ORIGINAL RESEARCH

Adequacy of Pediatric Triage

Pharrah Debono, MRCPCH; Juanita Debattista, MRCPCH; Simon Attard-Montalto, MD; David Pace, FRCPCH

ABSTRACT

Objective: To assess the adequacy of the pediatric triage system in an acute care general hospital.

Methods: All children younger than 14 years of age who presented with a primary medical condition to the accident and emergency department (ED) during January to March 2009 were recruited. Suitability of the triage system was assessed according to the vital parameters taken and the priority code assigned. Triage workload was assessed from the number of children presenting to ED and the timing of presentation.

Results: Of 2269 children presenting to ED, 1617 (71.3%) were younger than 5 years, and 883 (38.9%) were younger than 2 years. Only 0.26% (6/2269) had four vital parameters crucial for priority assignment measured, and 19.3% (437/2269) had at least one parameter measured. A priority code was assigned to 10% (225/2269).

Conclusions: Our study revealed inadequacies in the pediatric triage system. A simple and objective triage system that is based on the measurement of crucial vital parameters and on prompt recognition of warning signs and symptoms to correctly identify high-risk groups has been introduced to ensure appropriate and effective triage of sick children.

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Key Words: emergency services, children, triage

Triage is a crucial tool required to correctly identify and prioritize care to seriously ill children. Similarly, it should also identify children who do not require urgent medical care. It is essential that pediatric emergency departments are both equipped and involved in optimizing the standard of the current triage system and in forward planning for the management of a large influx of pediatric patients, which might occur in an influenza pandemic or national disaster.[1] An efficient triage system that is simple, valid, reproducible, and ethical needs to be in place. The development of a scoring system based on physiological parameter measurement and medical history can be used to reliably predict the requirement for further intensive care or inpatient management, whatever the diagnosis. Furthermore, such systems can help raise awareness of the importance of vital sign measurement in a way that is sustainable and, ultimately, to improve patient outcome.[2]

We carried out a prospective observational study in the pediatric accident and emergency department (ED) of an acute care general hospital serving a population of 80 000 children. The aims of the study were to quantify the workload on pediatric ED and to assess the adequacy of the triage system to deal with the increased number of pediatric ED attendees during the winter months, when influenza and other viral respiratory illnesses are at a peak.

METHODS

A single-center observational study was carried out in the pediatric ED at Mater Dei Hospital, Malta, during the peak months of one influenza season, from January 6 to March 31, 2009. Triaging of children (younger than 14 years) at the pediatric ED was performed exclusively by the ED nursing staff whose working shifts ran from 7:00 AM to 7:00 PM and from 7:00 PM to 7:00 AM. A triage nurse performed both adult and pediatric triaging.

All children presenting with a primary medical condition to the pediatric ED during this period were included in the study. Data were obtained from the casualty admission sheets. The suitability of triage was assessed according to the vital parameters taken (ie, pulse rate [PR], respiratory rate [RR], temperature [T], and oxygen saturation values [SaO_2]). The priority code assigned, mode of referral, and outcome (admission or discharge) were recorded. The number of children presenting with influenza-like symptoms, including fever and irritability or cough or sore throat or vomiting, in accordance with the Centers for Disease Control and Prevention guidelines for influenza-like illness,[3] was documented as an indication of the influenza burden on the pediatric ED.

The ability of the pediatric triage system to cope with the workload was assessed by documenting the number of children presenting during the study period. We further analyzed the timing of presentation and the mode of referral. Each 24-hour period was subdivided into 1-hour intervals to identify the peak hours of pediatric presentations to ED and hence the temporal distribution of the current workload. This guide then was used

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to interpret any variations in the efficiency of our triage system during periods of increased workload.

RESULTS

Demographics

A total of 2269 children younger than 14 years of age presented to the pediatric ED in the study period. Of these, 1129/2269 (49.8%) were boys. The mean age at presentation was 3.6 years. There were1617 children (71.3%) younger than 60 months of age and 883 children (38.9%) younger than 24 months of age (Table).

Workload

An average of 27 children was seen daily at the pediatric ED, with 1332 of 2269 (59%) presenting between 7:00 AM and 7:00 PM and 937 (41%) presenting between 7:00 PM and 7:00 AM ($\chi^2 = 52.4$, $P \leq .01$). Children presented more frequently between 9:00 AM and 12:00 PM (mean, 2.02 patients/h), with a second peak occurring between 4:00 PM and 9:00 PM (mean, 1.91 children/h) (Figure). Only 259 (11.4%) were referred from primary health care or from the private sector. The remaining 2010 (88.6%), were self-referred. The number of children presenting with influenza-like illness was 405 (17.8%).

Triage

A minimum of one parameter was assessed in 437 (19.3%) of 2269 children; only 6 (0.26%) children were assessed with all four parameters (PR, RR, T, SaO_2) needed for a suitable triage. No difference was found in the number of children having one parameter taken during the night (197/937; 21%) as compared to the daytime cohort (240/1332; 18%; $P = .63$). Similarly no difference was seen in children having all four parameters assessed (5/1332; 0.38% vs 1/937; 0.01%; $\chi^2 = 1.8$, $P = .18$), in the daytime and nighttime cohorts, respectively.

A priority code, ranging from BB (bypass waiting list: very urgent) to 1 (urgent), 2 (semi-urgent), and 3 (nonurgent), was assigned in 225 (10%) of 2269 cases. The remaining 2046 (90%) children were given a nonpriority code of 7/pediatrics by default.

DISCUSSION

In spite of the fact that the majority of children in this study passed through the hospital triage system, just 19.3% had at least one vital parameter assessed, and only 0.26% had all four essential parameters measured. These findings meant that 80.7% of children were triaged subjectively or solely based on the presenting complaint, which is inappropriate for prioritizing acutely ill children suffering from any illness. Although the presenting symptoms are important in triage, vital signs are essential in prioritizing children. An ED setting would pose significant emotional distress to a child, especially to preschool children, leading to an increase in pulse rate and respiratory rate, making clinical assessment difficult. Consequently, a single

TABLE

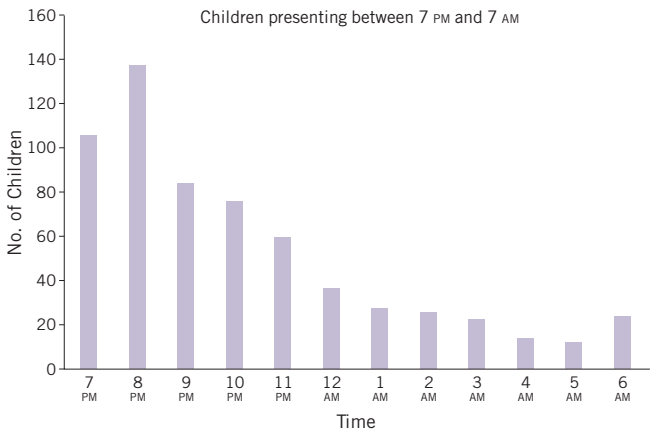
Demographic Details

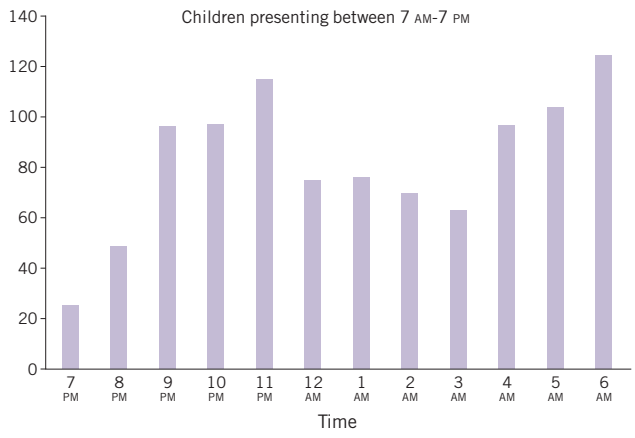
Age[a]	No. of Children
0-<12 mo	570
12-<24 mo	313
24-<36 mo	274
36 mo-<5 y	460
5-<10 y	384
10-<14 y	229

[a] Age was not specified in 39 cases.

FIGURE

Overall Distribution of Children (Younger Than Age 14 Years) Presenting per Hour to the Accident and Emergency Department (January-March 2009).





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abnormal physiological parameter cannot be interpreted in isolation. What would be more informative is a cohort of abnormal parameters in the same child together with the observation of a trend. A combination of vital signs can be used to differentiate children with serious illness from those with less serious infections. This assessment should be carried out at triage level.

Sensitivity of specific parameter measurement is comparable to more complicated triage systems.[4] Children with serious or intermediate infections are significantly more likely than those with a minor or no infection to have one or more signs of elevated temperature (≥39°C), tachycardia, a low SaO_2 (≤94%), or tachypnea, with a sensitivity of 80% and a specificity of 39%. These results are comparable to the Manchester triage score (MTS) and the National Institute for Health and Clinical Excellence (NICE) traffic light system.[4] The superiority of one triage system (eg, MTS, emergency severity index [ESI], pediatric Canadian triage and acuity score [paedCTAS], and Australasian triage scale [ATS]) over another in the setting of pediatric ED needs further evaluation.[5]

Similar to other reports,[2] our study has shown that current practice is to measure only one, or indeed none, of the vital signs on presentation. The assignment of a priority code based on the objective measurement of parameters was also scarce, with only 10% of all children being given a specific priority code. For the measurement of vital signs and priority code assignment to become part of standard practice, the issues of non- or incomplete measurement as well as inaccurate measurements or rough estimates should be addressed.[6] Complex scoring systems, although valid, are not easy to implement and might further aggravate noncompliance to the detriment of patient safety.[7] The implementation of a simple pediatric early warning tool that can be applied from the outset, at pediatric ED, may serve both to encourage staff to measure vital parameters at triage level, as well as to boost their confidence in the recognition and prioritization of seriously ill children.[8]

It is impractical to assume that nurses trained exclusively in the triage of adult patients could provide effective triaging of pediatric patients. The nonverbal, uncooperative child may be particularly difficult to assess. In addition, what defines a physiological parameter as normal varies among age groups. This holds true for respiratory rate, heart rate, and blood pressure measurements. Better education and training of nurses in assessing children, with particular focus on correct and consistent measurement of critical vital signs, serves to improve patient care. This, coupled with simple measures to ensure real-time communication of abnormal vital signs to clinicians, will also help to ensure timely intervention when needed.[9]

Analysis of the timing of presentation to pediatric ED revealed an average of 2.02 patients per hour during the peak hours of 9:00 AM and 12:00 PM, and 1.91 patients per hour during a second peak between the hours of 4:00 PM and 9:00 PM. There is no difference in the number of parameters assessed during peak and off-peak hours, but the anticipated longer waiting times during peak hours, for children who are inadequately prioritized, might mean a delay in initiating treatment. It follows, therefore, that the pediatric triage system in use in our hospital in 2009 was inadequate in prioritizing children. As a result, the increased number of children seen during winter months because of influenza (17.8%) poses an added strain on the ability of the pediatric department to provide an efficient ED service.

The burden of parent-referrals (88.6%) indicates a lack of awareness or lack of confidence of the general public in primary health care. The education of parents and caregivers is a key aspect in the smooth running of any hospital emergency service, especially during winter when infectivity and transmissibility of influenza is at its peak. Parents should be encouraged to first seek advice from their general practitioners or pediatricians. Similarly, the use of a telephone triage system conducted by trained medical or nursing staff could have a significant impact on decreasing the number of pediatric ED attendees and hence the likelihood of cross-infection. Equally important is the correct identification of comorbid factors or chronic illness in a cohort of children at risk of developing complications and requiring hospitalization. The identification of any warning signs and symptoms pertaining to any pediatric illness should prompt direct referral to ED or, if not life-threatening, to a general practitioner.

In a follow-up to the findings of this study, a series of simple triage algorithms based on correct measurements of vital parameters in children have been introduced in the pediatric ED at the beginning of October 2010 to improve triage methods and aid appropriate prioritization of ill children. This has been one of the first measures from the planned solutions discussed here that will be implemented to improve the pediatric ED service in our hospital.

CONCLUSION

Triage is an essential tool to correctly identify and prioritize children according to the severity of their illness. A simple triage system, which is objective and based on the measurements of crucial vital parameters, together with prompt recognition of warning signs and symptoms and correct identification of high-risk groups, is necessary for the appropriate and effective triage of sick children. Adequate training and exposure of nursing staff to a new system is essential for triage to be performed efficiently and consistently, and this has now been launched in our hospital. Subsequently, it may then be possible to create an adapted telephone triage system that, together with parental education, may decrease the number of self-referrals and would be additional key factors playing a role in the provision of safe and effective medical care.

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Author Affiliations: Department of Paediatrics, Mater Dei Hospital, Tal-Qroqq, Msida, Malta (Drs Attard-Montalto, Debono, Debattista, and Pace).

Correspondence: David Pace, FRCPCH, Department of Paediatrics, Mater Dei Hospital, Tal-Qroqq, Msida, MSD 2090, Malta (e-mail: dpace@go.net.mt).

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