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*Research Article*

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# Flowchart for Erectile Dysfunction Post-Heart Attack

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## Abstract

**Introduction:** Erectile dysfunction (ED) has a prevalence of 38-78% in patients after acute myocardial infarction (AMI), sharing pathophysiological substrates based on endothelial dysfunction. Despite this established relationship, a care gap persists in the comprehensive management of this condition in cardiac patients.

**Objective:** To design and validate a flowchart for the comprehensive management of erectile dysfunction in patients with a history of acute myocardial infarction.

**Methods:** A prospective, descriptive, mixed-methods study that included 36 patients with post-AMI ED. After characterizing the population, a sequential flowchart was designed and validated using the Delphi technique with 15 experts from Internal Medicine, Urology, and Psychology.

**Results:** The population showed a predominance of the 60-69 age group (52.7%), hypertension (86.1%), and vasculogenic ED (77.7%). The developed flowchart integrates five essential components: initial multidimensional assessment, cardiovascular risk stratification according to Princeton criteria, targeted multidisciplinary referral, stepped treatment from sexual education to advanced options, and protocolized follow-up. Expert validation showed excellent feasibility indices: applicability (86.6% "very adequate"), relevance (93.3% "very adequate"), and necessity (100% "very adequate").

**Conclusions:** The developed flowchart proved to be a clinically viable and necessary tool for standardizing the management of ED in post-AMI patients. Its implementation has the potential to significantly improve the quality of care and interdisciplinary coordination.

**Keywords:** Erectile Dysfunction, Myocardial Infarction, Flowchart, Comprehensive Management, Expert Validation.

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## Introduction

Erectile dysfunction (ED) is a frequent and underdiagnosed comorbidity in patients who have suffered an acute myocardial infarction (AMI), with documented prevalences ranging from 38% to 78% [1]. This close association is supported by shared pathophysiological mechanisms, where endothelial dysfunction and systemic atherosclerotic disease represent the common underlying substrate [2].

Recent research has shown that ED can precede the clinical manifestation of coronary artery disease by 2-5 years, acting as a sentinel marker of cardiovascular disease [3]. Despite this consolidated evidence, the management of ED in cardiac patients remains fragmented and insufficient in routine clinical practice [4]. Determining factors such as the lack of standardized protocols, limitations in specific professional training, and persistent cultural barriers contribute significantly to this care gap [5].

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In the context of the Camilo Cienfuegos Provincial General Hospital in Sancti Spíritus, a high prevalence of ED has been identified in the post-AMI population, with no standardized tools available for its comprehensive management. This study aimed to develop and validate a comprehensive care flowchart to optimize the management of ED in this high cardiovascular risk population.

## Methods

### Study Design and Population

A prospective descriptive study with a mixed-methods approach (Concurrent Triangulation Design) was conducted between May 2023 and May 2024. The study population consisted of 36 male patients with a confirmed diagnosis of AMI and ED who regularly attended the cardiovascular rehabilitation clinic. The entire population was studied (N=36), with no sampling techniques applied.

The inclusion criteria were: patients with a confirmed diagnosis of ED and AMI, over 18 years of age, who provided written informed consent. Those with severe neurological or psychiatric disorders compromising communication capacity were excluded.

### Procedures and Instruments

The research was developed in three sequential stages:

1. **Diagnostic Stage**: A comprehensive characterization of the population was performed by administering a standardized sociodemographic survey and conducting a thorough review of medical records to collect relevant clinical variables (associated comorbidities, type and severity of ED, time since AMI, current pharmacological treatment).
2. **Design Stage:** Based on the population characterization results and an extensive review of current scientific literature, a multidisciplinary team comprising specialists in Internal Medicine, Urology, Psychology, and Methodology designed the treatment flowchart. The instrument was conceived as a flexible, sequential, and dynamically adaptable system.
3. **Validation Stage**: The feasibility of the flowchart was assessed using a modified Delphi technique. An intentional panel of 15 experts (6 specialists in Internal Medicine, 4 in Urology, and 5 Clinical Psychologists) with over 10 years of professional experience and specific dedication to patients with ED and ischemic heart disease was selected. The experts evaluated the flowchart using a 5-point Likert-scale instrument that systematically measured the following criteria: applicability, feasibility, necessity, relevance, currency, and scientific soundness.

### Ethical Considerations

The study was approved by the institutional Ethics Committee and conducted in accordance with the principles of the Declaration of Helsinki [6]. All participants signed an informed consent form, and data confidentiality was guaranteed throughout the research process.

### Statistical Analysis

Quantitative data were analyzed using descriptive statistics, with absolute frequencies and percentages. Processing was performed using the Statistical Package for the Social Sciences (SPSS) version 25.

## Results

### Characterization of the Study Population

The analysis of the 36 patients revealed a characteristic epidemiological profile. The age group of 60 to 69 years predominated (52,7 %), followed by the 50 to 59-year-old group (30,6 %). All patients (100 %) had hypertension as a main comorbidity, and 88,9 % were under treatment with beta-blockers. Regarding the etiology of ED, 91,7 % presented with organic or mixed dysfunction, with 77,7 % of cases classified as arteriogenic vasculogenic ED. The time since AMI ranged from 10 to 15 years in 55,6 % of the population. The severity of ED, measured using the International Index of Erectile Function-5 (IIEF-5), was moderate in 50% of the patients, severe in 27,8 %, and mild in 22,2 %.

### Description of the Proposed Flowchart

The designed flowchart is structured into a sequential process of five interconnected stages:

1. **Comprehensive Initial Assessment:** Includes detailed history-taking, a complete physical examination with emphasis on cardiovascular assessment, administration of the IIEF-5 to quantify ED severity, and the Hospital Anxiety and Depression Scale (HADS) to detect associated psychological comorbidities. It includes requesting basic laboratory tests (blood glucose, lipid profile, total testosterone).
2. **Cardiovascular Risk Stratification:** Classifies patients as low, intermediate, or high risk for sexual activity, following updated recommendations from the Princeton Consensus [7]. This specifically guides the need for formal cardiological evaluation before resuming sexual activity or initiating specific ED treatments.
3. **Targeted Multidisciplinary Referral:** Based on initial findings, relevant referrals are activated: to Cardiology (for cardiovascular risk optimization), to Urology (for refractory ED, suspicion of hypogonadism or Peyronie's disease), and to Mental Health/Psychology (for specialized management of anxiety, depression, or relationship conflicts).
4. **Staged and Individualized Treatment**: Proposes a progressive therapeutic approach starting with first-line measures such as sexual education for the patient and their partner and intensive lifestyle modifications. Subsequently, it advances to oral pharmacotherapy with phosphodiesterase-5 (PDE5) inhibitors. For non-responding cases, second- and third-line therapies are considered, such as low-intensity extracorporeal shockwave therapy (LI-ESWT), intracavernosal injections, vacuum devices, and, as a last alternative, penile prosthesis implantation.
5. **Protocolized Follow-up and Reevaluation:** Establishes periodic follow-up consultations to systematically assess treatment adherence, efficacy, and adverse effects, as well as to readjust the therapeutic strategy according to clinical evolution. A formal reevaluation with the IIEF-5 is proposed every 3-6 months.

### Validation by Expert Consensus

The panel of 15 experts consistently evaluated the proposal favorably. Applicability and feasibility were rated as "highly adequate" by 86.6%. Relevance was considered "highly adequate" by 93,3 % of those consulted. All experts (100 %)

agreed that the need to implement the flowchart, as well as its currency and scientific soundness, were "highly adequate." Qualitative comments from the experts particularly highlighted the "interdisciplinarity as a consolidating tool" and the adequacy of the "strategic planning to identify and solve structural problems".

## Discussion

The present study succeeded in developing and validating a clinically viable flowchart for managing a prevalent and consistently undertreated health problem: ED in post-AMI patients. The population characterization reflects a typical epidemiological profile of this specific group: older males with established cardiovascular risk factors (especially hypertension) and ED of clear vasculogenic organic etiology, corroborating findings from previous national and international research [1,8].

The conceptual design of the flowchart aligns consistently with contemporary models of male sexual health, which, as current authors postúlate, demand moving beyond traditional biomedical reductionism to incorporate psychological, relational, and sociocultural dimensions in a comprehensive manner [9]. The systematic inclusion of psychological assessment using HADS and structured sexual education for the patient and their partner specifically addresses this need for comprehensiveness. This approach acknowledges that fear of a new cardiac event and performance anxiety constitute fundamental barriers in this population [10].

The sequential and staged treatment structure, from less invasive to more complex interventions, faithfully follows the recommendations of updated international consensus guidelines, such as those from the European Association of Urology, and the Princeton Consensus [7,11]. This approach not only rationally optimizes healthcare resources but also allows for the personalization of management based on individual response and the particular characteristics of each patient.

The high consensus rate among experts validates not only the robust scientific content of the flowchart but also its practicality and contextual adaptation to the local clinical environment. The lack of standardized tools is a common issue in many healthcare settings of similar complexity, and the present proposal specifically aims to fill that care gap, offering a clear and structured pathway for healthcare professionals [5].

A methodological limitation of this study is recognized: the moderate sample size and the fact that it was developed in a single tertiary care center. This prudently suggests the need for future large-scale implementation studies to assess its real-world clinical effectiveness and impact on sexual health-related quality of life.

## Conclusions

The comprehensive management flowchart for erectile dysfunction in patients with acute myocardial infarction proved to be a clinically viable, relevant, and necessary tool according to the unanimous consensus of a multidisciplinary expert panel. Its systematic and staged design, based on the best available evidence and specifically adapted to the local clinical reality, addresses a significant care gap in the management of this vulnerable population.

A controlled pilot implementation in Internal Medicine and Urology services is recommended, accompanied by specific training programs for healthcare professionals. The fundamental objectives of this implementation are to standardize care, improve patients' sexual health-related quality of life, and structurally strengthen collaborative work between specialties.

## Authorship Contribution

**Yoanka Cañizares Gorrín**: Conceptualization, Investigation, Methodology, Writing - original draft, Project administration.
**Félix Rafael Wert Tellez:** Formal analysis, Methodology, Validation, Visualization.
**Betsy Lidivet Bonachea Sánchez**: Supervision, Investigation, Writing - review & editing, Resources.
**Yuniel Abreu Hernandez**: Investigation, Resources, Data curation, Writing - review & editing
**Juan Carlos Mirabal Requena**: Investigation, Resources, Writing - review & editing; Formal analysis, Methodology, Writing - review & editing.

## Conflict of Interest

The authors declare no conflicts of interest.


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## Ethical Aspects

Approved by the Research Ethics Committee of the University of Medical Sciences of Sancti Spíritus (Minutes No. 15/2023). Informed consent will be obtained from all participants.

## Data Availability

The anonymized database will be available upon reasonable request.

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