Mortality Risk for Different Presenting Complaints Amongst Older Patients Assessed with the Manchester Triage System

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Key message

Aim

Examine characteristics of older patients presenting to the ED triaged with the presentational flowchart ‘unwell adult’ of the Manchester Triage System (MTS) and to assess the different mortality and admission rates among triage categories.

Findings

- Older patients assigned to the ‘unwell’ flowchart have the highest non-trauma mortality rate, independent of urgency category, and highest admission rates of all presenting complaints.
- Suprisingly, mortality was also observed in the lowest triage categories.

Message

Patients in the category ‘unwell’ have the highest non-trauma 30-day mortality and highest hospital admission rates when compared to other presenting complaints, indicating that the nonspecific disease presentation "unwell" is a serious medical condition.

Abstract

Purpose: Older people often present to the Emergency Department with nonspecific complaints. We aimed 1) to examine characteristics of older patients presenting to the ED triaged with the presentational flowchart 'unwell adult' of the Manchester Triage System (MTS) and 2) to assess the different mortality and admission rates among triage categories.

Methods: Retrospective cohort study including all consecutive patients aged 70 years and older who visited the ED of a tertiary care hospital in the Netherlands during a 1-year period. The primary outcome was 30-day mortality. Secondary outcomes were 7-day mortality, hospital admission and ED length of stay.

Results: 4255 patients were included in this study. The MTS presentational flowchart 'unwell adult' was the most commonly used flowchart (n=815, 19.3%). After the infrequent flowchart 'major trauma' (n=9, 13.8%), 'unwell adult' had the highest 30-day mortality (n=88, 10.8%). When compared to all other flowcharts, patients assigned as 'unwell adult' have significantly higher 30-day mortality rates (OR 1.89 (95%CI 1.46-2.46), p=<0.001), also when adjusted for age, gender and triage priority (OR 1.75 (95%CI 1.32-2.31), p=<0.001). Patients from the 'unwell adult' flowchart had the highest hospital admission rate (n=540, 66.3%), and had among the longest ED length of stay.

Conclusions: Older ED patients are most commonly assigned the presentational flowchart 'unwell adult' when using the MTS. Patients in this category have the highest non-trauma mortality and highest hospital admission rates when compared to other presenting complaints.

Introduction

Triage of Emergency Department (ED) patients is performed to predict the need for immediate care using symptoms, clinical signs and vital signs [1]. The Manchester triage system (MTS) is a commonly used five-level triage tool [2], which uses flow chart diagrams of presenting complaints to allocate the patient into one of five levels of priority based on discriminators that allow prioritization. Its reliability appears to be good, but a wide range of results for validity measures was observed [3].

Recently, safety concerns have been raised with regard to undertriage and mortality prediction, especially in older patients, when using the MTS [3-7]. Undertriage occurred in 30% of patients with sepsis in one study [5]. Interestingly, the most commonly assigned flow chart in patients with sepsis was ‘unwell adult’ underlining the fact that patients with sepsis will often present in a nonspecific manner [5, 8]. Nonspecific complaints (NSCs) such as weakness and fatigue are common in the ED, especially in older patients. ED patients with NSCs have a wide range of underlying diagnoses, high admission rates as well as a high mortality rate [9-12] and might be susceptible to undertriage [13, 6].

The aim of the present study was to examine characteristics of older patients presenting to the ED categorized to the ‘unwell adult’ flow chart of the MTS in comparison to other presentational flow charts. We aimed to describe the different 30-day mortality rates among presentational flow charts of the MTS in older ED patients. Further, we examined the impact of presenting complaint on admission rates and ED length of stay (ED LOS).

Methods

Study design and setting

This is a secondary analysis of a retrospective cohort study [14]. All patients aged 70 years and older who visited the Emergency Department (ED) of the Leiden University Medical Center (LUMC) between 1st January-31st December 2012 were assessed for inclusion. The LUMC is a tertiary care center with 260 beds and an annual census of 30.000 adult patients.

The Medical Ethics Committee of the LUMC waived the need for informed consent because data were collected routinely and de-identified after extraction from the patient files. Funding: Institute for Evidence based Medicine in Old Age (ZonMw project number 627003001) and Acutely Presenting Older Patient study (ZonMw project number 627005001).

Study protocol and measurements

Data were collected from the electronic patient records as described previously [15]. We collected demographic characteristics (age, sex) MTS triage category, presentational flowchart used and vital signs.

After registration, a specially trained nurse triages patients according to the MTS, using one of the 50 flowcharts. Patients assigned to triage category "red" need immediate resuscitation. Patients assigned to triage categories orange or yellow need evaluation by a physician within 10 and 60 min, respectively. Triage categories green and blue represent non-urgent patient categories and need to be evaluated within 120 or 240 min, respectively. Patients with suspected stroke are treated in a dedicated acute stroke pathway and are assigned 'unwell adult' in the 'orange' or 'red' categories, because there is no presentational flowchart for localized weakness. Data on mortality were acquired from the municipal database, a registry with 100% follow-up.

Outcome

The primary outcome of this study was 30-day mortality. Secondary endpoints were 7-day mortality, hospital admission rate and ED length of stay.

Data analysis

Data are presented as number and percentages or means and standard deviation for normally distributed variables, or as medians with interquartile ranges (IQR) for non-normally distributed variables. First, a top fifteen of most used flowcharts was created, accounting for 89.7% of all presentations. Presentational flowcharts not in the top 15 were categorized as 'other'. Baseline characteristics of patients assigned the presentational flowchart 'unwell adult' were compared to the rest of the population. A T-test was performed to compare means between normally distributed variables and Mann-Whitney-U test in case of non-normally distributed variables. Chi-square test was used to compare categorical variables. To investigate if triage category affected the association between flow chart 'unwell adult' and 30-day mortality we executed an interaction analysis. If the interaction p-value was >0.05 triage category was considered as a possible confounder. Multivariable logistic regression analysis was used to examine associations between presentational MTS flowchart and 30-day mortality, adjusting for age, gender and triage category. The level of statistical significance was set at the alpha=0.05 and all statistical analyses were performed using IBM SPSS Statistics package (version 23, New York, USA).

Results

A total of 27 862 patients visited the ED during the study period, of which 4458 were aged 70 years or older. After exclusions, 4255 patients (95.4%) were included (figure 1).

Baseline characteristics of the total study population and stratified by presentational MTS flowchart ‘unwell adult’ or other flowcharts are shown in table 1. Median age was 78.0 years (IQR 73.9-83.4) and approximately half were male (n=2098, 49.3%). Most patients were triaged in the ‘yellow’ urgency category (n=1909, 44.9%). Patients who were triaged with the 'unwell adult' flowchart were younger, more frequently male and more frequently triaged in urgent triage categories compared to patients triaged in other MTS flowcharts. The flowchart 'unwell adult' was most commonly assigned (n=815, 19.3%) (figure 2, left panel). ‘Unwell adult’ had the highest non-trauma related 30-day mortality (n=88, 10.8%, figure 2 right panel) after the infrequent flowchart ‘major trauma’ (n=9, 13.8%).

Further, ‘unwell adult’ had significantly higher 30-day mortality rates compared with patients assigned to other flowcharts (OR 1.89 (1.46-2.46), p=<0.001). This association persisted after adjusting for age and gender (OR 1.94 (1.46-2.53), p=<0.001). Triage category was not a significant effect modifier (p-interaction 0.600). Additionally, adjusting for triage category left the association unchanged (OR 1.75 (1.32-2.31), p=<0.001) (table 2).

Absolute numbers of the primary endpoint of 30-day mortality and all secondary endpoints are shown in table 3. From a total of 4255 patients 156 (3.7%) died within 7 days. Patients in flowchart ‘unwell adult’ have the highest non-trauma related 7-day mortality (n=57, 7.0%). Patients in this flowchart have the highest hospital admission rate (n=540, 66.3%). Patients in flowchart abdominal pain, collapsed adult and shortness of breath have longer ED LOS than patients in the ‘unwell adult’ flowchart (table 3).

Discussion

This retrospective study on a consecutive sample of patients aged 70 and older presenting to an ED demonstrates that 'unwell adult' is the most commonly assigned presentational flow chart when using the MTS. Older patients assigned to this flowchart have the highest non-trauma mortality rate, independent of urgency category, and highest admission rates of all presenting complaints.

It is not known why triage personnel chose the 'unwell adult' flowchart that frequently. One might speculate that patients assigned to this flowchart did not report specific complaints such as chest pain. Our finding that NSCs are common is in line with the literature [9, 16, 7]. High admission- and mortality rates were reported as well [11, 10, 17].

A troubling finding is that we observed mortality in the two lowest triage categories, which was found in another study as well [18]. The observation that - regardless of urgency category - the odds for mortality is still increased in 'unwell' older adults suggests that it is a high-risk complaint. Modifications of the MTS might be necessary [19]. The frailty construct is increasingly being used to risk stratify older people attending EDs, and in combination with physiological parameters, appears to be a powerful predictor of harms, as well as resource use [20]. For example, a recent study showed that within every triage urgency category, older patients with a high-risk geriatric screening result had a substantially higher 30-day mortality rate compared to patients who were identified as low risk during geriatric screening. Considering both urgency (as determined by a triage tool) and geriatric screening results could therefore potentially improve risk prediction.

Future studies should investigate whether the use of age specific cut-offs for vital signs, as well as modifications of the flowchart 'unwell adult', or integration of a frailty measure result in improvements of the MTS.

Limitations

This is a retrospective single-center study with limited generalizability. For example, ED length of stay is depending on local factors and the availability of hospital beds. Information on mortality was available for older patients only. Therefore, we were unable to assess whether similar patterns occur in younger patients as well. In

addition, the data were acquired xx years ago. However, we believe that these data are still valid today.

A strength of this study is that triage nurses were unaware of the study and followed routine clinical care. Therefore, this study is a representation of routine use of the MTS.

Conclusion

When using the MTS, ‘unwell adult’ is the most frequently assigned triage category in older ED patients. Patients in this category have the highest non-trauma 30-day mortality and highest hospital admission rates when compared to other presenting complaints, indicating that the nonspecific disease presentation "unwell" is a serious medical condition.

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Declarations

Funding: no funding was obtained for this study

Conflicts of interest: there are no conflicts of interest reported by the authors of thus study

Availability of data: data is available upon reasonable request through the corresponding author

Ethics approval: the Medical Ethics Committee of the Leiden University Medical Center waived the need for approval of this study

Table and Figure legends

Table 1, legend

Values are mean (SD) unless noted otherwise.

*Missing: MTS flowchart (n=30), heart rate (n=880), respiratory rate (n=1877), systolic BP (n=943), saturation (n=962), temperature (n=1294).

Table 2, legend

Abbreviations: UA: unwell adult, OR: Odds ratio, 95% CI: 95% confidence interval
Model 1: adjusted for age, gender
Model 2: adjusted for age, gender and triage category

Table 3, legend:

Values are n, % (of total number for the second column, and of presentational flow chart for the third,fourth, fifth and sixth column, respectively) or median and interquartile range displayed as (h:mm).
Missing presentational flowchart (n=30). Missing admission (n=5)