REVIEW

Factors related to early hospital readmissions after Acute Myocardial Infarctions: a scoping review*

HIGHLIGHTS

1. Post-AMI readmissions are due to multiple clinical, social and organizational causes.
2. Comorbidities and sociodemographic factors increase the readmission risk.
3. Prevention strategies optimize resources and improve quality of life.
4. Transitional care protocols and properly connected healthcare networks exert positive impacts on early post-AMI readmissions.

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ABSTRACT

Objective: To map the diverse scientific evidence on factors related to early and unplanned hospital readmissions after Acute Myocardial Infarctions. **Method:** This scoping review was conducted in 2025 in the *Biblioteca Virtual em Saúde*, PubMed, Cochrane Library, Web of Science and Scopus databases. **Results:** A total of 18 studies were selected. The main factors include the following: female gender, advanced age, less than eight years of study, tobacco use disorder, sleep apnea, hospitalization times of at least four days and chronic comorbidities such as renal and cardiovascular diseases, diabetes mellitus and chronic obstructive pulmonary disease. **Conclusion:** Readmissions are influenced by multiple clinical, sociodemographic, organizational and behavioral factors, highlighting the importance of post-discharge follow-up strategies, transitional care protocols and properly connected healthcare networks, with a view to improving quality of life and optimizing the available resources.

DESCRIPTORS: Hospitals; Delivery of Health Care; Patient Readmission; Risk Factors; Myocardial Infarction.

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INTRODUCTION

Acute Myocardial Infarction (AMI) represents the main cause of hospitalizations and mortality at the global level and is a pathology that presents challenges for health services[1].

In the United States of America, AMIs affect almost 3 million people and cause more than 1 million deaths a year[2]. Nearly 737,213 hospitalizations due to AMIs were recorded from 2019 to 2023 in Brazil, resulting in a 10% overall mortality rate[3]. In addition, it is evidenced that Brazil has presented a reduction in mortality due to AMIs mainly in the male gender and among individuals belonging to older age groups[4].

Thus, patients surviving an AMI remain at risk of developing subsequent adverse clinical events, especially cardiovascular complications such as recurrent AMIs, heart failure, arrhythmias and cardiac sudden death. These conditions can impair the clinical evolution of a person's health status and result in the need for hospital readmissions, reinforcing the importance of continuous monitoring, of effective secondary prevention strategies and of incorporating health networks in post-discharge follow-ups[5].

A hospital readmission is defined as a new hospitalization subsequent to the current admission (also called "index admission"), within a previously pre-established period of time and classified as early hospital readmission when this period is shorter than 30 days after hospital discharge[6]. This indicator is widely used in evaluating hospital performance, constituting an essential parameter to assess the quality of the assistance provided to the patients[7].

It is noticed that the factors associated with hospital readmissions in patients that suffered an AMI may or may not be of cardiovascular origin. Kidney diseases, heart failure and diabetes *mellitus* stand out among the cardiovascular factors. They are conditions widely acknowledged as significant for increased rehospitalization risks[8].

On the other hand, delayed pre-hospital care and time elapsed until performing procedures to release arterial blood flow are noted among the non-cardiovascular factors; these aspects can exert direct impacts on a patient's clinical evolution[9].

Although there are studies about factors associated with readmissions after AMIs, there is still a need for a synthesis of the scientific production to better understand their determining factors and prevention strategies, so that evidence-based health care can be provided. In this context, the objective of the current scoping review is to map the diverse scientific evidence on factors related to early and unplanned hospital readmissions after Acute Myocardial Infarctions.

METHOD

This is a scoping review seeking to explore the concepts that ground a given knowledge area, using various sources and a wide scrutiny of the literature to identify gaps in the existing research studies[10]. It is a cross-sectional procedure, especially recommended for still unreviewed areas[10], as is the case of the current study.

It was developed following the methodology proposed by the Joanna Briggs Institute (JBI), which recommends the following phases: Defining and aligning the research objectives and questions; Establishing the inclusion criteria according to

the objectives and questions; Devising and planning the study search and selection strategy; Identifying the relevant studies; Selecting the studies; Extracting the data; Mapping the data; and Summarizing the results[11].

The findings of this review were reported using the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) checklist extension (PRISMA-ScR)[12], adapted for conducting scoping review studies. In addition, this review was registered in the *Open Science Framework* (OSF) platform under the following code: 10.17605/OSF.IO/HRYBP.

The PCC (P - Population, C - Concept and C - Context) was used to formulate the research question. The following items were adopted: P - Adult patients that had suffered an AMI, C - Unplanned hospital readmission and C - In-hospital units. The following question was formulated: Which is the scientific evidence on the factors associated with early and unplanned hospital readmissions after Acute Myocardial Infarctions?

The eligibility criteria adopted to select the studies are presented in Chart 1.

Chart 1. Eligibility criteria to select the studies. Maringá, PR, Brazil, 2025

Inclusion criteria	Exclusion criteria
Population: Individuals aged at least 18 years old that had to return to a hospital institution after an AMI. **Concept:** Unplanned hospital readmissions within 30 days. **Context:** Hospital setting. **Types of study:** Scientific articles published in full, available free of charge; no restrictions as for publication year, country of origin and/or language were applied.	Study protocols; preliminary results; papers addressing any other type of hospital readmission without a previous history of AMI; letters to the editor, websites, blogs, abstracts presented in congresses, Course Conclusion Papers, Dissertations and/or Theses.

Source: The authors (2025).

In the current study, it was decided to exclude such secondary data sources considering the need to privilege more solid and methodologically consistent evidence to answer the research question proposed. This decision is in consonance with the recommendations set forth in the PRISMA-ScR protocol[12], which instructs defining eligibility criteria and imposing limits as for the type of evidence to be considered, so as to ensure relevance, quality and adequacy of the knowledge produced to address specific topics.

Data selection took place during the first half of 2025 and was conducted in four stages: 1) Initial search in the databases; 2) Analysis of titles and abstracts and exclusion of those not meeting any of the criteria; 3) Full-reading of the papers selected in stage 2; and 4) Assessment of the lists of references from the sources selected in their full texts and/or included in the review[12]. An initial search was made in *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) (via *Biblioteca Virtual em Saúde*) and in *Medical Literature Analysis and Retrieval System Online* (MEDLINE) (via PubMed) to identify and analyze possible keywords contained in the titles and abstracts of the studies selected in these databases. The keywords identified were used as search terms, adding them to the Descriptors in Health Sciences (*Descritores em Ciência da Saúde*, DeCS) for the LILACS database and to the Medical Subject Headings (MeSH)

in the case of MEDLINE. AND and OR Boolean operators were used to make crossing between descriptors.

Subsequently, the other databases were searched: Cochrane Library, SCOPUS and Web of Science. The search strategies used are presented in Chart 2.

Chart 2. Search strategy for the scoping review. Maringá, PR, Brazil, 2025

Data sources	Syntax	References retrieved
MEDLINE (Via PubMed)	("patient readmission" OR "hospital readmission") AND ("myocardial infarction") AND ("hospitals" OR "hospitalisation" OR "hospitalization" OR" "hospitalised" OR "hospitalising" OR "hospitality" OR "hospitalisations" OR "hospitalizations" OR "hospitalize" OR "hospitalized" OR "hospitalizing" OR "hospitals" OR "hospital")	672 results
LILACS (Via BVS)	(readmissão do paciente) OR (readmissão hospitalar) AND (infarto do miocárdio) AND (hospitalização) OR (hospitais) OR (hospital) OR (ambiente hospitalar) OR (hospitalizações)	796 results
Web of Science	Patient Readmission or "hospital readmission" (All Fields) and "myocardial infarction" (All Fields) and "hospitals" or "hospitalisation" or "hospitalization" or "hospitalised" or "hospitalizing" or "hospitality" or "hospitalisations" or "hospitalizations" or "hospitalized" or "hospitalized" or "hospitalizing" or "hospitals" or "hospital" (All Fields)	367 results
SCOPUS	(TITLE-ABS-KEY ("patient readmission") OR (hospital readmission) AND TITLE-ABS-KEY ("myocardial infarction") AND TITLE-ABS-KEY ("hospitals" OR "hospitalisation" OR "hospitalization" OR "hospitalised" OR "hospitalising" OR "hospitality" OR "hospitalisations" OR "hospitalizations" OR "hospitalize" OR "hospitalized" OR "hospitalizing" OR "hospitals" OR "hospital")	2,267 results
COCHRANE	"patient readmission" OR "hospital readmission" in Title Abstract Keyword AND "myocardial infarction" in Title Abstract Keyword AND "hospitals" OR "hospitalisation" OR "hospitalization" OR "hospitalised" OR "hospitalising" OR "hospitality" OR "hospitalisations" OR "hospitalizations" OR "hospitalize" OR "hospitalized" OR "hospitalizing" OR "hospitals" OR "hospital" in Title Abstract Keyword	504 results
Search date: February 20th, 2025		

Source: The authors (2025).

The records retrieved from the electronic search were imported into the RAYYAN® software, an automation tool whose objective is to assist in analyzing remaining duplicates and in their subsequent removal[13].

The titles and abstracts were read by two reviewers in a blind evaluation regime, so that one of them had no access to the decision to include or exclude a given reference defined by the other. Any and all disagreements were evaluated by a third reviewer.

An instrument developed by the reviewers themselves was used to extract the data in full from the articles included; this instrument included the following: identification of the study, title, publication year, indexing database, journal, level of evidence, objective, study design, main results and conclusion, which was based on the model available in the JBI manual[11].

The data were mapped descriptively employing concept simple frequency counts, the factors associated with hospital readmissions and other characteristics that contemplate the research question. A qualitative and descriptive content analysis was performed, including basic coding of the data[14].

For being a scoping review conducted based on data on the public domain, it was not submitted to appraisal by any Committee of Ethics in Research with Human Beings.

RESULTS

The searches were initially conducted in five electronic databases, yielding a total of 4,606 publications and excluding 1,510 of them due to duplicity; therefore, 3,096 articles were included to read their titles and abstracts. After the screening stage, 121 publications were selected for full-reading and 18 studies were finally included in this scoping review, as described in Figure 1.

As for the publication year corresponding to the studies analyzed, most of the articles were published in 2018 (n=Four publications). Regarding their methodological designs, prospective cohort and cross-sectional studies were the most frequent, with six publications each. United States of America was the country that developed the highest number of studies about the theme.

The main findings related to the factors associated with hospital readmissions within 30 days after hospital discharge due to AMIs include the following: presence of at least three comorbidities at the time of the hospitalization due to AMI and hospitalization time due to AMI of at least four days (ID – 16).

The following can be noted among the most frequent comorbidities related to readmissions: kidney diseases (IDs – 02, 04, 08, 12, 13, 15 and 16), cardiovascular diseases (IDs – 03, 07, 11, 12, 15, 17 and 18), diabetes *mellitus* (IDs – 02, 10, 12 and 15) and chronic obstructive pulmonary disease (IDs – 08, 15 and 17).

Referring to the sociodemographic characteristics, higher readmission risks were observed among individuals belonging to the female gender (IDs – 05, 07, 15 and 17), of advanced age (IDs – 03 and 09) and with less than eight years of study (ID – 17). As for life habits and conditions, the following risk factors were identified: low quality of life (ID – 01), tobacco use disorder (ID – 10) and sleep apnea (ID – 18), as detailed in Chart 3.
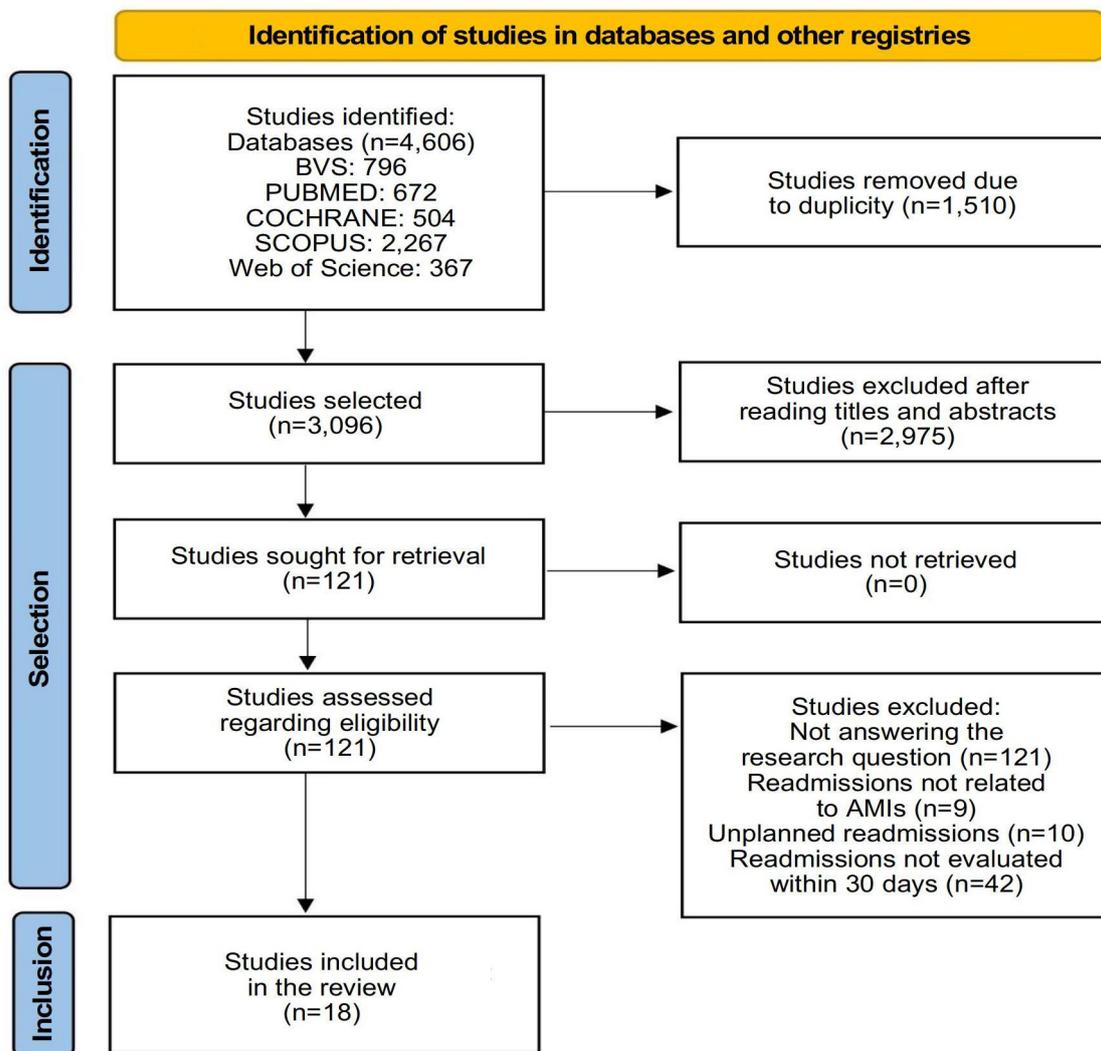
Identification of studies in databases and other registries

Studies identified:
Databases (n=4,606)
BVS: 796
PUBMED: 672
COCHRANE: 504
SCOPUS: 2,267
Web of Science: 367

Studies removed due to duplicity (n=1,510)

Studies selected (n=3,096)

Studies excluded after reading titles and abstracts (n=2,975)

Studies sought for retrieval (n=121)

Studies not retrieved (n=0)

Studies assessed regarding eligibility (n=121)

Studies excluded:
Not answering the research question (n=121)
Readmissions not related to AMIs (n=9)
Unplanned readmissions (n=10)
Readmissions not evaluated within 30 days (n=42)

Studies included in the review (n=18)

Identification | Selection | Inclusion

Figure 1. Scoping review results according to PRISMA-ScR. Maringá, PR, Brazil, 2025
Source: The authors (2025).

Chart 3. Characteristics of the publications related to hospital readmissions. Maringá, PR, Brazil, 2025

(continue)

ID	Reference/ Publication year	Method	Factors related to early hospital readmissions
1	Polsook R, Aungsuroch Y. Thailand. 2021[15]	Cross-sectional study	Low quality of life and Symptom severity.
2	Southern DA, et al. USA. 2014[16]	Prospective cohort study	Comorbidities (kidney disease, diabetes mellitus).
3	Salimi M, et al. Irak. 2023[17]	Cross-sectional study	Old age, arrhythmias, SAH, chest pain, comorbidities, reduced ejection fraction, having undergone coronary angioplasties, hydroelectrolytic disorders.
4	Kwok CS, et al. USA. 2018[18].	Cross-sectional study	Index hospital discharge against medical advice; discharge to nursing homes; chronic kidney disease.
5	Cholack G, et al. USA. 2022[19].	Retrospective cohort study	Female gender; AF; main discharge diagnosis of AMI; ICU admission during hospitalization.
7	Sun JY, et al. China. 2020[20].	Cross-sectional study	Female gender, AMI and multiple comorbidities.

Chart 3. Characteristics of the publications related to hospital readmissions. Maringá, PR, Brazil, 2025

(conclusion)

ID	Reference/ Publication year	Method	Factors related to early hospital readmissions
8	John AD, et al. USA. 2019[21].	Prospective cohort study	Reduced functional mobility; reduced ventricular ejection fraction; COPD, arrhythmias, SAH.
9	Kociol RD, et al. USA. 2012[22].	Randomized clinical study	Old age and elevated heart rate.
10	Wang Y, et al. China. 2022[23].	Retrospective and descriptive	Smoking habit; number of blood vessels affected; diabetes mellitus.
11	Alimadadi E, et al. Irak. 2020[24].	Case-control study	CHF; AMI; SAH; arrhythmias; patients using antiplatelet or anticoagulant medications; emergency surgeries; heart arrest.
12	Kim LK, et al. USA. 2018[25].	Prospective cohort study	Anemia; chronic kidney disease; vascular disease; diabetes mellitus; SAH; CHF; atrial fibrillation.
13	Zabawa C, et al. France. 2018[26].	Prospective cohort study	Chronic renal failure.
14	Li J, et al. China. 2019[27].	Prospective cohort study	Angina; low left ventricular ejection fraction; in-hospital complications.
15	Mahmoud AN, et al. USA. 2018[28].	Cross-sectional study	Female gender; anemia; COPD; diabetes; vascular disease; renal failure.
16	Tisminetzky M, et al. USA. 2015[29].	Cross-sectional study	Chronic kidney disease; comorbidities; hospitalization time; heart failure; diabetes mellitus.
17	Khawaja FJ, et al. USA. 2012[30].	Prospective cohort study	Female gender; years of study; CHF; kidney disease; COPD; cancer; hospitalization time.
18	Stewart RD, et al. USA. 2000[31].	Cross-sectional study	Infections; sleep apnea; cardiac arrhythmias; patients with intra-aortic balloons.

Key: SAH (Systolic Arterial Hypertension); AF (Atrial Fibrillation), AMI (Acute Myocardial Infarction); COPD (Chronic Obstructive Pulmonary Disease); CHF (Congestive Heart Failure).

Source: The authors (2025).

DISCUSSION

The individuals that suffered an AMI represent a population group that requires special care from health services, mainly during the first 30 days after hospital discharge, as the readmission rates during this period vary from 4.6% to 15.6%. Added to this, such patients are at a higher risk of recurrent cardiovascular events, increased infection risks, prolonged hospitalization times, high morbidity and mortality rates, quality of life impairments and financial impacts for patients and health institutions alike[32-33].

In this sense, an effective integration across the different health services comprising the Healthcare Network is fundamental, from the in-hospital intervention to the planned discharge and referral to Primary Health Care[34]. The absence of an integrated network and of effective referral and counter-referral mechanisms exposes these individuals to risks that can impair their recovery process. Such weakness in care continuity can result in deterioration of the clinical conditions and, consequently, in the need for hospital readmissions[34].

Transitional care quality is a crucial factor to prevent hospital readmissions. Diverse evidence indicates that hospital discharge against medical recommendations, transfers to short-stay units and discharge to long-stay institutions were independently associated with unplanned readmissions. These findings suggest possible flaws in care continuity, resulting in inadequate post-discharge assistance and in consequent deterioration of the clinical conditions[18].

Allied to the adoption of structured procedures for discharge planning, an effective integration across the healthcare levels can minimize those flaws and improve the clinical outcomes[35]. The results obtained in this review indicate that presence of comorbidities (especially heart failure, chronic kidney disease, diabetes *mellitus* and chronic obstructive pulmonary disease) is strongly associated with increased risks of hospital readmissions after AMIs. These chronic conditions impair the patients' functional capacity and hinder their recovery, demanding complex clinical management and strict follow-up[23,29.]

In particular, heart failure stands out as a consistent predictor, corroborating previous findings in the literature that link its presence to worse post-discharge outcomes[29-30,36]. Therefore, the strategies to control comorbidities are fundamental to reduce the incidence of hospital readmissions.

In addition to the clinical factors, the data analysis shows that sociodemographic characteristics such as old age, female gender and low schooling exert a significant influence on the hospital readmission risk. Aged patients are more vulnerable due to physiological decline and to presenting higher prevalence of comorbidities[17].

 Although it is generally associated with better AMI survival, the female gender presented more chances of hospital readmissions, possibly related to differences in clinical presentation and to access to care services[19,28]. Having studied for less than eight years can also indicate difficulties understanding the post-discharge guidelines, reflecting the need to implement changes in terms of health education[30].

Factors related to lifestyle (such as smoking habit and low quality of life) also emerged as important determinants of the readmission risk. Smoking contributes to the progression of coronary arterial disease and impairs the vascular function; as for low quality of life, it can reflect physical limitations and in developing activities of daily living, hindering treatment adherence[15]. Interventions targeted at lifestyle changes (including smoking cessation and rehabilitation and post-discharge care programs) are essential to improve the patients' overall status and reduce the recurrence of adverse events[37].

The following should be mentioned as a limitation of this review: the fact that the papers found were conducted in other realities and not in the Brazilian territory, which hinders understanding the characteristics of the hospital readmission process 30 days after an AMI in our country. In turn, the factors found point to certain integration across the healthcare network instances and control of non-communicable chronic diseases, situations that are soundly implemented and encouraged in the Unified Health System.

FINAL CONSIDERATIONS

Associated with factors like old age, female gender and low schooling, the presence of chronic comorbidities such as heart failure and kidney disease evidences the need for individualized and integrated post-discharge follow-up. In-hospital care quality and the transition across the different assistance levels reinforce the importance of having structured protocols and an effectively connected healthcare network. Factors related to lifestyle and to clinical severity should also be considered in the strategies to prevent

hospital readmissions, aiming at reducing their incidence, improving quality of life and rationalizing health resources.

Although the collection of materials that comprises this review consists of relevant and updated studies, the heterogeneity found in all the information and the diversity of factors analyzed limit data standardization and comparability. Nevertheless, the findings offer important aids for deepening what is known about the theme, in addition to providing solid grounds for future research studies targeted at evaluating the effectiveness of integrated care strategies (such as structured hospital discharge and post-discharge follow-up programs), with the intention of qualifying the clinical practice and reducing the incidence of hospital readmissions.

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Martins MA, Scholze AR, Costa AB, Uema RTB, Zanelato VANM, Rodrigues TFCS.** Drafting the work or revising it critically for important intellectual content - **Martins MA, Scholze AR, Costa AB, Uema RTB, Radovanovic CAT.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Martins MA, Radovanovic CAT.** All authors approved the final version of the text.

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The authors declare that all data are fully available within the article.