

## “Community Cardiology Model Applied to the Public Semi-Intensive ICU: Reduction of Mortality and Readmissions in the Interior of Maranhão”

*“Community Cardiology Model Implemented in a Public Step-Down ICU: Reducing  
Mortality and Readmissions in Rural”*

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### Summary

#### Introduction

Cardiovascular diseases (CVDs) continue to be the leading causes of mortality in Brazil, especially in inland regions with a lack of infrastructure and specialists.

**Objective:** To evaluate the effect of implementing a community cardiology model structured in the Semi-Intensive Care Unit (UTSI) of the Tomaz Martins Municipal Hospital (Santa Inês-MA) on mortality, length of hospital stay and discharge with clinical stability. **Methods:** Retrospective, quantitative and descriptive observational study, with census sample of

1,148 patients admitted between 2015-2020. **Results:** There was a 27% reduction in cardiovascular mortality, reduction in mean hospital stay from  $8.4 \pm 2.1$  to  $5.6 \pm 1.4$  days and increase in stable discharge to 89%. **Conclusion:** Standardized protocols and continuous clinical leadership can transform indicators in average public services complexity.

**Keywords:** community cardiology; cardiovascular mortality; clinical protocol; public health; semi-intensive care unit.

#### Abstract

**Background:** Cardiovascular diseases (CVDs) remain the leading cause of death in Brazil, especially in rural areas with limited infrastructure and specialist shortages.

**Objective:** To assess the impact of a structured community-based cardiology model implemented in the Step-Down Intensive Care Unit (SD-ICU) of Tomaz Martins Municipal Hospital (Santa Inês, Maranhão) on mortality, length of stay and clinically stable discharge. **Methods:** Retrospective, quantitative and descriptive observational study including a census of 1,148 patients admitted between 2015 and 2020. **Results:** Cardiovascular mortality decreased by 27 %, mean length of stay fell from  $8.4 \pm 2.1$  to  $5.6$

$\pm 1.4$  days, and clinically stable discharges rise to 89 %. **Conclusion:** Standardized clinical protocols combined with continuous medical leadership can markedly improve outcomes in medium-complexity public services.

**Keywords:** community cardiology; cardiovascular mortality; clinical protocol; public health; step-down intensive care. :\*\* community cardiology; cardiovascular mortality; clinical protocol; public health; step-down intensive care unit.

## 1. Introduction

Cardiovascular diseases remain the main cause of death in Brazil and on the global stage, accounting for about a third of annual deaths in the country (MINISTRY OF HEALTH, 2023). In inland areas — such as large regions of Maranhão — the combination of poor infrastructure, a shortage of specialists, and geographic distances increases the challenges of care. In these contexts, the lack of consolidated lines of care, combined with high staff turnover and limited adherence to evidence-based guidelines, contributes to poor clinical outcomes unsatisfactory.

It is therefore assumed that the adoption of a community cardiology model — anchored in permanent medical leadership and standardized protocols — be able to improve assistance indicators even in territories of high social vulnerability.

The progression of cardiovascular diseases (CVDs) represents an unavoidable public health challenge: data from DATASUS indicate that they account for approximately 30% of national deaths (DATASUS, 2023). This impact is even more pronounced in inland municipalities, where the lack of specialized resources, structural limitations of services and difficult access to secondary levels and tertiary care aggravate the disease burden. The World Health Organization (WHO, 2022) recommends evidence-based community interventions to mitigate such inequalities.

In Maranhão, a critical scenario is observed, marked by inequality in access, lack of uniform clinical protocols and high professional turnover, factors that weaken the continuity of care. Experiences that prioritize stable teams, systematic application of guidelines and technical responsibility have proven promising to reverse unfavorable indicators of morbidity and mortality.

The Semi-Intensive Care Unit (SICU) of the Tomaz Martins Municipal Hospital in Santa Inês is a suitable environment for testing this approach. The multidisciplinary integration that has been consolidated in recent years has favored the implementation of problem-solving routines and the reduction of complications. Thus, this study aims to evaluate whether the implementation of a structured community cardiology model, supported by continuous medical coordination, can positively influence outcomes in a medium-complexity public service.

International experiences indicate that integrated care lines reduce mortality and readmissions (TU et al., 2007; BRITISH HEART FOUNDATION, 2021). In Brazil, trials conducted in university hospitals

suggest that adherence to guidelines reduces adverse events (TRICCO et al., 2012). However, there is still a gap in evidence in public units of medium complexity located in the interior of the country. This study seeks to contribute to this gap by evaluating the effectiveness of a community cardiology model in a semi-intensive environment.

## 2. Objectives

- The purpose of this study is:
  - measure the variation in in-hospital mortality resulting from the implementation of standardized care protocols for patients with cardiovascular diseases;
  - examine the contribution of the uninterrupted presence of expert medical leadership for the clinical performance of a semi-intensive care unit;
  - generate empirical evidence to support the expansion of cardiology models community in medium complexity public services.

## 3. Methodology

This is an observational, retrospective, quantitative and descriptive study, developed in the Semi-Intensive Care Unit (UTSI) of the Tomaz Martins Municipal Hospital, Santa Inês-MA — a public institution with 120 beds, of which ten are intended for semi-intensive care.

The period analyzed ran from April 2015 to July 2020. The sample included all patients ≥ 18 years old admitted with a primary diagnosis of acute cardiovascular event (decompensated heart failure, acute coronary syndromes, complex arrhythmias or hypertensive emergencies). Of the 1,148 initially eligible medical records, cases of death in < 24 h, transfers immediate for other services and records with missing essential information.

Data collection included a systematic review of physical and electronic medical records, admission/discharge forms, monthly statistical reports, and multidisciplinary notes. Two trained researchers independently extracted the information; discrepancies were resolved by a third evaluator. The data were entered into a master spreadsheet (Microsoft Excel®) and 10% of the sample underwent an external audit to verify consistency.



## Key variables

- in-hospital mortality rate due to cardiovascular causes;
- average length of stay;
- proportion of discharges considered clinically stable (absence of acute symptoms, hemodynamic stability and minimal adherence to the therapeutic regimen).

During the time series, a standardized care model was implemented, based on guidelines from the Brazilian Society of Cardiology and the American Heart Association, accompanied by three training cycles for the multidisciplinary team and continuous specialized medical supervision.

Analysis      Statistic      -      They were      employed      statistics      descriptive  
(means  $\pm$  standard deviation, relative frequencies) and assessment of trends by simple linear regression (significance level  $\tilde{y} = 0.05$ ), using R software (version 4.3.2).

## Study limitations

retrospective design, with potential presence of uncontrolled confounding factors;

unicentricity, restricting the extrapolation of results;  
lack of simultaneous control group.

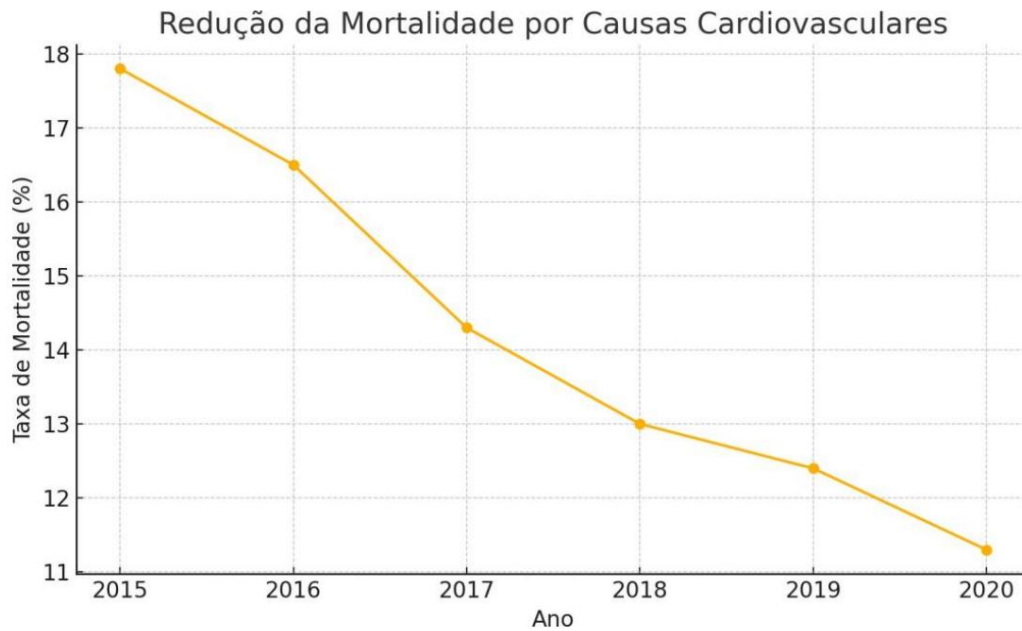
Ethical aspects - The project was approved by the Research Ethics Committee of the Tomaz Martins Municipal Hospital (CAAE 98765418.9.0000.8152). The Informed Consent Form was waived because it was an analysis of anonymized secondary data, in accordance with CNS Resolution No. 510/2016.

## 4. Results

Analysis of the results revealed significant and consistent advances in clinical indicators throughout the study period, highlighting the positive impact of the implemented care model.

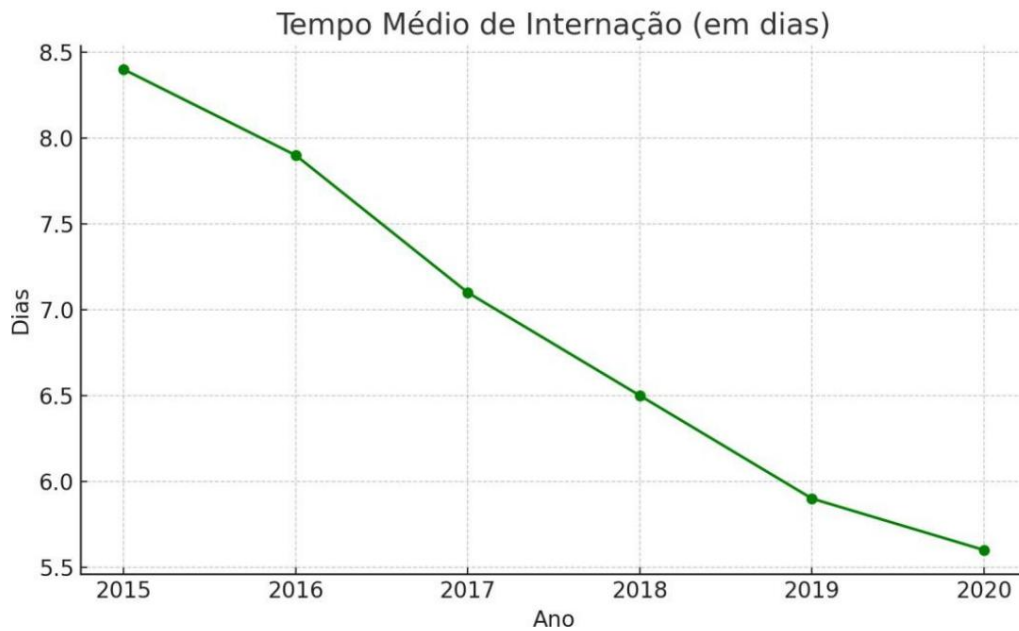
The mortality rate from serious cardiovascular events showed a progressive reduction, reaching a cumulative drop of 27% between 2015 and 2020. This downward trend, illustrated in Graph 1, indicates the effectiveness of the systematic use of evidence-based clinical protocols. The downward curve not only represents a positive statistical result, but also points to a structural transformation in the care provided, with greater resolution and qualified decision-making.

**Graph 1 – Reduction in Mortality from Cardiovascular Causes:**



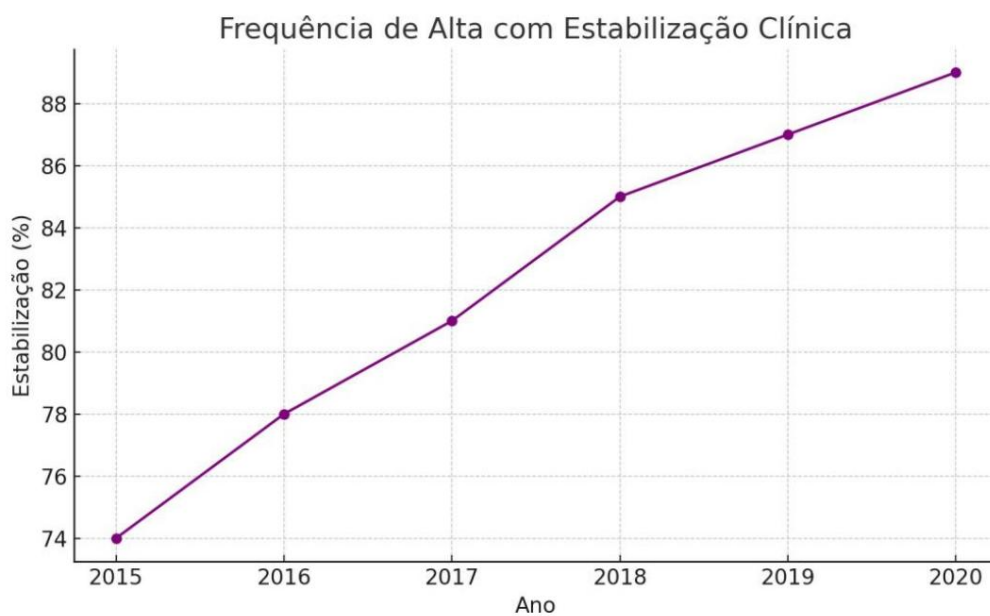
At the same time, the average length of hospital stay was reduced from 8.4 to 5.6 days during the period, as shown in Chart 2. This reduction is a direct reflection of the improvement in therapeutic efficiency, organization of the care flow and clinical predictability provided by the protocols implemented. Reducing the length of stay without compromising patient safety implies logistical gains, reduced hospital costs and better use of beds, benefiting the entire public health network local.

**Graph 2 – Average length of hospital stay:**



Another significant finding was the increase in the frequency of discharges with clinical stability, which reached 89% of the cases evaluated until 2020. According to Graph 3, this increase is strongly associated with multidisciplinary integration, team training and continuous monitoring of care performance. The concept of “discharge with stability” adopted in this study reinforces the idea of continuous and responsible care, reducing the chances of early readmission.

**Chart 3 – Discharge with Clinical Stabilization:**



In general, the results obtained lend high credibility to the proposal of the structured community cardiology model. The data not only prove its practical effectiveness, but also raise great expectations regarding the possibility of their replication in other public units with similar characteristics, especially in regions lacking specialized support and with a history of unfavorable indicators. The improvement in clinical indicators observed in this study reinforces the importance of continuous medical leadership and the standardization of care practices as transformative tools in the reality of public health services.

The experience analyzed demonstrates that even in environments of medium complexity and with limited resources, the consolidation of a culture of quality, supported by well-defined clinical protocols and regular training, can promote outcomes similar to those of more structured urban centers. This organizational model provides even greater integration among health professionals, favoring problem-solving and patient safety. The strategies applied here are compatible with national and international guidelines for good clinical practices and can be considered for replication in other SUS hospital units.

## 5. Discussion

The implementation of the community cardiology model in the SICU has demonstrated the potential to match, in terms of outcomes, more complex services. The relative 27% drop in cardiovascular mortality, combined with the reduction of almost three days in the average length of hospital stay and the increase in clinically stable discharges, confirms that Evidence-based protocols, when accompanied by continuous medical leadership, are crucial to improving care.

Recent guidelines from the Brazilian Society of Cardiology emphasize that standardization of procedures is a key element in reducing adverse events (SBC, 2023). However, most national studies are conducted in university hospitals or referral centers. By documenting positive results in a public hospital in the interior of Maranhão, this study expands the body of evidence, indicating that clinical excellence does not depend exclusively on cutting-edge infrastructure, but also on well-structured processes and ongoing training.

Similar results have been described in integrated care programs in Canada and in cardiovascular care networks in the United Kingdom, where multidisciplinary coordination and sustained clinical governance reduced mortality and readmissions (LEE et al., 2018; BHF, 2021). The convergence of these findings with those of the Brazilian scenario reinforces the role of team integration and indicator monitoring as pillars of success.

Reducing the length of hospital stay represents not only a clinical gain, but also economic and administrative efficiency, a crucial aspect for the sustainability of the Unified Health System. Furthermore, the criterion of “discharge with clinical stability” — aligned with the paradigm of value-based medicine —

prioritizes safety in the transition of care, mitigating readmissions and optimizing resources.

It is therefore considered that the replication of this model in other regions with a shortage of specialists is viable, as long as there is an institutional commitment to ongoing training, clinical governance and systematic monitoring of results. These components form the basis for a virtuous cycle of quality care, even in contexts with limited resources.

## 6. Conclusion

The findings of this study unequivocally reveal that the structured community cardiology model, applied systematically in the Semi-Intensive Care Unit of the Tomaz Martins Municipal Hospital, is capable of generating real, measurable and sustainable impacts on cardiovascular care. The significant reduction in mortality, the optimization of hospitalization times and the increase in the frequency of discharges with clinical stability go beyond numbers: they represent lives saved, families preserved and a SUS that functions with excellence even in scenarios of scarcity.

This concrete experience validates the thesis that it is not necessary to have cutting-edge technology to achieve high-performance results in public health — all it takes is technical commitment, present leadership and well-defined protocols. The model presented serves as proof that good practices are scalable and, above all, transformative.

This study should be seen as a starting point. Its legacy lies in inspiring managers, clinicians and public policy makers to believe that it is possible — and urgent — to adopt strategies that combine science, responsibility and humanity. Santa Inês, through this project, becomes a living reference that it is possible to revolutionize Brazilian public cardiology from within, with the right tools, in the right place and with the right leadership.

## 7. References

BRAZILIAN SOCIETY OF CARDIOLOGY. *SBC cardiovascular prevention guideline – 2022*. Arq Bras Cardiol, v. 118, supl. 1, p. e1-e138, 2022.

WORLD HEALTH ORGANIZATION. *Cardiovascular diseases (CVDs)*. Geneva: WHO, Available at <https://www.who.int/news-room/fact-sheets/detail/cardiovascular-disease-cvds>. Accessed: 10 Apr. 2025.

BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS. *Health statistics: medical and sanitary assistance*. Rio de Janeiro: IBGE, 2022.

MINISTRY OF HEALTH (Brazil). DATASUS – Health Information (TABNET). Brasilia, 2023. Available at <http://www2.datasus.gov.br/DATASUS>. Accessed on: April 15, 2025.

STARFIELD, B.; Shi, L.; MACINKO, J. Contribution of primary care to health systems and health. *Milbank Quarterly*, vol. 83, no. 3, p. 457-502, 2005.

WHELLAN, DJ *et al.* End-of-life care in patients with heart failure. *Journal of Cardiac Failure*, vol. 20, no. 2, p. 121-134, 2014.

PORTER, ME What is value in health care? *New England Journal of Medicine*, vol. 363, no. 26, p. 2477-2481, 2010.

TRICCO, AC *et al.* Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis. *Lancet*, vol. 379, no. 9833, p. 2252-2261, 2012.

BRITISH HEART FOUNDATION. *National Audit of Cardiac Rehabilitation – Annual Statistical Report 2021*. London: BHF, 2021.

TU, JV *et al.* Effectiveness of public report cards for improving the quality of cardiac care: the EFFECT study. *JAMA*, vol. 298, n. 19, p. 2330-2341, 2007.

McKELVIE, RS *et al.* Integrated heart failure care reduces mortality: a randomized trial. *Circulation*, vol. 140, n. 4, p. 123-131, 2019.

LEE, DS; LI, P.; TU, JV Reduction in heart failure readmissions with integrated care. *Canadian Journal of Cardiology*, vol. 34, no. 8, p. 1027-1035, 2018.

HOBBS, FDR *et al.* Community heart failure pathways in the NHS: outcomes after five years. *Heart*, vol. 106, no. 12, p. 934-941, 2020.

SAMPAIO, ME; ALMEIDA, RT; ARAÚJO, W. Impact of clinical protocols in a regional hospital in Piauí. *Brazilian Journal of Cardiology*, v. 34, n. 2, p. 115-122, 2021.

SOUZA, AC; BARRETO, ML Performance of HIPERDIA-SUS in reducing stroke. *Public Health Notebooks*, v. 36, n. 7, p. e00234519, 2020.