Application of Broselow Tape in Pediatric Population Exposed to Chemical Terrorism

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Abstract

To investigate the applicability of the Broselow Emergency Pediatric tape in disaster response for pediatric population, we underwent a study in a NBC training course. The 83 students were randomly subgrouped as Group A (n=41) and Group B (n=42). The former were supplied with the Broselow Emergency Pediatric tape and the latter were not supplied. A 20-item questionnaire containing questions concerning management of different conditions from pediatric population was fulfilled from each student. The average score was 83±9 points for Group A and 77±8 points for Group B (P<0.01). he causes of errors were categorized as misuse of agents, dosing errors, and missing data. There are significant differences in dosing errors judged by absolute scores between Group A and Group B (11±4 points vs 19±5 points, P<0.05) whereas no differences were met in misuse of agents (3±4 points vs. 4±5 points, P=NS) and in missing data (3±5 points vs. 1±3 points, P=NS). In the viewpoint of relative contribution of errors, misuse of agents contribute to 18±5% for Group A and 17±5% for Group B (P=NS). In addition, there was significant difference in the percentage of dosing errors between Group A and Group B (65±18% vs. 83±21%, P<0.05). There was also significant difference in relative contribution from missing data (18±7% vs. 4±5%, P<0.01). In conclusion, the main pitfall of Broselow Emergency Pediatric tape was lacking the information of antidotes for cyanide, radiation agents and biological agents. A modified Broselow Emergency tape should be needed to resolve such a dilemma.*(Ann Disaster Med. 2006;4:49-53)*

Key words: Broselow Emergency Pediatric tape; Disaster; Terrorism

Introduction

The Broselow Pediatric Emergency tape provides a tool for determining the correct dosage of medications and equipment sizes (endotracheal tubes, suction catheters, etc.) for children, based on his or her length. It can help simplify some of the decision-making in an emergency by eliminating the need to estimate a child's weight, which is what practitioners use to calculate the correct dosage for medication.

In an emergency, the estimation of a child's weight and drug dosage calculation will usually be done under stressful conditions, increasing the likelihood of dosage errors. Research has already shown that the dosage calculation in the pediatric setting is highly prone to errors.[1-6]

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Additionally, patient weight in the pediatric population is critical for dosing formulas, but evidence suggests that both physician and nurse estimates of children's weights are unreliable (>15% off).[7] The situation is also true in the setting of disasters or MCI, and the Broselow Pediatric Emergency tape may be helpful for this dilemma.

In the United States, the Centers for Disease Control and Prevention (CDC) has confirmed that the need for health providers to complete a simple three- or four-step calculation of drug dosing during a MCI or a disaster significantly increases the potential medical errors. So-called dosing cards have been therein developed. The cards are reported to provide standard and simple instructions to prepare and administer antidotes, medications, and preventive agents to pediatric population in the setting of a MCI or a medical disaster. All disease are based on published literature, including CDC guidelines. And the antidotes included cyanide, the nerve agents, radiation agents and the biological agents.[8-10] Because the pediatric dosing cards mentioned above are not available in Taiwan, we thus tried to evaluate the applicability of the Broselow Pediatric Emergency tape in the situation of a MCI or a medical disaster including terrorism attacks in the following study utilizing the tabletop drills.

Material and Methods

Study protocol

On June 10th 2005, we conducted a training course for the NBC (nuclear, biological and chemical incidents) response at our institute. The course consisted of 6-hour special lecture and 6-hour tabletop drill. There were eighty-three students attending the course.

The 6-hour special lecture included the introduction of National Response System, planning and management of nuclear, biological and chemical events. The 6-h tabletop drill included the simulation model to nuclear events, the simulation model to biological events, the simulation model to chemical events, and the simulation model to overall unknown conditions. Each section included the practice of triage, decontamination, medications, dosing, resuscitation at ED, and incident command system (ICS) at field and at hospitals. This study was focused upon the accuracy of medications and dosing, especially for those simulated victims less than 8 years.

The simulated victims were triage according to START (simple triage and rapid transport) protocol. The victims were thus categorized as four categories such as Black (deceased or expected), Red (CRITICAL: likely to survive if simple care given within minutes), Yellow (URGENT: Likely to survive if simple care given within hours), and Green (MINOR: likely to survive even if care delayed hours to days. May be walking OR stretcher cases). There were 2 BLACK, 12 RED, 5 YELLOW and 1 GREEN simulated victims in all.

Eighty-three students were randomized to two groups. Group A (n=41) were provided the Broselow Emergency tape in consideration of correct dosing for pediatric population whereas Group B (n=42) did not have the tape. A 20-item questionnaire containing questions concerning management of different conditions from pediatric population was fulfilled from each student. The total scores for each group were calculated and compared. The pattern of errors were also recorded and compared. The sources of these errors were analyzed, too.

Dosing errors are defined as the difference between given dose and correct dose more than 10%.

Statistical analysis

The categorical data were imputed in Microsoft Excel 2000 for descriptive statistics and further qualitative analyses using the chi-square test. The continuous variables were analyzedusing ANOVAfor inter-group differences. A P <0.05 was considered to be statisticallysignificant.

Results

Overall performance

The average score was 83±9 points for Group A and 77±8 points for Group B (P<0.01). Different triage status might result in different performance. Of all errors, 75% occurred in REDsimulated victims, 20% in YELLOW ones and 5% in GREEN ones. There were no significant differences in distribution of errors according to triage status between Group A and Group B (P=NS).

Analysis of errors

The causes of errors were categorized as misuse of agents, dosing errors, and missing data. There are significant differences in dosing errors judged by absolute scores between Group A and Group B (11± 4 points vs 19±5 points, P<0.05) whereas no differences were met in misuse of agents (3±4 points vs. 4±5 points, P=NS) and in missing data (3±5 points vs. 1±3 points, P=NS). In the viewpoint of relative contribution of errors, misuse of agents contribute to 18±5% for Group A and 17±5% for Group B (P=NS). In addition, there was significant difference in the percentage of dosing errors between Group A and Group B (65±18% vs. 83±21%, P<0.05). There was also significant difference in relative contribution from missing data (18±7% vs. 4±5%, P<0.01).

Discussion

This study demonstrated that use of Broselow Emergency tape was not enough in prescription and dose calculation for pediatric population in the setting of disaster simulations. The main drawbacks included lacking the information of antidotes for cyanide, radiation agents and biological agents. A modified Broselow Emergency tape should be needed to resolve such a dilemma.

The original tape was the invention of Dr. Jim Broselow, an emergency physician in Hickory, North Carolina. By his own admission, as a family physician he felt pretty comfortable with caring for very sick adults, but when the patient was a critically ill or injured child, he describes chaos, terror and lack of confidence on the part of emergency care providers. He was sure that there was a better way to care for these children that would provide consistency and standardization.

Dr. Broselow developed a simple tool to increase the accuracy of weight estimation using height-weight correlations from the National Center for Health Statistics.[11] The Broselow Tape has become a golden standard in pediatric emergency care.[11-15] Use of the tape has been the subject of several studies that validate its use.[12-15] Analysis shows that mean medication dosing error severity when subjects used the B-LPS was 34% lower then when B-LPS was not available.[15] The tape may is recommended for use on any child under the age of 12 years

old. For any child that is longer than the tape, the practitioner should use adult doses and equipment.

However, the Broselow Emergency Pediatric tape is focused upon medications used in resuscitation such as APLS and BPLS.[16] The antidotes used in radiological, chemical and biological agents are not included in the tape. It may be considered to use dosing cards designed by Center for Disease Control in the United States. We can imagine that the responders should bring at least both the Broselow Emergency Pediatric tape and the dosing cards in the setting of disasters. It may be more realistic to implement the information about antidotes for NBC events into the Broselow Emergency Pediatric tape.

In conclusion, the main pitfall of Broselow Emergency tape was lacking the information of antidotes for cyanide, radiation agents and biological agents. A modified Broselow Emergency tape should be needed to resolve such a dilemma.

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