

# Risk classification: portrait of a population using a Brazilian emergency service

Classificação de risco: retrato de população atendida num serviço de urgência brasileiro  
Clasificación de riesgo: retrato de personas atendidas en un servicio de emergencia de Brasil

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## Abstract

**Theoretical framework:** Urgent and emergency services have represented the main gateway into the health system, leading to unit overcrowding. Rearranging these services has become paramount for establishing criteria so that patients do not suffer further harm due to waiting times.

**Aims:** To characterize the population under analysis using the Manchester Triage System in the emergency service of a hospital from one city in the state of Minas Gerais, Brazil.

**Methodology:** This was a cross-sectional study using a sample of 500 medical records of systematically randomized patients.

**Results:** The mean age was 43.85 years (sd=26.10), most patients were male (56.4%) and their birth place was Diamantina (87.4%). Of the 34 flowcharts used, the most common were unwell adult, abdominal pain, chest pain, sore throat, wounds and vomiting, corresponding to 44% of the ratings. 50.8% of the patients were classified as green or blue.

**Conclusion:** The unit is used as a gateway into the health service and the most relevant complaints for which people seek assistance could be solved at primary health care level.

**Keywords:** nursing; emergency medical services; triage.

## Resumo

**Enquadramento:** Os serviços de urgência e emergência têm representado a principal porta de entrada no sistema de saúde, gerando uma sobrelotação nas unidades. Reorganizar esses serviços tornou-se primordial no intuito de estabelecer critérios para que o paciente não sofra prejuízos decorrentes da espera.

**Objetivos:** Caracterizar a população classificada em relação ao Sistema de Triage de Manchester num serviço de urgência de uma instituição hospitalar de um município de Minas Gerais, Brasil.

**Metodologia:** Trata-se de um estudo transversal realizado em 500 fichas de atendimento de pacientes selecionados por aleatorização sistemática.

**Resultados:** A média de idade foi de 43,85 anos (dp=26,10), a maioria (56,4%) do sexo masculino e natural do município de Diamantina (87,4%). Os 34 fluxogramas mais utilizados foram indisposição no adulto, dor abdominal, dor torácica, dor de garganta, feridas e vômitos e estes corresponderam a 44% das classificações. Entre os pacientes 50,8% foram classificados nas cores, verde ou azul.

**Conclusão:** A unidade é utilizada como porta de entrada ao serviço de saúde e as queixas mais relevantes que levam as pessoas a buscar pelo atendimento poderiam ser resolvidas no nível primário de atenção à saúde.

**Palavras-chave:** enfermagem; serviços médicos de emergência; triagem.

## Resumen

**Marco contextual:** los servicios de urgencia y de emergencia han representado la principal puerta de entrada al sistema de salud, lo que ha provocado una aglomeración en las unidades. Reorganizar esos servicios se ha convertido en algo fundamental para establecer criterios para que el paciente no se vea perjudicado por la espera.

**Objetivos:** caracterizar a la población clasificada como Sistema de Triage Manchester en un servicio de urgencia de un hospital en la ciudad de Minas Gerais (Brasil).

**Metodología:** se realizó un estudio transversal en 500 historias clínicas de pacientes seleccionados por aleatorización sistemática.

**Resultados:** la edad media fue de 43,85 años (dp=26,10), la mayoría (56,4 %) eran hombres y naturales del municipio de Diamantina (87,4 %). Los 34 diagramas de flujo más utilizados fueron malestar en el adulto, dolor abdominal, dolor torácico, dolor de garganta, llagas y vómitos, los cuales corresponden al 44 % de las clasificaciones. Entre los pacientes, el 50,8 % fue clasificado en verde o azul.

**Conclusión:** la unidad se utiliza como puerta de entrada a los servicios de salud y los motivos más relevantes que hacen que la gente solicite ayuda podrían ser resueltos en el nivel primario de atención sanitaria.

**Palabras clave:** enfermería; servicios médicos de urgencia; triaje.

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Received for publication: 17.04.13

Accepted for publication: 28.01.14

## Introduction

In recent decades, there has been a change in the morbidity and mortality profiles of the Brazilian population, and the health system is as yet considered unable to meet these changes. In turn, urgent and emergency services have been the main gateway into the health system, thus leading to unit overcrowding. This situation is aggravated by the teams' lack of preparation to welcome and organize such quota (Ministério da Saúde, 2006). Rearranging these services has become paramount for establishing criteria so that patients do not suffer further harm due to waiting times.

Hence, a structured triage or, according to the Ministry of Health, admission with risk classification is pointed out as an interesting tool as it allows more severe patients to be the first to receive care (Albino, Grosseman, & Riggensbach, 2007).

Risk classification is a dynamic identification process which takes into account the risk potential, health problems or suffering of patients. This classification aims to assess patients at the moment of admission, thus humanizing care since both the area of primary area and waiting time are then defined according to the severity of the condition. Then it would be possible to reduce congestion in urgent and emergency services and provide patients and relatives with the necessary care and information (Ministério da Saúde, 2004).

The Brazilian Ministry of Health is currently trying to standardise the admission process with risk classification by adopting measures to homogenise this process throughout the country. In 2007, the State Department of Health of Minas Gerais (SES-MG) began exchanging experiences on the risk classification process with Portugal, which uses the Manchester Triage System (MTS) for risk classification in their emergency services (Grupo Brasileiro de Classificação de Risco, 2009).

In December 2009, this exchange of experiences resulted in a deliberation of the Government of the State of Minas Gerais, the SES Resolution No. 2132, which defined criteria for the introduction and implementation of the MTS as a single language to be adopted in urgent and emergency services in the state. This deliberation considers the MTS as an emergency management tool which enables better quality of care and higher case resolution rates (Ministério da Saúde, 2009).

The municipality of Diamantina, located in the State of Minas Gerais (MG), Brazil, is a medium and high complexity macroregional reference which provides services for more than 30 municipalities in the Jequitinhonha Valley. In August 2008, the municipality introduced the MTS in its emergency service (ES), using a manual recording system. A process of empowerment of professionals and adequacy of physical and material resources is currently being developed so that the system can be more efficiently applied.

There is a great demand for urgent and emergency services in this hospital, although much of the care could be provided by primary health units as it does not require neither urgent nor emergency services. Hence, it is necessary to identify the main reasons which lead people to ES. This information will allow the mapping of the health care needs of the population of Diamantina and thus contribute to optimize care in these services and in basic health units.

Therefore, the aim of this study was to characterize the population classified based on the MTS in an emergency service of a hospital in a municipality of Minas Gerais, Brazil.

## Framework

In Brazil, urgent and emergency services are characterized according to the criteria of severity and complexity: urgency - no risk of death, but the patient presents a critical or acute condition; and emergency - risk of death. Urgent and ES operate 24/7 and provide care to patients with urgent problems, who have not been treated in primary care services and social urgency services. The criterion for access to the service is the patient's clinical severity, being the MTS one of the triage protocols (Valentim & Santos, 2009). The MTS has five clinical priority levels to which colours are assigned (red - immediate; orange - very urgent; yellow - urgent; green - standard; and blue - non-urgent). Colours identify the maximum waiting time for medical care: emergency - immediate care; orange - 10 minutes; yellow - 60 minutes; green - 120 minutes; and blue - 240 minutes.

This protocol recognizes that a triage method should not provide the professional with a diagnosis, but rather with a clinical priority. Each clinical priority

level is determined by clinical signs and symptoms—discriminators. These are arranged as flowcharts and guide the assessment starting with the main complaint presented by the patient at the time of admission (Mackway-Jones, Marsden, & Windle, 2010). After being classified, the patient moves to the monitoring and reassessment stage.

Risk classification is a dynamic process, i.e. if the signs and symptoms presented by the patient evolve, the patient is reclassified and, consequently, the waiting time changes (Mackway-Jones et al., 2010).

International studies confirm the effectiveness of the MTS. When comparing inter and intra-observer agreement of the MTS and the Emergency Severity Index (ESI), unanimity in judgement for MTS of 90% and for ESI of 73% was found. One-level disagreement was found in 8% and 23% of the cases, respectively. The study concluded that MTS had greater inter and intra-observer agreement than ESI in Holland (Storm-Versloot, Ubbink, Chin a Choi, & Luitse, 2009). In Portugal, a study concluded that the MTS distinguishes between patients with high and low risk of short-term death, as well as between those who will stay in hospital and those who will return home (Martins, Cuña, & Freitas, 2009).

In Brazil, a survey showed that, when compared with an institutional protocol, the MTS increased patients' level of priority, thus being more inclusive (Souza, Toledo, Tadeu, & Chianca, 2011) and capable of predicting the evolution of patients classified during their stay in the institution (Pinto Júnior, Salgado, & Chianca, 2012).

## Methodology

This cross-sectional study was conducted in an ES in the city of Diamantina, Jequitinhonha Valley. This is a medium and high complexity macro and microregional reference hospital which provides medical-hospital care 24 hours a day. It is the major gateway for clinical urgent care in the municipality and for other ESs of the macroregion of the Jequitinhonha Valley, and covers a population of 265 000 inhabitants.

The study sample comprised 13,000 manual recording clinical files which correspond to all the patients admitted to the ES during the data collection period (between 1<sup>st</sup> May and 30<sup>th</sup> September 2010).

Sample size was calculated based on a reliability level of 95%, a prevalence of 50%, and a tolerable sampling error of 5%, thus achieving a total of 388 files (Jekel, Katz, & Elmore, 2007). To compensate for losses, this number was increased by 20%, summing up to a minimum of 466 evaluated files. In order to increase reliability, 500 files were analysed using a systematic random sampling. The number of the first file was randomly selected, and then the system-26 was used (one file in each 26 files was analysed). Number 26 was chosen because it is the result of the ratio between the total population and the number of files which would be analysed ( $13000/500=26$ ).

Data were collected using a structured spreadsheet to group the information included in the medical form, which does not identify the patient. The variables analysed were: gender, age, complaint, colour coding according to risk classification, referral of the Basic Health Unit (BHU), and municipality of origin.

Data were entered into a database and analysed using the Statistical Package for Social Sciences (SPSS) software, version 17.0. A descriptive and bivariate analysis was conducted. The Kolmogorov-Smirnov test was used to test the normality of the distribution. Pearson's chi-square test and Kruskal-Wallis test were applied in the comparative analysis of categorical and numeric variables. The significance level adopted was  $p<0.05$ .

This study was approved by the Research Ethics Committee of the Federal University of the Valleys of Jequitinhonha and Mucuri - CEP/UFVJM, under protocol number 001/2011.

## Results

In the 500 files studied, patients' age ranged from 5 days to 93 years, with a mean age of 43.85 years,  $sd=26.10$  years. Significant differences were found in the mean ages between the different levels of risk classification ( $p=0.002$ ). The lowest mean age was observed in patients who were assigned a green colour of triage (Table 1).

TABLE 1 – Distribution of the risk classification group by age range.

Variables Risk classification	Age range			
	Mean (years)	Standard Deviation	CI	p value*
Red	41.57	23.74	19.61 - 63.53	0.002
Orange	34.39	23.98	27.27 - 41.51	
Yellow	35.98	25.78	32.20 - 39.76	
Green	26.17	20.40	23.55 - 28.79	
Blue	32.74	21.08	25.01 - 40.48	

Note: \* Kruskal-Wallis Test.

In terms of gender, most patients were male (56.4%) and 43.6% were female. No statistical difference was found ( $p = 0.269$ ) regarding gender among risk classification groups (Table 2).

TABLE 2 – Distribution of the risk classification group by gender.

Risk classification	Gender				Total	p value*	
	Male		Female				
	No	%	No	%			
Red	6	1.2	1	0.2	7	1.4	0.269
Orange	28	5.6	18	3.6	46	9.2	
Yellow	93	18.6	88	17.6	181	36.2	
Green	136	27.2	99	19.8	235	47.0	
Blue	19	3.8	12	2.4	31	6.2	
Total	282	56.4	218	43.6	500	100	

Note: \*Pearson's  $\chi^2$ .

Regarding the place of birth, most patients (87.4%) resided in the municipality, whereas 12.6% came from other 26 municipalities; 4.8% of the patients were referred by Basic Health Unit, while 2.2% were not referred by any Basic Health Unit. This information was not included in 93% of the clinical files.

The analysis also allowed us to identify, by comparing

these data with the risk classification, whether the municipalities which referred patients to the emergency service used satisfactory criteria. Significant differences were identified ( $p = 0.0001$ ) between the risk classifications of patients coming from the municipality itself and patients residing in other locations (Table 3).

TABLE 3 – Distribution of risk classification by place of birth.

Classification in the risk scale	Place of birth				p value*
	Diamantina		Other		
	No	%	No	%	
Red	5	1.1	2	3.2	0.0001
Orange	27	6.2	19	30.2	
Yellow	155	35.5	26	41.3	
Green	221	50.6	14	22.2	
Blue	29	6.6	2	3.2	
Total	437	100	63	100	

Note: \*Pearson's  $\chi^2$ .

The MTS contains 52 flowcharts which are used to classify patients according to the signs and symptoms presented. It was observed that 34 (65.3%) of the flowcharts were used following the colours of the risk

scale (Table 4). In 3.8% of the flowcharts analysed, patients were not assigned the risk classification which was documented in medical records. The flowcharts unwell adult, abdominal pain, chest pain,

sore throat, wounds and vomiting were the most used, corresponding to 44% of the classifications.

The difference between the groups using bivariate analysis (Chi-square) was significant ( $p < 0.0001$ ).

TABLE 4 – Distribution of the Classification in the risk scale by discriminator of the Manchester Triage System.

Flowcharts	Classification in the risk scale				
	Red (%)	Orange (%)	Yellow (%)	Green (%)	Blue (%)
Assault	0	0	0	1	0
Asthma	0	0.2	1.2	1.8	0
Foreign Body	0	0.2	0.2	0.4	0.4
Headache	0	0.2	2.8	1.8	0
Strange behaviour	0	0.2	0.4	0	0
Fits	0.2	0.2	0.2	0.2	0
Unwell child	0.2	0.8	0.6	2.4	0.2
Diarrhoea	0	0	1.6	0.6	0
Shortness of breath	0.4	0.4	1.2	0.4	0
Abdominal Pain	0	0.6	5.2	2	0.8
Neck Pain	0	0	0	0.8	0
Sore throat	0	0.2	1.4	4.6	0
Back Pain	0	0.4	2	1.6	0.6
Chest Pain	0	1.2	2	2.2	0.8
Apparently drunk	0	0	0.4	0	0
Rashes	0	0.2	0.6	1.6	0
State of Unconsciousness	0.2	0	0	0	0
Exposure to chemicals	0	0	0	0.2	0
Wounds	0	0	0.8	4.6	0.4
GI Bleeding	0	0	0.2	0	0
PV Bleeding	0	0.2	0	0	0
Unwell adult	0	0.8	5.4	4.8	0.6
Abscesses and local infections	0	0	0.4	0.8	0.2
Bites and stings	0	0.2	0	1	0
Worried Parent	0	0	0.2	0.4	0
Nose Problems	0	0	0	0	0.4
Limb problems	0	0	0.8	4	0
Eye Problems	0	0	0.6	0.6	0
Ear problems	0	0	0.2	1.6	0.4
Urinary problems	0	0	0.8	1.4	0
Falls	0	0.2	1	1.2	0
Burns	0	0	0	0.2	0
Overdose and poisoning	0	0.2	0.2	0	0
Head Injury	0.2	2	1.2	1.4	0
Vomiting	0	0	3.4	1.8	0.4
Total	1.2	8.8	35	45.6	5.2

Patients residing in the municipality itself who were assigned green or blue colour tags had no appointments with a physician and were referred back to their BHU. In 10% of the cases, the referral

was carried out directly by the nurse. In 2.4% of the cases, the nurse referred the patient to the social service of the ES so that an appointment at the BHU was scheduled.

## Discussion

Results show that the public who seeks urgent and emergency services comprises people of all age groups; however, the age group 20-59 years stands out. The mean age of 43.85 years was low when compared to a study carried out in a municipal ES of Belo Horizonte, Minas Gerais State, where a mean age of 57.3 years was found (Pinto Júnior et al., 2012), and high in relation to the results of a study conducted in the same hospital, in which a mean age of 39.32 years was found (Souza et al., 2011).

There was a predominance of male individuals. This result is in line with the literature, which shows that, in general, men suffer more from severe and chronic conditions than women, and, for this reason, they seek emergency services more often. This fact is directly related to the low attendance of male individuals in basic care units, i.e. men are less involved in health prevention than women (Gomes, Nascimento, & Araújo, 2007). The gender distribution between risk classification groups was similar, a result which was also observed in the study carried out in a municipal hospital in Belo Horizonte (Pinto Júnior et al., 2012).

In Portugal, where the MTS has been used for more than 10 years, patients were classified as follows: red (0.7%), orange (24.7%), yellow (50.6%), green (20.2%), blue (2.0%) and white (1.5%) (Martins et al., 2009). These data show that the Portuguese population seeks the service presenting a higher clinical priority. However, in Brazil, the use of the MTS is still recent. Adjustments to the system will have to be permanently made and population awareness must also be increased.

We verified that the number of people who seeks the ES after referral from a BHU is very low. This means that people continue to see the emergency service as a gateway into the health service and that primary care services in this municipality have not been effective, conversely to the legislation in force which states that primary care should tackle 85% of the cases. This information corroborates the results of a study carried out in the emergency service of a public state hospital in Santa Catarina, where it was observed that the service was mostly used by patients who were not in a situation of clinical severity. Only a few cases were considered a priority in terms of immediate care according to a risk classification, and many only

required primary health care (Baggio, Callegaro, & Errdmann, 2008). People access the system by the easiest or possible way (Cecílio, 1997). In this study, low resolvability in basic healthcare services was observed in the municipality, as more than half (53.2%) of the users who sought the ES could have been treated in a BHU, which was confirmed by the high number of blue and green colour tags assigned. This difficulty to properly enter the health service was also identified by researchers in other countries. A study conducted in Lisbon (Portugal) found a readmission rate of 28% within 30 days after discharge for dependent patients. Patients with severe dependence were not the most frequently readmitted in the emergency service, which was justified by the better social support and support from health professionals from which the caregivers of non-readmitted patients benefited, thus reducing their need to use emergency services (Marques, 2011).

Regarding the place of birth, we concluded that 74.7% of the patients from other municipalities who used urgent and emergency services were classified in terms of risk as red, orange and yellow, which shows that patients referred by other municipalities to the ES are people who really need this type of care. However, only 43.1% of the patients residing in the municipality itself did really require urgent or emergency care.

Of the six most common flowcharts, three relate to pain complaints (abdominal pain, chest pain, sore throat). It is evident that several patients who seek care report pain in some body part. A study carried out in another municipality of Minas Gerais aiming to define the profile of the type of care provided in the hospital using the risk classification, obtained similar results: 48% of the care was related to the discriminator unwell adult. Of these, 28.9% of the patients presented pain as a discriminator. The second most common complaint was abdominal pain (9.1%) (Madeira, Loureiro, & Nora, 2010).

A survey conducted in Belo Horizonte also found that pain was the most common complaint in patients who were admitted and risk classified, being present in 76.7% of the cases both as a major or an associated complaint (Souza et al., 2011). In 2008, a study conducted by Ponte, Machado, Dutra, Cardoso, & Lima (2008) in a hospital in São Pedro do Sul, in the state of Rio Grande do Sul, concluded that pain was the most common complaint in 39.3% of patients.

Even though these data are subjective, it is necessary

to pay more attention and assess this symptom, especially in urgent and emergency services. Hence, it is the responsibility of the professionals who perform risk classification, as well as of the whole team, to enhance the techniques and knowledge for pain assessment and management (Souza et al., 2011).

Another important flowchart was wounds, which was present in 5.8% of the patients. These data differ from those found in a municipal hospital in Belo Horizonte (Souza et al., 2011), where the wounds flowchart occupied the 26<sup>th</sup> place, with a 0.3% frequency in the MTS classification, and the 20<sup>th</sup> place, with 0.6%, in the classification using the Institutional Protocol in that same institution. Although only 18 cases (3.6%) required immediate and very urgent care, patients classified as urgent (yellow) should not be overlooked, since, according to the World Health Organization, these morbidities are the 3<sup>th</sup> most common cause of death in Brazil (Organização Mundial de Saúde, 2011). It is therefore evident that already classified patients should be reassessed, as their symptoms may have worsened.

An intervention at management level is required so as to provide more and better information to the population regarding where they should seek for care, as well as to make primary care more effective as it should solve 85% of the cases (Ministério da Saúde, Secretaria de Políticas da Saúde, 2000), which was not evidenced here.

This study achieved its initial aims. However, a study limitation was the lack of follow-up of the clinical outcomes of classified patients. This follow-up would enrich knowledge on the validity of the MTS. With these data it would be possible to establish an association between the risk classification assigned and the outcome of discharge/transfer and death.

## Conclusion

This cross-sectional study was carried out in an ES of a municipality of the Jequitinhonha Valley, in Minas Gerais. Despite being a health reference for many municipalities, most of the care was provided to people who were born in Diamantina.

The mean age of the patients was 43.85 years (sd=26.10). Most patients were male (56.4%) and their birth place was the municipality of Diamantina (87.4%). In 93% of the files, information on the

origin of the referrals was not included. Of the 34 flowcharts used, the most frequently used (44%) were unwell adult, abdominal pain, chest pain, sore throat, wounds and vomiting. In this sample, 50.8% of the patients were classified using the green or blue colours, thus they should have sought assistance in basic health units.

We observed that the population has been using the ES as a gateway to the health service. This fact shows that the flow between the different levels of health care is reversed and that this may be imposing an overload on the urgent and emergency service under analysis. However, in what concerns patients referred by other municipalities, they were observed to show real signs and symptoms requiring ES assistance.

It is important to highlight that further studies on services using this risk classification should be carried out, especially if we consider that this classification is currently being implemented in all health services of the State of Minas Gerais. Other studies aiming to analyse the problem of risk classification in ES, the nurse's assessment and the applicability of the instrument are also important, for nursing professionals are the ones responsible for risk classification at the gateways of urgent and emergency services in several parts of the world.

Data can be used to plan quality care directed to the health needs of the population in urgent and emergency services as the characteristics of the patients who seek treatment have already been identified.

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