# Increasing Knowledge and Perceptions of Disaster Preparedness: A Brief Educational Intervention on Evacuation Procedures at a Free-Standing Children's Hospital

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## Abstract

Disasters occur unpredictably, which generally leads to inconsistent training efforts on disaster preparedness and response. Globally, research has shown that disaster education is significantly lacking, especially for nurses and other first responders[1,2,3]. Patient evacuation, in particular, is an aspect of disaster preparedness that has been researched minimally[4,5,6].

Nonetheless, disasters can trigger the need to evacuate health care facilities, such as what was witnessed during Hurricane Katrina. Therefore, it is critical for health care organizations to develop plans addressing evacuation, educate hospital staff on those response procedures, and practice those protocols through drills and exercises[7].

In reviewing the evacuation plan of a children's hospital in Southern California, gaps in evacuation processes and staff education were identified. Communicating these gaps helped engage stakeholders to review the organization's evacuation plan and pilot an educational intervention in an overflow pediatric intensive care unit (PICU) that was newly re-opened.

## Methods

The question posed by this project was: **for inpatient PICU nurses, does the presentation of evacuation concepts and weekly education, as compared to no presentation and education, increase disaster knowledge and perceptions of preparedness over five weeks?**

The project methods included:

- Pre-intervention assessment of disaster preparedness knowledge amongst PICU nurses (See Table 1)
- A working group to assess evacuation concepts (See Fig. 1)
- Weekly disaster preparedness tips (See Fig. 2)
- Evacuation concepts presented at 2 PICU staff meetings
- Post-intervention assessment of disaster preparedness knowledge (re-assessment)

*NOTE: The assessment tool was adapted from a tool validated in previous studies*[8].

During the working group sessions, the following key concepts of evacuation were discussed:

- Patient prioritization (reverse triage) (See Fig. 3)
- Patient tracking
- Evacuation locations
- Evacuation equipment

### Figure 1

**Weekly Meetings (Project Plan)**:

WEEK 1: Presentation
- Overview of problem, project objectives, review of current evac plan, sharing of EVAC123 and other hospital's evacuation guides

WEEK 2: Breakout Rooms
- Clinical = patient prioritization (reverse triage), patient tracking
- Non-clinical = evacuation locations (staging areas, routes)

WEEK 3: Breakout Rooms
- Clinical = clinical equipment necessary for evac (ranking importance) → evac go-bags
- Non-clinical + transport = transport equipment for evac; locations of equipment

WEEK 4: Group Discussion
- Coms modalities
- Overview of entire guide

The working group consisted of bedside staff (clinical nurses and respiratory care practitioners), internal transport team, emergency transport team, emergency management, house supervisors, and safety/security.

### Figure 2

**Weekly Education Topics (PICU RNs)**:

WEEK 1: Evacuations should never be spontaneous. If a disaster or emergency occurs, the hospital may issue a CODE TRIAGE (internal or external). Evacuation orders would come from the Incident Commander, a role often initially filled by the House Supervisor.

WEEK 2: The hospital's emergency preparedness manual can be found on insideCHLA under the Employee Quick Links. Do you know that CHLA has an evacuation plan? Take some time this week to review the document. Evacuation information can also be found in your unit's "Emergency Preparedness Procedures" flipchart. Do you know where those are located?

WEEK 3: Evacuations can occur either horizontally or vertically. Horizontal movement is the firs preferred route, whereas vertical evacuation is for worst-case scenarios. Ideally, patients in the Page PICU should be relocated to the PACU or CTICU (horizontal evacuation). Vertical evacuation could occur via the stairwell near the Tiger elevators that lead down to the Altamed pod area (which is the old ED).

WEEK 4: Emergency nurses taught about the START model, which is the industry standard method for triaging a surge of victims in a disaster. This model helps identify the sickest people so they can be treated first. However, the opposite must be considered for evacuation scenarios. Remember that the most critically ill patients must be transported last because they require the greatest number of resources (meaning staff & equipment) to move.

- *Mention EAP this week. "If this causes stress, please reach out to EAP"*

### Table 1: Pre-Intervention Data Trends

| Variables | Correlation | Statistical Test |
|---|---|---|
| Years of Experience & Familiarity Scores | Moderate ($r_s = 0.68$) | Spearman's Rank Correlation |
| Previous Disaster Experience & Perception of Preparedness | Yes ($p = 0.02$) | Mann-Whitney U Test |
| Years of Experience & Perceptions of Preparedness | Strong ($r_s = 0.71$) | Spearman's Rank Correlation |
| Years of Experience & Personal Preparedness | No ($p = 0.60$) | Mann-Whitney U Test |
| Previous Disaster Experience & Personal Preparedness | No ($p = 0.99$ and $0.09$) | Fisher's Exact Test |
| Familiarity with Reverse Triage & Comfort Leaving Patient Behind | Weak ($r_s = 0.32$) | Spearman's Rank Correlation |

### Table 2: Comparison of Pre and Post Data

| % Change | Attended PICU Staff Mtg | Weekly EDU Was Helpful | Part of Project Workgroup |
|---|---|---|---|
| - 8% | No | No | No |
| 0% | No | No | No |
| 0% | No | No | No |
| + 8% | Yes | Yes | No |
| + 21% | Yes | No | No |
| + 22% | No | Yes | No |
| + 28% | No | Yes | No |
| + 28% | No | Yes | Yes |
| + 33% | Yes | Yes | No |
| + 35% | Yes | Yes | No |

### Figure 3. Modified TRAIN Tool (for reverse triage)

This tool is a modified version of Stanford's TRAIN (Triage by Resource Allocation for Inpatients) model[9].

The incorporation of clinical support (pink rows) into our modified reverse triage tool helps to further define how many resources it will take to move a patient.

This clinical support concept was inspired by an evacuation guide from British Columbia Children's Hospital[10].

| Acuity | Blue/Level 5 | Green/Level 4 | Yellow/Level 3 | Orange/Level 2 | Red/Level 1 |
|---|---|---|---|---|---|
| Life Support* | Stable | Stable+ | Minimal | Moderate | Maximal |
| Mobility** | Car/Car Seat | Wheelchair or Stretcher | Wheelchair or Stretcher | Stretcher | Incubator or Immobile |
| Nutrition | All PO | Intermittent Enteral | Continuous Enteral or Partial Parenteral | TPN Dependent | |
| Pharmacy | PO Meds | Intermit IV Meds | IV Fluids | IV Drip x 1 | IV Drip ≥ 2 |
| Clinical Support | 1 Other*** | 1 RN or Other*** | 1 RN, 1 Other*** | 1 MD, 1 RN, 1 RCP, 1 Other*** | 1 MD, 2 RNs, 1 RCP (+1 perfusionist, if ECMO) |

| | | |
|---|---|---|
| *Life Support | Stable+ | Low flow oxygen |
| | Minimal | Oxygen hood, chest tube, etc. |
| | Moderate | CPAP/BIPAP/Hi-Flow, Conventional Ventilator, Peritoneal Dialysis, External Pacemaker, Continuous Nebulized Treatments, etc. |
| | Maximal | Highly specialized equipment (e.g., Neonatal Ventilator, HFOV, ECMO, iNO, CVVH, Berlin Heart, weight ≤ 1.5 kg, etc. |
| **Mobility | Car/Car Seat | Able to ride in automobile with age-appropriate restraints, or Able to be held/carried in adult's arms (internal facility transport only) |
| | Incubator | Transport incubator with equipment for connecting to ambulance |
| | Immobile | Unsafe to move without special equipment (e.g., neurosurgical, bariatric) |
| ***Other | Anyone available, unlicensed (e.g., CP, transport) or licensed (e.g., RN, RCP, MD) | |

## Results

This project was evaluated using two metrics:

- Recommendations from working group addressing each of the key evacuation concepts (listed in methods section)
- An increase in disaster knowledge and perceptions of preparedness (by comparing data from pre- and post-intervention assessments).

The working group addressed each of the key evacuation concepts, which were then incorporated into the revision of the organization's evacuation plan. The most valuable result from the working group was the modification of Stanford's reverse triage tool (See Fig. 3).

The second metric (knowledge and perceptions) was more difficult to assess due to the project limitations. Forty-four pre-intervention assessments were completed, but only seventeen post-intervention responses were received. Furthermore, only ten of those responses were able to be paired due to discrepancies in the unique identifiers self-chosen by the respondents. Despite the limited data set, some conclusions were able to be drawn (see Table 2).

## Conclusions

There is some evidence that the educational interventions produced an increase in familiarity scores. While the pre-intervention data did show strong correlations between years of experience and higher knowledge and perceptions, there is no way to predict when someone will gain practical experience during a real-world disaster.

Limitations of this project are small sample size, respondent bias, and time constraints. Nurse burnout and short staffing most likely resulted in a lower response rate for the post-intervention assessment. The project timeline was also accelerated to fit within a master's program practicum. Finally, the survey data was from a convenience sample and did not assess any application of knowledge, including the useability of the modified TRAIN tool.

There is an opportunity for future research in developing a more robust intervention that lasts longer than five weeks and requires active participation from the individuals being educated. Another aspect is assessing information retention, which speaks to how often disaster training should occur to keep information fresh in the minds of frontline clinicians.

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