[2]
- Hospital stays represent a large proportion of total hospital costs
- Reducing length of hospital stays can play an important role in limiting the growth of total healthcare expenditure
- Facilitating early discharge using remote monitoring technologies would reduce length of stay, however the budget impact of such an initiative is not clear
- A large teaching hospital in The Netherlands with an adherent population of 470,000 is in the process of evaluating the potential impact of implementing remote monitoring

Goal: to conduct a Budget Impact Analysis of remote continuous monitoring at various scales

METHODS

- A BIA on remote monitoring was conducted according to ISPOR guidelines[3]
- The analysis was conducted from a hospital perspective and for a time horizon of 5 years.
- The intervention consists of three components: infrastructure, technology, and service
- Cost data for each component were retrieved from project documents, a quotation, reference prices, and market prices
- Potential capacity reductions were estimated using queueing theory
- These estimations were based on admissions data of the hospital
- The analysis was conducted for implementation at multiple scales: a single ward, an entire hospital, multiple hospitals

The intervention



In the intervention, patients receive a wearable sensor upon discharge. Software centrally processes data and generates alerts automatically. Video- or teleconsultations with a telenurse are scheduled three times daily. Patients can call in to the remote monitoring service 24/7. If necessary, nurses will conduct home visits and treatment. In case of major complications, patients are transported to the hospital via ambulance.

RESULTS

Investments for remote monitoring

Technology	
Relay[u]	€1150
Client license[u]	€130
Mobile client license[u]	€170
Patient license[u]	€520
Infrastructure	
Server hardware	€33900
Software license fees	€12100
Computer[u]	€360
Monitor[u]	€230
Tablet computer[u]	€300
Office furniture[u]	€500
Start-up	
Project management	€48400
Technical implementation	€20000
External consultancy	€40500
Education	€25000

[u] Unit prices

Fixed costs of remote monitoring

Service	
Telenurse	€65000
Remote technical support	€16000
Hospital day[u]	
Specialists	€30
Doctor's assistants	€20
Nurses	€220
Real estate	€20
Overhead	€130

Variable costs of remote monitoring

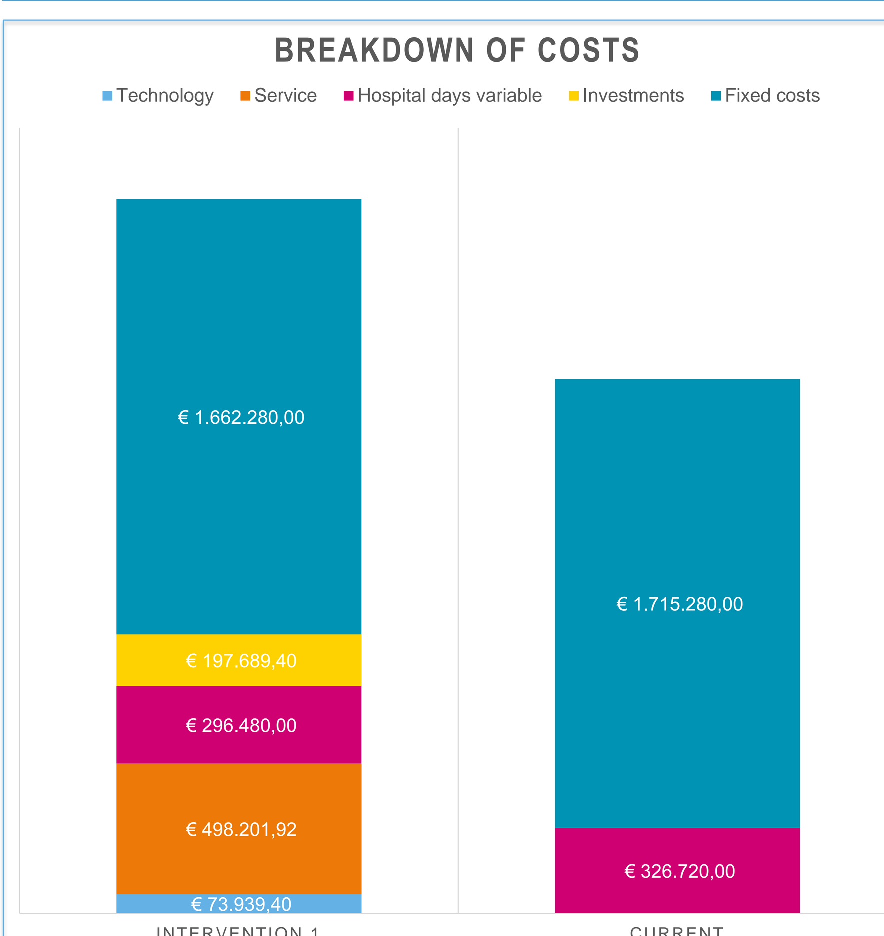
Technology	
Wearable sensor	€120
Service	
Home visit	€80
Home treatment	€130
Ambulance transport	€760
Hospital day	
Materials	€10
Room and board	€70

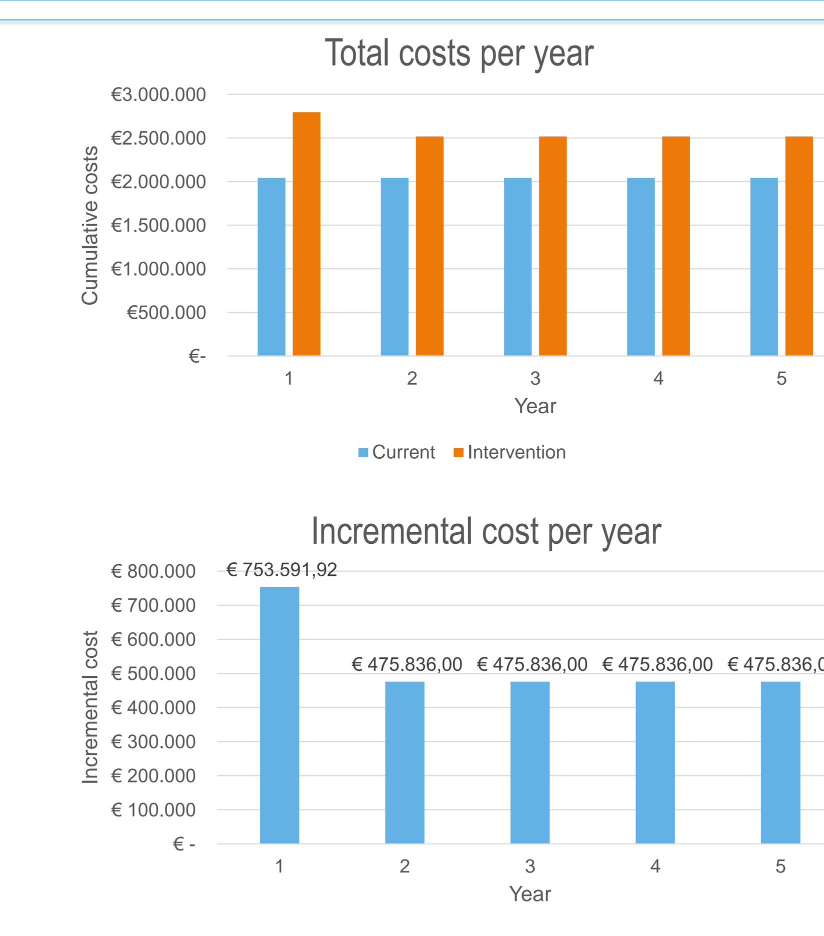
Base case assumptions

1	One third of all patients is eligible for the intervention
2	Complication rates do not differ between patients with the sensor and those without
3	If a patient experiences complications at home, treatment is the same as if that complication had occurred in hospital
4	Mortality rates do not differ between the group with the sensor and the one without
5	There is no difference in quality of life outcomes between the two groups
6	Revenue cannot be increased by performing more surgeries in a day, due to restrictions imposed by health insurers
7	Capacity that is freed up by early discharge of patients with the sensor is not used by patients from other wards
8	There is no impact on overhead costs, such as management, maintenance, security, electricity, heating, etc

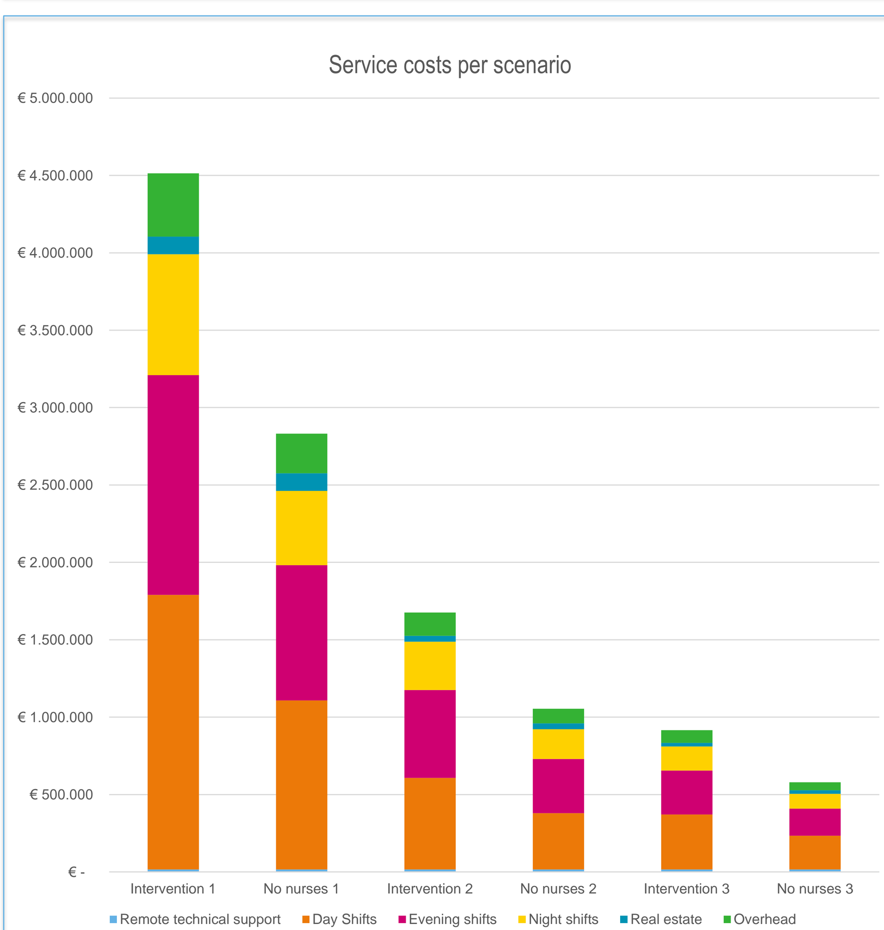
The assumption that one third of patients is eligible for the intervention is based on implementation in the bariatrics ward of the case hospital. The true eligible proportion will differ per target group.

Single ward analysis

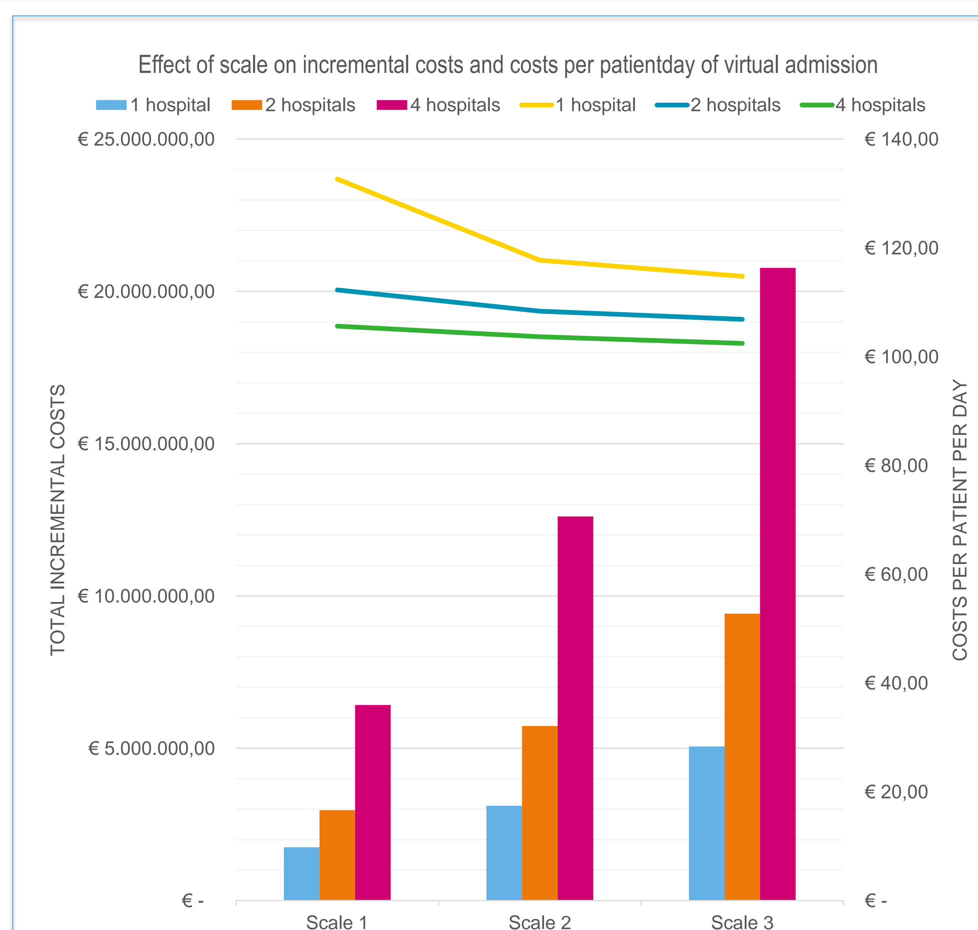




- Costs per day of virtual admission per patient are €390,87 in Year 1, and €246,80 in subsequent years
- According to capacity estimation:
  - 382 out of 4084 hospital bed days could be saved
  - 2 out of 16 beds could be closed
  - Nurse day shifts could be reduced by 0,5 shift out of 4,5
- Costs of the intervention mainly originate from the service
  - Therefore, scenario analyses were conducted on variations of the service
  - Variations presented below explored the effect of employing different types of staff to provide the intervention, as well as the extent of scheduled contacts



1) Base case. 2) Only scheduled contacts on day after discharge. 3) No scheduled contacts. All analyses were performed for whole hospital scale



Scale represents the proportion of eligible admitted patients out of all admissions in a given year, where 1 is a proportion of 0,1; 2 = 0,2; and 3 = 1/3

CONCLUSION

Admitting patients to a virtual hospital is unlikely to result in cost savings given the assumptions used in this study. However, if the intervention can contribute to reducing the number of complications, or if freed up capacity *can* be used by patients from other wards, the conclusion could be different. Finally, one option that has not yet been explored is the effect of reducing length of hospital stay by more than one day. If this were achievable, it stands to reason that more savings could be realized, which could be enough to offset costs, depending on the chosen service model.

References

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3. Sullivan SD, Mauskopf JA, Augustovski F, et al. Budget Impact Analysis – Principles of Good Practice: Report of the ISPOR 2012 Budget Impact Analysis Good Practice II Task Force. *Value in Health*. 2014; 17 (1): 5 – 14.

Rijnstate

UNIVERSITY OF TWENTE.

TECHMED CENTRE