EMJ Online First, published on January 23, 2013 as 10.1136/emermed-2012-201782

Manchester triage system version II and resource utilisation in emergency department

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Received 20 July 2012
Revised 14 December 2012
Accepted 19 December 2012

ABSTRACT

Emergency department (ED) triage systems aim to direct the best clinical assistance to those who are in the greatest urgency and guarantee that resources are efficiently applied.

The study's purpose was to determine whether the Manchester Triage System (MTS) second version is a useful instrument for determining the risk of hospital admission, intrahospital death and resource utilisation in ED and to compare it with the MTS first version.

This was a prospective study of patients that attended the ED at a large hospital. It comprised a total of 25 218 cases that were triaged between 11 July and 13 October 2011. The MTS codes were grouped into two clusters: red and orange into a 'high acuity/priority' (HP) cluster, and yellow, green and blue into a 'low acuity/priority' cluster.

The risk of hospital admission in the HP cluster was 4.86 times that of the LP cluster for both admission route and ages. The percentage of patient hospital admission between medical and surgical specialties, in high and low priority clusters, was similar. We found the risk of death in the HP cluster to be 5.58 times that of the risk of the low acuity/priority cluster. The MTS had an inconsistent association relative to the utilisation of x-ray, while it seemed to portray a consistent association between ECG and laboratory utilisation and MTS cluster.

There were no differences between medical and surgical specialities risk of admission. This suggests that improvements were made in the second version of MTS, particularly in the discriminators of patients triaged to surgical specialties, because this was not true for the first version of MTS.

INTRODUCTION

The emergency department (ED) triage system's purpose is to provide the best clinical assistance to those who are in greater urgency or need, and to guarantee that the department's resources are efficiently applied to this end.[1]

The worldwide disseminated triage systems are the Australian Triage Scale, the Canadian Emergency Department Triage Scale and the Manchester Triage System (MTS).[2] All of these are five level scales based on the work of Fitzgerald.[3]

Introduced in 1996 in the UK, the MTS was developed by a group of emergency care experts. It consists of specific procedures in which the patient's principal complaint is allocated to one of 52 flowcharts diagrams. Each of these flowcharts uses key discriminators to determine the triage category.[4 5]

It divides and prioritises the patients into the following subgroups: emergent, very urgent, urgent, less urgent and non-urgent. Of these emergent signifies the need for immediate medical attention, while very urgent, urgent, less urgent and non-urgent mean the necessity of medical attention in 10, 60, 120 and in 240 min, respectively. Patients who should not be seen in ED because the problem is suitable to resolution in a non-ED setting are coded as white; usually they are referred to the ED by the assistant doctor.

Since its implementation, several studies have proven that MTS is a reliable and sensitive instrument and is widely validated, including paediatric patients.[1 6] The usefulness of triage systems surpasses the objective for which they have been built; it is proven that they can be predictors of resource utilisation, hospital cost,[7] likelihood of admission and risk of short-term death.[8] A second version of MTS has been designed upon improvements from the original version.

MTS is presently used throughout Europe, although no systematic review of utilisation exists. The MTS triage group is used in Norway, Sweden, Holland, Germany, Austria, Spain, Slovenia, UK and Portugal. In Portugal, all National Health System hospitals have implemented the MTS; at Hospital Professor Dr Professor Doutor Fernando da Fonseca (HFF) it has been used since 2000, via a computerised protocol.[8]

In July 2011, the second version of the MTS was implemented in HFF for all patients admitted in the ED (general adults, gynaecology and obstetrics, paediatric cases and basis emergency services). This, associated with the newly implemented electronic health record of every patient in the institution, provided the opportunity to gather qualitative and quantitative information regarding the immediate outcomes of patients' treatment. Such data mining capacities were almost impossible using the previous electronic health record.

The aim of this study is to determine whether the MTS second version is a useful instrument for determining the risk of hospital admission, intrahospital death and utilisation of diagnostic tools (x-ray—roentogram, ECG, laboratory analysis) in the ED. Furthermore, we attempt to analyse the consistency of the outcomes, according to patient age and route of admission (via medical or surgical specialties). Our second objective is to assess whether the second version of MTS is better than the first version in determining risk of hospital admission and risk of intrahospital death according to route of admission. In previous studies MTS was not an equally powerful discriminator when considering admissions via medical and surgical specialities.[8]

METHODS

This was a prospective study, based on the electronic health records database of patient cases

To cite: Santos AP, Freitas P, Martins HMG. *Emerg Med J* Published Online First: [*please include* Day Month Year] doi:10.1136/emermed-2012-201782

between 11 July and 13 October 2011 attended at the HFF ED. For data consistency we only included patients observed by the general ED (excluding those who presented directly to the gynaecology and obstetrics, paediatrics and basic ED). The variables analysed were: age, sex, MTS code, admission, route, hospital admission, death outcome and utilisation of diagnostic tools.

After the initial triage, patients can be sent for observation through two admission routes, either through medical specialties (general medicine, neurology or psychiatry) or surgical specialties (general surgery, minor surgery, ophthalmology, orthopaedics or ENT).

We carried out a descriptive and inferential analysis. The sample was divided in age quartiles and by admission route. For statistical and clinical rationale, the MTS codes were grouped into two clusters: red and orange into a 'high acuity/priority' cluster, and yellow, green and blue into a 'low acuity/priority' cluster.

The MTS was not developed for the purpose of exploring the association with admission, mortality or resources utilisation. However, to this specific objective and after a first data analysis we suggest grouping MTS codes in 'high acuity/priority' and 'low acuity/priority'. Although we acknowledge that triage scales were developed as measures of acuity and not severity, such acuity is likely to be reflected on priority of care given to the patient; thus, a mix term is used in the grouping.

This study comprises a total of 25 218 cases that were triaged between the time intervals considered. We performed a complete analysis of the database; cases with missing data about route of admission were excluded. A total of 497 cases (2%) were excluded because there was no codification in the admission route, and thus the final sample was of (n=24 721) cases.

The white codes were included for descriptive analysis; however, for the inferential analysis, this group was excluded. Patients who died in the ED were considered as not admitted to the hospital; however, they were considered for mortality analysis. From the total sample, 1918 (7.8%) were triaged but abandoned the ED before medical discharge or admittance; for analysis reasons, these were considered as non-admitted. For risk analysis by age, the white code group was excluded, and hence after exclusion, we analysed 23 615 cases.

The association between the nominal variables and the MTS code was evaluated using the χ^2 test or Fisher's exact test, if applicable. The Mantel–Heanszel technique was used to calculate the combined risk when the homogeneity between strata was present (Cochran values of $p>0.05$). All the data were analysed in SPSS for Windows V.17.0 and Stata V.10. The study was considered clinical audit and thus exempted from formal research ethics committee approval.

RESULTS

From a total of 24 721 cases, there were 13 876 (56.1%) female and 10 485 (43.9%) males patients; the mean age was 52.3 years (SD 19.9). The 25, 50 and 75 age percentiles were respectfully 35.4, 51.1 and 69.0 years. The main findings are presented in tables 1 and 2.

The high acuity/priority cluster represented 14.4% of the patients triaged, while the low acuity/priority represented 81.1%, and the white code represented the remaining 4.5%.

Table 1 Summarises the distribution of the sample regarding admission, all-cause death outcome and consumption of x-ray, ECG and laboratory tests

					Utilisation at ED (%)		
MTS code		Triaged	Admitted (%)	Deaths (%)	x-Ray	ECG	Laboratory
Red	All	98	58 (59.2)	30 (30.6)	23.5	29.6	26.5
	Med	83	56 (67.5)	29 (34.9)	25.3	33.7	31.3
	Surg	15	2 (13.3)	1 (6.7)	13.3	6.7	0.0
Orange	All	3467	427 (12.3)	113 (3.3)	37.7	45.3	60.0
	Med	3076	374 (12.2)	107 (3.5)	36.6	49.7	65.4
	Surg	391	53 (13.6)	6 (1.5)	46	11.0	17.1
High acuity/priority	All	3565	485 (13.6)	143 (4.0)	37.3	44.9	59.1
	Med	3159	430 (13.6)	136 (4.3)	36.3	49.3	64.5
	Surg	406	55 (13.5)	7 (1.7)	44.8	10.8	16.5
Yellow	All	8150	386 (4.7)	72 (0.9)	38.5	17.7	33.7
	Med	5523	234 (4.2)	60 (1.1)	32.4	23.6	27.5
	Surg	2627	152 (5.8)	12 (0.5)	51.2	5.3	8.4
Green	All	10 982	146 (1.3)	32 (0.3)	34.0	4.9	13.6
	Med	4950	74 (1.5)	23 (0.5)	28.0	9.4	27.5
	Surg	6032	72 (1.2)	1 (0.1)	39.0	1.1	2.1
Blue	All	918	3 (0.3)	3 (0.3)	19.9	2.8	7.5
	Med	389	2 (0.5)	2 (0.5)	26.2	6.2	16.7
	Surg	529	1 (0.2)	1 (0.2)	15.3	0.4	0.8
Low acuity/priority	All	20 050	535 (2.7)	107 (0.5)	35.2	10.0	21.5
	Med	10 862	310 (2.9)	85 (0.8)	30.2	16.5	36.3
	Surg	9188	225 (2.4)	22 (0.2)	41.1	2.3	3.9
White	All	1106	108 (9.8)	26 (2.4)	16.0	5.8	10.3
	Med	309	68 (22)	20 (6.5)	17.2	9.1	22.7
	Surg	797	40 (5.0)	6 (0.8)	15.6	4.5	5.5
Total	All	24 721	1128 (4.6)	276 (1.1)	34.6	14.8	26.4
	Med	14 330	808 (5.6)	241 (1.7)	31.2	23.6	42.3
	Surg	10 391	320 (3.1)	35 (0.3)	39.3	2.8	4.5

ED, emergency department; MTS, Manchester Triage System.

Table 2 Relative risk of hospital admission, death and utilisation of diagnostic tools by age and admission route, comparing high acuity/priority cluster to low acuity/priority cluster (n=23 615)

						Utilisation at ED					
		Admission hospital		Death		x-Ray		Laboratory		ECG	
Age groups	Admission route	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
All ages	Med†	4.77***	4.14 to 5.49	5.50***	4.21 to 7.19	1.20***	1.14 to 1.27	1.77***	1.70 to 1.83	2.98***	2.82 to 3.15
	Surg‡	5.53***	4.19 to 7.30	7.20***	3.10 to 16.76	1.09	0.98 to 1.22	4.28***	3.34 to 5.48	4.73***	3.45 to 6.50
	Combined§	4.86	4.28 to 5.52	5.58	4.31 to 7.22	1.18	1.12 to 1.24	NH	NH	NH	NH
18 to 35	Med	3.89***	2.30 to 6.57	¶	¶	1.11	0.94 to 1.30	1.89***	1.71 to 2.10	3.47***	2.90 to 4.14
	Surg	6.16***	3.00 to 12.66	¶	¶	0.95	0.76 to 1.18	4.39***	2.73 to 7.04	6.53***	3.02 to 14.1
	Combined	4.38	2.86 to 6.73	¶	¶	1.05	0.93 to 1.20	NH	NH	3.56***	3.00 to 4.23
36 to 50	Med	4.07***	2.85 to 5.23	6.18*	2.41 to 15.88	1.00	0.88 to 1.15	1.88***	1.73 to 2.05	2.88***	2.52 to 3.30
	Surg	4.91***	2.68 to 9.01	¶	¶	1.14	0.94 to 1.39	3.78***	2.15 to 6.66	4.16***	1.98 to 8.73
	Combined	4.21***	3.09 to 5.76	¶	¶	1.04	0.92 to 1.16	NH	NH	2.91	2.55 to 3.31
51 to 70	Med	4.84***	3.72 to 6.29	4.09***	2.53 to 6.60	1.20	1.09 to 1.33	1.75***	1.64 to 1.87	2.82***	2.55 to 3.12
	Surg	7.16***	4.26 to 12.04	8.35	0.88 to 79.62	1.10	0.88 to 1.38	4.41***	2.59 to 7.49	5.36***	2.79 to 10.3
	Combined	5.06	3.98 to 6.43	4.15	2.59 to 6.66	1.19**	1.08 to 1.30	NH	NH	NH	NH
> 70	Med	3.77***	3.08 to 4.62	4.26***	3.02 to 6.02	1.17***	1.08 to 1.27	1.45***	1.37 to 1.54	2.40***	2.21 to 2.61
	Surg	5.53***	3.57 to 8.55	7.36*	2.84 to 19.05	1.27	0.98 to 1.62	5.01***	3.31 to 7.60	4.88***	3.06 to 7.77
	Combined	3.90	3.23 to 4.71	4.40	3.17 to 6.11	1.18	1.09 to 1.28	NH	NH	NH	NH

*p<0.05;**p<0.001;***p<0.0001.
†14 021 valid cases.
‡9594 valid cases.
§Combined Mantel–Heanszel relative risk, only presented if the relative risks in the med and surg strata were homogeneous.
¶Not computable due to inexistent deaths high and low acuity/priority cluster; NH, not homogeneous (relative risks from the strata were not homogeneous so the combined relative risk is not presented).
ED, emergency department; Med, medical specialties; Surg, surgical specialties.

Patients were sent to medical and surgical specialties in 58% and 42% of the cases, respectively.

Admission to the hospital

The total hospital admission rate was 4.6%, of which the medical specialities were responsible for more than 71.6% of all hospital admissions. The admission rate was significantly different between high and low acuity/priority clusters (13.6% and 2.7%, respectively) for patients triaged through both admission routes (medicine and surgery) (p values <0.001). We observed a trend of a higher proportion of admission in higher age groups in both acuity/priority clusters (high acuity/priority, p value <0.001; low acuity/priority p value <0.001). The percentage of patient hospital admissions between medical and surgical specialties in high and low acuity/priority clusters was similar, although slightly higher in medical specialties, as shown in table 1. The risk of hospital admission in the high acuity/priority cluster was 4.86 times that of the low acuity/priority cluster, combined risk for both admission routes. For all age strata, the risk was always significantly higher in the high priority cluster. Surgical specialties have higher risks compared with the medical specialities; there was no pattern in the risk tendencies across age.

Mortality

The death rate within the high acuity/priority cluster was 4.0% and accounted for 51.8% of the total number of deaths. The proportion of deaths in the low acuity/priority cluster was 0.5% and represented 38.8% of the total of deaths. Patients coded as white represented the remaining 9.4%. We observed a trend, where higher age groups suffered a higher proportion of deaths in both acuity/priority clusters (high acuity/priority and low acuity/priority, p value <0.001).

The proportion of deaths was higher in the patients triaged to the medical specialities than in the surgical specialities (see table 1). There was a clear association between acuity/priority cluster and death rate. We found the risk in the high acuity/priority cluster to be 5.58 times that of the risk of the low acuity/priority cluster. The association remained significant when considering the admission routes with higher risk of death in the high acuity/priority cluster, as shown in table 2. However, the association was not constant for all the age groups. In the 18–35-year-old groups there was only one death in the low acuity/priority group admitted by medical specialities; therefore, it was impossible to compute the relative risk. In the medical admission route, the association was true for all the other age groups. In the surgical admission route, only the two older groups were possible to compute the relative risk. We found the differences significant only for patients over 70 years old.

Utilisation of diagnostic tools at ED

x-Ray utilisation

The MTS had an inconsistent association relative to the utilisation of x-ray. In the lower age groups (18–70-years-old), there was no difference in utilisation. However, in the oldest group (over 70), x-ray was more used in the high acuity/priority cluster. Globally, x-ray was more used by the surgical specialities; however, there was no association between the utilisation of x-ray and the MTS acuity/priority clusters, as expected. Nevertheless, in the medical specialities it seemed that MTS acuity/priority clusters were associated with the utilisation in the two older age groups, as shown in table 2.

ECG and laboratory utilisation

The overall utilisation of ECG and laboratory analysis was higher in the medical specialities. The highest proportion of ECG and laboratory analysis utilisation occurred in the orange MTS code cluster (see table 1). The MTS seemed to portray a consistent association between ECG and laboratory analysis utilisation and

MTS acuity/priority clusters, in both medical and surgical specialities, across the age groups. The relative risk of using those diagnostic tools in the surgical specialities was consistently higher compared with the medical specialities. However, for the utilisation of laboratory analysis, the proportions between medical and surgical specialities were not homogenous, p value <0.05, as well as for the ECG in the older age groups.

DISCUSSION

Generally MTS proved that there is an increased of risk of death in the high acuity/priority cluster, with a 5.58-fold increase in combined risk of death, for both specialities in conjunction as well as isolated. When stratifying the risk of death by age group, we found inconsistent results, whereby it seemed that in medical specialties the MTS performed better than in surgical specialities. However, in most age groups the numbers of deaths in surgical specialties were too small to find a statistical difference, although this appeared to be a tendency in especially younger age groups.

To prove that there is no association between MTS and death in surgical specialties for younger age groups, we need a higher sample size with more cases of death for these age groups.

We hypothesised a strong association among MTS and risk of hospital admission, risk of death, and use of diagnostic tools. In medical specialties, the MTS had a fair association with the utilisation of x-rays in the older age groups. Regarding x-rays, no difference between high and low acuity/priority patients was seen. It is possible that x-rays may be of diagnostic use in younger patients of a lower acuity/priority cluster due to the increased frequency of upper respiratory symptoms and minor trauma-related symptoms. x-Rays can justifiably be used as a first auxiliary for differential diagnosis and hence were found to be used in this group as much as in high acuity/priority patients.

Concerning ECG and laboratory analysis, MTS prioritisation showed an association between MTS acuity/priority clusters, with higher acuity/priority clusters meaning a higher use of resources. This relationship was true for both admission groups and translatable to all age groups analysed. Although surgical specialities used ECG and laboratorial analysis less frequently than the medical specialities, both received a similar proportion of hospital admissions. This may indicate that surgical specialities need fewer resources for admission.

We should acknowledge the possibility of confounding factors in the study of resource utilisation. Portuguese hospitals are paid according to a diagnostic-related groups system, providing hospitals a financial incentive to overinvestigate in the ED, especially in patients triaged as low acuity/priority. This could lead to weaker association between MTS acuity/priority cluster and resource utilisation. Another factor to consider is the occurrence of overtriage (triaging a patient into a higher acuity/priority category) in order to achieve higher returns in ED when funding is adjusted by MTS prioritisation. This 'gaming' phenomena has been reported by other authors;[1] this is not likely to have occurred in this scenario because all cases are paid equally according to present funding rules for Portuguese hospitals.

Besides these constraints, the study of resource utilisation in the ED is a promising approach in two problematic areas of EDs: overcrowding and funding. The low acuity/priority and low consumer patient profile could be explored further as these individuals may be redirected to primary care facilities, although some studies affirm that these low complexity patients have no impact on length of stay in ED and time to first physician contact of high complexity patients.[2] Regarding funding, the study of resource utilisation by MTS code and by diagnoses could help to build an algorithm to accurately estimate the cost of each episode. However, further investigation is needed to explore the resource utilisation in different diagnostic categories and to ensure the comparability of ED in different settings. Such studies would need to take into account that differences in outcomes after triage are not due to factors other than the real different levels of workload complexity.

Comparing the findings in this paper with those from MTS version I, Martins *et al*[8] is only possible at an aggregated level due to study methods. The first data on MTS version I show a higher number of patients triaged in the high acuity/priority cluster: 25.9% against 15.1% revealed in this paper. There may have been a slight change in the pattern of population access to ED with opening of some basic emergency services in 25% of the population served but equally there may be a difference in the prioritisation between versions I and II. Table 3 shows the brief comparative analysis.

Regarding hospital admission, the MTS prioritisation showed a consistent association: the high acuity/priority cluster had higher admission rates, across age groups and admission routes. Comparing with Martins *et al*,[8] MTS version II shows a reduction in overall admission rates to half in both high and low acuity/priority clusters. In high acuity/priority clusters, Martins *et al*[8] had an admission rate of 22.3% while this paper shows a rate of 12.8%. The decrease was also observed in the low acuity/priority clusters, with a previous rate of 5.3% which is now 2.7%. The seasonal variation of hospital admission cannot be discounted (higher rates during winter season) but is unlikely to account for such a large difference. With a larger timeframe of MTS version II it will be possible to compare the two versions considering seasonal admission variation. Death rates were not compared due to small number on MTS version II data and significant methodological differences between the papers.

Regarding routes of admission, the data shown on MTS version II suggests that there are no significant differences between medical and surgical specialties risk of admission to the hospital. In Martins *et al*,[8] the findings suggested more differences between the admission routes and propensity for

Table 3 Comparison between versions I and II of MTS, concerning the patients triaged and hospital admission

		MTS version I*	MTS version II†	p Value	OR	CI
Triaged	High acuity/priority	82 068 (25.9%)	3565 (15.1%)	<0.0001	1.97	1.90 to 2.04
	Low acuity/priority	234 554 (74.1%)	20 050 (84.9%)			
Admitted	High acuity/priority	18 285 (22.3%)	485 (12.8%)	<0.0001	1.63	1.43 to 1.84
	Low acuity/priority	12 464 (5.31%)	535 (2.67%)			

Note: the number of triaged patients do not account for patients triaged as white.
*January 2004 till June 2007.
†Data from 11 July till 13 October 2011.
MTS, Manchester Triage System.

admission to the hospital. This suggests that improvements were made in the second version of MTS, particularly in the discriminators of patients triaged to surgical specialties.

CONCLUSIONS

From our knowledge, this was the first paper that was able to stratify by age, the risks of hospital admission and death for MTS. We conclude that high acuity/priority groups have a higher risk of hospital admission, in both medical and surgical specialties across ages. The risk of admission in MTS version II is about five times higher for high acuity/priority (red and orange) compared with low acuity/priority groups (yellow, green and blue) and that of death during hospitalisation is 5.5 times higher.

Overall the risk of death was higher in higher MTS codes for both medical and surgical specialties.

MTS proved to be a good discriminator of the utilisation of diagnostic tools in the ED department, except for x-ray utilisation. In the future, MTS may have some value as a tool for cost estimation or a predictor of resource utilisation.

There were no differences between the risk of admission for medical and surgical specialities. This suggests that improvements were made in the second version of MTS, particularly in the discriminators of patients triaged to surgical specialties because this was not true for the first version of MTS. Future research should address the association of MTS with admission and risk of death by diagnostic groups.

Acknowledgements The authors would like to acknowledge Diogo Ermida, IT engineer, for the data extraction and Professor Baltazar Nunes for his support with statistical appraisal of data.

Contributors APS was responsible for the data analysis and interpretation and writing the first draft of the article. PF revised the article and added some important intellectual content. HMGM designed, revised the article and gave the final approval.

Competing interests Dr P Freitas is a member of the Portuguese Triage group and the International working group for triage; no other competing interests are declared.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1 FitzGerald G, Jelinek G. Emergency department triage revisited. *Emerg Med J* 2010;27:86–92.
2 Farrohknia N, Castrén M, Ehrenberg, *et al*. Emergency Department triage scales ans their components: a systematic review of the scientific evidence. *Scandinavian J Trauma Resusc Emerg Med* 2011;19:42.
3 Fitzgerald G. Emergency department triage [thesis]. Brisbane, Queensland, Australia, University of Queensland, 1989.
4 Christ M, Grossmann F, Winter D, *et al*. Modern triage in the emergency department. *Dtsch Arztebl Int* 2010;107:892–8.
5 Cooke M, Jinks S. Does Mancherter triage system detect the critically ill? *J Accid Emerg Med* 1999;16:179–81.
6 Pinto D, Lunet N, Mendes A. Sensivity and specificity of Manchester triage system for patients with acute coronary syndrome. *Rev Port Cardiol* 2010;29:961–87.
7 Dong L, Bullard J, Meurer P, *et al*. Predictive validity of a computurized emergency triage tool. *Acad Emerg Med* 2007;14:16–21.
8 Martins M, Cuna M, Freitas P. Is Manchester (MTS) more than a triage system? A study of its association with mortality and admission to a large Portuguese hospital. *Emerg Med J* 2009;26:183–6.

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Emerg Med J published online January 23, 2013
doi: 10.1136/emermed-2012-201782