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Heart Nearby a Strategic Simulation-Based Proposal for Compassionate and Cost-Effective Telecardiology at Casa Sollievo Della Sofferenza

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ABSTRACT

Heart Nearby is an original initiative designed to bring compassionate, continuous, and economically sustainable cardiac care to patients with chronic heart conditions. This paper presents a simulation-based telecardiology model tailored for implementation at Casa Sollievo della Sofferenza (CSS), a prominent IRCCS located in southern Italy. The proposed model integrates three key pillars: remote telemonitoring of patients with chronic cardiovascular disease, virtual cardiac rehabilitation services, and psychosocial-spiritual support in line with CSS's humanistic mission. Using hypothetical but realistic institutional data, the model calculates net savings derived from the reduction of unnecessary hospitalizations and outpatient visits, balanced against the cost of implementing telemedicine infrastructure and operations. The simulation demonstrates that the project is financially scalable and institutionally coherent. Heart Nearby aligns perfectly with the goals outlined in CSS's 2024–2029 Strategic Plan and Italy's PNRR Mission 6 (Health), making it a viable candidate for national funding and replication across similar settings.

Keywords: Telemedicine; Cardiology; Economic Simulation; Chronic Disease Management; IRCCS; Casa Sollievo della Sofferenza; Cost Effectiveness; PNRR; Digital Health; Public Health Innovation

Introduction

Cardiovascular diseases (CVDs), including heart failure and ischemic cardiomyopathy, continue to be the leading cause of hospitalization and death in Europe. Managing these conditions requires not only high-quality acute care, but also robust long-term follow-up, home-based monitoring, lifestyle support, and integrated multidisciplinary care. Telemedicine especially when applied to cardiology-offers the potential to dramatically improve the quality, continuity, and cost-effectiveness of care. It allows patients to be monitored in real time from home, to access virtual rehabilitation services, and to receive timely interventions that prevent deterioration and reduce hospital readmissions. This paper presents a new model, titled "Heart Nearby", originally conceived by the author and offered for potential implementation by Casa Sollievo della Sofferenza (CSS). The proposal is based on the hospital's strategic priorities and moral mission and responds directly to the digital health transformation encouraged by the Italian National Recovery and Resilience Plan (PNRR) [1-3].

What is Casa Sollievo della Sofferenza (CSS)?

Casa Sollievo della Sofferenza, meaning "Home for the Relief of Suffering", is a major scientific hospital and research institution located in San Giovanni Rotondo, Apulia. It was founded in 1956 by Saint Pio of Pietrelcina, who envisioned a center of care where science, compassion, and spirituality could harmoniously coexist. CSS is recognized as an IRCCS (Scientific Institute for Research, Hospitalization, and Healthcare) by the Italian Ministry of Health, signifying its dual role in clinical excellence and biomedical research. The hospital includes advanced facilities, and research departments in oncology, neuroscience, rare diseases, and cardiology. Despite ongoing financial pressures, CSS has maintained its commitment to universal, compassionate care-providing services without discrimination and promoting innovation within its ethical and spiritual framework. In 2024, Newsweek ranked CSS among the Top 100 Hospitals Worldwide, affirming its global stature. CSS's Strategic Plan 2024–2029 explicitly calls for new models of digital, home-based care, cost containment,

and alignment with PNRR goals. Heart Nearby offers a direct operationalization of that vision [4-6].

Institutional Recognition and Ranking (Newsweek 2025)

The strategic proposal presented in this paper is further validated by the international recognition recently received by Casa Sollievo della Sofferenza. In 2025, the IRCCS Casa Sollievo della Sofferenza of San Giovanni Rotondo was once again ranked first among all hospitals in Southern Italy in the Italian edition of the prestigious World's Best Hospitals list compiled annually by Newsweek, in collaboration with the global data and research company Statista. The hospital also ranked 35th nationally among 133 institutions evaluated, maintaining its previous year's position. This distinction marks the sixth consecutive year that CSS has held the top ranking in the South and places it ahead of several nationally renowned hospitals located in larger, more accessible metropolitan areas such as Milan, Rome, Turin, Bologna, Florence, and Genoa. The 2025 ranking was based on the evaluation of 2,445 hospitals across 30 countries, selected using criteria such as population size, healthcare infrastructure, life expectancy, and data availability. The ranking methodology incorporated four weighted factors:

1) Peer recommendation surveys from tens of thousands of medical professionals and healthcare workers (40%);
2) Hospital quality metrics, including patient-to-staff ratios, treatment quality, hygiene, safety protocols, and waiting times (37.5%);
3) Patient-reported experience data (17.5%);
4) Use of PROMs (Patient-Reported Outcome Measures), evaluating how hospitals measure care results from the patient's perspective (5%).

The Director General of CSS, Prof. Gino Gumirato, commented:

"We are deeply proud to have once again received Newsweek's recognition as one of the World's Best Hospitals in 2025. This award confirms Casa Sollievo as the leading hospital in Southern Italy for the sixth consecutive year. It is the result of the unwavering commitment of our entire medical and healthcare staff, to whom the Board of Directors extends its deepest gratitude. Their professionalism, rooted in the ethical values taught by our founder Saint Pio of Pietrelcina, ensures that patients remain at the center of our mission — in both clinical care and scientific research." This continued excellence underscores why Casa Sollievo della Sofferenza is not only suitable, but strategically ideal, to serve as a national pilot center for innovative care models such as Heart Nearby.

Project Overview: Heart Nearby

Heart Nearby is a telecardiology program structured around three pillars:

1) Remote Monitoring – Daily biometric and clinical tracking of patients with chronic cardiovascular disease using wearable technology and connected platforms;
2) Virtual Cardiac Rehabilitation – Exercise and counseling modules delivered via telehealth, reducing the need for in-person rehab sessions;
3) Spiritual and Psychosocial Support – A unique feature inspired by CSS's mission, offering patients remote access to counselors and chaplains for emotional and spiritual care.

This combination not only addresses clinical needs but also reinforces patient dignity, continuity of care, and the relational dimension of healing—a cornerstone of CSS's founding values.

Formal Economic Model and Its Explanation

To evaluate the cost-effectiveness of the Heart Nearby telecardiology initiative, we estimate the net savings using the following economic equation:

$$S_{net} = (C_{hosp} \times R \times N) + (C_{visit} \times V \times N) - (C_{kit} + C_{OP}) \times N_S$$

Component-by-Component Explanation

Table 1.

Symbol	Meaning
C_{hosp}	Average cost of one hospitalization for a cardiac patient (assumed €4000)
R	Percentage of hospitalizations that could be prevented by telemonitoring (30%)
N	Number of enrolled patients in the program
C_{visit}	Average cost per outpatient cardiology visit (€150)
V	Number of outpatient visits avoided per patient due to remote care (2/year)
C_{kit}	Cost of telemonitoring equipment per patient (one-time, €600)
C_{op}	Annual operational cost per patient (IT support, staff, logistics; €200)

Interpretation

1) The first term (C_{hosp} × R × N) estimates the total money saved from avoiding hospitalizations.
   - For example, if 30% of 100 patients avoid hospitalization at €4000 each, that saves €120,000.
2) The second term (C_{visit} × V × N) estimates total outpatient visit savings.
   - Avoiding 2 visits per patient at €150 each for 100 patients saves €30,000.
3) The third term (C_{kit} + Cop) calculates the total cost of delivering the telehealth service (equipment + management).

- For 100 patients, this equals €80,000 (€600 + €200 = €800 per patient × 100).

Finally, the net savings S_{net} is simply: Total Savings – Total Costs

This model assumes all patients are equally eligible and that clinical teams have already identified them as appropriate for remote care.

Simulation Code in Python

To explore how these calculations scale, we simulate the results for different cohort sizes using Python. Here's a fully annotated version of the code: (Appendix Figure 1)

```python
# Define patient group sizes
n_patients = [100, 200, 500]

# Input parameters (in euros)
C_hosp = 4000      # cost per hospitalization
R = 0.30           # proportion of avoidable hospitalizations
C_visit = 150      # cost per outpatient visit
V = 2              # outpatient visits avoided per patient
C_kit = 600        # equipment cost per patient
C_op = 200         # operational cost per patient

# Run simulation
for n in n_patients:
    # Total avoided hospitalization savings
    savings_hosp = n * R * C_hosp

    # Total avoided outpatient visit savings
    savings_visit = n * V * C_visit

    # Total cost of program implementation
    total_cost = n * (C_kit + C_op)

    # Calculate net savings
    net_saving = savings_hosp + savings_visit - total_cost

    # Display results
    print(f'Patients: {n}, Net Saving: €{net_saving:,.2f}')
```

Appendix Figure 1.

Results and Interpretation

The simulation generates the following results based on different patient cohort sizes. (Table 2)

Table 2.

Patients	Avoided Hospital Savings (€)	Avoided Visit Savings (€)	Program Cost (€)	Net Savings (€)
100	€ 120,000	€ 30,000	€ 80,000	€ 70,000
200	€ 240,000	€ 60,000	€ 160,000	€ 140,000
500	€ 600,000	€ 150,000	€ 400,000	€ 350,000

Key Findings

1) The net savings per patient is consistently around €700/year under conservative assumptions.

2) The model's linear scalability is particularly attractive for medium-sized hospitals or regional pilots.

3) Most of the savings are driven by prevented hospitalizations, which are both the most costly and most disruptive for patients with chronic cardiac conditions [7,8].

Alignment with the CSS Strategic Plan (2024–2029)

The Heart Nearby model directly responds to multiple strategic pillars identified in CSS's official 2024–2029 Strategic Plan: Strategic Fit by Section: (Table 3)

Table 3.

Strategic Objective	Strategic Plan Reference	Model Alignment
Home-based integrated care	Page 9	Implements "Assistenza Domiciliare Integrata" via remote cardiology
Cost containment and resource optimization	Page 6 & 9	Reduces inappropriate hospital admissions and outpatient overload
Digital innovation (PNRR)	Page 9	Fully aligned with Missione 6 of the National Recovery and Resilience Plan
Humanistic and spiritual care	Pages 4–5	Includes psychosocial and spiritual support modules
Positive EBITDA and long-term sustainability	Page 21	Demonstrates how digital investment yields measurable ROI

Policy and Funding Implications

Why this Model Deserves PNRR Funding

1) Directly supports PNRR Missione 6 – Salute: digital transformation, territorial care, and equity.

2) Targets chronic disease management, a core priority for long-term health system sustainability.

3) Embeds evaluation and replicability, making it suitable as a pilot project for regional and national scaling.

Why CSS is the Ideal Site

- IRCCS designation and proven scientific excellence
- Ethical and spiritual orientation aligned with person-centered care
- Strong regional identity and institutional credibility
- Strategic vision already oriented toward innovation

Conclusion

Heart Nearby is more than a telemedicine project — it is a strategic blueprint for how hospitals like Casa Sollievo della Sofferenza can:

1) Honor their humanitarian legacy,

2) Reduce operational strain,

3) And pioneer the next generation of compassionate, data-driven healthcare delivery.

By combining cost-effectiveness, spiritual care, and policy alignment, this proposal offers a real-world roadmap to modernize cardiovascular services while preserving the human heart of medicine.

The author invites Casa Sollievo della Sofferenza to adopt and champion this proposal, and is available to collaborate in its implementation and evaluation (Appendix Figure 2).

```python
# Define patient group sizes
n_patients = [100, 200, 500]

# Input parameters (in euros)
C_hosp = 4000     # cost per hospitalization
R = 0.30          # proportion of avoidable hospitalizations
C_visit = 150     # cost per outpatient visit
V = 2             # outpatient visits avoided per patient
C_kit = 600       # equipment cost per patient
C_op = 200        # operational cost per patient

# Run simulation
for n in n_patients:
    # Total avoided hospitalization savings
    savings_hosp = n * R * C_hosp

    # Total avoided outpatient visit savings
    savings_visit = n * V * C_visit

    # Total cost of program implementation
    total_cost = n * (C_kit + C_op)

    # Calculate net savings
    net_saving = savings_hosp + savings_visit - total_cost

    # Display results
    print(f'Patients: {n}, Net Saving: €{net_saving:,.2f}')
```

```
Patients: 100, Net Saving: €70,000.00
Patients: 200, Net Saving: €140,000.00
Patients: 500, Net Saving: €350,000.00
```

Appendix Figure 2: Python Simulation Code.

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