Evaluation of the Manchester Triage System in the Acute Coronary Syndrome

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Background: Cardiovascular diseases are the leading cause of death worldwide. The search for safe solutions to ensure priority in the healthcare of patients with severe conditions, such as acute coronary syndrome, is a determining factor in the prognosis.

Objective: To evaluate the healthcare of patients with acute coronary syndrome undergoing the Manchester triage system applied by nurses.

Methods: Retrospective observational study based on the review of medical reports of patients admitted for acute coronary syndrome between October 2010 and April 2012 in a public hospital of cardiology in Joinville, Brazil. The following were assessed: health history, symptoms on admission, medical diagnosis, classification by the Manchester triage system, opening hours and procedures, information on admission, and the outcome of the case. The data were entered into an e-form and submitted to statistical analysis.

Results: Of the 191 patients selected, 65.0% were men and 47.0% had a history of coronary artery disease. The Manchester triage system allowed correctly classifying 80.1% of patients. The flowchart “thorax pain” with the discriminator “chest pain” was the most used. The average waiting time for classification, medical care and first electrocardiogram were 12.2, 28.6 and 24.9 minutes, respectively.

Conclusion: The Manchester triage system allowed a high rate of correct classification by the nurse of patients with acute coronary syndrome.

Keywords: Triage; Acute coronary syndrome; Emergencies

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Introduction

Excessive demand for emergency care is a global problem that causes a greater need for medical appointments, exceeding the capacity for which the services are organized¹. In this context, it is of the essence to find safe solutions to ensure priority care to patients with severe conditions. Among the diseases in which the waiting time can affect the prognosis of the patient, the acute coronary syndrome (ACS) is largely responsible for deaths and disabilities in the world²-⁴. Risk classification (RC) is a tool used in emergency services in many countries to ensure an expeditious healthcare for people at high risk of death. Among the different classification systems in operation, the Manchester triage system (MTS) is the most used⁵.

The MTS is usually applied by nurses in most services due to their general training in health and their ability to recognize and act on the most prevailing health problems⁶. The MTS is based on a scale that uses five priority levels, allows classifying patients according to the degree of urgency and emergency, linking them to the target times for medical evaluation and respective colors and for the visual identification of cases:
The objectives of this study were to describe and evaluate healthcare to patients with acute coronary syndrome in the emergency room of a reference cardiology hospital using the Manchester triage system, applied by nurses in risk identification.

Methods

This is a retrospective observational study including patients with ACS admitted between October 2010 and April 2012 in a public hospital of cardiology in Joinville, the most populous city in the state of Santa Catarina, Brazil, with more than 500,000 inhabitants.

The hospital under study assists patients in spontaneous demand, seeking emergency on their own initiative, and also by those previously assisted in other emergency services (hospitals or emergency care), where they were classified by the MTS and are transferred to reference and reclassified.

The study included individuals aged 18, admitted to hospital through the hospital emergency service, registered in the MTS classification by nurses in initial care (at the hospital or at another healthcare center) and final medical diagnosis of unstable angina (UA) or acute myocardial infarction (AMI), identified by the International Classification of Diseases and Related Health Problems — 10th revision (ICD-10). Exclusion criteria included unavailability and incompleteness of data or information essential to the study.

Identification data collected: health history, symptoms on admission, medical diagnosis, classification by the MTS, doctor’s appointment times and procedures, information about admission, and the outcome of the case.

Selection of cases performed from the report issued by the information technology service including all patients admitted to the hospital during the study under the codes ICD-10 associated with UA or AMI used in the hospital (I21 - Acute myocardial infarction; I21.1 - Acute transmural infarction of the anterior myocardial wall; I21.2 - Acute transmural infarction of the anterior myocardial wall from other locations; I21.4 - Acute subendocardial myocardial infarction and I20.0 - Unstable angina). Data were obtained from the electronic medical records of these patients and additional documentation from the Medical Archive Service.

The data were entered into the e-form using the software EpiData Entry (EpiData Association, v. 3.1) and analyzed by the software SPSS (IBM, v. 13.0). The continuous quantitative variables were expressed as mean±standard deviation and the qualitative variables were expressed through frequencies. The analytical statistics included the Student’s t test and the chi-square test (Fisher’s exact test, where applicable) for numeric and categorical variables, respectively. A level of significance of 0.05 was accepted to analyze the differences.

The research was conducted according to the CNS Resolution 466/12 and its execution was approved by the Research Ethics Committee of the institution under No. 031/11.

Results

The main diagnoses on admission were unstable angina (UA) and acute myocardial infarction (AMI). The mean age of the 191 patients was 59.1±11.92 years, 65.1% were male and 91 (47.4%) had a personal history of coronary artery disease (CAD). Demand for emergency service took place between 15 minutes and 72 hours (average 12.8 hours) from the onset of symptoms. The average time between arrival to the emergency department and the risk classification in the hospital was 12.2 minutes. From then on, there was an average waiting time of 28.6 minutes for the medical care and 24.9 minutes for the electrocardiogram (ECG) (Table 1).

The first assistance given to the patient’s complaint was in the cardiology hospital in 136 (71.2%) patients. The 55 (28.8%) remaining assistances were in local emergency care centers. As for the RC by the MTS, 80.1% of patients were classified as very urgent and as an emergency.

In the public emergency care centers, 45 (83.8%) patients were classified in orange, 6 (11.1%) in yellow and 4 (5.6%) in green, with no patients classified in red and blue colors.
The flowchart of chest pain was used in 160 (83.3%) cases, and the discriminator chest pain was the most frequently used (68.1% of patients). The average time between the reception and the risk classification was significantly higher among patients who had their first assistance in hospitals (Table 2).

### Table 1
Mean values of quantitative variables in the sample population

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>191</td>
<td>59.1±11.9</td>
</tr>
<tr>
<td>Duration of symptoms on arrival (minutes)</td>
<td>177</td>
<td>769.5±1316.7</td>
</tr>
<tr>
<td>Time to classification (minutes)</td>
<td>192</td>
<td>12.2±14.7</td>
</tr>
<tr>
<td>Time to medical care (minutes) §</td>
<td>152</td>
<td>28.6±29.9</td>
</tr>
<tr>
<td>Time to ECG (minutes) §</td>
<td>150</td>
<td>24.9±31.1</td>
</tr>
<tr>
<td>Time between arrival and admission (minutes)</td>
<td>190</td>
<td>827.53±597.45</td>
</tr>
</tbody>
</table>

§ – Time from risk classification; SD – standard deviation; ECG – electrocardiogram

### Table 2
Quantitative variables of the patients studied, according to the healthcare facility

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hospital</th>
<th>Emergency Care Centers</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>mean±SD</td>
<td>n</td>
<td>mean±SD</td>
</tr>
<tr>
<td>Age (years)</td>
<td>137</td>
<td>59.82±11.89</td>
<td>54</td>
</tr>
<tr>
<td>Time from symptoms to arrival (minutes)</td>
<td>130</td>
<td>1065.39±2163.66</td>
<td>52</td>
</tr>
<tr>
<td>Time to classification (minutes)</td>
<td>137</td>
<td>14.74±16.17</td>
<td>54</td>
</tr>
<tr>
<td>Time to medical care (minutes) §</td>
<td>137</td>
<td>28.78±30.76</td>
<td>15</td>
</tr>
<tr>
<td>Time to ECG (minutes) §</td>
<td>97</td>
<td>23.9±34.2</td>
<td>53</td>
</tr>
<tr>
<td>Time between arrival and admission (minutes)</td>
<td>135</td>
<td>853.24±608.66</td>
<td>54</td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td>135</td>
<td>10.79±30.37</td>
<td>54</td>
</tr>
</tbody>
</table>

§ – Time from risk classification; SD – standard deviation; ECG – electrocardiogram
The average time from the RC to medical care was 28.6±29.9 minutes. There was no statistically significant difference as to the site of the first assistance.

The emergency care of patients who had a history of coronary artery disease, as well as those classified in orange and red colors, was more frequent in the referral hospital. An increased use of the flowchart “chest pain” and diagnosis of AMI in the cardiology hospital compared with other emergency services was also observed.

The time for medical care and ECG in patients classified as red or orange compared to other colors (Table 3) was significantly smaller.

Only 7 (3.7%) patients died during the hospital stay. These patients had a mean age of 67.1 years. Four of them were males. All of them were first assisted in the referral hospital and were classified by the MTS: 2 in the red color and 5 in the orange color.

### Table 3
Quantitative variables of the patients studied according to the classification by the MTS (orange/red and other colors)

<table>
<thead>
<tr>
<th></th>
<th>Orange/red</th>
<th>Other colors</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>mean±SD</td>
<td>n</td>
</tr>
<tr>
<td>Age (years)</td>
<td>153</td>
<td>59.25±12.32</td>
<td>38</td>
</tr>
<tr>
<td>Time from symptoms to arrival (minutes)</td>
<td>146</td>
<td>965.28±1974.52</td>
<td>36</td>
</tr>
<tr>
<td>Time to classification (minutes)</td>
<td>153</td>
<td>12.21±14.47</td>
<td>38</td>
</tr>
<tr>
<td>Time to medical care (minutes) §</td>
<td>129</td>
<td>26.05±21.63</td>
<td>23</td>
</tr>
<tr>
<td>Time to ECG (minutes) §</td>
<td>119</td>
<td>19.46±24.62</td>
<td>31</td>
</tr>
<tr>
<td>Time between arrival and admission (minutes)</td>
<td>151</td>
<td>856.31±638.36</td>
<td>38</td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td>151</td>
<td>10.48±29.11</td>
<td>38</td>
</tr>
</tbody>
</table>

§ – Time from risk classification; SD – standard deviation; MTS – Manchester triage system; ECG – electrocardiogram

### Discussion

ACS is associated with high morbidity and mortality with prognosis closely linked to the speed and quality of healthcare provided to the patients\(^9\). Recognizing the set of symptoms that is typically associated with ACS, by the population and emergency teams, is of the essence in the healthcare. In this study, 84.0% of patients had typical symptoms, which is similar to the data found in the literature\(^9\). Nevertheless, it was worrisome to note the long average time (12 hours) it took patients to seek treatment, from the onset of symptoms. This may be the result of poor knowledge about the symptoms and the risks associated with this condition.

During the preparation of the data collection instrument, it was found that much of the information necessary for the study was available in a computer system due to the implementation of the MTS. Data were obtained from electronic and print records. Information regarding admission time, risk classification and medical care represent the moment when professionals did the record. Most often, it takes place along with the service, except
in more severe cases when the patient is first served, and subsequently does the record. Most ECG tests had their dates and times printed on the test by the equipment itself. Because it is a university hospital, clinical and laboratory data were also appropriately recorded. Something that was particularly difficult in this study was to obtain data from patients who had their first service in emergency care centers that do not use a computer system, and in the data of ECG devices that do not record information regarding date and time automatically.

It was observed in this study that the local population was able to recognize the referral hospital’s calling for assisting patients with heart problems, since it was one of the most sought services (71.2%) and there was a higher proportion of severe patients (61.3% of patients with myocardial infarction) and with a history of coronary artery disease (88.9%) compared to assistance in other emergency services.

The MTS method suggests that the maximum waiting time between arrival at the emergency room and the risk classification should not exceed 10 minutes. In this study, the average time for the classification was 12.2 minutes, and was significantly higher in hospitals (14.7 minutes) compared with the units of emergency care (5.9 minutes). In another study, 82.2% of patients were classified in under 10 minutes. There is also reference in the literature of an average waiting time for a 5-minute risk classification.

The wait for triage observed in this study was higher than those found in the literature. A study in the United Kingdom suggests that the participation of nurses responsible for triage, with the performance of other activities in the emergency department, may be related to longer waiting times. There are no national studies that make it possible to compare this information. It is worth mentioning the possible influence of the difficulties described in the literature as for excessive demand in emergency care units and the shortage of professionals in the emergency services. Still, we found a suitable waiting time in the emergency care units, where nurses are also the classifiers. This result may demonstrate the commitment and responsibility of nurses to classify patients in a timely manner, since the overall outcome of the assistance will be influenced by the decision taken in the risk classification.

Regarding the average time for medical care, this study found high values (28.6±29.9 minutes) and not very different from those of the patients classified with the colors orange or red (26.1 minutes). This finding is of concern if we consider that the MTS recommends that patients classified in red or orange colors have their service prioritized and carried out immediately in 10 minutes from the RC. Another study also demonstrated the same weakness in the time of medical service post-triage: an average of 15.0 minutes for those classified in red and 36.2 minutes for the orange color, respectively.

It is recommended that all patients with chest pain be subjected to ECG in the first 10 minutes after admission. However, it is known that many emergency services have difficulties with personnel and equipment, which make such practice difficult. A 10-minute target time for carrying out the ECG is related to the recommendation of the sequential completion of all necessary procedures so that reperfusion therapy occurs within 90 minutes after the patient’s arrival at the emergency service. Despite evidence, the average time to perform the ECG in the study was 24.9±31.1 minutes, significantly lower (p=0.006) for patients with chest pain (21.5±26.3 minutes), although still higher than recommended. This information can portray the lack of a service routine that prioritizes electrocardiogram testing promptly on the patient’s arrival to the service.

In this study, it was observed that when assistance was sought, 83.8% of patients were classified in the flowchart of chest pain, demonstrating the predominance of typical SCA symptoms at risk classification. It was also observed that 80.2% of patients were classified as emergency (red) or very urgent (orange). These results are similar to those found in the Portuguese literature with 76.5% in a study, 79.0% in another and 87.3% sensitivity in the MTS in the identification of patients with ACS.

Even though the MTS had been implemented as late as in May 2010 in Joinville, Brazil, and the study was conducted from October 2010 to April 2012, it is worthy to mention the performance of classifying nurses in risk identification in ACS.

Analyzing the classification site and the establishment of priority, it was found that 100% of patients classified as red, 78.8% as orange, 57.1% as yellow and 23.0% as green received the first classification in hospital, which may be related to the hospital’s referral status and greater attention of the medical staff to the signs and symptoms related to cardiovascular problems compared to other points of attention.
Patients with atypical pain received a less urgent priority level than those with typical pain. As expected, the clinical presentation seems to interfere decisively in the initial screening of patients and their journey in the emergency room. Therefore, it is important to consider that the MTS is based on information collected from the patients or their companions. While it is undesirable to classify cases of ACS in yellow and green, this may be due to the symptoms reported at the time of triage. These situations can be reduced if we consider objective data such as oxygen saturation, vital signs, pain scale and blood glucose.

Martins et al. found an association between patients who were prioritized and the short-term mortality. Patients classified as high priority were associated with a 39-times higher probability of dying than those with low priority. Additional efforts are required for the risk classification to be disseminated in the emergency services and specific healthcare protocols be developed or implemented to ensure proper attention to serious conditions. This will enable not only the streamlining and improvement of the assistance to patients in emergency rooms, but will also provide some substrate for further research on the subject. Healthcare organizations should make efforts to provide conditions and require the professionals to respect the time set for both risk classification, completion of ECG and for medical care. By doing so, the users will get all the benefits of the MTS, especially those at higher risk, in order to ensure more efficient and effective services.

Conclusions

The Manchester triage system allowed a high rate of correct classification by the nurse of patients with acute coronary syndrome. Despite the adequate classification, waiting times exceeded the times recommended for most services and procedures.

Potential Conflicts of Interest
No relevant potential conflicts of interest.

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Academic Association
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