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A New Quantitative Triage System for Hospitalized Neonates to Assist with Decisions of Hospital Evacuation Priorities

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Abstract

Introduction: Hospitalized neonates are vulnerable to natural and man-made disasters because of their persistent requirement for medical resources and may need to be evacuated to safe locations when electricity and medical gas supply become unreliable. In Japan, a triage system for hospitalized neonates, or the Simple Triage and Rapid Treatment for Neonates, Revised (START-Neo-R), has been used to determine whether neonates are in suitable conditions for transportation. Using the START-Neo system, NICU nurses, neonatologists, and even trainees can easily classify neonates into four categories, grey, red, yellow, and green (ranging from high-demand to low-demand neonates), based on the clinical conditions of and medical care provided for the neonates. When the 2016 Kumamoto Earthquake occurred in Japan, the START-Neo system helped determine the evacuation order of 38 hospitalized neonates from a tertiary NICU that was at risk for collapse. However, because START-Neo subsequently classified 95% of the neonates into either the red category or the yellow category, NICU staff had difficulties assigning the evacuation order of the neonates within the same categories.

Study Objective: To solve this problem, a novel triage system, Neonatal Extrication Triage (NEXT) was developed. This study tested the validity and reproducibility of both triages and compared them with a standardized prognostic scoring system for hospitalized neonates, the Neonatal Therapeutic Intervention Scoring System (NTISS).

Methods: In this retrospective observational study, physicians and nurses independently assessed each neonate hospitalized at a tertiary neonatal intensive care unit (NICU) twice weekly using NEXT and START-Neo-R. The NEXT system comprises six questionnaires regarding medical resources required during transition and transportation, providing composite scores on a 12-point scale. The START-Neo-R classified neonates into five levels based on the severity of disease and dependence on medical care. Inter-rater reliability of both systems was assessed using Cohen's kappa coefficient, whereas the criterion validity with NTISS was assessed using Spearman's correlation coefficient.

Results: Overall, 162 neonates were assessed for 49 days, resulting in triage data for 1,079 accumulated patients. Both NEXT scores and START-Neo-R ranks were well-dispersed across different levels without excessive accumulation in specific categories. Inter-rater reliability of NEXT (kappa coefficient, 0.973; 95% confidence interval, 0.969-0.976) and START-Neo-R (kappa coefficient, 0.952; 95% confidence interval, 0.946-0.957) between physicians and nurses was sufficiently high. The correlation coefficient of NEXT and START-Neo-R scores with NTISS scores were 0.889 ($P < .001$) and 0.850 ($P < .001$), respectively.

Conclusions: Both START-Neo-R and NEXT had good reproducibility and correlation with the severity of neonates indicated by NTISS. With its well-dispersed scores across different levels, the NEXT system might be a powerful tool to determine the priority of evacuation objectively. (Prehosp Disaster Med. Published online April 7, 2022:1-7.)