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ORIGINAL RESEARCH ARTICLES

Developing a reference standard for assessing paediatric triage scales in resource poor settings

Élaborer une norme de référence pour évaluer les échelles de triage pédiatrique dans des contextes caractérisés par un manque de ressources

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Introduction: One of the main challenges for emergency healthcare services in low to middle income countries (LMICs) is limited capacity to deal with heavy emergency caseloads. The process of triage is one mechanism for mitigating this challenge.
Methods: In a two-round consensus building process (the Delphi process), a panel of emergency centre (EC) experts were asked to independently triage 50 clinical vignettes using one of four acuity levels: emergency (patient to be seen immediately), very urgent (patient to be seen within 10 min), urgent (patient to be seen within 60 min), or routine (patient to be seen within four hours). The vignettes were based on real paediatric EC cases in South Africa. Vignettes that reached a minimum of 80% group consensus for acuity ratings on either round one or two were included in the final set of reference vignettes.
Results: Of the 50 vignettes presented to 11 EC experts, in the first round, 80% group consensus on acuity ratings was obtained for 10 (20%) of the vignettes. In the second round, 80% consensus was reached for 30 of the 40 remaining vignettes. Thus, overall, 40 (80%) of the vignettes reached a minimum group consensus of 80% (emergency $n = 4$; very urgent $n = 8$; urgent $n = 12$; routine $n = 16$).
Conclusion: This study demonstrates how context-specific reference vignettes can be developed to provide a cheap, effective, and feasible means by which to evaluate paediatric triage systems in LMICs.

Introduction: L'une des principales difficultés associées aux services de santé d'urgence dans les pays à faible et moyen revenu (PFMR) est leur capacité limitée à faire face à une lourde charge d'urgences médicales. Le processus de triage est l'unique mécanisme permettant d'atténuer cette difficulté.
Méthodes: Au cours d'un processus de recherche de consensus en deux étapes (la méthode Delphi), il a été demandé à un panel d'experts issus de centres d'urgence (CU) de trier indépendamment 50 vignettes cliniques en sélectionnant un niveau d'acuité parmi les 4 niveaux proposés: urgence (le patient doit être examiné immédiatement), très urgent (le patient doit être examiné dans les 10 min), urgent (le patient doit être examiné dans les 60 min) ou routine (le patient doit être examiné dans les 4 heures). Les vignettes étaient basées sur de véritables cas d'urgences pédiatriques en Afrique du Sud. Les vignettes résultant sur un consensus de groupe de 80% minimum quant aux évaluations de l'acuité à la première ou à la deuxième étape ont été incluses à l'ensemble final de vignettes de référence.
Résultats: Sur les 50 vignettes présentées à 11 experts issus de CU, au cours de la première étape, un consensus de groupe de 80% quant aux évaluations de l'acuité a été obtenu pour 10 (20%) des vignettes. Dans la seconde étape, un consensus de 80% a été obtenu pour 30 des 40 vignettes restantes. Ainsi, au total, 40 (80%) vignettes ont atteint un consensus de groupe minimum de 80% (urgence n = 4; très urgent n = 8; urgent n = 12; routine n = 16).
Conclusion: Cette étude a montré comment des vignettes de référence spécifiques à un environnement donné pouvaient constituer un moyen peu coûteux, efficace et faisable d'évaluer les systèmes de triage pédiatrique dans les PFMR.

African relevance

- Triage is poorly researched in Africa, especially paediatric triage.
- Poor record keeping makes validating triage scales very difficult.
- Paper based vignettes can be used in low resource settings.

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Introduction

One of the main challenges for emergency health care services in low to middle income countries (LMICs) is their limited capacity to deal with heavy emergency caseloads. The process of triage is one mechanism for mitigating this challenge.[1]

Triage aims to determine a patient's urgency for medical care (defined as their acuity level) in order to separate critically ill patients, who need immediate lifesaving interventions, from patients who need medical attention but can safely wait to be seen.[2] Triage is recognised as being one of the core requirements for the provision of effective emergency care, and has been shown to reduce patient morbidity and mortality.[3]

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In LMIC settings, however, triage remains under-used and under-researched, particularly in the area of paediatric emergency care.

The triage of adults and children relies on different triage scales in order to take account of physiological differences between the two. Very few paediatric triage scales exist for the triage of children in LMIC settings.[4] Until recently, the most widely recommended scale was the Emergency Triage Assessment and Treatment (ETAT) system developed in 1998 by the World Health Organisation. However, this scale is only applicable for use in children under five.[5] The South African Triage Scale (SATS) – developed in 2004 by the Cape Triage Group – is the only other triage scale designed specifically for LMIC settings, and one of its advantages over the ETAT, is that it includes scales for the triage of infants and children up to the age of 12 years.[6] The main issue with both the paediatric versions of the SATS and the ETAT is that they are not formally validated in various contexts of use.

Validating a triage system in many contexts remains a challenge due to lack of a gold standard.[7] To circumvent this, various studies have assessed validity using surrogate outcome markers such as mortality rates, resource utilisation, and length of hospital stay as proxies for true acuity level.[8,9] In LMICs, however, reliance on such surrogate markers is difficult due to varying levels of care, lack of basic resources, and poor record keeping. As an alternative, Twomey et al. have recommended using the modified Delphi method to develop an objective reference standard against which to evaluate a triage scale.[10] The Delphi method is a consensus-building technique, which, in the context of triage validation, can be used to develop a set of reference vignettes (short written case reports based on real emergency centre (EC) cases). This methodology has been used by Twomey et al. to assess the validity of the adult version of the SATS.[10]

In this study, we aim to demonstrate how the modified Delphi method can be applied to develop a representative sample of context specific vignettes for assessing paediatric triage systems.

Methods

The study involved applying a modified Delphi method to a series of clinical vignettes based on real paediatric EC cases. Fifty paediatric vignettes were generated by randomly selecting real paediatric EC cases aged 0–12 years presenting at ECs across the Western Cape from 3 October to 30 November 2011. The source of these cases was an electronic database. Each vignette included information on patient gender, age, presenting complaint, mode of arrival to the EC, and vital signs. All information included in the triage paperwork was included in the vignettes, including information from additional investigations such as blood glucose and haemoglobin (see Appendix 1 for examples of the vignettes – data Supplement). The 50 vignettes comprised 10 surgical/trauma cases and 40 medical cases.

The Delphi group of study participants was comprised of individuals deemed by the authors to be EC triage experts on account of them either having published research on triage or having worked in ECs in LMICs, and who gave consent to participate in the study. The Delphi group was asked to independently complete a two-round consensus building process, each round lasting a month. In round one, each participant was emailed and asked to triage the 50 vignettes based on their clinical experience and the triage tool that they were most familiar with using. They were requested to assign one of the following four acuity levels to each vignette: emergency (patient to be seen immediately), very urgent (patient to be seen within 10 min), urgent (patient to be seen within 60 min) or routine (patient to be seen within 4 h).

The vignettes were made available online to facilitate easy access at a time that was convenient to each participant and an online survey tool was used to collect the triage ratings that they assigned to each vignette. On completion of round one, any vignettes achieving at least 80% consensus among the participants were kept aside. Vignettes that did not reach this level of consensus were sent back to the Delphi group for round two, where the acuity level assigned to each vignette by the majority of participants during round one was indicated and participants were given the opportunity to either change the original acuity rating that they had assigned or leave it as it was. At the end of round two, triage ratings were summarised for all vignettes, and only those that reached a minimum of 80% consensus on either round one or two were included in the final set of reference vignettes.

Informed consent was obtained from all experts participating in the study. The Western Cape Paediatric Triage database, which was used to develop the vignettes, contains no patient names or identifying information. Ethics approval was obtained from the University of Cape Town Human Research Ethics Committee.

Results

A total of 59 triage experts were contacted to participate in the study. Of these, 14 took part in the first round of the Delphi process, and 11 of the 14 completed the second round. These 11 participants made up the final Delphi group.

In the first round of the Delphi process, a minimum of 80% group consensus on acuity ratings was obtained for 10 (20%) of the 50 vignettes. Of the 40 vignettes for which 80% group consensus was not reached, 19 (48%) reached between 60% and 79% consensus, 16 (40%) reached 50–59% consensus and five (13%) reached less than 49% consensus. Discrepancies for these 40 vignettes were as follows: 13 (33%) were found between 'routine' and 'urgent' acuity levels, 11 (28%) between 'urgent' and 'very urgent' acuity levels, 6 (15%) between 'very urgent' and 'emergency' acuity levels and ten (25%) had discrepancies at multiple acuity levels.

In the second round, a minimum of 80% consensus was reached for 30 (75%) of the 40 vignettes that had failed to reach 80% consensus in round one. The degree to which panel members changed their assigned acuity levels to reach a 80% consensus between round one and round two for these 30 vignettes was as follows: for nine (30%) of the vignettes only one member changed their acuity level, for a further nine (30%) vignettes, two members changed their acuity levels, for five (17%) vignettes three members changed their acuity levels, for three (10%) vignettes four members changed their acuity level, and for the remaining four (13%) vignettes five members changed their acuity level.

Overall, 40 (80%) of the 50 vignettes reached a minimum group consensus of 80% (emergency $n = 4$; very urgent $n = 8$; urgent $n = 12$; routine $n = 16$).

See Appendix 1 (data supplement) for the final 40 vignettes reaching 80% consensus and Appendix 2 (data supplement), for the 10 vignettes failing to reach consensus. Of note, five of the vignettes that failed to reach consensus were for respiratory presentations.

Discussion

This study demonstrates how the modified Delphi method can be used to develop a validated set of context specific reference vignettes for assessing paediatric triage scales. This methodology has previously been applied by Twomey et al. to generate a set of adult reference vignettes but has not been formally used to develop paediatric vignettes.[10]

Validation of triage scales (including paediatric scales) is a major challenge, particularly in resource limited settings. As such, in most LMIC settings where triage systems are being used, these scales have not been formally evaluated for that context. Reference vignettes based on real EC cases and formally validated by a group of experts provide a potentially cheap, effective, and more feasible means by which to evaluate such triage scales.

The merits of these validated reference vignettes are that (i) they are based on the random selection of real EC cases (and are thus representative of true EC case presentations seen in a particular context), and (ii) the ascribed acuity ratings for each vignette are based on a two-round consensus building process using the expert opinions of emergency medicine specialists either working or having experience in different LMIC settings.

Possible limitations of the reference vignettes are linked to the composition of the Delphi panel and the Delphi method itself. First, fifty-nine experts were invited to take part in this study, of which 14 agreed to participate, and of these only 11 completed both rounds of the study. Despite this low initial response rate and some attrition during the second round of the study, the final Delphi panel was relatively well-represented comprising of approximately equal numbers of emergency medicine doctors, paediatricians, and emergency nurses, with half practicing in LMICs and half practicing in developed countries. Second, the dramatic increase in the proportion of vignettes attaining a minimum of 80% consensus between round one and two (20–80%) may appear to imply that a substantial proportion of the panel members changed their mind on acuity ratings from round one to round two. In fact, this was often not the case. For a significant number of those vignettes where 80% consensus was not reached, the actual level of consensus was often not far below the 80% threshold in round one. Third, where panel members did change the acuity rating that they assigned to a vignette between rounds, we did not explore the basis for this change and cannot therefore speculate on the relative logic underlying a panel member's decision to change their mind. Further exploration of this would provide useful information about the relative validity of this consensus building technique for developing reference vignettes. Fourth, important minority issues may have been overlooked by trying to obtain consensus.[10]

The Delphi methodology was first introduced by the Research and Development (RAND) Corporation in 1946 to develop information in fields where little data exist.[10] It deals with complex problems by acknowledging human judgment as legitimate and useful as a method of gathering expert opinion into a single useful statement(s). The strengths include rapid results, cheap costs, avoidance of self-censorship common in group meetings, and the ability of experts from all around the world to participate. Some of the limitations of this method include high dropout rates of experts and difficulty to ensure engagement over a period of time, poor expert selection, time demands related to coordinating the process, and a decreased transparency of decisions comparative to face to face meetings.[11]

Despite the limitations, we believe that the Delphi Method is a feasible way for developing an objective reference standard against which to validate paediatric triage scales in LMIC settings. What is important, however, is that the reference vignettes are context specific (i.e. are based on EC cases specific to the setting in which the triage system is being validated), and thus, an epidemiologic pattern of disease and trauma is reflected. In the current study, the reference vignettes were based on EC cases seen in South Africa. We believe it would be reasonable to use these vignettes to assess a triage system in other very similar LMIC settings, but in dissimilar settings, context specific reference vignettes would need to be developed.

Several other findings in our study also have implications for further study and for the future development of reference vignettes using the Delphi methodology. First, it was observed that lack of consensus in the first round was most often linked to discrepancies between 'routine' and 'urgent' acuity ratings and 'urgent' and 'very urgent' acuity ratings. Difficulties in reaching consensus between 'urgent' and 'very urgent' acuity ratings have been reported previously by Twomey et al. for adult EC cases (reference). This extended to 'routine' and 'urgent' acuity levels for paediatric presentations in the current study. Exploring the reasons underlying Delphi members' decisions to assign specific acuity ratings would help to better understand the basis of these discrepancies and to decide how best to accommodate this issue when developing a set of paediatric reference vignettes. Finally, half of the vignettes that failed to reach consensus were for respiratory presentations, suggesting possible difficulties in triaging respiratory signs and symptoms in children. As such, when a set of paediatric reference vignettes are generated using the Delphi method, there may be a tendency for respiratory presentations to be under-represented. If this is found to be the case (on account of many of the vignettes that fail to reach consensus being respiratory in nature), this should be acknowledged when using the reference vignettes to assess a triage scale.

In conclusion, this study demonstrates how context specific reference vignettes can be developed to provide a cheap, effective and feasible means by which to evaluate paediatric triage systems in LMICs. Formal studies reporting on the use of these reference vignettes to evaluate the paediatric version of the SATS are now needed.

Conflict of interest

The authors declare no conflict of interest. The study was funded by the Medical Research Council of South Africa under the MRC Clinician Researcher Program.

Author contribution

M.D. and M.T. conceived the original idea. M.D., M.T. and L.W. designed the experiments and helped with acquisition of data. K.T.S. and M.D. carried out analysis and interpretation of data. M.D. and K.T.S. prepared the manuscript. K.T.S., L.W. and M.T. revised the article and approved final content for submission.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.afjem.2015.08.002.

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