Collegian 31 (2024) 258–266

Contents lists available at ScienceDirect

Collegian

journal homepage: www.elsevier.com/locate/colegn

A cost-effectiveness analysis of community nurse-led self-care education for heart failure patients

Paolo Iovino [a,*], Daniela D'Angelo [b,c], Ercole Vellone [d,e], Matteo Ruggeri [f]

[a] Department of Health Sciences, University of Florence, Florence, Italy
[b] Azienda Sanitaria Locale Roma/6, Albano Laziale, Rome, Italy
[c] Italian Evidence-Based Practice Nursing Scholarship: A JBI centre of excellence
[d] Department of Biomedicine and Prevention, University of Rome Tor Vergata, Rome, Italy
[e] Department of Nursing and Obstetrics,Wroclaw Medical University, Poland
[f] St. Camillus International University of Health Sciences, Rome, Italy

ARTICLE INFO

Article history:
Received 26 June 2023
Received in revised form 9 May 2024
Accepted 9 May 2024

Keywords:
Cost-effectiveness analysis
Health care costs
Heart failure
Mortality
Self-care
Quality-adjusted life years

ABSTRACT

Background: Community nurses delivering heart failure self-care education improve patient outcomes, but the cost-effectiveness of this type of nurse-led intervention has not been recently established.
Aim: To determine the cost-effectiveness of community nurses' self-care education for heart failure patients compared with usual care.
Methods: We performed a cost-effectiveness analysis from the perspective of the Italian National Health Service. A Markov model simulated the progression of a cohort of 1000 heart failure patients receiving remote self-care education after hospital discharge or usual care. Outcomes included costs, quality-adjusted life years, and incremental cost-effectiveness ratio. The willingness-to-pay threshold was established at €40,000/quality-adjusted life years.
Findings: Over the 20-year time horizon, community nurses' care incurred an extra cost of €1.3 million while gaining 247 quality-adjusted life years compared with usual care, and the incremental cost-effectiveness ratio was €5490/quality-adjusted life years.
Conclusions: The involvement of community nurses in self-care education is a potential cost-effective way of delivering home self-care education to heart failure patients.

Summary of relevance
Problem or Issue
The cost-effectiveness of community nurses providing heart failure self-care education has not yet been established.
What is already known
HF self-care education significantly reduces readmissions and mortality and improves quality of life and health care costs.
What this paper adds
Employing community nurses to deliver heart failure self-care education is a cost-effective way to increase patient outcomes.

1. Introduction

Heart failure (HF) represents a heterogeneous life-altering disease that affects around 65 million people globally (Groenewegen, Rutten, Mosterd, & Hoes, 2020). As a real epidemic, HF is still on the rise, especially in developed countries, given the growing expansion of the aging population and the improvements in medical care (Lippi & Sanchis-Gomar, 2020).

HF is well recognised to be associated with unfavourable outcomes; high mortality and recurrent hospitalisations are prevalent in this population, and this tendency is expected to continue as patients age (Lippi & Sanchis-Gomar, 2020). HF has a negative impact on quality of life, with a recent meta-analysis revealing variability ranges from moderate to poor levels, depending on disease severity, stage, age, and other factors (Moradi et al., 2020).

HF also imposes a substantial economic burden due to the high medical costs. Globally, the financial burden is estimated to be $108 billion each year, with more than 65% of spending attributed to direct costs (Lesyuk, Kriza, & Kolominsky-Rabas, 2018). According to a

* Corresponding author at: viale Morgagni, 48, 50143, Florence, Italy. Tel: +393479392534
E-mail address: paolo.iovino@unifi.it (P. Iovino).

https://doi.org/10.1016/j.colegn.2024.05.003
1322-7696/

recent systematic analysis of studies conducted in the United States, annual median costs for HF care are approximately $25,000 per patient, with a median cost of $16,000 for each hospitalisation; thus, hospital admissions are regarded as the major drivers of HF-related expenses (Urbich et al., 2020).

2. Background

Along with therapeutic developments in medicine that have expanded HF treatment options, there has also been a significant increase in awareness about self-care promotion to improve prognosis and other health-related outcomes (Riegel et al., 2009). According to international recommendations (Jaarsma et al., 2021), self-care is the cornerstone of HF treatment, and improving self-care has become the primary focus of health care programs worldwide. Self-care behaviours are defined as an ensemble of health-promoting practices performed to maintain health and manage chronic disease (e.g., physical activity, diet, and treatment adherence) (Riegel, Jaarsma, & Stromberg, 2012).

There is evidence that self-care improves health outcomes; specifically, patients who perform self-care better adhere to pharmacological treatment and physical activity, constantly monitor signs and symptoms of HF exacerbations, and respond to them promptly (Jaarsma et al., 2021). These behaviours have been linked to reduced admission rates, lower mortality, and higher quality of life (McAlister, Stewart, Ferrua, & McMurray, 2004). Self-care also appears to lower total health care expenditures, most likely due to lower health care utilisation (Hamar, Rula, Coberley, Pope, & Larkin, 2015). The mechanism by which all these outcomes improve is mainly explained by the fact that effective self-care triggers a plethora of complex biochemical reactions, including cardioprotective mechanisms (Lee, Tkacs, & Riegel, 2009); improvements in lipid profiles, insulin sensitivity, and glucose homeostasis; and reduction of systemic inflammation (Silverman & Deuster, 2014).

The education provided by health care practitioners is crucial in promoting self-care. Nurses are in the ideal position to educate patients because their activities can spread across multiple health care settings (e.g., from hospital wards to communities). Five years ago, the European Society of Cardiology developed the 'HF nurse curriculum,' a document that explicitly acknowledges and emphasises the important role nurses play in HF care and education (Riley et al., 2016). Self-care education has been associated with positive health outcomes; for example, a structured review that included several randomised controlled trials, six systematic reviews, and other nonrandomised studies found that educational strategies used by nurses could reduce symptom exacerbations, emergency services visits, and readmissions (Baptiste, Mark, Groff-Paris, & Taylor, 2013). Additional studies found that HF self-care education significantly impacted unplanned readmissions, all-cause mortality (Son, Choi, & Lee, 2020), quality of life, and costs (Rice, Say, & Betihavas, 2018).

Self-care education is typically provided by community nurses (CNs). These professionals are widely recognised throughout Europe since they help counteract unhealthy lifestyles and behaviours, especially among older people and those who have chronic conditions (Bagnasco et al., 2022). Despite this, some nations continue to offer fragmented services; one such country is Italy, where the general practitioner (GP) plays a major role in addressing health education, and the CN is used inhomogeneously (Marcadelli, Stievano, & Rocco, 2019).

Evidence on the effectiveness and cost-effectiveness of CNs delivering self-care education in chronic diseases is lacking and inconclusive; for example, in chronic obstructive pulmonary disease patients, these interventions seem to be useful in improving unplanned visits, anxiety, and self-efficacy, but more definitive conclusions are required on whether they also reduce costs (Baker & Fatoye, 2017).

In HF, nurse-led education seems to reduce hospital readmissions, improve quality of life, and yield substantial cost-benefit (Rice et al., 2018); however, further evidence is needed in this field because prior economic evaluations have been limited to relatively small trials with short time horizons (Ruschel et al., 2018), whereas others included other types of participants (i.e., caregivers) (Agren, Evangelista, Davidson, & Stromberg, 2013) or are not sufficiently recent (Hebert et al., 2008). Furthermore, data for an entire country, such as Italy, are lacking, where the prevalence of HF remains high (Cortesi et al., 2021).

Therefore, the purpose of this study is to evaluate the cost-effectiveness of self-care education provided to HF patients by the CNs, in comparison to usual care (i.e., clinical and nursing care in hospital settings) in Italy.

3. Methods

This study's reporting followed the recommendation of the Consolidated Health Economic Evaluation Reporting Standards statement (Husereau et al., 2022). This analysis compares the costs and effectiveness of two approaches for managing patients with HF: (i) usual care, defined as community and in-hospital care aimed at HF management, and (ii) usual care plus CNs providing self-care education to the patient discharged from the hospital. Usual care was defined as any in-hospital care delivered by cardiologists and nurses to manage the disease and the service delivered by GPs in the community. Self-care education was defined as any intervention tailored to the individual and delivered by a nurse in the community, which addresses health-promoting practices, including nutrition, well-being, physical activity, medication adherence, and management of HF signs and symptoms. This included all types of nurse-led education, regardless of its length or format.

The study was conducted from the perspective of the Italian National Health Service. The model simulates the progression of a cohort of 1000 patients aged between 50 and 85 years.

3.1. Structure of the model

A Markov model with a monthly time cycle and a 20-year time horizon was used to replicate the Italian context. The basic structure of this model is similar to that published by Pandor et al. (2013). A Markov model is a mathematical framework that allows us to simulate the natural history of a disease. This is represented in different and mutually exclusive health states. A hypothetical cohort of patients can move across different health states through different Markov cycles representing time according to transition probabilities that can be different depending on the arms of the model. The difference between control and experimental arms derived from transition probabilities can be observed in terms of different utilities and costs associated with the health states of the model, which allows us to present the results of the simulation in terms of cost-effectiveness.

Our Markov model reproduces the natural history of HF by taking into account the monthly probability of being alive, dying, or being hospitalised for HF or other causes after discharge (Fig. 1). The model compares usual care versus usual care with home self-care education. Fig. 1 depicts the structure of the Markov model.

Table 1 displays the transition probabilities associated with the various health statuses included in the model. Also, patients experiencing HF can die from other causes according to their age. The probabilities of death from other causes were provided by the Istituto Nazionale di Statistica for cohorts aged between 50 and 85 years (ISTAT, 2002). Mortality rates from other causes were changed according to the number of annual cycles of the model. The probabilities of death from other causes are detailed in Appendix 2.

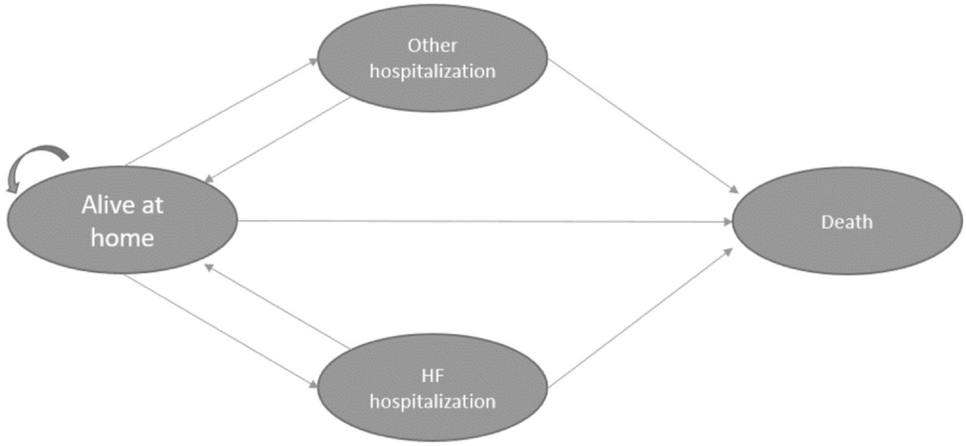

Fig. 1. Diagram of the Markov model. All patients start the Markov simulation in the 'alive-at-home' status. Arrows represent transitions that may occur each month, during which the patient dies or is hospitalised due to HF or other causes. Legend. HF, heart failure.

3.2. Effectiveness data

The data on the effectiveness of the CN's educational intervention were extrapolated from a review by Rice et al. (2018), which assesses the influence of clinical outcomes of nursing interventions providing HF self-care education to patients. Data regarding the effectiveness of usual care were the same used by Pandor et al. (2013). Table 1 reports the effectiveness data used to model the impact of CNs and of the usual care in terms of mortality and risk of re-hospitalisation for HF or other causes.

3.3. Cost data

The model incorporated cost data for (i) GP visits, (ii) specialist visits and exams, (iii) hospitalisations for HF, (iv) hospitalisations for other causes, (v) HF treatment, and (vi) health education sessions conducted by CNs.

The model incorporated cost data for each health state. Specifically, the health state 'Alive at home' was associated with the costs of (i) GP visits, (ii) specialist visits and exams, (iii) HF treatment, and (iv) health education sessions conducted by CNs (only in the usual care plus CNs arm). The national tariff for outpatient services was used to value the specialist's and GP visits (Ministero Della Salute, 2010, 2017). The GP visits were valued by estimating an average number of 750 patients and assuming the hypothesis of a 30-minute visit for 16 visits per day (Ministero Della Salute, 2022). The cost of HF hospitalisations and the mean cost of the pharmacological treatment were extrapolated from the available literature (Maggioni et al., 2016). For the pharmacological treatments, the mean considers the price of the treatments currently reimbursed in Italy for HF (i.e., sartans, beta-blockers, and diuretics).

Table 1
Transition probabilities associated with HF- and all-cause–related hospitalisation.

	Usual care	CNs
Mortality		
Time since discharge (months)		
0–1	0.046	0.038
2–3	0.033	0.028
4–6	0.027	0.023
7–12	0.024	0.020
13–24	0.019	0.016
> 24	0.015	0.013
HF risk of hospitalisation (monthly)	0.040	0.03
All-cause hospitalisation (monthly)	0.090	0.08

Legend. CNs, community nurses; HF, heart failure.
Note. Transition probabilities were extracted from a review by Rice et al. (2018).

In order to estimate the cost of hospitalisations for other causes, the average daily cost reported by the State General Accounting Office (RGS) was considered, with the hypothesis of an average duration of hospitalisation of 3 days (Ministero Dell'Economia e Delle Finanze, 2007). For the cost of CNs, an average of 2 visits/month was estimated coherent with the current Italian practice. Costs for CNs were not included in the usual care arm. Table 2 shows the costs included in the model, with unit costs and units per year reported separately.

3.4. Quality-of-life data

Quality-of-life data were extrapolated from the literature (Pandor et al., 2013), which, compared with the corresponding baseline health status (alive at home), associate a disutility of 0.1 with hospitalisations due to HF. Because of the scarcity of literature estimating the utility coefficient to be associated with patients undergoing hospitalisations for other causes, we assumed the same disutility of the hospitalisation due to HF. Coherent with Pandor et al. (2013), during the first year since discharge, the event of patients being hospitalised for HF or other causes was associated with a utility coefficient of 0.57. Starting from the second year since discharge, patients alive at home were associated with the related coefficient (0.67).

3.5. Discount rate

Consistent with the Italian methodological guidelines on good practices for economic evaluation, both the costs and the quality-adjusted life years (QALYs) were discounted at a rate of 3% (Fattore, 2013).

3.6. Incremental analysis

The results were expressed in terms of incremental cost-effectiveness, comparing the incremental costs generated by the introduction of the CNs with the incremental QALYs. To assess the economic sustainability of the cost-effectiveness ratio, a maximum willingness-to-pay (WTP) threshold of €40,000/QALY was used as it is the threshold value commonly considered in the Italian context. Therefore, to quantify the social benefit (or loss) resulting from the introduction of the CNs, the net monetary benefit was calculated, that is:

(INCREMENTAL QALY * WTP) – INCREMENTAL COSTS

Table 2
Costs associated with HF education and usual care.

	Units per year	Unit cost (€)	Total cost (€)
GP visits	3	13	39
Specialist visits	2	20.66	41.32
HF hospitalisation (number of admissions)	1	10,000	10,000
Hospitalisation for other causes (lenght of stay — days)	3	674	2022
HF treatment (yearly cost — average)	-		1720
Nurse costs (number of visits/year)	24	8.50	204

Legend. GP, general practitioner; HF, heart failure.

3.7. Sensitivity analysis

Probabilistic sensitivity analyses were conducted to spread the model's uncertainty across costs and utility data. Consistent with the current methodological guidelines used in suitable practice contexts, 'Beta' type random distributions have been associated with the data relating to the probability of transition, the effectiveness of the treatments, and the utilities. In particular, confidence intervals presented in a review by Rice et al. (2018) were used in order to fit random distributions associated with transition probabilities. A triangular distribution (range −0.08 to 0.12, mode 0.1) was associated with disutilities related to hospitalisations, whereas gamma random variables were associated with resources. However, only deterministic values were associated with the costs of treatment and hospitalisations for HF. The scale and shape parameters associated with each distribution are shown in Appendix 2. The probabilistic sensitivity analysis was carried out using a 1000-iteration Monte Carlo analysis. The results are presented using cost-effectiveness plans and acceptability curves of the cost-effectiveness ratio. Finally, univariate sensitivity analysis was carried out to investigate the variation of single parameters.

The results of the probabilistic sensitivity analysis were presented using a cost-effectiveness plane reporting incremental QALYs on the x-axis and incremental costs on the y-axis. Secondly, the simulation results were ordered to estimate a cumulate joint distribution representing the cost-effectiveness acceptability curve, which reports the probability associated with incremental cost-effectiveness ratio (ICER) values being lower than a predefined threshold, which in our case was set up at €40,000/QALY in order to represent the implicit threshold used in the Italian context.

The results of the univariate sensitivity analysis were presented using a Tornado graph reporting as a central value of the base-case incremental analysis. The Tornado graph allows us to observe the impact on the variation of the ICER deriving from the variation of each parameter using histograms reporting the extreme values associated with cost, effectiveness, and utility data.

4. Results

The results of the economic analysis (Table 3) demonstrate that the management model based on CNs' self-care education is highly cost-effective compared with usual care. Specifically, on a hypothetical cohort of 1000 individuals, against additional costs of just over €1.3 million over the entire simulation period, 247 additional QALYs are produced, yielding an ICER equal to €5490/QALY. Moreover, the comparison between the ICER and the WTP threshold for a QALY of €40,000 generates a net monetary benefit of €8,502,000.

Table 3
Results of the cost-effectiveness analysis.

Total costs of usual care	€7,359,876.56
Total costs CNs	€8,712,606.86
Total QALYs usual care	2317.56
Total QALYs CNs	2563.93
Incremental costs	€1,352,730.30
incremental QALYs	€246.37
ICER	€5490.57
NMB	€8,502,208.82

Legend. CNs, community nurses; ICER, incremental cost-effectiveness analysis; NMB, net monetary benefit; QALYs, quality-adjusted life years.

4.1. Sensitivity analysis

Fig. 2 shows the scatterplot of the cost-effectiveness plane resulting from the Monte Carlo simulation that allows the spreading of the uncertainty of the model across multiple stochastic parameters. It can be seen that 100% of the simulations are in the first quadrant, thus confirming that the management model based on CNs always involves extra costs and QALY gains. The 95% confidence interval of the ICER ranges from €3543 to €10,559/QALY. The acceptability curve of the cost-effectiveness ratio (Fig. 3) shows that the cost/QALY remains below the hypothetical threshold of WTP €40,000 in 100% of cases. Moreover, in 80% of the simulations carried out, the ICER remains below €7500/QALY.

Appendices 1 and 2 show the results of the univariate sensitivity analysis. Fig. A1.1 shows the results of the impact of clinical parameters on the final results, where the most sensitive parameters are the HF- and all-cause–related risk of hospitalisation in the usual care plus CNs arm. In this case, as the risk increases, the ICER is expected to increase up to €25,500/QALY. For the lowest value of HF risk of hospitalisation, the ICER is expected to decrease to €200/QALY.

The risk of HF hospitalisation associated with usual care involves an inverse relationship with the ICER. In other words, a higher risk is associated with a decrease in the ICER. In this case, the ICER is expected to range from €1200 to €10,500/QALY.

In general, the mortality risk in the usual care plus CNs directly relates to the increase in the ICER, with an overall variation ranging from €1500 to €10,800/QALY (0–1 month mortality). Instead, the mortality risk with usual care is only associated with an inverse relation with the ICER variations ranging from €3500 to €9500/QALY. The sensitivity decreases if long-term values are considered.

Fig. A1.2 shows the results of the sensitivity analyses relating to the model's economic parameters (costs and utilities). In this case, the most sensitive parameter is the cost of the HF-related hospitalisation (€750–€11,000/QALY), followed by the utility value associated with the patient being at home (€1300–€9300/QALY). The increase in HF hospitalisation costs is associated with a decrease in the ICER. The variation of the ICER associated with changes in treatment costs results in a range of €3000–€7600/QALY. In this case, the cost of the treatment is inversely related to the variation in the ICER.

5. Discussion

We performed a cost-effectiveness analysis from the perspective of the Italian National Health Service, comparing usual care provided by GPs, cardiologists, and nurses in hospital settings, and usual care plus CNs delivering HF self-care education after discharge. We found that self-care education delivered by CNs was associated with a significant improvement in QALYs and a 100% likelihood of being cost-effective over the 20-year time horizon.

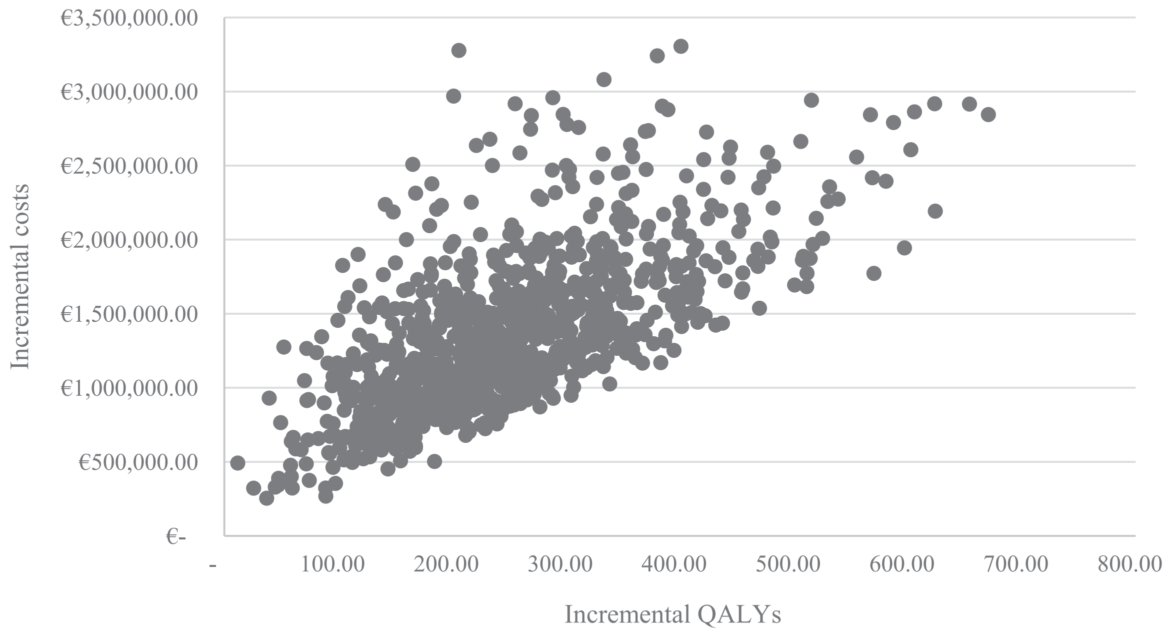

Fig. 2. Scatterplot of the cost-effectiveness plane. Legend. QALYs, quality-adjusted life years.

To the best of our knowledge, this is the first recent study that assesses the cost-effectiveness and acceptability of self-care programs implemented by CNs in the context of HF care. Our results provide more detailed information for deciding an intervention strategy that possibly improves HF outcomes. Such evidence was highly required, given that, despite the advances in pharmacotherapy, HF is still linked to poor prognosis and quality of life (Iovino et al., 2021).

In Europe and the US, CNs are considered the most important professionals to contribute to HF health promotion, where this role is embedded in primary health care. However, although this system is recognised as a cornerstone of health systems, a few European countries, such as Germany and Italy, still struggle to have the CNs well-defined in primary care (Marcadelli, Stievano, & Rocco, 2019). In Italy, despite post-graduate training courses being available for more than a decade, the role of the CN is still in its infancy due to a series of interrelated barriers; first, this role has not been formally recognised; second, there is an uneven distribution of such professionals in the community (under pilot forms); third, there is a general chronic lack of nursing staff, most of whom are dedicated to

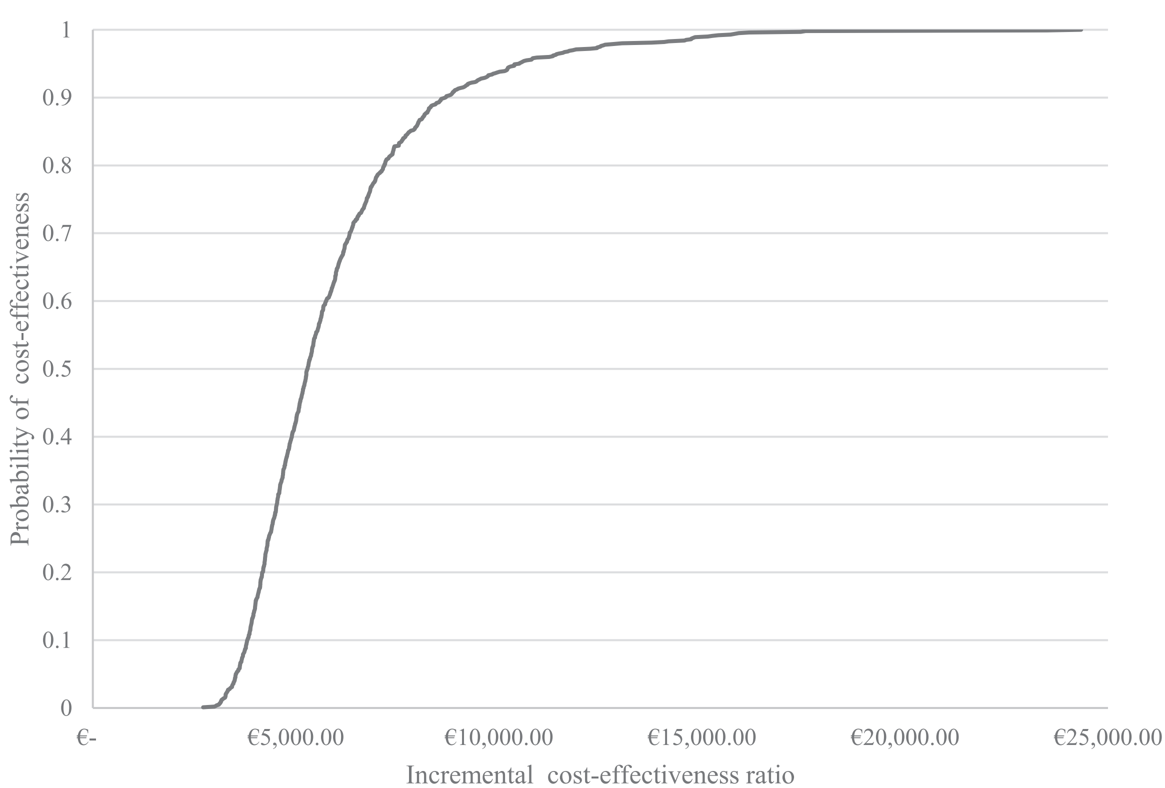

Fig. 3. Cost-effectiveness acceptability curve.

hospital settings; and finally, the employment of nurses in the community for educational purposes is often perceived as an expensive intervention (Busca et al., 2021; Marcadelli, Stievano, & Rocco, 2019). As a result, while the majority of patients in Italy are treated by multidisciplinary teams during their hospital stay, they are solely followed by the primary care physicians after discharge, who may lack the time or experience to provide HF education (Heart Failure Policy Network, 2020).

Hence, patients might not receive appropriate instructions on how to self-manage the disease at home, resulting in greater health care services utilisation and a higher likelihood of premature death. There is evidence that a significant proportion of hospital admissions can be avoided if patients are encouraged to engage in consistent self-care behaviours (Long, Howells, Peters, & Blakemore, 2019; Ruppar, Cooper, Mehr, Delgado, & Dunbar-Jacob, 2016; Savini et al., 2021).

Our study may have important implications for HF care, given the paucity of evidence regarding the cost-effectiveness of CNs in the HF field. HF education has proven to be the mainstay of HF management, and CNs are in a prime position to deliver HF self-care education and empower patients to become active participants in their health. However, as previously stated, significant barriers remain, and CNs' promotion in primary care ideally requires interventions at the political and societal levels. Given that we have provided evidence-based proof that HF self-care education can be extremely cost-effective over a wide range of WTP thresholds, institutions and governments should be sensitised toward optimal decision-making.

However, our study also has a number of caveats that are worth mentioning. First, our model considers a time horizon of 20 years, assuming that the mortality due to cardiovascular events remains constant. Although this assumption can be considered a limitation in the accurateness of the estimates, disease-specific mortality was adjusted with the yearly general mortality rate, which could mitigate at least partially the bias induced by our assumption. Second, the parameters used in the model were extracted from a 10-year-old systematic review of studies that used telephone education. This could further complicate the generalisation of the results, as the costs of remote education are likely to be lower than those of face-to-face visits. Quality-of-life utility values may also have been affected, given the advancements of modern education strategies.

Third, like all economic models, the results from this analysis are contingent on the primary assumption of the Markov model that the transition probabilities are constant over time, which may not always be true in our population. Specifically, we assumed that after 24 months following discharge, the mortality risk for cardiovascular events is the same for up to 20 years. This limitation was due to lack of information about mortality for cardiovascular events after 24 months following discharge. Also, we assumed that both the resources and the effectiveness of all the community self-care education programs were the same regardless of their design (i.e., content, mode of administration, length, and so on). Although we understand that this can be a limitation to our analysis, extra sources of variability such as content, length, and way of delivery of the programs could not be taken into account in the sensitivity analysis due to the impossibility of quantifying these sources of bias.

A further limitation of this analysis is that transition probabilities used to model the progression of the patients across different health states were not time-dependent, which means that the model was not able to present scenarios, including explicitly the variation of the likelihood of being admitted in the hospital for HF due to age. However, we are confident that variations in the results due to age-related parameters are included in the confidence interval of the cost-effectiveness plan. Finally, we did not take into account the probability of dying in the hospital, which for these patients ranges from 4% to 7% (Farmakis, Parissis, Lekakis, & Filippatos, 2015). However, the introduction of international guidelines and therapeutic advancements has resulted in a significant decrease in HF in-hospital mortality over the past 20 years (Akintoye et al., 2017); thus, it is possible that our results may not be affected, especially in light of the strong results obtained by the sensitivity analysis.

6. Conclusion

In conclusion, our findings show that self-care education delivered by CNs is potentially cost-effective for health care systems while also adding to the efficacy documented in several other clinical trials. Future research is needed to account for the contextual heterogeneity of the interventions and patients and provide more generalisable evidence of their cost-effectiveness in the context of HF care. Policymakers and clinicians should use this evidence to develop more sensible and cost-effective nursing programs.

Authorship contribution statement

Paolo Iovino: Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Daniela D'Angelo:** Conceptualization, Resources, Writing – review & editing, Supervision. **Ercole Vellone:** Methodology, Resources, Writing – review & editing, Supervision. **Matteo Ruggeri:** Conceptualization, Resources, Writing – review & editing, Supervision, Formal analysis.

Ethical statement

The submitted manuscript involves human research. However, since the data have been extrapolated from published studies, Ethical Approval has not been deemed necessary.

Conflict of interest

The authors of this paper have no conflict of interest to disclose.

Appendix 1

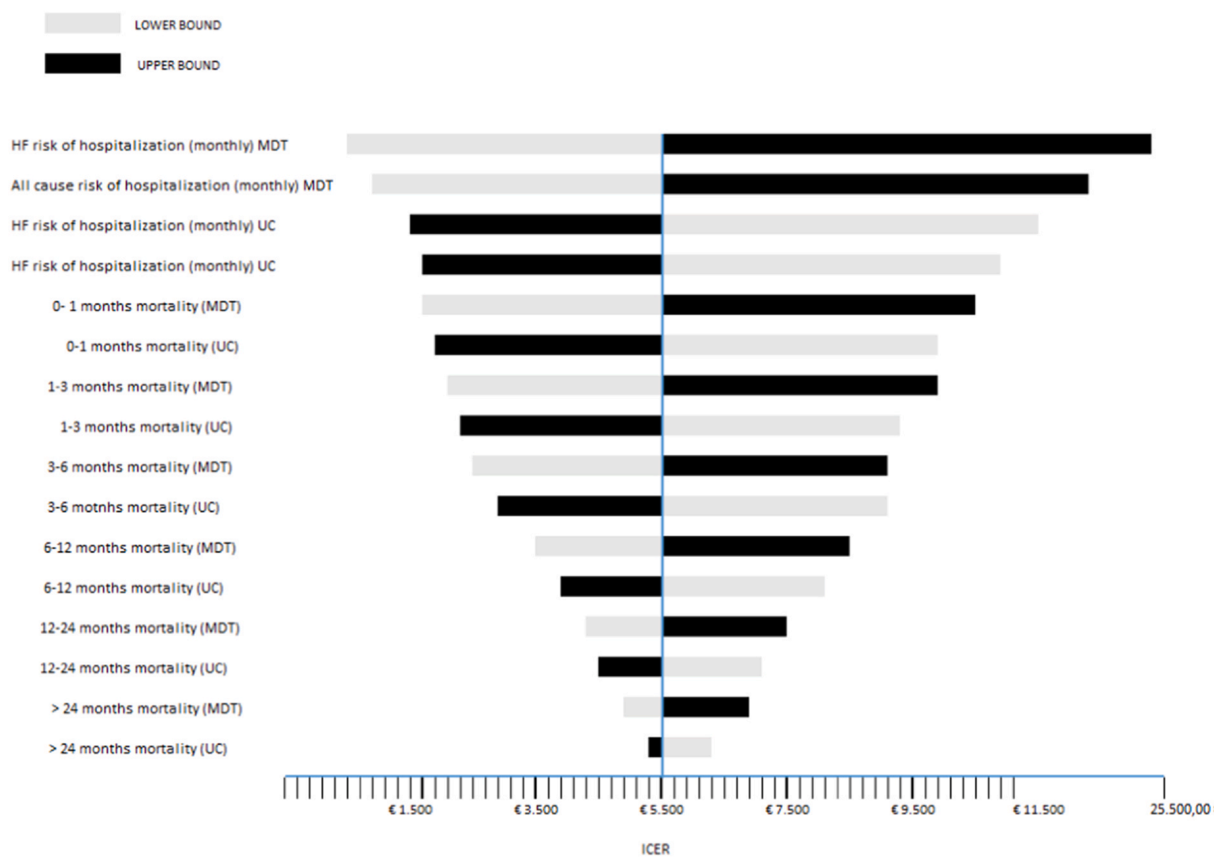

Fig. A1.1. Tornado graph, clinical and effectiveness parameters.

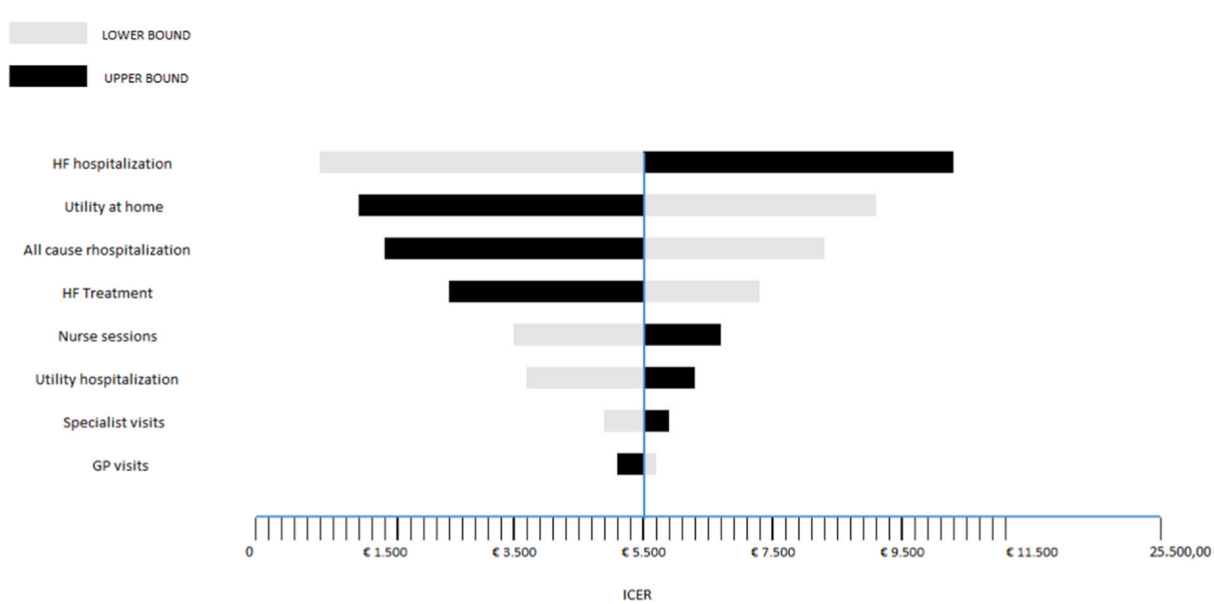

Fig. A1.2. Tornado graph, cost and utility parameters.

Appendix 2

Table A2.1
Probabilistic sensitivity analysis, scale, and shape parameters.

Usual care mortality							
	Deterministic	**95% CI**		**SD**	**Alpha**	**Beta**	**Distribution**
0–1	0.046	0.04	0.06	0.01	0.00	0.01	BETA
2–3	0.033	0.026	0.04	0.007	0.00	0.01	BETA
4–6	0.027	0.02	0.03	0.005	0.00	0.01	BETA
7–12	0.024	0.019	0.028	0.0045	0.00	0.01	BETA
13–24	0.019	0.016	0.022	0.003	0.00	0.01	BETA
> 24	0.015	0.011	0.019	0.004	0.00	0.01	BETA
Usual care effectiveness							
	Deterministic	**95% CI**		**SD**	**Alpha**	**Beta**	**Distribution**
HF risk of hospitalisation (monthly)	0.035	0.0325	0.0375	0.0025	0.00	0.00	BETA
All-cause hospitalisation (monthly)	0.0875	0.0841	0.0908	0.00335	0.00	0.00	BETA
Nurse-led education effectiveness							
	Deterministic		95% CI	SD	Alpha	Beta	Distribution
Mortality	0.8	0.6	0.95	0.3	0.23	0.05	BETA
All-cause hospitalisation	0.9	0.7	0.96	0.3	0.32	0.03	BETA
HF hospitalisation	0.9	0.66	0.95	0.2	0.18	0.02	BETA
Resources							
	Deterministic costs	**Measure**	**Unit costs**	**Total costs**	**Alpha**	**Beta**	**Distribution**
GP	€3.25	3	13	€39.00	2.25	1333	GAMMA
Specialist	€3.44	2	20.66	€41.32	4	0.5	GAMMA
Hospitalisation HF	€833.33			€10,000.00			GAMMA
Hospitalisation other causes	€168.50	3	674	€2022.00	2.25	1.333	GAMMA
HF treatment	€143.31			€1719.68			DETERMINISTIC
Nurse	€17.00	24	8.5	€204.00	2.56	9.375	GAMMA
Utilities							
	Deterministic QALYs	**Deterministic QALYs (month)**		**SD (month)**	**Alpha**	**Beta**	**Distribution**
At home	0.67	0.056		0.00125	0.00006	0.00118	BETA
Hospitalisation	0.57	0.048		0.0015	0.0005	0.0015	BETA
Disutility	0.1	0.001		0.0007	Probabilistic		DETERMINISTIC

Legend: QALY, quality-adjusted life years; SD, standard deviation, GP, general practitioner; HF, heart failure.

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