Economic evaluation and budget impact analysis of integrated care services for heart failure patients in Friuli-Venezia Giulia

A SmartCare project sub-study

Stafylas P[1], Di Lenarda A[2], Chatzopoulos S[3], Appuzo G[4], Radini D[4], Papatsouma I[3], Da Col P[1], Mar Medina J[7], Stellato K[4], Aletras V[5], Hurtado M[6], d'Angelantonio M[6], on behalf of SmartCare project collaborators

[1]Health Information Management Spain SL, Barcelona, Spain, [2]Italian Association of Hospital Cardiologists & FVG-ASS1, Trieste, Italy, [3]Medical Research & Innovation LP, Thessaloniki, Greece, [4]Azienda Sanitaria Universitaria Integrata di Trieste, Trieste, Italy, [5]University of Macedonia, Thessaloniki, Greece, [6]Health Information Management SA, Brussels, Belgium, [7]Alto Deba Integrated Health Care Organization, Mondragon, Spain,

Introduction

The SmartCare project tested and evaluated the impact of ICT enabled integrated care on different regions and stakeholders[1]. The objective was to identify the changes introduced by implementing ICT supported integrated health and social care in different domains according to the MAST evaluation framework[2], including safety and clinical outcomes, resource use and cost of care, user / carer experience, and organisational changes. The MAST evaluation framework has been complemented by novel health technology assessment techniques, including predictive modelling in order to support informed decision making. Predictive modelling techniques have been used by public organisations, insurance companies, and pharma industry in order to support informed decision-making, mainly concerning the reimbursement of the service or product under evaluation[3]. Predictive modelling has already been applied in the CareWell project to represent the pathway followed by frail patients with multiple diseases to test different possible interventions in order to maximise health benefits, taking into account the scarcity of resources from now to the 2020 horizon. The SmartCare project is collaborating closely with the CareWell and BeyondSilos projects. The three projects strive to create synergy and coherence between the methodologies used in the evaluation framework for the projects. This will allow comparisons and assessment of the transferability of the results from the three projects.

Objectives

The main objectives of the application of predictive modelling techniques in SmartCare are:

- Test the feasibility of the application of these techniques in a European project of integrated care.
- Predict future outcomes based on project results.
- Assess the financial consequences of the SmartCare services for patients with heart failure in FVG and their sustainability.

Methods

A cost-utility and a budget impact analysis have been performed[3-5]. A 4-states Markov model (Figure 1) was developed in order to predict short and medium-term clinical and economic outcomes (Figure 2) of integrated care services compared with the usual care in the same setting. The analysis has been conducted from the perspective of the Regional Health Authority of FVG with 2016 as the reference year. All estimates are in Euros (€). Future costs and benefits have been discounted at 3.5%. The basic time horizon of the analysis was five years, in accordance with the regional strategy, but longer and shorter horizons have also been tested. Due to the severity of the disease and the age of the participants, this time horizon represents the lifetime scenario (longer than the average expected survival for most of the patients under evaluation). We have adopted 3-months cycle lengths, to correspond to the short pathway duration, with half cycle correction. A hypothetical cohort of 5.000 patients has been simulated to receive integrated care, and 5,000 patients to receive usual care, in probabilistic sensitivity analysis. The primary outcome of the model was the incremental cost-utility ratio (incremental cost per quality adjusted year gained, ICUR €/QALYs).

A model was developed in Microsoft Excel 2016 in order to determine the budget impact of the introduction of ICT-enabled integrated care for the management of patients with HF in the FVG region from a budget holder perspective (Region of FVG). The model considered: regional population; national and regional prevalence of the disease, number of patients likely to be eligible for receiving integrated care services; cost of development of new services and operational cost; cost of HF management; predicted uptake of new type of care; frequency and cost of hospitalisation; cost of care in nursing homes / residential care; contacts with the nurses and social workers; and, finally, the impact on mortality, hospital admissions and total number of days in hospital[6].

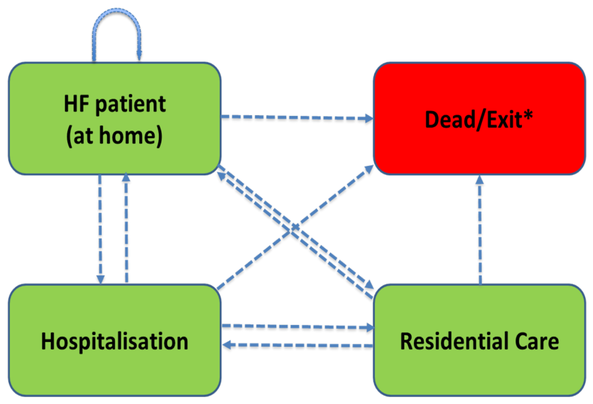

Figure 1. The 4-states Markov model

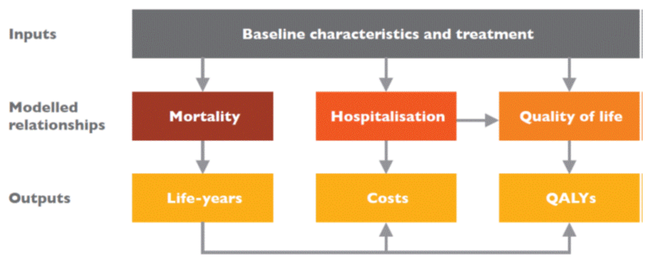

Figure 2. The conceptual model for the prediction of the outcomes[7]

Results

Although, it was assumed that there was no improvement in quality of life from the integrated care services, the significant reduction of hospital admissions had a small positive impact on quality adjusted life years. Moreover, this benefit has been achieved with significant cost savings, about 6.000 € per patient over a time horizon of five years (Figure 3). When a service under evaluation is cheaper and more effective it is called "Dominant" and should be reimbursed[4]. The cost-effectiveness analysis, based on the lack of any benefit in terms of mortality, demonstrated that there was no difference in survival between the two groups, with mean survival 3,17 years, and transformed to cost-minimisation analysis. In accordance with the principles for the evaluation of healthcare programmes[4], when there is no difference in the effectiveness between the comparators, the total costs have to be measured and the decision-makers should select the cheaper solution, which in this case is integrated care.

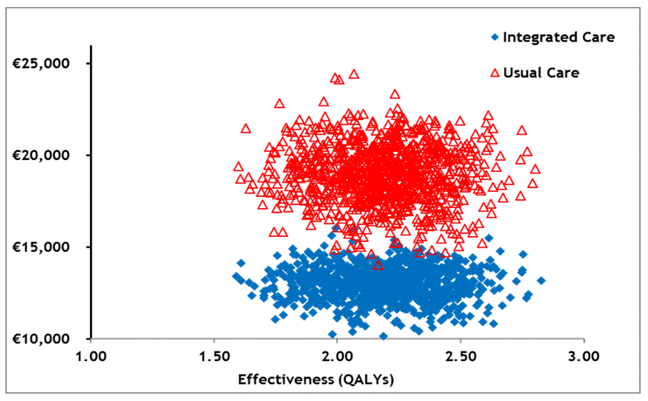

Figure 3. Cost-effectiveness scatterplot

The clinical impact of the introduction of ICT-enabled integrated care in heart failure patients in FVG is presented in Table 1, and the predictions for cost in Figure 4. While ICT-enabled integrated care is associated with a significant investment for the development of the service, including ICT-infrastructure, devices, training of personnel etc., and an even more significant operational cost, these costs have been outweighed after the third year by the savings as a result of significantly reduced days in-hospital.

Sensitivity and scenario analyses under different assumptions have supported the robustness of the results.

Probability	3 years	5 years (base case)	10 years
Annual			
Deaths avoided	0	0	0
Hospital admissions avoided	5	9	17
Days in-hospital avoided	2,665	5,050	9,910
Cumulative			
Deaths avoided	0	0	0
Hospital admissions avoided	8	24	95
Days in-hospital avoided	4,736	13,614	54,465

Table 1. Clinical impact of the introduction of ICT-enabled integrated care in heart failure patients in FVG

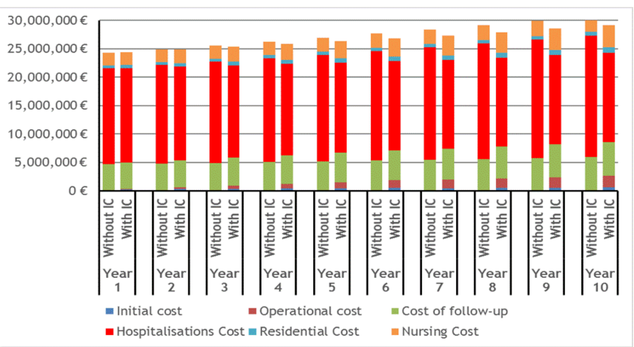

Figure 4. Forecasting the annual cost for the management of heart failure in FVG

Conclusions

The application of predictive modelling in integrated care projects is feasible and could produce a reasonable approximation about how a service will behave without actually testing it in real practice. In the SmartCare project, cost-effectiveness and budget impact analyses show that ICT-enabled integrated care for patients with heart failure in FVG could be a sustainable service, and has the potential to release resources which could be used to cover other needs or priorities. This conclusion cannot be generalized for the whole project, since significant diversity has been seen and the transferability of the model has not been validated yet.

Funding

The SmartCare project is co-funded by the European Commission within the ICT Policy Support Programme of the Competitiveness and Innovation Framework Programme (CIP). Grant agreement no.: 325158

References

1. Keijser W, de Manuel-Keenoy E et al. DG Connect Funded Projects on Information and Communication Technologies (ICT) for Old Age People: Beyond Silos, CareWell and SmartCare. J Nutr Health Aging 2016;20(10)1024-33

2. Kidholm K, Ekeland AG, et al. A model for assessment of telemedicine applications: mast. International journal of technology assessment in health care. 2012;28(1):44-51.

3. Caro JJ, Briggs AH, et al. Modelling good research practices--overview: a report of the ISPOR-SMDM Modeling Good Research Practices Task Force-1. Medical Dec Making 2012;32(5):667-77.

4. Drummond M, Sculpher M, et al. Methods for the Economic Evaluation of Health Care Programmes. Oxford, UK: Oxford University Press; 2005.

5. Husereau D, Drummond M, et al. Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement. Int J Tech As Health Care 2013;29(2):117-22.

6. Sullivan SD, Mauskopf JA, st al. Budget impact analysis-principles of good practice: report of the ISPOR 2012 Budget Impact Analysis Good Practice II Task Force. Value Health 2014;17(1):5-14.

7. McMurray JJ, Cowie MR, et al. A New Cost-Effectiveness Modelling Approach In Chronic Heart Failure With Reduced Ejection Fraction. Value Health 2015;18(7):A394.