Disaster Preparedness: Emergency Planning in the NICU

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A DISASTER IS ANY NATURAL OR MAN-MADE EMERGENCY that, because of its complexity, scope, or duration, threatens the hospital's capabilities and requires outside assistance to sustain care, safety, or security.¹ Several natural disasters and terrorist events in recent history have captured the attention of hospitals and government agencies. Examination of health care response plans following these events revealed unsettling patterns of disorganization and weaknesses that may delay response time and result in increased morbidity and mortality, especially in vulnerable populations.² Therefore, a great deal of focus has been placed on the importance of hospitals engaging in advanced emergency planning in preparation for mass casualties and vulnerable populations.

Emergency planning guidelines are available to hospitals, but these resources are limited and may not be well understood by hospital leadership. Schultz, Pouletsos, and Combs³ list several governmental agencies that have established initiatives and standards supporting and guiding the efforts of hospital emergency preparedness programs, including the Department of Health and Human Services (DHHS), the National Incident Management System (NIMS), the Federal Emergency Management Agency (FEMA), and the Occupational Safety and Health Administration (OSHA). Other organizations that influence health care emergency planning include the Centers for Disease Control and Prevention (CDC), Centers

for Medicare and Medicaid Services (CMS), and the Hospital Preparedness Program (HPP).

THE JOINT COMMISSION STANDARDS

In addition to establishing standards that focus on patient safety and improved outcomes, the Joint Commission has provided a framework for comprehensive emergency management for hospitals. The emergency planning standards published by the Joint Commission incorporate guidelines established by other private and governmental agencies. Such standards direct a comprehensive approach to emergency management and incorporate the following four phases: mitigation, preparedness, response, and recovery. Mitigation activities include efforts that reduce or eliminate risk to patients, staff, and property as a result of emergencies and disasters. Preparedness consists of plans and preparations that are aimed at saving lives and facilitating response and recovery

operations. Response efforts focus on saving lives and reducing damage at the time of an emergency. Recovery activities include more long-term interventions such as rehabilitating personnel, repairing equipment, and restocking resources.¹

Disclaimer

This article is not intended to be a comprehensive review of every state's law, nor is it intended to provide legal advice. Seek legal counsel in the event you have questions regarding legal issues.

ABSTRACT

Hospital emergency management has evolved beyond satisfying regulatory requirements. Although tools and resources have been developed to support hospitals in emergency planning, there appears to be a scarcity of resources to guide hospital departments. To ensure that standards of care are maintained and to minimize the impact on the hospital and/or a nursing unit, Good Samaritan Hospital has developed a mobile emergency system and an Emergency Operations Plan (EOP) template to assist other nursing units in their planning efforts. This article focuses on the development of emergency bedside backpacks, mobile disaster boxes, disaster documentation and forms go-kits, and guidelines for creating such a plan. The ongoing equipment testing, inventory rotation, staff training, and exercising response protocols are all crucial to test the effectiveness of the program in place. All these activities require a multidisciplinary approach to ensure integration with hospital-wide emergency planning efforts.

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The Joint Commission standards also address the need for hospitals to take an all-hazards approach to emergency planning, which focuses emergency planning on the identification and examination of a wide range of potential disasters. Emergency planning is ultimately based on the results of an annual Hazards Vulnerability Analysis, which identifies top-ranking threats and allows hospitals to prioritize planning efforts according to the hazards most likely to impact the facility or geographic area. Further, these standards direct hospitals to concentrate efforts on six critical areas, including (a) communications, (b) resource and asset management, (c) safety and security, (d) staff roles and responsibilities, (e) utility management, and (f) patient clinical and support activities.¹

Emergency Operations Plan

As part of emergency planning, hospitals are required by the Joint Commission to have an Emergency Operations Plan (EOP), which is a document that provides the structure and processes used by the facility to respond to and recover from all hazards.¹ Each facility's EOP is intended to provide a framework for dealing with hospital-wide emergencies. However, it is difficult for a hospital-wide plan to address the needs of individual hospital departments or patient populations. Therefore, in addition to the hospital-wide plan, each hospital department and nursing unit must consider taking steps to develop an individualized and detailed EOP to minimize the impact on department or unit operations.²

Hospital Incident Command System

In the 1980s, several government agencies worked together to develop an incident command system as a response to poor coordination of firefighting efforts in California. Hospitals began to work with emergency agencies to apply these principles to create a system that could be used to bring order to emergency situations in hospitals. Ultimately, the Hospital Incident Command System (HICS) was developed.⁴ This system satisfies the Joint Commission's requirement to adopt an identifiable emergency management structure that facilitates responses to emergencies. Briefly, the HICS consists of a flexible organization structure and management principles and includes defined responsibilities and reporting channels. The HICS employs the use of common language to promote internal and external communication and integration with community responders. Implementing the HICS helps hospitals improve their emergency management planning, response, and recovery capabilities and helps hospitals interface more effectively with community response agencies during a disaster.⁵

In addition to establishing an organizational structure and providing descriptions of the roles for staff members serving particular roles, the HICS provides various numbered standardized forms that allow hospitals to track communications and actions taken during an incident, convey information concerning patient care needs, and transmit information

regarding building damage and injuries to patients, visitors, and staff members to the Hospital Command Center (HCC). These forms are sometimes modified by hospitals to best suit the needs of a particular patient population. This is true particularly in the case of HICS Form 260 (Patient Evacuation Tracking Form), which contains specific information related to equipment required to provide care to each patient. This form may be modified for the NICU to include equipment such as cribs, umbilical lines, and mothers' milk, which would not ordinarily be included in this form (Figure 1).

Vulnerable Populations

The Joint Commission¹ standards also direct hospitals to address the management of vulnerable populations in emergency planning. Infants in the NICU clearly represent a vulnerable population, and their needs must be anticipated in the emergency planning process. Infants present challenges because of their unique and complex physiological requirements,⁶ often requiring respiratory support, and are sensitive to changes in external temperature, interruptions in hydration and nutrition, and increased stimulation. Although NICU patients are among the most vulnerable in the hospital and planning for this population must be a priority, tools that provide guidance for emergency planning specifically for the NICU are scarce. The remainder of this article outlines the components of the EOP created for the NICU at Good Samaritan Hospital, a 46-bed Level III unit in San Jose, California. This plan uses concepts from the HICS, the Joint Commission emergency planning standards, knowledge gained through drills and exercises, and the expertise of the hospital's emergency planner in emergency management.

EMERGENCY PLANNING IN THE NICU

After the September 11 terrorist attack and Hurricane Katrina, the medical director of the NICU at Good Samaritan expressed concerns regarding the unit's ability to respond to emergencies that may compromise the care of critically ill infants. As a result, the medical director reviewed the hospital-wide EOP and determined that it was inadequate to meet the needs of the population served by the NICU. This inspired the medical director to write a brief, unit-specific evacuation plan, with the goal of ultimately creating a comprehensive unit-specific emergency response system for the NICU. It became clear that achieving such a goal would require a team approach. Therefore, a NICU disaster subcommittee was assembled, consisting of the medical director, the nursing director, assistant managers, a respiratory therapist, staff nurses, and facility emergency planning personnel. The team conducted a capability assessment to examine the unit's ability to maintain a safe standard of care in the event of an emergency and concluded that the availability of adequate supplies and staff preparation would be given priority. The results of this assessment led to the development of emergency bedside backpacks and mobile disaster boxes, both of which are inventoried and maintained by members of the NICU disaster subcommittee.

FIGURE 1 ■ Patient Evacuation Tracking Form used by Good Samaritan Hospital

HICS 260 – PATIENT EVACUATION TRACKING FORM (NICU)			
1. DATE		2. UNIT	
3. PATIENT NAME (OR LABEL)	4. AGE	5. MR #	
6. DIAGNOSIS (-ES)		7. ADMITTING PHYSICIAN	
8. FAMILY NOTIFIED ☐ YES ☐ NO CONTACT INFORMATION:			
9. ACCOMPANYING EQUIPMENT (CHECK THOSE THAT APPLY)			
☐ Isolette	☐ Monitor	☐ Arterial Line	☐ PICC
☐ Warmer	☐ Oxygen	☐ PIV	☐ Broviac
☐ Bassinette	☐ Ventilator	☐ Peripheral Arterial Line	☐ Breast Milk
☐ Crib	☐ CPAP	☐ UAC	☐ Feeding Tube
☐ Other	☐ Chest Tube(s)	☐ UVC	☐ IV Pumps
ISOLATION ☐ YES ☐ NO		TYPE	
REASON			
10. DEPARTING LOCATION		11. ARRIVING LOCATION	
ROOM#	TIME	ROOM #	TIME
ID Band Confirmed ☐ YES ☐ NO	By:	ID Band Confirmed ☐ YES ☐ NO	By:
Medical Record Sent ☐ YES ☐ NO		Medical Record Sent ☐ YES ☐ NO	
Patient Labels Sent ☐ YES ☐ NO		Patient Labels ☐ YES ☐ NO	
Belongings ☐ with Patient ☐ Left in Room ☐ None		Belongings Received ☐ YES ☐ NO	
Medications ☐ with Patient ☐ Left on Unit ☐ to Pharmacy		Medications Received ☐ YES ☐ NO	
PEDS/INFANTS			
Bag/Mask with Tubing Sent ☐ YES ☐ NO		Bag/Mask with Tubing Received ☐ YES ☐ NO	
Bulb Syringe Sent ☐ YES ☐ NO		Bulb Syringe Received ☐ YES ☐ NO	
12. TRANSFERRING TO ANOTHER FACILITY			
TIME TO STAGING AREA		TIME DEPARTING TO RECEIVING FACILITY	
DESTINATION			
TRANSPORTATION ☐ Ambulance Unit ☐ Helicopter ☐ Other:			
ID BAND CONFIRMED ☐ YES ☐ NO BY: (please print)			
DEPARTURE TIME			
13. FACILITY NAME: Good Samaritan Hospital			

PURPOSE: Document details and account for patients transferred to another facility. **ORIGINATION:** Medical Care Branch Director
ORIGINAL TO: Patient **COPIES TO:** Patient Tracking Manager and Departing Location

HICS 260

Emergency Bedside Backpacks

The availability of appropriate and adequate supplies is important for timely emergency response efforts, so the NICU team compiled a list of essential supplies that would be required to provide routine assessments, respiratory care, nutritional support, and thermoregulation for 12 hours in the event of emergency. This supply list was used to create standardized emergency bedside backpacks (Table 1).

One emergency bedside backpack was placed at each patient bedside with a contents list and breakaway plastic lock attached. If a lock is found to be broken, the contents of the backpack are inventoried and supplies replaced, if needed. The backpacks are also checked after drills and exercises,

TABLE 1 ■ Emergency Bedside Backpack

Purpose: Assembled to provide equipment necessary to maintain and care for an infant during and after an evacuation.

Location: An emergency backpack is stored/hung at each patient's bedside.

Maintenance: NICU disaster subcommittee rotates and/or replenishes items annually and after use.

CONTENTS	
Item	Quantity
Self-inflating anesthesia bag	1
Full-term mask	1
Premature mask	1
Heimlich valve	1
Bulb syringe	1
Stethoscope	1
Chemical warming mattress	1
Thermal blankets	2
Hats	2
Formula 60 mL bottles	4
Nipples	4
Feeding syringes	4
Diapers	4
Diaper wipes	1 package
Flashlight	1
Notepad and pen	1
Watch	1
Hand sanitizer	1 bottle
Sterile gloves, size 6.5	1 pair
Sterile gloves, size 7.0	1 pair
Sterile gloves, size 7.5	1 pair
Sterile gloves, size 8.0	1 pair
Saline wipes	4
Alcohol wipes	4
Adhesive tape	1 roll
Whistle	1
Watch	1

emergency events, and annually for expiration of their contents. Items that are due to expire in the next year are returned to hospital circulation and replaced with more current stock. The backpacks are considered a permanent part of the bed space. Therefore, when patients are relocated or discharged, the exterior of the backpacks are wiped clean.

The upfront cost for purchasing each backpack and the extra stock to fill each backpack was approximately \$100.00 each. A rolling supply box or cart filled with emergency supplies might be an option to conserve costs or in units, such as pediatrics, where patients are mobile and individual backpacks in patient rooms cannot be kept secure. Supply carts may save time on a daily basis, as maintenance and evaluation of supplies is simplified. However, the additional steps involved in distribution of supplies during an emergency may be complicated and confusing, which can delay emergency response times. In addition, supplies on carts are readily visible and easily used for daily or routine care of patients, rather than saved for emergencies. Therefore, care must be taken to ensure that supplies on such carts are labeled and reserved for emergency use only.

Mobile Disaster Boxes

The team also examined the possibility that, during an emergency or loss of utilities, some infants may need more invasive basic procedures. Thus, a list of medical supplies that would be needed for intubation and intravenous (IV) access was created. These supplies were assembled and stored in red mobile disaster boxes (Table 2), located in cupboards in each NICU room for quick and easy access.

Evacuation Exercises

In order to evaluate the NICU's level of preparedness and readiness to execute response protocols, a full-scale evacuation exercise was conducted to test the unit's ability to quickly mobilize critical emergency supplies. This exercise involved the evacuation of 16 dolls with IV access and various forms of respiratory support, mobilizing the emergency bedside backpacks and mobile disaster boxes. Even with these resources in place, the charge nurse was quickly overwhelmed by tasks during the exercise. In addition to maintaining communication with the HCC via the two-way radio and working with the neonatologist to prioritize the patient evacuation sequence, the charge nurse was pressured to assist the rest of the staff in ensuring that patients were prepared for evacuation, necessary equipment was assembled, and appropriate downtime paperwork was distributed and filled out. To establish clear roles and responsibilities and promote staff preparedness, the existing evacuation plan was expanded, Job Action Sheets were developed, and a centralized system to house all guidelines and necessary paperwork for emergencies was created.

NICU Disaster Documentation and Forms Go-Kit

To facilitate the quick mobilization of necessary guidelines, forms, and paperwork, a NICU Disaster Documentation and Forms Go-Kit (Table 3) was created for the unit. This kit is a plastic file with 21 dividers that contain documents such

TABLE 2 ■ Red Disaster Box Medical Supplies

Purpose: Assembled to provide equipment necessary to maintain respiratory care and hydration when supplies are limited.

Location: Room 1, Room 2, Room 4, Room 6, and Room 7. These boxes are located above the sinks in the rooms. The exception is Room 7 where the box is located in the cupboard near the back door.

Maintenance: NICU disaster subcommittee rotates and/or replenishes items annually and after use.

CONTENTS

Item	Quantity
Laryngoscope	1
Blades for laryngoscope	2
Stylettes	3
Endotracheal tubes, 2.5 mm	2
Endotracheal tubes, 3.0 mm	2
Endotracheal tubes, 3.5 mm	2
Endotracheal tubes, 4.0 mm	2
CO ₂ detectors	3
Inline suction	3
Suction tubing	2
6 Fr suction catheters	2
8 Fr suction catheters	2
10 Fr suction catheters	2
Nasal aspirators	2
IV catheters	4
T-connectors	2
Chlorhexidine	2
Saline wipes	2 packages
Alcohol wipes	4
0.9 normal saline vials	2
3 mL syringes	2
18 g needles	2
Microtubing	2
IV tubing	2
D ₁₀ W bags	2
Arm boards	2
4 × 4 gauze sponges	2
Nonsterile 2 × 2s	10
Transparent dressing	2
Adhesive tape	1 roll
Scissors	1 pair
Calculators	2

Key: CO₂ = carbon dioxide; D₁₀W = 10% dextrose in water; Fr = French; IV = intravenous.

as the unit's EOP, emergency response procedures specific to the NICU, HICS forms, emergency contact information, and computer downtime charting forms. An important component of the NICU Disaster Documentation and Forms Go-Kit is unit-specific job cards (Table 4), which use

TABLE 3 ■ Disaster Documentation and Forms Go-Kit

Purpose: Assembled to serve as a reference and facilitate the quick mobilization of necessary guidelines, forms, and paperwork needed in case of emergency.

Location: Charge nurse's office

Maintenance: NICU disaster subcommittee to replenish supplies after use.

Form/Document/Item	Purpose
Laminated job cards	A quick reference task list for staff assigned a role.
Internal phone numbers	As a quick reference to call other departments when necessary
External phone numbers	As a reference to contact other facilities or NICUs to arrange support or transport
Emergency operations plan	Quick reference on response protocols for staff
Critical equipment photos	To assist labor pool personnel when deployed to retrieve critical equipment
HICS Form 214—Operational Activity Log	To record and track activities, decisions, and actions taken during a response
HICS Form 255—Master Patient Evacuation Tracking Form	To record information concerning patient disposition during a hospital/facility evacuation.
HICS Form 260—Patient Evacuation Tracking Form	To document patient needs and account for patients transferred to another facility
Hospital Emergency/Disaster Status Report Form	To convey the status of patients, visitors, staff, and damage to equipment/building to HCC
Drill Critique Form	To evaluate exercise or drill outcome
Blank Kardexes	
Paper Medication Administration Records	
Consent forms	
Progress notes	
Specimen slips	
Staff phone numbers	
Total Parenteral Nutrition Sheets	
Physician Order Sheets	
Transport paperwork	
Clipboard	
Pencils and pens	
Permanent marker	

Key: HCC = Hospital Command Center; HICS = Hospital Incident Command System.

common terminology and mirror NICU Job Action Sheets. These quick reference cards are color coded, laminated, and simplify the actions required by each job classification in checklist format. These durable and waterproof cards are clearly visible at bedsides that are often cluttered with white

TABLE 4 ■ Inpatient Unit Leader (Charge Nurse)

Retrieve the NICU Disaster Documentation and Forms Go-Kit.
Pull the following from the Go-Kit: <ul style="list-style-type: none"> • All job cards • HICS forms (214, 255, and 260) • Emergency/Disaster Status Report Form
Use HICS Form 214 for documenting your actions.
Direct unit clerical leader (secretary) to notify medical director and the NICU manager.
Alert labor and delivery charge RN to the situation and request that a hold be placed on nonemergent deliveries.
Obtain two-way disaster radio from secretary's desk. Upon hearing "CODE TRIAGE" overhead, turn on radio and use for communicating with the Hospital Command Center.
Fill out the Emergency/Disaster Status Report Form and relay information on that form to the command center by phone, radio, fax, or runner.
Assign one area/room unit leader for each room. Give each area leader a job card, downtime charting forms, and HICS Form 260—Patient Evacuation Tracking Form for each patient.
Gather and distribute extra cell phones to area/room leaders, and use these phones for communicating with others in the NICU.
Distribute remaining job cards to logistics unit leader (relief nurse), respiratory unit leader (RT), and unit clerical leader (secretary).
Consult with the physician unit leader (neonatologist) to review patients and determine order of potential evacuation based on level of acuity and nature of event. <i>DO NOT EVACUATE WITHOUT AN ORDER FROM THE HOSPITAL COMMAND CENTER.</i>
Give HICS Form 255—Master Patient Evacuation Tracking Form and Emergency/Disaster Status Report Form to the unit clerical leader (secretary) and instruct him or her to follow the steps listed on his or her card.
Direct labor pool helpers/support persons to assist area/room leaders and logistic unit leader (relief nurse) in gathering and carrying supplies.
If ordered to evacuate by the command center, bring NICU Disaster Documentation and Forms Go-Kit, Charge Nurse Rand, and assignment sheet.

Key: HICS = Hospital Incident Command System; RN = relief nurse; RT = respiratory therapist.

papers and allow staff to quickly identify and focus on prioritizing duties and rapid mobilization of resources.

CREATING THE EMERGENCY OPERATIONS PLAN

After the emergency kits were created and the team participated in emergency exercises, staff became more engaged in the process. NICU management then began working with the NICU disaster subcommittee and the hospital's emergency planner to develop an EOP for the NICU that addressed all four phases of emergency management and all hazards response procedures, as directed by the Joint Commission standards. This resulted in a comprehensive, unit-specific plan that addresses mitigation and preparedness activities at the department level, establishes unit-specific response protocols, and provides recovery guidelines to restore services that may have been interrupted. The remainder of this article presents the template used

in the development of the NICU's comprehensive EOP. This template may be used as a guidance tool for NICUs and other hospital departments when developing a unit-specific plan.

Emergency Operations Plan Introduction

The plan begins with an introduction that defines and contextualizes the unit by incorporating basic information, providing the reader with an overview of the unit's function, patient population, and requirements for the provision of care. Information considered and contained in the introduction includes the following:

- Type of unit
- Population it serves
- Unique patient needs that complicate the provision of care
- Patient acuity
- Average unit census
- Potential to temporarily increase census (surge capacity)
- Usual staffing ratios and numbers of staff required for care
- Staffing ratios that may occur as a result of shortage of care providers
- Basic consumption rates and predetermined supply levels that would be required to sustain the unit for at least 96 hours

Emergency Operations Plan Mission Statement

A mission statement spells out the overall purpose of the program and ensures a sense of direction in terms of what the department is attempting to achieve through its efforts.⁷ This short and formal mission statement focuses on providing safe care under all circumstances and guides the unit's emergency planning program.

Emergency Operations Plan Policy

Hospitals are responsible for responding to emergencies in a manner that protects the health and safety of patients, visitors, and staff. The policy of the EOP provides a set of basic principles that guide emergency planning efforts. The policy addresses the unit's plan for activating the plan, implementing response and recovery procedures, and restoring disrupted services. It is essential that all hospital units work closely with the HCC and external agencies in the event of an emergency to ensure a coordinated response. The plan's policy briefly outlines the unit's plan for these collaborative efforts.

Emergency Operations Plan Scope

It is important to set the tone for emergency planning efforts and provide focus for the work that leads to the formation of the EOP. The scope takes the unique requirements of emergency planning into account to establish criteria, and incorporates the principles and considerations of mitigation, preparation, response, and recovery. Thus, in the creation of the EOP, the scope is aimed at the following:

- Providing a multihazard approach to disaster planning
- Considering and prioritizing all threats to the department and/or the facility

- Creating responses that are integrated with hospital emergency planning efforts
- Incorporating HICS and National Incident Management System concepts and principles
- Satisfying emergency management requirements of the Joint Commission and CMS
- Ensuring maximum compatibility with national and local government response plans
- Meeting other local and state codes and regulations

Mitigation

According to the Joint Commission,¹ mitigation includes ongoing efforts that reduce or eliminate risk to patients, staff, and property as a result of emergencies and disasters. The Joint Commission also asserts that EOPs must be written with an all-hazards approach to mitigation and based on the perceived internal and external threats identified by the Hazards Vulnerability Analysis. Planning and training priority is given to the top-ranking threats for the unit, hospital characteristics, and any pertinent hazards related to geographical region. Mitigation activities in the NICU include but are not limited to the following:

- Alarmed entrances
- The presence of security cameras
- Personnel stationed to detect breeches in security
- Chemicals remaining in original containers or labeled appropriately when transferred
- Availability of Personal Protective Equipment (PPE) in each room
- Clearly labeled emergency supplies to ensure visibility
- Availability and placement of fire extinguishers
- Keeping loose paper to a minimum to avoid combustibles
- Securing equipment, furniture, shelves, and pictures to the walls
- Policies to lock wheels on equipment

Roles and Responsibilities

In case of emergency, some or all of the positions associated with the HICS may be activated hospital-wide. In addition to the HCC and hospital-wide roles, each unit must identify and define roles and responsibilities for key staff positions that may be needed to respond to emergencies. Whether hospital-wide or within a particular unit, these roles are created as Job Action Sheets using the HICS and outlined using common terminology. In addition, staff must receive training to rehearse their roles and responsibilities at staff meetings, departmental workshops, and periodic drills and exercises. The HICS positions that may be activated within the NICU and those who are capable of assuming those roles include the following:

- NICU medical care branch director (unit manager)
- NICU physician unit leader (neonatologist)
- NICU inpatient unit leader (charge nurse)
- NICU bedside nurse room leader (relief nurse [RN])
- NICU bedside nurse (RN)
- NICU logistics unit leader (relief/transport nurse)

- NICU respiratory unit leader (respiratory therapist)
- NICU unit clerical leader (secretary/unit clerk)

PREPAREDNESS

According to the Joint Commission,¹ hospital preparedness consists of plans and preparations that may ultimately save lives and facilitate response and recovery operations in a timely and organized manner. Preparedness efforts address (a) emergency staffing resources, (b) preservation of vital records, (c) communication systems, (d) staff training and education, (e) facility- and community-wide integration efforts, (f) resource and asset management, (g) transport arrangements and (h) 96-hour contingency planning. Therefore, a large portion of the EOP is devoted to preparedness efforts.

Emergency Staffing Resources

In the event of a staff shortage, preparedness efforts in the EOP address medical and nonmedical care providers that may be used during an emergency or disaster along with contact information for such providers. Contingency and emergency staffing resources to be considered for the NICU may include the following:

- Calling in off-duty unit staff
- Internal rapid response team members
- Contracted staffing agencies
- Medical Reserve Corps (MRC)
- Trained hospital volunteers
- Parents and family members

Preservation of Vital Records

Hospitals must identify the most critical information needs for patient care, treatment, and services when creating an EOP. The Joint Commission¹ indicates that plans must be in place to identify alternative means for processing data, providing for recovery of data, and returning to normal operations. Many hospitals rely on electronic medical records. In the event of an emergency or disaster, these electronic charts may not be available. The types of vital records that will accompany patients in the event of a disaster, how charting will occur when computer systems are down, and how records will be stored must be considered. The HICS forms are used to collect patient information and track patients, victims, and fatalities. HICS forms are also used to account for communications, decisions, operational activities, personnel time, and resources used. In addition, after a disaster, these forms may be valuable tools when seeking reimbursement from government agencies. HICS and downtime charting forms necessary for the preservation of vital records are included in the NICU Disaster Documentation and Forms Go-Kit (Table 3).

Communications Systems

In case of an emergency, redundant communication strategies must be established to direct staff and communicate information to patients, families, and external agencies. Hospitals typically rely on several redundant communications systems. It is important to address all communications

systems available to staff as well as the person or department that is responsible for maintaining such systems or devices. Landline phones, cell phones, two-way radios, fax machines, mass notification systems, and Internet websites are all devices that may be listed as communication systems in hospitals. These devices may be used alone or in combination should one or more systems fail. This increases the likelihood that devices will be available to staff for communication in case of emergency. This information should be included in unit-specific emergency plans as well as in the hospital-wide EOP.

Training and Education

The unit's accountability to train staff on facility emergency codes, HICS positions and functions, unit EOP procedures, equipment use, and use of communication devices must be addressed in the plan. Staff training provides an opportunity to enhance competencies and emergency response skills. This training is often accomplished in workshops, skills labs, and staff meetings. The plan is tested during drills, exercises, and tabletops, which provide opportunities to evaluate emergency performance and capability and ensure the competency of staff in the use of emergency equipment and supplies.

Facility- and Community-Wide Integration

It is essential to maximize health care resources and ensure the coordination of scarce resources during a disaster. It is also important to share planning efforts and lessons learned with other units within the hospital and the community. In addition, in order to streamline communication between hospitals and facilitate movement of patients to alternate care settings, hospitals must consider developing plans for responding collaboratively to disasters within large geographic regions.⁸ This may involve establishing alliances with health care agencies spanning several counties. The EOP outlines efforts that integrate the NICU with the hospital's overall emergency management program activities, alliances forged with other similar units, and collaborative efforts with other organizations and community partners.

Resource and Asset Management

According to the Joint Commission, resource and asset management strategies, which allow hospitals to continue to care for patients and support staff, are essential to the EOP.¹ It is important to identify, inventory, and maintain emergency supplies and equipment as part of emergency planning. Standard par levels of medical supplies (72–108 hour supply), critical portable equipment located on the unit (including battery life), and emergency supplies that are essential to the provision of care are identified in the EOP. The person or department that is responsible for managing, maintaining, and conducting annual inventory of supplies for the unit must be identified, and a rotation schedule for expired supplies must also be included in the plan.

Because medication administration is a key component of care in the NICU, it is essential to incorporate planning for pharmaceuticals in the EOP. In the NICU, this may include

medications designated for transport or medications ordinarily located in code carts. In addition, the hospital pharmacy must create a plan that addresses the need to provide medications for hospitalized patients in case of emergency. The pharmacy must stock, inventory, and prepare lists of medications most commonly used in hospital units. These medications are to be used when resources become scarce as part of the hospital's emergency planning efforts.

Transport

In the event of an emergency or disaster, alternative arrangements for transport of infants to other hospitals may become necessary. Establishing community relationships and mutual aid agreements to ensure the ability to reliably and safely transport infants to a safer location for care is important in preparedness efforts. Guidelines for transporting patients to other hospitals are addressed in the EOP. In case of emergency, the hospital's incident commander is responsible for decision making and coordinating patient transports. However, it is important to have documentation and consent forms for transport readily available in the NICU Disaster Documentation and Forms Go-Kit for easy access and completion.

Ninety-Six-Hour Contingency Planning

The Joint Commission¹ dictates that the EOP must identify the hospital's capability to provide care for at least 96 hours and establish contingency plans to sustain or stretch resources until help arrives or services are restored. Therefore, protocols that outline procedures for stretching resources that allow for the continued provision of care with limited supplies and equipment are addressed in the EOP. Procedures for conserving and rationing resources that may become scarce must be planned, and staff must be educated regarding the conservation of supplies in advance.

In the event that resources are at risk for depletion in the NICU, the EOP directs staff to implement rationing such as consolidating feeding schedules to minimize waste of formula, encouraging breastfeeding, and decreasing the number of diaper changes per day. Other contingency plans, such as Memorandums of Understanding with vendors and stockpiles located externally, are also addressed in the EOP.

RESPONSE

According to the Joint Commission,¹ response efforts encompass activities aimed at saving lives and reducing damage from an emergency or disaster. This includes providing emergency assistance to victims, restoring critical infrastructure, and ensuring the continuation of critical services. Hazards that would most likely threaten the NICU are identified, and specific response procedures that are unique to the NICU patient population, location, and floor plan must be created as checklists (Table 5). Any required reporting forms must also accompany these response procedures. In addition, response procedures in the NICU are sometimes different from hospital-wide responses,³ and it is beneficial to detail

TABLE 5 ■ Emergency Response Procedures

ANNEX A: Code triage
ANNEX B: Code red (<i>fire</i>)
ANNEX C: Code purple (<i>child abduction</i>)
ANNEX D: Code pink (<i>infant abduction</i>)
ANNEX E: Code orange (<i>hazardous material spill/release</i>)
ANNEX F: Code gray (<i>abusive/assaultive behavior</i>)
ANNEX G: Code yellow (<i>bomb threat</i>)
ANNEX H: Code silver (<i>assault with weapon/hostage</i>)
ANNEX I: Code shelter in place
ANNEX J: Earthquake
ANNEX K: Power failure
ANNEX L: Heat, ventilation, air conditioning (HVAC) failure
ANNEX M: Medical gas failure
ANNEX N: Medical vacuum failure
ANNEX O: Internal flood
ANNEX P: Sewer system failure
ANNEX Q: Medical information system failure
ANNEX R: Evacuation of the NICU

them separately and attach them to the EOP. Factors that make plans unique to the NICU include the following:

- Inability of patients to ambulate
- Patient requirements for complex respiratory support
- Risks to patients as a result of high concentrations of oxygen
- Patient sensitivities to alterations in temperature and increased stimulation
- Large and complicated equipment that is difficult to move
- Floor plans that are open without individual room doors

Evacuation

When the infrastructure of the hospital is compromised and patients are in danger or an adequate standard of patient care cannot be provided, it may become necessary to evacuate patients to a safer area. However, an evacuation is a very challenging and high-risk activity for the NICU. Thus, special consideration must be given to planning for this particular response procedure. For an emergency evacuation of the NICU to be effective, it would require the coordination of all staff members, the rapid mobilization of equipment, and a flexible evacuation response plan (Table 6). Careful consideration must be given to establishing clear roles and responsibilities, rehearsing of roles, and quick and easy access to emergency equipment, supplies, and documentation forms prepared in advance.

In case of emergency, the hospital's incident commander is responsible for making the decision to evacuate. Evacuation procedures will differ depending on the type of evacuation. Horizontal evacuations occur when moving patients and staff to a safer area on the same floor is sufficient. Vertical evacuations involve moving those in danger to a lower or higher

area. Vertical evacuation is often performed when the entire hospital structure is threatened and all floors need to be emptied. A great deal of equipment can be mobilized during a horizontal evacuation, if time allows. However, when vertical evacuation becomes necessary, elevators may be unsafe or unusable. In this case, it may be safer to use stairs. Therefore, if a vertical evacuation becomes necessary, equipment such as incubators, ventilators, and monitors would most likely be left behind.

The procedure for evacuating the NICU and methods for continuing to provide various types of respiratory support, hydration, and thermoregulation must be outlined in the evacuation response procedure and the staff must be trained accordingly. The following considerations are listed to facilitate a safe evacuation of the NICU⁶:

- More than one staff member may be needed to evacuate infants requiring oxygen support.
- Self-inflating ambu bags may be used to deliver manual breaths to infants.
- High-flow nasal cannula may be considered for infants receiving continuous positive airway pressure (CPAP).
- Methods for portable suction should be available for use in evacuation.
- IV infusions may be stopped temporarily for the purpose of evacuation.
- Portable IV and/or medication pumps may be used to provide hydration for NPO (nothing by mouth) infants.
- Intermittent infusions of IV fluids may be necessary if no pumps are available.
- Infants may be double wrapped with hats to provide warmth.
- Chemical warming mattresses may be used to prevent hypothermia.

To address a potential evacuation of the NICU, a list of critical evacuation equipment must be compiled. Because those who respond to help in an emergency may be labor pool employees or outside emergency responders, it is wise to have photos of each piece of equipment to aid in equipment identification and a more rapid response. Finally, guidelines that detail procedures for providing routine and emergency care during and after evacuation must be evaluated and included in the EOP.

In case of evacuation, the hospital's incident commander is responsible for deciding which patients to evacuate first. The sequence of evacuation will depend on patient acuity and type of emergency. When evacuating an entire hospital, the sequence of evacuation usually begins on the ground floor, working upward. When time allows, the most critical patients are usually evacuated first. There are other circumstances, however, when the sequence of evacuation focuses on saving the greatest number of lives in a short amount of time. In this case, the decision is often made to evacuate lower acuity patients first. This may be deemed necessary when patients are in immediate danger or building structure is clearly compromised.⁹

TABLE 6 ■ Evacuation of the NICU

The removal of patients from one or more rooms of the NICU is considered a partial evacuation. The complete relocation of all patients of the NICU to another area of the hospital or to an area outside the hospital is considered a full evacuation. Moving away from the area of danger but remaining on the same floor of the hospital is considered a horizontal evacuation, whereas vertical evacuation involves moving patients upstairs or downstairs to a safer area.

Under emergency conditions, when patients are in immediate danger, partial or full evacuation of the NICU may be necessary. The first choice for evacuating is a horizontal evacuation to the Second Floor Mother Baby Unit. If a vertical evacuation becomes necessary, infants may be transferred to the First Floor Mother Baby Unit or the Children's Surgery Center. The decision to evacuate can only be made by the incident commander and/or by the fire chief. Once evacuated, personnel and patients may not return to the unit unless ordered to do so by the incident commander or the fire department.

Partial Evacuation of the Unit

- Activate the NICU EOP.
- Use the NICU Disaster Documentation and Forms Go-Kit.
- Adhere to procedures outlined on Job Action Sheets (job cards).
- Employ additional resources needed for transporting infants.
- Bring along portable equipment necessary for the provision of care.
- Using colored tape, mark the doors of the evacuated rooms with an "X."

Full Evacuation of the Unit

- Activate the NICU EOP.
- Lateral evacuation of the NICU is preferable.
- Vertical evacuation—use the stairs unless the incident commander or fire chief approves the use of the elevators.
- Using colored tape, mark the doors of the evacuated rooms with an "X."

Considerations for Evacuating Infants

- Infants shall be carried by nursing staff, if at all possible.
- Evacuate infants in beds or incubators for horizontal evacuation, if possible.
- *Infants who are the least sick* (without oxygen, chest tubes, and so forth) may be transported using evacuation vests with a limit of two infants in each vest.
- Unstable infants shall be carried in arms or in bassinet inserts for vertical evacuation.
- *Infants receiving oxygen via nasal cannula or hood* shall be evacuated using E-cylinder tanks and blended oxygen, when possible. However, these infants may have the oxygen disconnected, if immediate evacuation is necessary.
- *Infants requiring continuous positive airway pressure (CPAP)* may be switched over to high-flow nasal cannula with E-cylinders during evacuation. Use blended oxygen, if possible.
- *Infants requiring mechanical ventilation* will be evacuated using the Neopuff and blended oxygen, if possible. Otherwise, hand-ventilate using the patient's bedside bag or self-inflating bag with E-cylinder, if needed.
- Additional ancillary staff may carry E-cylinders and other equipment during evacuation.

Maintaining Ventilation

- If electricity or generator power is unavailable, intubated infants shall be ventilated using the Neopuff and blended oxygen, if possible.
- Otherwise, hand-ventilate using the patient's bedside bag or self-inflating bag with E-cylinder, if needed.
- Care should be taken to hand-ventilate for short period, switching off with another health care provider, to avoid injury.
- Infants receiving CPAP may be placed on high-flow nasal cannula, as tolerated. Use blended oxygen, if possible.

Suction

- Use portable suction to maintain airway patency for ventilated patients.
- Maintain chest tube systems to water seal, keeping collection chambers below the level of the infant's chest.

Maintaining Heat

- Closely monitor the temperature and glucose of all infants.
- Use regular and warmed blankets and hats, as needed, to maintain temperature.
- Place infants weighing less than 2,000 g in incubators or on open warmers, if available.
- Consider using K-pads or chemical mattresses, as needed and if available.

Maintaining Infusions

- Check battery power for pumps. If not working, locate another pump with functional battery.
- If unable to locate battery-powered pump, give slow IV pushes of appropriate IV fluids.
- Do not exceed the hourly IV rate ordered.
- Provide continuous feedings manually if necessary, with small boluses every 30–60 minutes.

Monitoring Vital Signs

- Use battery-powered pulse oximeters for infants who require continuous monitoring.
- If portable monitoring equipment is not available, assess infant's color visually and respiratory rate and heart rate via auscultation.

At the Evacuation Assembly Area or Alternate Care Site

- Assessment and stabilization shall occur.
- Ensure that all patients are returned to support devices and that all equipment is functional.
- Each patient's nurse will document an objective assessment of the patient's condition using downtime charting forms.
- An assessment of each patient's needs shall be performed and supplies will be distributed from stockpiled supplies in storage areas.

Transport to Outside Facilities

- Once evacuation is initiated, alternative arrangements for transport of infants to other NICUs will be considered if the NICU cannot be repopulated.
- Communication must be established between the incident commander, the County Department Emergency Operation Command Center (DEOC), and the Northern California Perinatal Transport System.
- Bed availability for NICUs in the area can be ascertained through the California Perinatal Transport System website at <http://www.perinatal.org/>.
- The highest acuity infants will be sent to other Level III nurseries.
- Lower acuity infants can be sent to Level II nurseries in the surrounding area.
- Required forms for transporting infants can be found in the NICU Disaster Documentation and Forms Go-Kit.

Recovery and Demobilization

- Unite families with patients.
- Inventory supplies and equipment.
- Evaluate equipment function.
- Remove broken equipment from service and send to Biomed for repair.
- Reorder/replace supplies, as needed.
- Determine whether appropriate HICS forms have been sent to HCC.
- Assure that copies of HICS forms are on charts, as appropriate.
- Place downtime charting forms on charts.
- Gather documentation for reporting injuries.
- Implement Staff Shortage Plan (see Disaster Staffing Resources), if necessary.
- Return to normal staffing levels as soon as possible.
- Monitor mental health needs and provide support for patients, visitors, and staff.
- Conduct debriefing for staff involved in the incident.
- Compile an After Action Report and send to emergency management program manager.
- Implement Corrective Action Plan.

Key: EOP = Emergency Operations Plan; IV = intravenous.

DEMOBILIZATION AND RECOVERY

According to the DHHS,¹⁰ demobilization refers to activities that focus on disengaging resources after objectives are met and operations return to normal function, whereas recovery efforts include more long-term activities, such as rehabilitating personnel, repairing equipment, and restocking resources. To facilitate recovery and system improvement, the following steps are listed in the EOP and are considered priority in the recovery phase after an emergency.

- Treating and reporting injuries
- Implementing staff shortage plans
- Providing emotional support for patients, visitors, and staff
- Uniting families with patients
- Inventorying supplies and equipment
- Evaluating equipment function
- Removing and repairing broken equipment
- Reordering/replacing supplies
- Evaluating the use and effectiveness of HICS forms
- Assuring that copies of HICS and downtime charting forms are on charts
- Returning to normal staffing levels as soon as possible
- Conducting debriefings for staff involved in the incident
- Compiling after action reports
- Implementing corrective action plans and establishing target completion dates

DISCUSSION

Jorgensen and colleagues² recognize that most individual hospital units are unprepared to cope with disasters that disrupt health care infrastructure. Therefore, to prepare for emergencies, it is essential for hospitals to provide staff training in emergency procedures and involve staff members in the creation of comprehensive EOPs that are unit specific. When designing an emergency management program at the department level, it is important for hospital emergency planners to enlist the input of unit managers, clinical nurse specialists, charge nurses, and bedside nurses in addition to representatives from other disciplines, such as respiratory therapists and pharmacists. This multidisciplinary approach to emergency planning results in an effective and useful plan that ensures integration with the hospital's emergency planning efforts.

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