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Determining factors of service priority in the risk classification of patients with chest pain

Fatores determinantes de prioridade de atendimento na classificação de risco a pacientes com dor torácica

Factores determinantes de la prioridad de servicios en la clasificación de riesgo de pacientes con dolor torácico

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ABSTRACT

Objective: To verify the determining factors of high priority in the risk classification and the outcomes of the care provided to adult patients with chest pain.

Method: Retrospective study, conducted at an emergency referral service of a public hospital in the interior of São Paulo State, analyzing the records of care performed in the risk classification in 181 medical records of patients with the symptom of chest pain, between August and November 2020.

Results: Individuals were most males 98 (54.1%), with moderate pain 133 (73.5), high priority for care 135 (74.5%) and who sought the service spontaneously 139 (76.8%). Of those classified as high priority, 47 (34.8%) were referred to the emergency room and, of these, 27 (17.0%) remained hospitalized. Female gender (p=0.0198; OR=0.40; CI=0.189-0.866) was independently associated with high priority of care.

Conclusion: Despite the priority classification, few participants were referred to the emergency room and required hospitalization. Female gender was a protective factor in the risk classification as high priority.

Descriptors: Triage. Chest pain. Nursing care. Emergency medical services.

RESUMO

Objetivo: Verificar os fatores determinantes de alta prioridade na classificação de risco e os desfechos deste atendimento realizado a pacientes adultos com dor torácica.

Método: Estudo retrospectivo, realizado em pronto-socorro referenciado, de hospital público do interior de São Paulo, analisando-se os registros dos atendimentos realizados na classificação de risco em181 prontuários de pacientes com o sintoma dor torácica, no período de agosto a novembro de 2020.
Resultados: Prevaleceram indivíduos do sexo masculino 98 (54,1%), com dor moderada 133 (73,5%), alta prioridade de atendimento 135(74,5%,) e que procuraram o serviço espontaneamente 139 (76,8%). Dos classificados em alta prioridade, 47 (34,8%) foram encaminhados para sala de emergência, e destes 27(17,0%) permaneceram internados. Sexo feminino (p=0,0198; OR=0,40; IC=0,189-0866) associou-se ao atendimento prioritário.
Conclusão: Apesar da classificação prioritária, poucos participantes foram encaminhados à sala de emergência e evoluíram com necessidade de internação hospitalar. Sexo feminino foi fator protetor para classificação em alta prioridade de atendimento.
Descritores: Triagem. Dor no peito. Cuidados de enfermagem. Serviços médicos de emergência.

RESUMEN
Objetivo: Verificar los factores determinantes de prioridad en la clasificación de riesgo y los resultados de las atenciones realizadas a pacientes adultos con dolor torácico.
Método: Estudio retrospectivo realizado en urgencias referidas, del hospital público del interior de Sao Paulo, analizando los registros de las atenciones realizadas en la clasificación de riesgo en 181 prontuarios de pacientes con el síntoma dolor torácico, en el período de agosto a noviembre de 2020.
Resultados: Los principales hallazgos del estudio deben presentarse de manera concisa y clara, sin excesivos detalles. Los resultados deben estar alineados con la sección de resultados del artículo completo, proporcionando información más detallada sobre los análisis estadísticos realizados y los principales resultados encontrados.
Conclusión: A pesar de la clasificación prioritaria, pocos participantes fueron remitidos a la sala de emergencias y evolucionaron con necesidad de ingreso hospitalario. El sexo femenino fue un factor protector en la clasificación de riesgo como alta prioridad.
Descriptores: Triaje. Dolor en el pecho. Atención de enfermería. Servicios médicos de urgencia.

INTRODUCTION

Chest pain is the second most prevalent complaint in patients seeking emergency services worldwide[1]. Being subjective in nature, it can be described with different intensities and manifestations, and often presenting as intense pain or discomfort, mainly in the precordial and retrosternal regions, radiating through the upper limbs, accompanied or not by sweating, dyspnea and nausea[2].

This symptom, which can have both cardiac and non-cardiac origins, requires accurate diagnosis and appropriate treatment, given that 20% of these cases are related to acute coronary syndrome (ACS)[3,4],which non ST-elevation (NSTE-ACS) is composed of unstable angina and acute myocardial infarction without ST segment elevation. Acute myocardial infarction (AMI) represents the progression of myocardial ischemia and the main cause of

disability and death worldwide[5]. In 2020, an estimated 25 million deaths occurred globally, with 19 million in developing countries[6].

The electrical instability that affects the heart after AMI favors the occurrence of potentially malignant ventricular arrhythmias and predisposes survivors to the risk of sudden death, requiring intervention within the first ten minutes of patient care in emergency services[7].

Therefore, the time for treatment is considered a primary factor for greater survival and effectiveness in the treatment of these diseases, making it necessary to provide appropriate initial care in response to the complaints presented, to obtain quick assessment followed by appropriate solutions on the specific case[6].

In an effort to reorganize and humanize emergency care in the country, in 2004, the Ministry of Health implemented the Reception with Risk Classification (*Acolhimento com Classificação de Risco* - ACCR) as a strategy to reorganize the flow of care in emergency services, through the prioritization of cases with the potential for risk, health issues or the degree of suffering presented by the patient [8].

Risk classification is based on recognized screening protocols, such as the Manchester Triage System (MTS), structured in flowcharts of symptoms and discriminators, which allow adaptations to better meet local needs, as long as its guidelines are maintained[8].

The flowcharts are representative of the patient's main complaint, which, based on signs and symptoms, lead to the categorization of the clinical priority for their care with severity level indicators, represented by colors: Red (emergency), immediate care via emergency room ; Orange (very urgent, time 10 minutes); Yellow (urgent, time up to 50 minutes), urgent service and as quickly as possible; Green (less urgent, time up to 120 minutes), they can wait for assistance or be referred to another less complex service; Blue (non-urgent, up to 240 minutes). Lower complex and urgent care can also wait for treatment or be referred to another healthcare service[9].

It is known that there are different classification protocols, and some of them allow more subjectivity in the evaluation than others, even if evaluators follow the same parameters to determine the severity and priority of care[10,11].

In this process, the role of the Nurse as the main actor in this care model stands out, as they are accustomed to provide comprehensive and humanized care for the patient, increasing the effectiveness of care. In this scenario, starting from the selection of the "Chest Pain" flowchart, a series of questions allow the nurse to differentiate the type of pain, resulting to the correct discriminator in the risk classification[12,13].

Chest pain is a symptom indicative of high priority care, as it is associated with a severe clinical condition and the impacts of cardiovascular diseases on the worldwide population. It is estimated that these diseases represent approximately 32% of deaths in Brazil[5,14,15]and their main risk factors are: inadequate nutrition, sedentary lifestyle, dyslipidemia, hyperglycemia, high blood pressure, obesity, selected population risks (advanced age, race/ethnicity and gender differences), thrombosis/smoking, renal dysfunction and genetics with familial hypercholesterolemia[16].

Despite the relevance of the topic, this study is justified by the need to learn about the factors that determine the classification of patients with chest pain as a high priority for care, since most articles evaluate the specificity and sensitivity of different screening systems[17-19].

It is in this gap that the present study aims to answer the following guiding questions: What are the determining factors for priority in the risk classification of patients with complaints of chest pain? What is the outcome of these services in the risk classification?

Given the above, this study aimed to verify the determining factors of high priority in the risk classification and the outcomes of this care provided to adult patients with chest pain.

METHOD

This is a retrospective, cross-sectional study with a quantitative approach.

The study was conducted in a referenced emergency room of a public hospital in the interior of the state of São Paulo, where risk classification is conducted 24 hours a day, every day of the week, for adults seeking care with medical referral or by spontaneous demand. In this service, cases referred by the mobile emergency care service (*Serviço de Atendimento Móvel de Urgência* - SAMU) are admitted directly to the emergency room and are not classified, as well as those cases regulated by the health services supply regulation center (*Central de Regulação de Oferta de Serviços de Saúde* - CROSS) with an established entry route to emergency room.

In the risk classification protocol, adapted from the Manchester Triage System by the institution where the research was conducted, the “chest pain” symptom flowchart presents four priority levels represented by colors. After anamnesis and measurement of vital signs, the descriptor is selected, being: red color (discriminators - intense pain: pain/discomfort/burning/compressive sensation in the precordial or retrosternal region, which may radiate) indicative of immediate medical attention, in the emergency room; yellow color (discriminators – moderate pain: ventilatory-dependent pain or pain that worsens with cough with fever, cough or expectoration and fever > 38.5 ºC) predicts the need for medical

healthcare within one hour; green color (discriminators - normal VS: muscular pain, mild pain without other associated symptoms in patients without a previous history of coronary artery disease or pulmonary embolism) establishes waiting time for medical healthcare in up to 2 hours; blue color (discriminators - chronic pain without characteristics of ischemic pain with normal VS) establishes the 4-hour limit for medical healthcare.

In this study, for analysis purposes, the severity level indicators were classified as high priority in the colors red and yellow, and low priority in green and blue.

In convenience sampling, medical records of patients aged 18 years or older, of both genders, who underwent care in the emergency room risk classification with the symptom "Chest Pain" were considered eligible for the study. Duplicates visits and without information in the electronic medical record were excluded.

To compose this sample, a survey was initially conducted at the Medical Informatics Center (*Centro de Informática Médica* - CIMED) of the institution of care provided with risk classification and which used the discriminator "chest pain", during the period from July to December 2019, the last semester preceding the outbreak of the new Coronavirus pandemic.

Subsequently, data collection was conducted by accessing the electronic medical record in use at the institution called SOUL MV, from August to November 2020.

Data were collected using an instrument developed for this study consisting of sociodemographic data and clinical information relevant to the service, namely: city; gender (Male/Female); priority color (red/ yellow/ green/ blue); discriminator (already presented); local pain (retrosternal/ precordial/ epigastric); irradiation (yes/no); associated symptoms (yes/no); vital signs (yes/no); blood pressure (yes/no); oximetry (yes/no); heart rate (yes/no); temperature (yes/no); HGT (yes/no); respiratory rate (yes/no); pain (yes/no); pain history (yes/no); does follow-up (yes/no); has a personal history (yes/no); patient's origin (spontaneous demand/referral/not included); medical diagnosis (absent/cardiological/pulmonary/other etiologies) hospitalization (yes/no); classification outcome (discharge after medical care/ waiting room/ observation room/ redirected care flow/ evasion). It is reiterated that the outcome variable refers to what occurred immediately after the initial medical assessment in the risk classification.

Initially, all variables were analyzed descriptively. The ACCR variable was reclassified into two categories (high and low priority of care). With this categorization, mean comparisons were made using the Student's t-test for quantitative variables and associations with the categorized variables using the chi-square test. In analyzing care outcomes, the Mann-Whitney test, Pearson's chi-square test and Fisher's exact test were used.

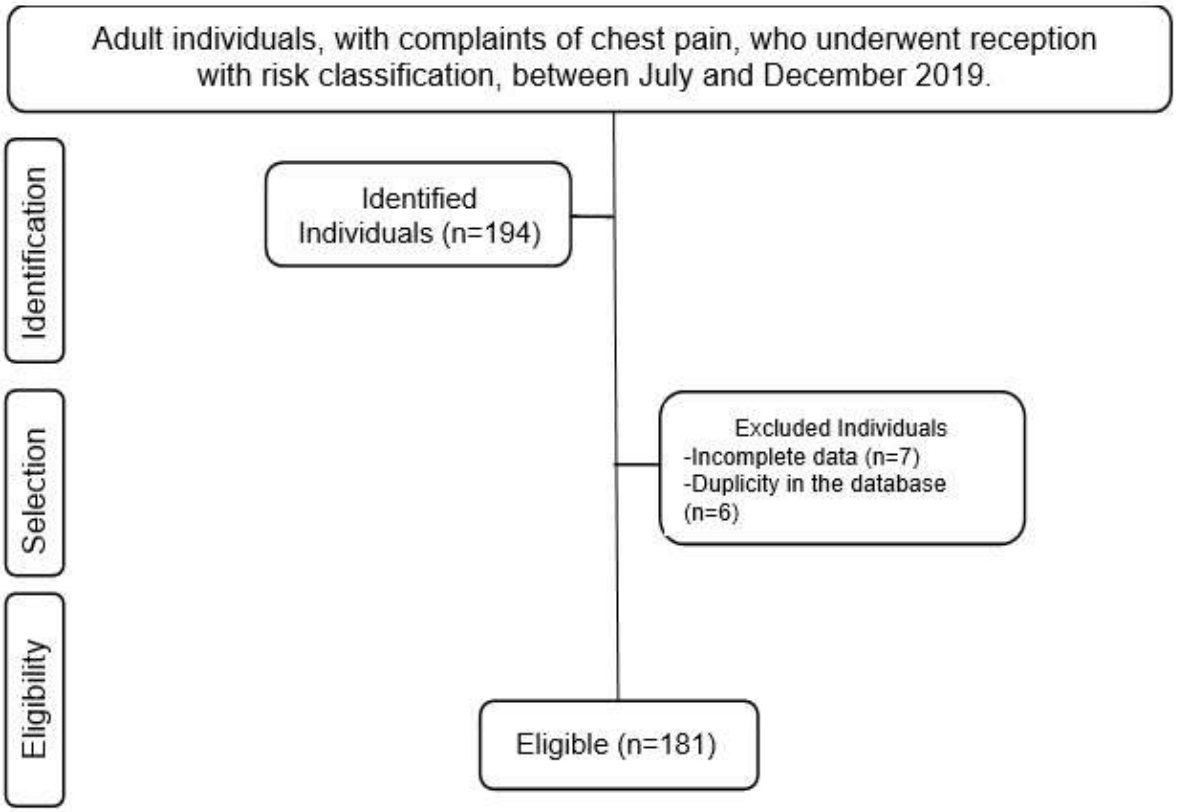
Considering the recategorized binary variable, high priority of care by ACCR as the response variable, a logistic regression model was adjusted with the other explanatory variables using the 'stepwise' variable selection method. The analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 22 (IBM SPSS). The significance level adopted was 5%.

The study was approved by the Ethics Committee of the *Faculdade de Medicina de Botucatu*, under opinion number 4,011,394. This study was developed in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines, despite the article not fully adhering to the checklist due to the characteristics of the proposed study[20].

RESULTS

A total of 194 cases related to the symptom "chest pain" were identified. After analysis, 13 cases were excluded: six due to duplications in the database, and seven because they had incomplete information regarding risk classification, which resulted in a sample of 181 medical records (Figure 1).

Figure 1 - Flowchart for sample selection, adapted from STROBE.



Source: Research data, 2019.

There is a predominance of male individuals 98 (54.1%), with high priority for healthcare according to the risk classification 81 (60.0%), who sought the service spontaneously 103 (76.3%), during the day shift 107 (79.3%) and 95 (70.4%) had comorbidities. The mean age was 58 years for the low priority group and 57 years for the high priority group. Cardiological diagnoses accounted for 49.7% of the sample (Table 1).

Chest pain was predominant in both groups, but differed in intensity between the groups, that is, moderate pain was highlighted in the high priority group by ACCR 119 (88.1%), while mild pain predominated in the low priority group 32 (69.6%), ($p<0.0001$). Regarding care outcomes, 47 (34.8%) of individuals classified as high priority in the risk classification were referred for care in the emergency room, with a significant difference between the groups ($p <0.001$). Of these, 23 (17.0%) remained hospitalized (Table 1).

Table 1 - Clinical-demographic characteristics of participants and initial outcome of care in risk classification. Botucatu, Brazil, 2021

Variables	Low priority (n=46) n (%)	High priority (n=135) n (%)	Total n (%)	p-value
Age	58 (16.1±DP)	57(16.5±DP)	57(16.5±DP)	
Gender				
Female	29 (63.0)	54 (40.0)	83 (45.9)	
Male	17 (37.0)	81 (60.0)	98 (54.1)	0.0068
Demand				
Not informed	0 (0.0)	11 (8.1)	11 (6.1)	0.1009
Spontaneous	36 (78.3)	103 (76.3)	139 (76.8)	0.9439
Referred	10 (21.7)	21 (15.6)	31 (17.1)	0.4625
Shift				0.4127
Day	39 (84.8)	107 (79.3)	146 (80.7)	
Night	7 (15.2)	28 (20.7)	35 (19.3)	0.6798
Comorbidities				
No record	2 (4.3)	4 (3.0)	6 (3.3)	0.9021
Yes	32 (69.6)	95 (70.4)	127 (70.2)	0.1026
No	12 (26.1)	36 (26.6)	48 (26.5)	0.805
Location of pain				
Not informed	16 (34.8)	37 (27.4)	53 (29.3)	0.3506
Retrosternal	11 (23.9)	22 (16.3)	33 (18.2)	0.3501
Epigastric	2 (4.3)	10 (7.4)	12 (6.6)	0.706
Precordial	17 (37.0)	66 (48.9)	83 (45.9)	0.2182
Pain Intensity				
Mild	32 (69.6)	7 (5.2)	39 (21.5)	<.0001
Moderate	14 (30.4)	119 (88.1)	133 (73.5)	<.0001
Severe	0 (0.0)	9 (6.7)	9 (5.0)	0.1604
Irradiation				

Yes	13 (28.3)	61 (45.2)	74 (40.9)	0.0654
No	19 (41.3)	46 (34.1)	65 (35.9)	0.4809
Not informed	14 (30.4)	28 (20.7)	42 (23.2)	
Risk classification outcomes				
High	33 (71.7)	67 (49.7)	100 (55.2)	0.0149
Observation	0 (0.0)	19 (14.1)	19 (10.5)	0.0159
Emergency Room	8 (17.4)	47 (34.8)	55 (30.4)	0.042
Redirected	5 (10.9)	1 (0.7)	6 (3.3)	0.0045
Evasion	0 (0.0)	1 (0.7)	1 (0.6)	1.000
Hospitalization	4 (8.7)	23 (17.0)	27 (15.0)	
Diagnosis				
Absent*	5 (10.9)	1 (0.7)	6 (3.3)	0.0045
Cardiological	19 (41.3)	71 (52.6)	90 (49.7)	0.2494
Pulmonary	4 (8.7)	14 (10.4)	18 (9.9)	0.9661
Other etiologies	18 (39.1)	49 (36.3)	67 (37.1)	0.8674

Source: Research data, 2019.
*Refers to those who were referred to another lower complex service.

Table 2 presents the main study variables related to the hospitalization outcome, after risk classification. It was observed that the patients hospitalized were younger, males 16 (59.3%) and had comorbidities (p= 0.014). Chest pain 73 (47.4%), without irradiation 60 (39.0%) was not considered a determining factor for hospital admission. Regarding pain intensity, despite moderate pain predominating among those hospitalized 19 (70.4%), the proportion of patients discharged with this symptom surpasses this percentage 114 (74%).

Table 2 - Association between the main study variables related to hospitalization outcome in the risk classification. Botucatu, Brazil, 2021

Variables	**Hospital Admission**			
	No (n=154)	**Yes**n=27	**Total**	**p-value**
	n (%)	n (%)	n (%)	
Age (years)				0.297
Mean (±DP)	55.6 (16.5)	54.6 (16.5)	57.6 (16.9)	
Gender				0.563
Male	82(53.2)	16 (59.3)	98 (54.1)	
Female	72 (46.8)	11 (40.7)	83(45.9)	
Vital signs				0.220
No record	4(2.6)	2(7.4)	6(3.3)	
Recorded	150 (97.4)	25(92.6)	175(96.7)	
Comorbidities				0.014
No record	5 (3.2)	1(3.7)	6(3.3)	
Yes	102 (66.2)	25 (92.6)	127(70.2)	
No	47 (30.6)	1(3.7)	48(26.5)	
Location of pain				0.697
Not informed	43 (27.9)	10(37.0)	53(29.3)	
Retrosternal	28(18.2)	5 (18.6)	33(18.2)	
Epigastric	10 (6.5)	2 (7.4)	12(6.6)	

Precordial	73 (47.4)	10 (37.0)	83(45.9)	
Irradiation				0.108
Not informed	35 (22.7)	7 (25.9)	42(23.2)	
Presented	59 (38.3)	15(55.6)	74(40.9)	
Did not present	60 (39.0)	5 (18.5)	65(35.9)	
Pain intensity				
Mild	32 (20.8)	7 (25.9)	39(21.5)	0.808
Moderate	114 (74.0)	19 (70.4)	133 (73.5)	
Severe	8 (5.2)	1(3.7)	9 (5.0)	
ACCR				0.475
Blue	1(0.6)	0 (0.0)	1(0.6)	
Green	41(26.7)	4 (14.8)	45(24.9)	
Yellow	104 (67.5)	21 (77.8)	125(69.0)	
Red	8 (5.2)	2 (7.4)	10 (5.5)	

Source: Research data, 2019.

The analysis and logistic regression of explanatory variables for high priority risk classification are presented in table 3. It is noted that female gender (p=0.0198) was considered a protective factor for high priority risk classification.

Table 3 -Logistic regression of the main variables associated with the high priority risk classification. Botucatu, Brazil, 2021

	OR	**95% CI**		
Variables		**Minimum**	**Maximum**	**P**
Age	1.01	0.986	1.035	0.405
Female	0.40	0.189	0.866	0.019
Origin (other city)	1.83	0.849	3.953	0.122
Shift (daytime)	1.46	0.543	3.905	0.455
Having comorbidities	1.36	0.541	3.418	0.804
Chest pain	1.78	0.258	12.267	0.327

Source: Research data, 2019.

DISCUSSION

The results of this study allowed us to identify clinical-epidemiological characteristics of patients who sought care in a tertiary-level emergency room and contribute to reflection on the ACCR protocol for chest pain complaints.

In the present investigation, males were prevalent in seeking care with complaints of chest pain and classified as a high priority for care. Divergent data from a study conducted with 217 patients treated in a hospital emergency unit in Brazil, in which the majority were men (61.2%) classified as low priority (51.1%)[21].

Another aspect related to service was the prevalence of demand during the daytime. However, high priority (20.7%) were higher at nighttime compared to low priority calls (15.2%), which may be related to demand with characteristics of urgency during this period.

These findings are corroborated by a study conducted in the southern region of the country, in which the majority of emergency service visits occurred at night[15].

Regarding comorbidities, it was predominant among patients complaining of chest pain. Similar data present in other studies in which comorbidities such as arterial hypertension (SAH), dyslipidemia, coronary artery disease (CAD) and obesity are important risk factors for the presentation of AMI[6,22,23].

Regarding the etiology of pain, it was observed that more than half of the causes classified as low priority were of non-cardiac origin, as described in the literature. Although chest pain is described as the main symptom of CAD, only some patients present the typical form. Moreover, it is necessary to consider the subjectivity of each patient, the presentation of chest pain which may be atypical with reports of non-specific malaise, weakness and dyspnea, on the other hand, present not only in ACS. This fact can hinder the evaluation of professionals and guide care towards appropriate behaviors. Therefore, it is essential that care is provided with qualified listening, evaluation and interpretation of the complaint by the nurse during risk classification[6,18,24].

Other studies point out that some patients, mainly elderly people, women and diabetics, require greater attention at the time of care, as they may present atypical clinical symptoms of coronary diseases more frequently, with diagnosis and management being directed, initially, for other diseases and comorbidities[10,14,24].

In this study, the outcome of discharge after medical healthcare was prevalent in both high and low priority care. In Brazil, there is currently an excessive demand for urgent and emergency services, causing overcrowding in services, overload and accumulation of tasks for healthcare professionals[6,18].

Another fact demonstrated in this study is the low number of redirected cases (3.3%), even with the large number of cases classified as low priority and high as outcome, highlighting the inadequate use of urgent and emergency services, since part of the cases treated could be resolved in lower complex services[25,26].

With the flow of referrals between services still precarious, referring inappropriate cases to the emergency service seems to be one of the limitations to the effectiveness of risk classification. It is known that the limitations for the proper functioning of risk classification are multifactorial, and it is essential to implement strategies that reduce these limitations, in order to achieve an effective classification, with quality and resolution. The classification organized to prioritize the patient, through the accurate and qualified assessment of the nurse

at the service entry, contributes to rapid diagnosis and appropriate actions, enhancing the effectiveness of care[6,12].

In this scenario, nurses assume an important role, capable of carrying out risk classification due to their careful and expanded view of the conditions, with continued education, qualifications and training of these professionals being essential to support actions and increase the accuracy of the classifying nurse[6,10,13,24]. It is reiterated that mastering knowledge about the symptoms, typical and atypical, of coronary diseases or not, as well as risk groups and associated comorbidities makes it easier for nurses to assess and increases the efficiency of classification, intervening early when necessary, in addition to reducing complications related to the evolution of heart diseases[6,22,24,25].

To respond to the second specific objective of this study, a logistic regression analysis of the explanatory variables was conducted to classify the service as a high priority. Female gender was considered a protective factor. Studies have shown that women aged 45 or younger are less likely to feel chest discomfort as the main symptom, however, women with acute myocardial infarction who do not have chest pain are at greater risk of death[23,27,28]. However, a clinical study with 1,941 patients, 39% females, showed that women are more likely to present atypical symptoms, such as epigastric pain, dyspepsia, including unusual fatigue, shortness of breath, indigestion, weakness, dizziness, palpitations or anxiety[23].

Anxiety disorders are significantly associated with coronary endothelial dysfunction (CED) in women with chest pain and non-obstructive coronary artery disease, as shown in a study conducted with 1,974 patients, 66.2% of whom were female. Thus, CED may represent a mechanism that supports the association between anxiety disorders and coronary artery disease and its complications, highlighting the role of anxiety as a potential therapeutic target to prevent cardiovascular events[14].

It is observed that despite the emergency room being referred to, there is still a big demand of patients who require risk classification to meet their health needs, since the population does not use the healthcare network and directly seeks the service.

A limitation of the study is the fact that it was conducted in a single public hospital with local specificities, which limits the generalization of the results. Furthermore, the possible imprecision of the records is also a natural limitation of the study. The study's main contribution highlights the role of the nurses' work in risk classification and provides support to local managers that allow improving healthcare practices in the institution where the research was conducted by reorganizing the flow of care between levels of complexity.

CONCLUSION

Being female was a protective factor in risk classification as high priority, according to the protocol used in the institution, that is, it contributed to women not being classified as a high priority for care.

The main outcome of the risk classification was discharge, after medical care, for both low and high priority classifications.

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