






# Profile of cardiovascular diseases and physiotherapeutic intervention in a hospital emergency service

*Perfil das doenças cardiovasculares e atuação fisioterapêutica em um serviço de emergência hospitalar*

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## Abstract

**Introduction:** Cardiovascular disease (CVD) is the leading cause of death globally, with a high proportion of hospitalizations and costs. In view of this, it is essential to understand the main CVDs in patients admitted to hospital emergency services and the role of physiotherapists, in order to plan and direct health services, and to denote participation and encourage specific physiotherapy training in the context of tertiary care. **Objective:** To outline the profile of cardiovascular emergencies and to evaluate physiotherapy in adult patients in the emergency department of a hospital in the interior of the state of São Paulo. **Methods:** This was an observational study which analyzed 1,256 on-call records over a period of eight months. The data collected included age, gender, cardiovascular diagnostic hypothesis and physiotherapy treatment carried out. **Results:** A total of 75 patients with cardiovascular emergencies were included, the most prevalent of which were: heart failure (n = 21), acute coronary syndrome (n = 14), acute myocardial infarction (n = 13), bradyarrhythmia (n = 6) and hypertensive crisis (n = 5). Regarding physiotherapeutic actions and their applications, the most frequent were invasive mechanical ventilation management (n = 34), lung re-expansion maneuvers (n = 17), orotracheal intubation assistance (n = 17), non-invasive mechanical ventilation (n = 14), bronchial hygiene maneuvers (n = 12), kinesiotherapy (n = 10) and sedation (n = 10). **Conclusion:** Heart failure and acute coronary syndrome were the cardiovascular diseases that caused the most admissions to the hospital emergency department and that the procedures with an emphasis on the respiratory system were the most applied.

**Keywords:** Cardiac Rehabilitation. Decision trees. Emergency service, hospital. Heart diseases. Physical therapy department, hospital.

## Resumo

**Introdução:** As doenças cardiovasculares (DCV) representam a principal causa de morte global, destacando-se em internações e gastos. Diante disso, é essencial compreender as principais DCV em pacientes admitidos em serviços de emergência hospitalar e a atuação do fisioterapeuta para planejamento e direcionamento dos serviços de saúde e para denotar a participação e incentivar formações fisioterapêuticas específicas no contexto da atenção terciária. **Objetivo:** Traçar o perfil de emergências cardiovasculares e avaliar a atuação fisioterapêutica em pacientes adultos de serviço de emergência de um hospital no interior do estado de São Paulo.

**Métodos:** Trata-se de um estudo observacional, em que foram analisadas 1.256 fichas de passagem de plantão, no período de oito meses. Os dados coletados foram idade, sexo, hipótese diagnóstica cardiovascular e tratamento fisioterapêutico realizado. **Resultados:** Foram incluídos 75 pacientes que apresentavam o perfil de emergências cardiovasculares, sendo as mais prevalentes: insuficiência cardíaca ( $n = 21$ ), síndrome coronariana aguda ( $n = 14$ ), infarto agudo do miocárdio ( $n = 13$ ), bradarritmia ( $n = 6$ ) e crise hipertensiva ( $n = 5$ ). Em relação à atuação fisioterapêutica e suas aplicações, as mais frequentes foram manejo da ventilação mecânica invasiva ( $n = 34$ ), manobras de reexpansão pulmonar ( $n = 17$ ), auxílio a intubação orotraqueal ( $n = 17$ ), ventilação mecânica não invasiva ( $n = 14$ ), manobras de higiene brônquica ( $n = 12$ ), cinesioterapia ( $n = 10$ ) e sedação ( $n = 10$ ). **Conclusão:** A insuficiência cardíaca e a síndrome coronária aguda foram as doenças cardiovasculares que mais ocasionaram internação no serviço de emergência hospitalar e as condutas com ênfase no aparelho respiratório foram as mais aplicadas.

**Palavras-Chave:** Reabilitação cardíaca. Árvores de decisões. Serviço hospitalar de emergência. Cardiopatias. Serviço Hospitalar de Fisioterapia.

## Introduction

Despite advancements in diagnosis and treatment, cardiovascular diseases (CVD) remain the leading cause of global mortality. In Brazil, in 2021, they accounted for one-third of deaths, disproportionately affecting vulnerable groups. Meanwhile, in low- and middle-income countries, these diseases were responsible for 80% and 88% of premature deaths, respectively.<sup>1,2</sup>

Studies conducted in hospital emergency and urgent care services have shown that in recent years, CVDs have been prominent in hospitalizations and healthcare expenditures, with heart failure, angina, and ischemia being the most prevalent.<sup>3,4</sup> Risk factors for the development of these diseases include high blood pressure, dyslipidemia, sedentary lifestyle, diabetes mellitus, family history of premature coronary disease, obesity, and smoking.<sup>5,6</sup>

The role of physiotherapists in hospital emergency services has increasingly been emphasized as a strategy to enhance the quality of patient care, leading to greater effectiveness and efficiency, thereby improving the overall organization of healthcare services.<sup>7,8</sup> Working as part of a multidisciplinary team in emergency services, physiotherapists play a crucial role in diagnosing dysfunctional kinetic movements, treating various conditions, and enhancing a comprehensive healthcare approach and quality. This allows for more individuals to be attended to with increased collaboration among professionals.<sup>9</sup> Understanding the role of physiotherapists in hospital emergency services prompts reflections on potential changes in the healthcare delivery model.<sup>10</sup>

On a global scale, concerning acute cardiovascular situations, physiotherapists in emergency services contribute to hemodynamic stabilization, respiratory monitoring, and early mobilization. Despite being essential, this role demands quick decision-making and adaptation to continually evolving protocols.<sup>11</sup> Recognizing subtle signs of clinical deterioration, interpreting relevant tests, and providing effective respiratory and cardiovascular rehabilitation interventions are also crucial to optimizing patient outcomes in these critical circumstances.<sup>11,12</sup>

Given this context, this study aims to elucidate the profile of cardiovascular care and the role of physiotherapists in the emergency service of a significant public hospital in the interior of São Paulo. This research provides relevant information for healthcare managers, institutions, and future professionals regarding the physiotherapist's role in caring for patients with cardiovascular diseases in critical situations.

## Methods

This is an observational study approved by the Re-

search Ethics Committee (CAAE: 61491422.8.0000.5515) and the Institutional Research Advisory Committee (CAPI) of the Universidade do Oeste Paulista (UNOESTE), Presidente Prudente campus (Protocol n° 7635).

We analyzed shift handover records of the physiotherapy team working in the emergency service of a major public hospital in the West of São Paulo over eight months (January to August 2022). A total of 1,256 records were included, involving patients who were admitted only once to the service, were over 18 years old, presented with a diagnostic hypothesis related to cardiovascular characteristics, and received physiotherapy care in any department of the emergency service (emergency room, semi-intensive care, and ward). Records with missing data regarding the diagnostic hypothesis and patients admitted for other pathologies were excluded (Figure 1).

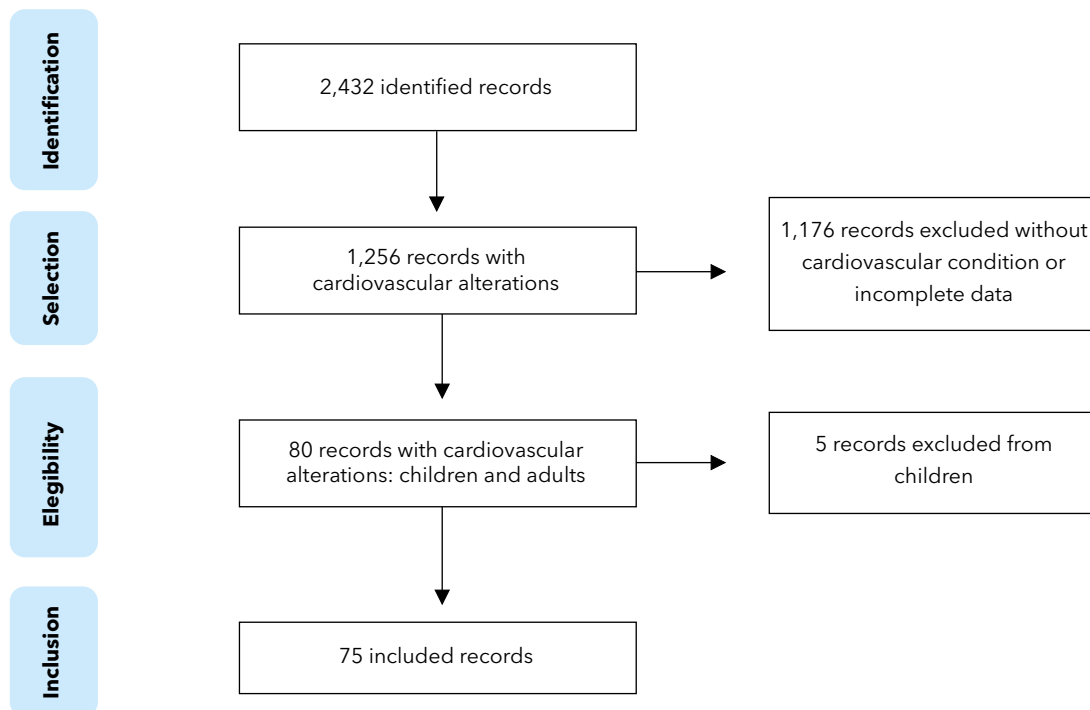
The research was divided into two phases: initial data collection and tabulation (M1) and statistical elaboration of the most commonly found pathologies in descending order (M2).

M1: Following committee approval, medical records of patients attended between January and August 2022 were reviewed, and selected from the physiotherapy team's shift handover records. Data collected for these patients included: gender, age, cardiovascular diagnostic hypothesis, department of attendance, and applied physiotherapeutic approach. These data were compiled into a table developed using Microsoft Excel®.

M2: After data collection within the specified period, these were depicted through graphs and static tables, outlining the population's profile and the prevalence of cardiovascular emergencies.

### Data analysis

Descriptive analysis was conducted using absolute values and percentages for the sample's profile, cardiovascular emergency prevalence, and physiotherapeutic interventions. All collected data were inputted into a table page using Microsoft Excel®.



**Figure 1** - Flowchart describing the sample.

## Results

A total of 1,256 shift handover records from the physiotherapy team between January and August 2022 were analyzed. Upon analysis, it was determined that 75 patients presented with a cardiovascular disease profile during their first entry into the department, comprising 35 females (46.67%) and 40 males (53.33%). Table 1 presents the sample characterization.

**Table 1** - Characterization of individuals (n = 75) who attended a hospital emergency service at a public hospital in the West of São Paulo (January - August 2022)

Features	n = 75
<b>Sex n (%)</b>	
Female	35 (46.67)
Male	40 (53.33)
<b>Age (years)</b>	65.59 (14.20)
<b>Risk factors</b>	
Diabetes mellitus	2.0 (1.75)
Systemic arterial hypertension	3.0 (1.48)
Smoking	3.5 (2.44)

Note: data expressed as mean (standard deviation), except for sex.

Regarding the identified pathologies (Table 2), heart failure, acute coronary syndrome, acute myocardial infarction, bradyarrhythmia, and hypertensive crisis were the most common. The average length of stay for these patients in the emergency room was  $2.38 \pm 3.87$  days.

The most commonly utilized physiotherapeutic interventions for treating cardiac patients are described in Table 3. Initially, it was observed that all patients were assessed, even if they declined therapy. Among the conducted interventions, management of invasive mechanical ventilation, lung re-expansion maneuvers, assistance with orotracheal intubation, bronchial hygiene maneuvers, and non-invasive mechanical ventilation were the most frequently performed (Table 3). Encouragement for ambulation was an intervention not documented in the treatment of these patients.

Among the top five cardiovascular pathologies, the interventions applied involved assistance with orotracheal intubation, management of mechanical

ventilation, oxygen therapy, and metabolic exercises, among others (Table 4).

**Table 2** - Most prevalent cardiovascular pathologies in patients (n = 75)

Pathologies	n (%)
Heart failure	21 (28.00)
Acute coronary syndrome	14 (18.67)
Acute myocardial infarction	13 (17.33)
Bradyarrhythmia	6 (8.00)
Hypertensive crisis	5 (6.67)
Endocarditis	4 (5.33)
Atrial fibrillation	3 (4.00)
Atrial flutter	2 (2.67)
Obstructive shock	1 (1.33)
Aortic dissection	1 (1.33)
Acute cardiogenic pulmonary edema	1 (1.33)
Aortic insufficiency	1 (1.33)
Temporary pacemaker	1 (1.33)
Occlusion of the right internal carotid artery	1 (1.33)
Ventricular tachycardia	1 (1.33)

**Table 3** - Interventions applied during the stay of cardiac patients in the hospital emergency services

Immediate action	Applications (n)
Management of invasive mechanical ventilation	34
Pulmonary re-expansion maneuver	17
Assisting orotracheal intubation	17
Non-invasive mechanical ventilation	14
Bronchial hygiene maneuver	12
Nebulizer mask	10
Cardiopulmonary resuscitation	5
<b>Conduct after stabilization</b>	
Seating and/or chair	10
Kinesiotherapy - free active exercise	9
Calisthenic exercises	5
Low-flow nasal catheter	4
Assisted active movement	3
Non-resetting mask	2
Orthostatism	1
Kinesiotherapy - passive exercise	1

**Table 4** - Interventions applied versus cardiological pathologies

Conduct	Pathologies				
	IC	AMI	ACS	Bradyarrhythmia	HC
Low-flow nasal catheter	✓	-	-	-	-
Metabolic exercises	✓	-	-	-	-
Orotracheal intubation	✓	✓	✓	✓	✓
Bronchial hygiene maneuver	✓	✓	-	-	-
Non-resetting mask	✓	✓	-	-	-
Assisted active movement	-	-	✓	-	-
Free active movement	✓	-	-	-	-
Passive movement	-	-	-	-	-
Pulmonary re-expansion maneuver	✓	-	✓	-	✓
Nebulization	✓	✓	✓	-	-
Orthostatism	-	-	-	-	-
Cardiopulmonary resuscitation	✓	-	✓	-	-
Seat and/or armchair	✓	-	-	-	-
Invasive mechanical ventilation	✓	✓	✓	✓	✓
Non-invasive mechanical ventilation	✓	✓	-	-	-

Note: HF = heart failure; AMI = acute myocardial infarction; ACS = acute coronary syndrome; HC = hypertensive crisis

## Discussion

This study aimed to outline the profile of cardiovascular conditions and physiotherapeutic interventions in the emergency service of a significant hospital in the interior of São Paulo. A total of 75 individuals were attended to, with the five most prevalent cardiovascular conditions being heart failure, acute coronary syndrome, acute myocardial infarction, bradyarrhythmia, and hypertensive crisis, emphasizing the need for special attention to these conditions. Regarding physiotherapeutic interventions, the most immediate ones used were the management of invasive mechanical ventilation, lung re-expansion maneuvers, and assistance with oro-tracheal intubation. After stabilization, sitting and kinesiotherapy with free active exercises were the most employed interventions.

The study demonstrates that male individuals sought the hospital emergency service more frequently due to cardiac alterations, aligning with previous studies stating that adult men present a higher prevalence of cardiovascular diseases.<sup>13</sup> The average age of individuals was  $61.81 \pm 19.11$  years, characterizing an elderly profile and in line with the increased prevalence of diseases in individuals over 60 years old.<sup>14</sup>

Heart failure was the most common cause for seeking emergency care, accounting for 25% of the pathologies. The Brazilian Society of Cardiology reported 3,085,359 hospitalizations due to heart failure between 2008 and 2019, representing one-third of cardiovascular hospitalizations, imposing significant costs on the healthcare system.<sup>1</sup> The etiology is diverse, including ischemic, hypertensive, chagasic, valvular, cardiomyopathy, and congenital origins.<sup>15</sup> In this study, the use of a low-flow nasal catheter, oro-tracheal intubation, non-rebreather mask, lung re-expansion maneuver, nebulization, invasive mechanical ventilation, and non-invasive mechanical ventilation were the utilized interventions.

Typically, upon admission of patients with heart failure to the emergency department, increased respiratory effort is common. A physiotherapeutic intervention aimed to provide respiratory support to maintain  $SpO_2 > 90\%$  and reduce respiratory effort, using a nasal catheter or non-invasive mechanical ventilation, except in the presence of chronic obstructive pulmonary disease (1-2 L/min).<sup>16-18</sup> The objective was to improve respiratory comfort and combat hypoxia. Invasive ventilatory support was also an option in cases of inadequate  $SpO_2$  or when non-invasive ventilation was contraindicated.<sup>19</sup>

Acute coronary syndrome, including acute myocardial infarction, were the second and third causes for seeking emergency services, respectively. Chest pain is a frequent symptom, accounting for 5% of admissions, and some patients are discharged without a specific diagnosis.<sup>20,21</sup> Patients with acute coronary syndrome present a complex differentiation between unstable angina and acute myocardial infarction without ST-segment elevation due to myocardial ischemia without necrosis, requiring differentiated management due to distinct prognoses.<sup>22</sup> Regarding the initial physiotherapeutic management of the studied patients, the focus was on the respiratory system. Oxygen administration was indicated only when SpO<sub>2</sub> was ≤ 90%, as excess oxygen can cause coronary vasoconstriction, worsening blood flow. After at least 12 hours from the event, the treatment was initiated, with prerequisites being the absence of anginal pain and complications such as heart failure, complex arrhythmias, and ventricular aneurysms.<sup>23-25</sup> Bed exercises for upper and lower limbs and orthostatism were appropriate, and the intensity was based on heart rate, with an increase of up to 20 bpm. If signs of decompensation such as a drop in blood pressure, fatigue, and sweating were observed, the approach would include health education with guidance on the disease, bed rest, respiratory exercises, and/or non-invasive ventilation.<sup>26,27</sup> If the individual remained in the emergency service, the treatment progression would involve orthostatism and ambulation.<sup>6,27</sup>

Bradyarrhythmias were identified as the fourth cause, involving frequency dysrhythmias or possibly caused by atrioventricular block. They can occur in acute myocardial infarction during its acute phase, associated with a decrease in ejection volume and cardiac output, resulting in hypotension.<sup>28</sup> Even though the influence of exercise on heart rate is understood, there is a lack of studies guiding emergency interventions. Kinesiotherapy and lung expansion were employed only after clinical intervention and bradyarrhythmia reversal.<sup>29,30</sup> There is a need for more evidence regarding physiotherapeutic management of this condition.

Hypertensive crisis is a common condition characterized by acute blood pressure changes, representing about 0.45 to 0.59% of emergency service visits, usually responding well to effective drug treatment.<sup>31,32</sup> Orotracheal intubation and invasive mechanical ventilation were the adopted measures. A study by Mitsungrern

et al.<sup>33</sup> revealed that the labial breathing technique, combined with antihypertensive medication, reduced blood pressure and heart rate in patients with hypertensive urgency. This technique promotes baroreflex sensitivity, improving heart rate variability and blood flow in small vessels, resulting in lower peripheral vascular resistance, and it can be used in conjunction with lung re-expansion,<sup>33-35</sup> suggesting an effective intervention, although respiratory interventions in the emergency context still require further study.

The present study has significant strengths in elucidating the profile of cardiovascular emergencies and associated physiotherapeutic interventions, offering a more effective direction to physiotherapy professionals in emergencies. This research also opens promising perspectives to evaluate the effectiveness of different techniques and optimize employed strategies, providing insights to enhance care and address more efficiently the complex clinical conditions related to cardiovascular emergencies.

Regarding limitations, the data collection period occurred during the COVID-19 pandemic, which might have caused interferences, as cardiovascular diseases could have been considered a concomitant pathology to the respiratory virus. Studies on physiotherapeutic management of cardiovascular emergencies are scarce, making it essential to deepen clinical studies that investigate the effectiveness of physiotherapeutic interventions on prognosis and quality of life for these patients. This highlights the importance of new educational strategies aiming to train and deploy these professionals in the hospital emergency department. As it is an emerging area, understanding their role in cardiovascular diseases is necessary.

## Conclusion

The profile of cardiovascular emergencies predominantly involves heart failure, acute coronary syndrome, acute myocardial infarction, bradyarrhythmia, and hypertensive crisis. Within the context of these pathologies, respiratory interventions such as management of invasive mechanical ventilation and lung expansion, along with motor interventions like sitting and kinesiotherapy, were the most utilized interventions by physiotherapists.

## Authors' contributions

Each author significantly contributed to the development of this article. PVTS and FLP were responsible for the study's conception. Data were collected by PVTS, GCS, LSA, and TRO and analyzed by PVTS and FLP. The article's writing was carried out by PVTS, GCS, LSA, and TRO, and the revision was conducted by PVTS and FLP. PVTS was responsible for the statistical analysis, the intellectual conception of the article, and the development of the entire research project. All authors approved the final version.

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