Is it possible to safely increase the number of patients classified as non-urgent in triage? A prospective observational study

Arian Zaboli,[1] Serena Sibilio,[2] Michael Mian,[1,3] Francesco Brigo,[1] Gianni Turcato[4]

[1]Innovation, Research and Teaching Service (SABES-ASDAA), Teaching Hospital of the Paracelsus Medical Private University (PMU), Bozen; [2]Hospital of Merano-Meran (SABES-ASDAA), Department of Emergency Medicine, Merano; [3]College of Health Care-Professions Claudiana, Bozen; [4]Hospital of Santorso (AULSS-7), Department of Internal Medicine, Santorso, Italy

Abstract

Triage systems, calibrated to discriminate acute conditions, seem unable to deal with minor non-urgent conditions. The aim of the present study to verify whether some level 4 priority codes can be safely declassified to level 5 priority codes. A prospective observational study was performed between 1° October 2022 and 31° March 2023 All patients with a code 5 according to the Manchester Triage System (MTS) were compared with patients with a priority level 4 code but with a general indicator that was downgraded to a code 5 after the triage nurse's assessment. Of the 2032 patients enrolled, 58.6% were part of the 'blue from MTS' group while 41.4% were part of the 'blue after re-evaluation' group. There was no statistical difference in the rate of hospitalisation and discharge between the two groups (p=0.928). There was also no difference between the two groups in the comparisons of short- and medium-term death. This study highlights the need to rethink strategies to declassify patients through MTS, especially given the continuous increase of non-urgent patients presenting in the ED.

Introduction

Tang *et al.* demonstrated that the increase in visits to the Emergency Department (ED) in the United States is double compared to the population growth.[1] This is attributed to the rise in ED access for non-urgent reasons.[1]

There are consistent data in the literature indicating that emergency departments (EDs) in European countries consistently experience crowding, attributed to various factors. One notable cause is the population's inability to comprehend the ED's specific focus, leading individuals to seek treatment in the ED for any medical issue.[1-3] Supporting this, Gonçalves-Bradley *et al.*, in their systematic review, demonstrated that unnecessary ED admissions, not requiring evaluation in the ED, ranged from 6.7% to 89%.[4]

Despite this situation repeatedly reported by many authors, ED flow reports from several countries suggest that both the Emergency Severity Index (ESI) and Manchester Triage System (MTS), the two most commonly used triage systems, assign a non-urgent priority code to less than 5% of patients.[5,6] Therefore, in the face of a significant increase in non-urgent patients, triage systems, which were created to distinguish urgency within acute conditions, appear to be unable to conceive of and thus address non-acute pathology or non-urgent presentations.[5,6] The result is the inability to clearly categorize that range of patients who should not be evaluated in the ED with a clear stratification as non-urgent.[4-6] This may be particularly linked to the fact that triage systems are designed for classifying the severity of patients and not for determining whether the ED is the appropriate setting for them.[4,7] Moreover, triage systems like MTS include general indicators such as "recent mild problem" and "recent mild pain" that do not allow assigning a code 5 to patients who have an issue that occurred within 7 days of arriving in the ED.[7]

Triage systems were developed and introduced in the 1990s, a period when access to the ED by the population was more restricted and known to be more appropriate.[7] These systems were calibrated to swiftly identify the most critical patients requiring imme-

diate medical treatment.[8-10] However, in pursuit of high specificity, triage systems exhibit low sensitivity. Despite their high specificity, a consistent proportion of patients with non-critical, non-time-dependent conditions are classified as urgent codes (false negatives) due to overtriage.[8-10]

The ability to prioritize non-urgent clinical presentations and minor codes appears to be a new challenge for triage systems which, given the increasing centrality of EDs even in the management of chronic and non-critical conditions, seems crucial to address the multiple problems in European healthcare systems. Increasing the number of patients with a non-urgent code would allow a larger proportion of patients to wait safely longer than others, thus enabling the ED to improve its management and distribution of resources.

The study aims to investigate whether it is possible to safely reduce the priority of patients identified as code 4 (green code) according to MTS by assigning a code 5 (blue code) to effectively identify patients without acute conditions.

Materials and Methods

Study design and setting

This is a prospective observational study performed at the ED of the General Hospital of Merano (Italy, 70,000 accesses/year before the COVID-19 pandemic) from 1° October 2022 to 31° March 2023. Since 2014, at the studied ED, triage has been performed following the MTS, which was constructed based on the translated Italian manual.[11] All patients presenting to the ED of the Merano General Hospital have been assessed according to the MTS by dedicated and specially trained nurses to discriminate their level of urgency. MTS is a triage system that is based on patient-reported symptoms and for each symptom presents a flow diagram (53 specific symptom diagrams in total) that guides the triage nurse in choosing a priority level. Each diagram contains different indicators which allow the patient's priority level to be excluded in decreasing order. MTS can assign 5 priority levels, each of which corresponds to a color and a waiting time until medical attention: code 1 (red; immediate emergency; waiting time 0 minutes), code 2 (orange; emergency; waiting time 10 minutes), code 3 (yellow; urgent; waiting time 60 minutes), code 4 (green; deferrable issue; waiting time 120 minutes) and code 5 (blue; non-urgent; waiting time 240 minutes).

Minor non-urgent presentations or those lacking the characters of severity are classified into code 4 (green, deferrable issue) or code 5 (blue, non-urgent). Code 5 is only assigned when no indicator in the diagram is selected and therefore when no criteria are present assign another code from 1 (red, immediate) to 4 (green, deferrable issue). During the triage assessment, nurses complete the triage chart by entering the presenting symptoms (primary and secondary), vital parameters, and a brief description of the patient, then select an MTS chart and a corresponding indicator that assigns the patient a priority code. The triage assessment is subsequently attached to the patient's complete ED chart and recorded in the ED computer database.

Study protocol

During the six months considered, patients who received a priority code 5 (code blue) after the triage assessment according to MTS were enrolled and included in the 'blue according to MTS' study group.

At the same time, all patients who at the end of triage were classified by MTS as priority code 4 (code green) using the non-specific indicators "recent mild pain" (any pain that occurred in the last 7 days) and "recent mild problem" (any problem that occurred in the last 7 days), were considered for a possible reduction of the code from 4 to 5 at the discretion of the triage nurse. The choice to use these two indicators is related to the fact that they are general indicators. While for each specific chart, level 4 indicators are symptom-specific, these two ("recent mild problem" and "recent mild pain") are universal and do not allow assigning a code 5 to the patient due to the 7-day timeframe.[11] Considering that patients who genuinely require a code 4 will have the selection of a specific indicator, the decision to use these two indicators is often made because it is not classifiable through other indicators. This is the behind the choice of these two indicators.

Patients deemed eligible for declassification by the nurse were identified by the nurse on a dedicated chart, leading to their inclusion in the "blue after re-evaluation" study group. This marked chart was appended to all other documentation related to the patient in the ED. Demographic, clinical, and triage characteristics (main symptom, secondary symptom, diagram, and indicator) were documented at the time of enrollment. Exclusions comprised patients under 16 years of age, pregnant patients, non-residents in the district, and those returning to the ED for a follow-up visit. In the ED under study there are 32 nurses performing triage, every day there are 2 triage nurses during the day (8 a.m. – 8 p.m.) and 1 only during the night (8 p.m. – 8 a.m.). All triage nurses participated in the implementation of the study protocol.

The two study groups, 'blue according to MTS' and 'blue after re-evaluation,' were compared in terms of both clinical characteristics and presented outcomes. Specifically, the risk of hospitalization and short- and medium-term mortality (death at 24h, 72h, 7 days, and 30 days) were taken into account. Mortality data were obtained from the registry office.

Statistical analysis

Continuous variables were expressed as median and Interquartile Ranges (IQRs) and categorical variables were reported as numbers and percentages of total events. Hospitalization or death in the short to medium term has been reported as several events and a percentage of the total. Comparisons between variables and study outcomes were performed using Fisher's exact test, a Chi-square test, or a Mann–Whitney U test, as appropriate. All analyses were considered statistically significant if the p-value was <0.05. Statistical analyses were conducted with STATA 16.0 (StataCorp, College Station, Texas, USA)

Ethical committee

The study was conducted following the relative local ethical committees (Comitato etico per la sperimentazione clinica, Azienda Sanitaria dell'Alto Adige, Bolzano, Italia, approval number 95–2019) and was conducted according to the Declaration of Helsinki regarding the Ethical Principles for Medical Research Involving Human Subjects. All patients gave their consent to participate in the study.

Results

The number of patients enrolled during the study period was 2032. 58.6% (1190/2032) were in the blue group according to

MTS while 41.4% (842/2032) were placed in the blue group after re-evaluation by the triage nurse. The baseline characteristics of the patients are listed in Table 1.

Patients in the blue group after re-evaluation were predominantly men (58.8% *vs*. 50.1%, p<0.001) and had a shorter time to presentation in the ED from the onset of symptoms compared to patients classified in the blue group according to MTS (3 days *vs*. 73 days, p<0.001) (Table 1). Patients with code blue assigned according to MTS presented more on weekdays (26.4% *vs* 17.0%, p<0.001) and during daytime hours (92.9% *vs* 81.5%, p<0.001). Patients in whom blue code was assigned after re-evaluation were more likely to arrive by ambulance (18.2% *vs* 7.1%, p<0.001) (Table 1). Among the symptoms (primary or secondary) reported by the patient at triage assessment, abdominal pain (5.3% *vs*. 3.1%, p=0.017), urological problems (11.4% *vs*. 8.8%, p=0.031), non-traumatic limb problems (23.6% *vs*. 12.9%, p<0.001) and back pain (9.2% *vs*. 5.1%, p=0.001) were more associated with patients with a priority code blue assigned by MTS (Table 2). In contrast, the symptoms declared in triage and most associated with patients classified as priority code blue according to the re-evaluation were those with psychiatric problems (2.6% *vs*. 1.0%, p=0.005), intoxication (10.8% *vs*. 0.3%, p<0.001), wounds (3.8% *vs*. 0.8%, p<0.001) and fever (2.3% *vs*. 0.5%, p<0.001) (Table 2).

More patients reclassified as blue code had alcohol misuse (9.7% *vs*. 0.2%, p<0.001) or social problems (9.7% *vs*. 0.6%, p<0.001) compared to patients initially classified as blue by MTS (Table 1).

Patients who were visited (11.6% *vs*. 6.1%, p<0.001) or were sent by their general practitioner (4.6% *vs*. 2.7%, p=0.029) were more likely to have a priority code 5 according to the MTS.

There were no differences between the two groups about hospitalisation (p=0.928) or death at 72h (p=0.862), 7 days (p=0.060) and 30 days (p=0.672) (Table 3). Of the patients who encountered any cause of death, the only patient who died within 72 hours was due to a traumatic cause unrelated to the cause of admission to the emergency department and had been discharged

Table 1. Characteristics related to arrival in the ED and characteristics collected in triage divided into blue patients assigned by MTS and blue patients assigned after re-evaluation.

Variables	Blue according with MTS	Blue after re-evaluation	p
Patients	1190 (58.6)	842 (41.4)	
Sex			<0.001
Male	596 (50.1)	495 (58.8)	
Female	594 (49.9)	347 (41.2)	
Age in years, median (IQR)	53 (49-57)	46 (43-50)	0.571
Days from the onset of the complained of symptoms, median (IQR)	73 (49-97)	3 (2-4)	<0.001
Days of arrival in the ED, n (%)			<0.001
During the week	988 (61.4)	620 (38.6)	
During the weekend	202 (47.6)	222 (52.4)	
Arrival time, n (%)			<0.001
Day (8 a.m.– 8 p.m.)	1105 (92.9)	663 (78.6)	
Night (8 p.m.-8 a.m.)	85 (7.1)	180 (21.4)	
Arrival mode, n (%)			<0.001
Autonomously	1103 (92.7)	686 (81.5)	
Ambulance	85 (7.1)	153 (18.2)	
Out-of-hospital physician	2 (0.2)	3 (0.4)	
Vital parameters, median (IQR)			
Temperature,	36.1 (35.7-36.4)	36.2 (36.1-36.3)	0.927
Oxygen saturation	99 (98-99)	99 (98-99)	0.934
HR	83 (81-86)	85 (83-87)	0.095
Systolic BP	137 (134-140)	136 (132-139)	0.626
Diastolic BP	81 (79-83)	80 (79-82)	0.540
Respiratory Rate	15 (15-16)	15 (15-16)	0.636
Pain in triage expressed with NRS, mean (SD)	1 (1)	1 (1)	0.225
ED arrival problem, n (%)			0.057
New onset	1053 (88.5)	767 (91.1)	
Chronic problem	137 (11.5)	75 (8.9)	
ED movement modality, n (%)			0.001
Deambulates	1116 (58.9)	776 (41.1)	
Chair	74 (56.5)	57 (43.5)	
Strecher	0 (0.0)	9 (100.0)	
Acute alcohol misuse, n (%)	2 (0.2)	82 (9.7)	<0.001
Patients with a social problem, n (%)	7 (0.6)	82 (9.7)	<0.001
Performed a visit to the general practitioner before coming to the ED, n (%)	138 (11.6)	51 (6.1)	<0.001
Sent by general practitioner for a ED evaluation, n (%)	55 (4.6)	23 (2.7)	0.029

by the physician after the visit. Furthermore, of the 26 patients admitted only 2 died within 30 days. No hospitalized patients were admitted to the Intensive Care Unit. Of the 9 patients who died during the follow-up, 77.7% (7/9) had previously been discharged by the ED physician.

Discussions

This prospective observational study demonstrated how patients with code 4 (green code), that is patients without organ-specific conditions, can often be safely reclassified to non-severe conditions with only the experience and activity of the triage nurse. The study observed how the number of patients classified as code 5 (blue code) could be increased by about twice as much (41.4%) without an increase in adverse outcomes. These results reinforce the idea that triage systems, created to discriminate against severe pathology, suffer in assessing patients without acute conditions, assigning a non-negligible proportion of patients a priority 4 code (green code) instead of code 5 emphasizing the absolute absence of ED-dependent medical conditions. For instance, considering

patients with acute alcohol abuse, MTS rarely assigns a code 5 as it does not allow a recent, even if minor, health problem to be downgraded to a code 5; in other terms, these patients would be given a code 4 (green), corresponding to "recent mild problem", unless they have chronic alcohol abuse. As reported by Grosgurin *et al.*, the presenting symptom in the ED with the highest rate of leaving without being seen by the ED physician is acute alcohol intoxication (odds ratio 6.08; 95% CI 5.04-7.34), suggesting that often this type of patients does not require rapid and acute treatments.[12] Thus, MTS does not assign non-urgent codes to this type of patients, and when the choice is left to the nurse, the percentage of these patients receiving a non-urgent code significantly increases (0.2% *vs*. 9.7%, p<0.001).

Although the study is based on the nurse's subjective assessment of the appropriateness of reducing the code, this seems to emphasize that objective coding of even minor non-urgent conditions or improper presentations is necessary to address the increasing crowding present in EDs.

The results of this study can be considered for the development and improvement of triage systems in future clinical practice.

The validated and currently most studied triage systems were

Table 2. Symptoms declared in triage by the patient (primary symptom and associated symptom) divided between patients with blue code according to MTS and blue code after re-evaluation.

Variables	Blue according with MTS	Blue after re-evaluation	p
Patients, n (%)	1190 (100.0)	842 (100)	
Primary and secondary symptom, n (%)			
Abdominal pain	63 (5.3)	26 (3.1)	0.017
Vertigo	33 (2.8)	13 (1.5)	0.067
Urological problem	38 (3.2)	14 (1.7)	0.031
Limb trauma	136 (11.4)	74 (8.8)	0.054
All traumas excluding limbs	16 (1.3)	21 (2.5)	0.056
Psychiatric problem	12 (1.0)	22 (2.6)	0.005
Ophthalmological problem	70 (5.9)	38 (4.5)	0.175
Gynaecological problem	28 (2.3)	11 (1.3)	0.090
Gastroenterological problem	52 (4.4)	23 (2.7)	0.054
Dermatological problem	81 (6.8)	53 (6.3)	0.647
Non-traumatic limb problem	281 (23.6)	109 (12.9)	<0.001
Otolaryngological problem	30 (2.5)	30 (3.6)	0.172
Back pain	109 (9.2)	43 (5.1)	0.001
Intoxication	3 (0.3)	91 (10.8)	<0.001
Wound	10 (0.8)	32 (3.8)	<0.001
Fever	6 (0.5)	19 (2.3)	<0.001
Dyspnea	21 (1.8)	14 (1.7)	0.862
Chest pain	45 (3.8)	32 (3.8)	0.982
Asthenia	44 (3.7)	34 (4.0)	0.694
Palpitations	16 (1.3)	6 (0.7)	0.175
Headache	27 (2.3)	29 (3.4)	0.111
Cervicalgia	26 (2.2)	24 (2.9)	0.340

Table 3. Outcomes considered in the study divided between the two study groups.

Variables	Blue according with MTS	Blue after re-evaluation	p
Outcome, n (%)			0.928
Discharged	1175 (98.7)	831 (98.7)	
Hospitalised	15 (1.3)	11 (1.3)	
Death, n (%)			
Death within 24 hours	0 (0.0)	0 (0.0)	
Death within 72 hours	0 (0.0)	1 (100.0)	0.862
Death within 7 days	0 (0.0)	2 (100.0)	0.060
Death within 30 days	3 (50.0)	3 (50.0)	0.672

developed before the 2000s and, despite the modifications made over the years and attempts to improve their performance, many gaps need to be filled, not only because of the different populations arriving in the ED.[13] Over the last two decades, the number of patients accessing the ED has increased exponentially also as a result of a migration of the population with non-urgent problems from community care to the ED.[14,15] As a demonstration thereof, more and more strategies and organisational models have been studied in the literature to better deal with the large flow of non-urgent patients arriving in the ED.[16] One of the most investigated new possibilities at present is the introduction of the general practitioner (GP) within the ED itself to assess and manage patients with non-urgent codes or to divert them to other facilities or outpatient clinics.[17] Uthman *et al.*, in their study on GPs in the ED, demonstrated that through their inclusion in the facility not only waiting times are reduced but also resource utilisation, thus suggesting this as an implementable strategy given the increase in non-urgent patient flows.[18] Although it has been demonstrated repeatedly that there has been a change in the type of patients who enter the ED with clinical presentations that are not of immediate and potential risk for life, the most well-known triage systems have focused their attention on the ability to discriminate patients with serious underlying pathology, neglecting triage performance in the stratification of patients who do not require immediate care.[19,20] Additionally, triage systems have been developed for stratifying the urgency of patients and not for assessing whether the patient requires the ED or not.[4] However, current triage systems tend to have high specificity and low sensitivity. Despite the high specificity, there remains a multitude of patients classified as urgent codes even though only a few of these had a real underlying urgent pathology (false positives).[8,9,21] This incorrect stratification can have a major impact on the flow and management of EDs, as reported by Parenti *et al.*, point out that overtriage is strongly correlated with a greater expenditure of resources and a deterioration in the care of urgent patients, which is delayed to dedicate time to those patients who could safely wait.[22] Furthermore, as described by Chen et al., crowded conditions in the ED tend to increase the number of codes in triage resulting in overclassification, with an already overstressed system not only due to the constant flow in the facility but also due to the increase in patients wrongly classified as urgent.[23] This mechanism increases the already high stress in the ED leading the structure to the edge of collapse.[23] Conversely, the suboptimal sensitivity of triage systems results in a high rate of false negative cases (*i.e.*, patients with severe or time-dependent conditions being classified as non-urgent).

To increase the accuracy of triage systems in risk stratification, both overtriage and undertriage should be avoided. However, the degree of risk matters: for non-urgent conditions, a triage system should have high specificity (avoiding overtriage to reduce false positives), and for urgent conditions, it should have high sensitivity (avoiding undertriage to reduce false negatives).

This study, to the best of our knowledge for the first-time investigated safety in decreasing triage codes, demonstrating the need to rethink modalities and strategies to be integrated into triage systems for even better patient stratification. Increasing the percentage of patients with code 5 could allow better management of the ED and a better organisation of flows, especially since from code 4 to code 5 the waiting time doubles (120 minutes for code 4 and 240 for code 5) and would therefore allow the ED staff to better manage patients and treat those with a greater need before the others. The discriminators 'Recent mild problem' or 'Recent mild pain' within the MTS are very general and do not allow an easy downgrading from priority level 4 (green code) to 5 (blue code)

due to the intrinsic nature of their discrimination criteria.[21] The consideration of 7 days as the only variable between a priority code 4 and a priority code 5 is quite reductive, considering that these indicators are present in most diagrams and prioritize patients with totally different problems at the same priority level (*e.g.* traumatic chest pain with stable parameters priority level 4, insect bite with localised reaction priority level 4).[24] A similar analysis to that of the present study was carried out by Brutschin *et al.* in their study on the "Unwell Adult" diagram in MTS, where they demonstrated that the ability to stratify patients assigned to this more general diagram is very different compared to the use of symptom-specific diagrams.[25] These results show that in a system such as MTS, which is therefore symptom-specific, the application of such diagrams or indicators does not allow the same levels of performance to be maintained as those studied on specific symptoms or presentations with dedicated diagrams and indicators.[25]

Analysing the studies currently available on triage systems, we can note an almost overlapping percentage of priority 1 codes ranging from 1% to 5%, but the same cannot be said for priority 5 codes, where the variability ranges from 2% to 20% depending on the system.[5,7,26,27] This difference demonstrates that triage systems do not have a unanimous definition of a non-urgent patient, highlighting the need not only to deepen this concept but also to expand and integrate it in the different triage systems in the best possible way, especially in view of the continuous and perpetual increase of non-urgent patients.

The present study has some limitations: firstly, the single-centre nature of the study subjects it to all the biases typical of this type of study. Secondly, the choice of assigning a priority code 5 to patients who obtained a priority code 4 according to the indicators "Recent mild problem" and "Recent mild pain" of MTS was of the nurse's opinion based on clinical experience. Thirdly, there were no variables recorded and assessed about triage nurses. Fourthly, patients downgraded to code 5 did not directly benefit from this choice, both in terms of waiting time and management.

Finally, the triage manual used was in Italian, translated with the support of the original manual and the German version.[11,28] The publication of the manual took place in agreement with the Manchester Triage Group.[11,24]

Conclusions

The results of the present study demonstrate that it is possible to safely increase the number of patients with priority code 5 (blue code) without incurring an increase in adverse patient outcomes. If the results of this study were confirmed by further research, it would be necessary to reconsider how to allow assign code 5 through the MTS.

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