

THE STATE OF PEDIATRIC TRANSPORT

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RETHINKING PEDIATRIC EMS TRANSPORT

In a world without true uniform national standards, where are EMS providers to turn?

Currently, there is no federal standard to test crashworthiness of restraints on cots and no national crash standard available specific to stretchers or ambulances that can be used by manufacturers of ambulance restraints or child passenger safety seats. In 2009 the National Highway Traffic Safety Administration (NHTSA) convened an expert interdisciplinary panel to develop guidelines based upon current pilot testing, manufacturers' recommendations and existing standards for cars.

The result was Working Group Best-Practice Recommendations for the Safe Transportation of Children in Emergency Ground Ambulances, published in 2012, which strives to put forth industry guidelines for properly restraining children in EMS vehicles. The ultimate goals of the recommendations were to prevent forward motion/ejection, secure the torso, and protect the head, neck and spine of all children transported in emergency ground ambulances.

Two years in and the EMS industry in the U.S. is only incrementally closer to developing true universal standards for pediatric ambulance restraints. But the Best-Practice Recommendations have kept the discussion near the forefront of the industry, says one of its authors, Katrina Altenhofen, EMS for Children program manager in Iowa. And that's a monumental step forward for an industry where kids often come a distant second to adults.

The Problem

According to the NHTSA document, estimates "suggest that ground EMS responds to approximately 30 million emergency calls each year. Approximately 6.2 million patient transport ambulance trips occur annually, of which approximately 10 percent of those patients are children. Insurance companies report that approximately 10,000 ambulance crashes result in injury or death each year. Estimates suggest that up to 1,000 ambulance crashes involve

pediatric patients each year."

The problem isn't so much that ambulances are crashing with kids in the back; it's that in the U.S., unlike the U.K. and other countries, there aren't any real standards for restraining patients—children or adults—in the back of a moving ambulance.

"We knew going in to the whole process of writing the recommendations that all of us wanted to shoot for the moon," Altenhofen says. "Many of us had a hard time actually trying to describe the problem in a 10-second sound bite because there are so many moving parts. Early into the process we had to be reminded to modify, or narrow, our scope, realizing there would be limitations to the recommendations." That meant not looking at things like neonatal or interfacility transport, and acknowledging the restraint devices the working group did consider don't have crash test standards.

"Our hope was maybe this document could keep pushing people toward that and we would

keep this issue on the minds of our federal partners. And I can say that, yes, that has happened; for some of us, that has not happened as fast as we'd like to see it, but it is happening," Altenhofen explains.

The Research

According to Altenhofen, when the working group began putting together its best practice recommendations, it tried looking at existing research and hit a wall. "We did a literature search, and found there is no single national EMS dataset in the United States that can be analyzed to better understand the annual number of ambulance trips, the number that involve children, the frequency of ambulance crashes, the victims or types of injuries associated with such crashes, or the possible causes of such crashes. Now, since this document, it's kind of brought forth more of an examination of best practices, or promising practices as I like to call them."

The Recommendations

While the best practice recommendations, available at www.ems.gov/bestpracticerecommendations.htm, laid out in the NHTSA document aren't a rigid standard, they do offer a variety of options EMS agencies can consider based on very specific situations.

The NHTSA recommendations were written with the "ideal" solution in mind for each situation, meaning they meet the ultimate goal of safety and appropriately transporting children

are Limited,' is also presented."

Going further, the NHTSA working group also stated its consensus that it is not appropriate to transport children, even restrained, on the bench seat located in the rear of many ambulances. Included in its recommendations, the NHTSA working group noted some inherent limitations, namely that local, state and national EMS organizations all have their own protocols and guidelines they must operate within. The working group also stated its efforts did not include recommendations of specific child restraint devices or assessments of ambulance design and crashworthiness, among other considerations.

"I'm a paramedic; I still work with a volunteer service here in southeast Iowa—we want the down and dirty, let me know what it is I need," says Altenhofen. "I take great pride that as a workgroup in the five different situations we put forth we were able to address that. That, if you have a child whose X, Y, or Z, this is the ideal way you should restrain them. And if that is not feasible or practical, here's some other practical ways that can potentially achieve that same goal."

According to Altenhofen, the options under any situation can range from commercial child seats to a number of EMS-specific devices. Each device has its pros and cons, not the least of which is many of them can only accommodate children up to 40 pounds, or aren't built for infants. In addition, while some devices are lightweight and easy to store, others—like

instructions for their specific stretcher allow such a device to be used on it. "But that flexibility has also left room for confusion," Altenhofen continues. "If you went to EMS providers in a bunch of different states and asked, 'What kind of child restraints do you need in an ambulance,' they'll probably all say they've got to meet Federal Motor Vehicle Safety Standard No. 213. Well, no, you can't, because that's a motor vehicle standard, not an ambulance standard. However, we do want that restraint device to meet the crash criteria and the injury index of Federal Motor Vehicle Safety Standard No. 213, so we know if that ambulance crashes this device is going to keep that child as safe as a conventional child safety seat in a regular passenger vehicle would."

A Glimpse at the Future

In Altenhofen's perfect world, there would be one restraint device for everyone: "It would be nice if we had a cot that had the ability—no matter who you are, how tall you are, how wide you are—to have a five-point harness system that would fit any person," she explains. "So it wouldn't be that it's just a pediatric device or just an adult device, it is a restraint device that is non-age specific. I could lie on that cot and at 5'11" and 125 pounds you could restrain me, but you could also restrain my husband who is 5'11" and 275 pounds or the kid down the road who's 8 years old and weighs just 75 pounds. That would help so much in an EMS environment, because it's fewer things for providers to have to train on, less equipment they have to think about and work with, etc." Altenhofen hopes in her lifetime we see an ambulance design standard and a testing standard that address safety issues for patients as well as the providers working in the back of the rig.

Fortunately there is now a solution. Quantum EMS (quantumems.com), says in a world without true uniform national standards, it's still managed to develop a solution with its Ambulance Child Restraint (ACR). According to Quantum EMS, they recognized that several hundred thousand children per year were being transported in ambulances while inadequately restrained.

The ACR combines the functionality of several restraint devices into one neat package. The ACR offers the broadest weight range of any dedicated pediatric harness in the world from

"I'm a paramedic; I still work with a volunteer service here in southeast Iowa—we want the down and dirty, let me know what it is I need."

—Katrina Altenhofen

in ground ambulances. But knowing the number and variety of devices available, the authors also provided a backstop for each of the five situations.

"If the Ideal is not Practical or Achievable' is also provided in each of the five situations—this recommendation provides guidance to EMS professionals for the safe transportation of children if the ideal cannot be achieved. For the situation involving the transportation of a child who is uninjured and/or not ill, a third recommendation for safely transporting the child, 'If Resources

commercial car seats—are bulky and impractical for regular use on an ambulance, if they're even recommended by the manufacturer for use in the emergency transport setting at all. And, there's also the cost. Some devices are only available in new ambulance construction, making it an expensive proposition to ensure every ambulance in service at a given agency is properly equipped.

EMS providers must not only look at the instructions of use for the transport device but also for their stretcher, and ensure that the



4–99 pounds. It's been fully crash tested under acceleration and deceleration and it's a universal device, capable of being fitted and secured to any brand of ambulance cot in seconds. And unlike other devices, it can be machine-washed for effective infection control. One big advantage of the ACR is the patient doesn't need to have the restraint removed in order to perform procedures during transport.

Once they're in the restraint there's an open channel between the airway and the waist, so I can keep them restrained and still do procedures on them. Additionally, when you tighten the restraint it tightens into the mattress of the cot, not into the child.

Still, while the ACR does solve the problem of inadequate restraint, without true national standards for restraining pediatric patients in ambulances, nobody is really sure which device(s) to use or when to use them. That's where Quantum EMS saw an opportunity to forward a mission of getting kids to be properly restrained in every ambulance.

It launched its ACR On Board program, in which it works with state EMS children's coordinators, EMS providers and ambulance services to provide additional education about the importance of proper child restraint. The state coordinators can't endorse any products, including the ACR,

but Quantum's support of the participants in the On Board program allows them to better spread the word about the need for proper restraint devices and standards to go with them.

Much of the research on pediatric ambulance restraint that does exist comes from two sources—Marilyn Bull, MD, an Indianapolis-based pediatrician specializing in neurodevelopment disabilities, and another of the NHTSA document's authors, and Nadine Levick, MD, MPH, chair and CEO of Objective Safety, which provides expert insight on emergency transport safety and injury prevention. Both note deficiencies in current pediatric transport practices.

A report headed by Bull, *Crash Protection for Children in Ambulances*,² sought to determine the most effective and reliable means of restraining children on an ambulance cot and to develop recommended field procedures for EMS providers. In testing "successful" methods of securing a convertible child restraint and a modified car bed to the stretcher, it was determined the anchors for the cot did not fare well in dynamic testing. Additionally, restraint devices designed for passenger vehicles were not recommended for emergency use by the manufacturer. Further research by Bull notes utilizing a reinforced securing mechanism on the ambulance cot improves outcomes by 95%, but the cot head needs to be

completely elevated to an upright seat position for optimal restraint.

Levick, a recipient of NHTSA funding to crash-test ambulances, as well as funding from the Emergency Medical Services for Children (EMSC) National Resource Center to observe pediatric transport, found that of 200 ambulances observed carrying 206 pediatric patients, more than half of the patients were lying on the stretcher, and 11% were unrestrained. Additionally, 27% of observed pediatric patients were unrestrained on the bench seat, 10% were on the lap of a parent or EMS provider, and 13 different types of medical equipment were minimally secured or not secured at all. Creating awareness, educating and implementing the ACR into the world of EMS will mean children's injuries will be thing of the past—building a better and safer future for patients. ☺

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DRIVING THE CULTURE IN PEDIATRIC TRANSPORT

It is not uncommon to hear providers talk about how safe EMS is today compared to twenty years ago. Significant advances have been made as patient safety takes a greater focus in EMS, a very risk-filled industry for providers and patients. Common themes of risk include a lack of teamwork, insufficient training, and a punitive culture. When looking at other high risk industries, the common theme is a strong organizational culture focused on safety. From aviation to nuclear power, a strong and positive safety culture is the foundation of the organization, influenced by leaders, and communicated at every level.

The Center for Patient Safety (CPS) believes EMS is experiencing a culture paradigm shift, a logical step in the maturity life cycle that supports the awareness of risk and the reduction of preventable harm. The most significant challenges in supporting a culture shift include defining one's organizational culture, implementing positive cultural changes and determining how to assess the changes.

Is harm preventable in an industry like EMS where every patient encounter is different and risks are all around? (See "Common Themes of Risk.")

Defining Organizational Culture

Organizational culture is a complex topic and has many interpretations, however, in its simplest form, it can be defined as the action, or actions, of an employee when their supervisor is not looking.

An organization's culture is comprised of the many perceptions, attitudes, beliefs, and values which can shape behaviors or decision making.

Safety culture is learned by observable actions of coworkers and leaders and can positively, or negatively, impact patient outcomes.

EMS is a fast-paced environment and it is easy to look for shortcuts and workarounds that save time. While the desire and intent may be well placed in finding greater efficiencies, shortcuts can lead to errors. These types of behaviors are good learning moments and can often be addressed with coaching and education.

One common example of a shortcut is drift. Drift may result in providers not securing the two shoulder straps on a stretcher. Providers may realize the importance of shoulder straps and they may know there is an organizational protocol for using them, but they drift from the

PERCEPTIONS

Definition -

The ability to see, hear, or become aware of something through the senses.



ATTITUDES

Definition -

A settled way of thinking or feeling about someone or something, that is typically reflected in a person's behavior.



BELIEFS

Definition -

Trust, faith, or confidence in someone or something.

VALUES

Definition -

A person's principles or standards of behavior; one's judgment of what is important in life.

protocol because there is a perception that using the straps is time consuming, will interfere with providing patient care, or, in some cases, might mean additional work later to decontaminate the straps. Drift can unintentionally be encouraged by leaders if protocols are, for example, visually available, but verbal cues from leaders suggest shortcuts are tolerated or even celebrated.

Cultural transformation starts at the top of the organization where leaders provide the resources and drive the vision that will guide perceptions, attitudes, beliefs and values. Strong leadership is necessary to develop a culture of safety.

Implementing Culture Changes

Start with a goal to drive dialogue, increase discussion, then implement actions to prevent future safety-related events.

Leaders are responsible for the implementa-

Common Themes of Risk

- Lack of teamwork
- Distraction or inattention
- Lack of training or knowledge
- Lack of standardization
- Competency
- Fatigue or tiredness
- Negative culture of safety
- Lack of communications
- Protocol deviations
- Poor system design or process

tion of provider and patient safety programs and, therefore, need tools to magnify and strengthen their efforts. Consider developing an environment in which the daily aspects of the job keep safety in the forefront with simple, but important, cultural changes.



- Discuss patient safety with new job candidates.
- Conduct daily leadership “walk arounds”.
- Incorporate patient safety in the performance review process.
- Display visible safety posters.
- Start every meeting with a safety story or discussion.
- Recognize, celebrate, and learn from “great catches” that could have resulted in harm.

Assessing Culture Changes

Measuring culture with a validated tool, benchmarking against others and using the results to determine priority areas for improvement is a valuable step in the change process. Many EMS organizations still find their culture to be punitive. A punitive culture is one in which human error is punished, resulting in an organizational culture that is fearful or intimidating.

Rather than lead with fear, leaders should adopt and create a learning environment where open communication and safety improvements are valued. This allows the focus to shift from punishment to understanding what happened, why it occurred, and what can be done so it doesn't happen again.

One of the foundational tenets of patient safety is developing a culture where staff report mistakes. Unless a provider feels safe to come forward and report a mistake, the mistake is likely to reoccur. No situation is the same, but most errors are preventable and most often they are linked to a process failure. The communication of events to determine causal factors can help reduce, or even prevent, future mistakes and harm to patients and providers.

It is time to adopt a safety culture that shifts from personal performance and human reliability to improved systems and safety behaviors.

AS A PROVIDER OR LEADER, ASK YOURSELF... HAVE I CHANGED THE WAY I THINK?

WHAT WE USED TO DO/THINK

Who did it?

Blame the people involved

Failure oriented

Focus on bad events needing RCAs

Reactive

Punish people

Manage by fear

Punishment is the result of poor outcomes

Define employees with rules

Actions are dictated by written policies and rules

Management-oriented

Managers don't interact with employees

"Your idea is wrong"

Beliefs are ethnocentric and self-serving

Safety is a priority

Goals and processes are documented

WHAT WE NEED TO DO/THINK

Why did it happen?

Learn from the people involved

Achievement oriented

Focus on near misses and unsafe conditions

Proactive

Fix processes

Instill desire

Extraordinary efforts and achievements are recognized and celebrated

Guide employees with strong values

Good judgment and situational evaluation drive employee actions

Individuals are self-governing (values)

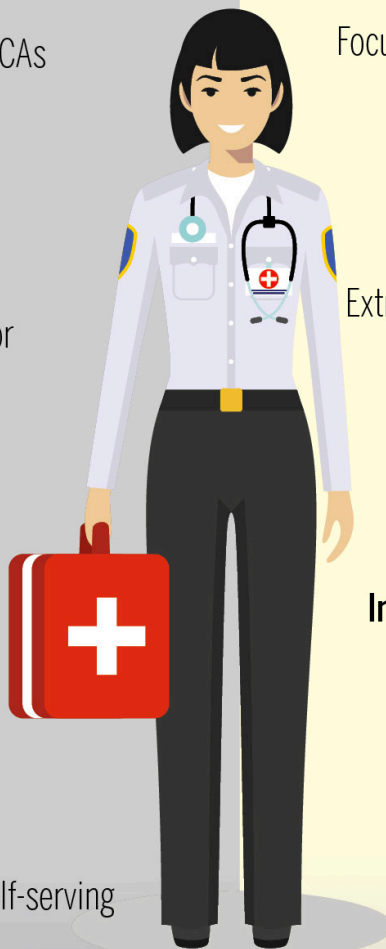
All employees are accountable and two-way communication is expected

"Your idea is different"

New ideas are appreciated and acceptance is the norm

Safety is a value

Safety is the basis for new ideas and necessary change



SAFE INFANT TRANSPORTATION FROM 4lbs - 99lbs

The Ambulance Child Restraint provides the safe and effective transport of infants and children in an ambulance, covering weight ranges from 4lbs to 99lbs.

- History - 9 years proven track record
- Open channel design allows complete patient access from the airway to the waist without unrestraining the child.
- The restraint tightens into the mattress of the stretcher not into the child preventing any additional injury to the patient.
- Compact packaging, the ACR-4 fits into its own 10 x 10 custom bag taking up less room in the back of an ambulance.
- ACR-4 replaces the need to carry multiple devices to accomplish the task of restraining all size patients
- Machine washable



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DID YOU KNOW?...

30,000,000



EMERGENCY CALLS FOR
AMBULANCES EACH YEAR

620,000

PATIENTS ARE CHILDREN



10,000



ACCIDENTS INVOLVING
AMBULANCES EACH YEAR

6,200,000



AMBULANCES TRIPS
EACH YEAR

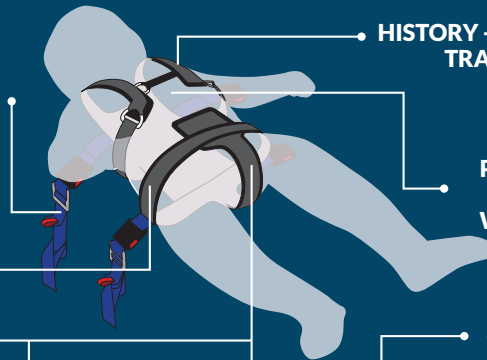
1,000



AMBULANCE ACCIDENTS
INVOLVING CHILDREN EACH YEAR

SOLUTION - THE QUANTUM ACR-4

THE RESTRAINT TIGHTENS
INTO THE MATTRESS OF THE
STRETCHER NOT INTO THE
CHILD PREVENTING ANY
ADDITIONAL INJURY TO THE
PATIENT.



HISTORY - 9 YEARS PROVEN
TRACK RECORD

OPEN CHANNEL DESIGN
ALLOWS COMPLETE
PATIENT ACCESS FROM THE
AIRWAY TO THE WAIST
WITHOUT UNRESTRAINING
THE CHILD.

MACHINE WASHABLE

4 DIFFERENT SIZES



4-11
POUNDS



11-26
POUNDS



22-55
POUNDS



44-99
POUNDS



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"I walked away from this unhurt"



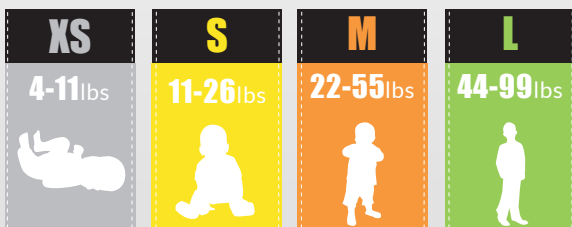
"I was wearing an ACR-4"

The Ambulance Child Restraint provides the safe and effective transport of infants and children in an ambulance, covering weight ranges from 4lbs to 99lbs.



In addition to the Small (11-26lbs), Medium (22-55lbs) and Large (44-99lbs) sizes, this innovative, flexible and fully adjustable harnessing system now comes in an Extra Small (4-11lbs) and are all colour coded for easy selection.

Quick release clips dock with the ACR harness, holding the patient in place to prevent potentially dangerous movement during transportation.



Features and benefits

- History - 9 years proven track record
- Open channel design allows complete patient access from the airway to the waist without unrestraining the child.
- The restraint tightens into the mattress of the stretcher not into the child preventing any additional injury to the patient.
- Compact packaging, the ACR-4 fits into its own 10 x 10 custom bag taking up less room in the back of an ambulance.
- ACR-4 replaces the need to carry multiple devices to accomplish the task of restraining all size patients
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THE SEATBELT
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MULTI - PATIENT TRANSPORTS.**

**TESTED FOR FRONTAL,
REAR AND SIDE IMPACT.**

FDA General Wellness Product
US and International Patents Pending



MULTI PATIENT TRANSPORT

Safely restraining newborn infants for ambulance transport is a critical challenge. Often, mother is restrained and newborn is held unrestrained. However, NHTSA guidelines recommends individual transports, thus separating mother and newborn shortly after birth. An estimated 1,000 ambulance crashes involve pediatric patients annually.

AEGIS[®] THE SEATBELT OF MATERNITY

is an innovative disposable harness system that significantly improves safety and security for newborns during multi-patient ambulance transports to minimize risk of injury. AEGIS provides close proximity for transport team to assess and continually monitor mother and newborn during transport.

AEGIS establishes the best-practice procedure by safely harnessing and restraining the newborn skin to skin with mother. This practice eliminates a separate transport alternative, which has been clinically proven to cause emotional distress.

CURRENT



Possible reasons for multi patient transfers.³

- According to the CDC, home births in the U.S. have increased 29% from 2004 to 2009.
- Complications with home birth requiring transport such as failure to progress, postpartum hemorrhage, perineal tears, neonatal resuscitation, IV therapy, pain relief, deep suctioning, positive pressure ventilation, endotracheal intubation, and CPR.

According to the NHTSA Working Group Best-Practice Recommendations²

"Please note: a child passenger, especially a newborn, must never be transported on an adult's lap. Newborns must always be transported in an appropriate child restraint system. Never allow anyone to hold a newborn during transport."

"If possible, for multiple patients, transport each as a single patient according to the guidance shown for Situations 1 through 4."

"...a rear-facing-only seat will not safely secure a child in a rear-facing EMS provider's seat."

PROPOSED



According to the NHTSA Working Group Best-Practice Recommendations²

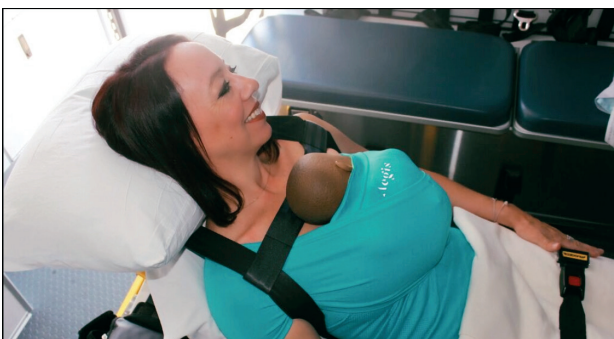
"Seat belt and restraint use for ALL ambulance occupants all of the time."

"Prevent forward motion/ejection, secure the torso and protect the head, neck, and spine of all children transported in emergency ground ambulances."

Considerations for Manufacturers:

"Develop products and provide instructions that improve correct and easier use of devices designed for ambulance use."

SAFE MULTI-PATIENT MOTHER/NEWBORN TRANSPORT



- Transport both patients with one ambulance and crew.
- Decrease mother and newborn stress.
- Suitable for newborns and early infants 4 to 14 lbs (1.8-6.3 kg).
- Skin to skin contact with mother increases healthy microbiome and breastfeeding success.
- Newborn's face is visible, easily monitor breathing by mother and transport team.
- Nanoguard supports newborn's head and neck.
- Pulls newborn limbs close to the torso in a frog-legged natural anatomical/in utero position.
- Harnesses entire newborn torso with 4-way stretch material.
- Quick emergency access 60 lb tested zipper with two sets of eye hook closures for added security.
- Easy access to neonate foot pulse oximeter.
- Allows tubes/lines to pass through.
- X-Static silver thread knitted throughout AEGIS provides the wrap with antimicrobial/anti-odor properties.
- X-Static Silver thread thermoregulatory properties keep newborn warm and helps reduce the risk of hypothermia.
- Transports newborn in inclined position.
- Moms chest acts as a support system like a rear-facing carseat to mitigate impact during a frontal collision.
- Unisex, single use item with 5 customizable sizes.
- Compact and easy to store in ambulance unit.
- Eliminates standard belt system that can pose harm to infant's organs in the event of an accident.
- Pocket for owners manual and instructions.

NHTSA BEST-PRACTICE RECOMMENDATIONS Situations 1-3 and 5 ³

SITUATION 1. For a child who is uninjured/not ill (accompanying an injured or ill patient)
Consult manufacturers' guidelines to determine optimal orientation for the child restraint (i.e., rear-facing or forward-facing) depending on the age and size of the child.

IDEAL SOLUTION. Transport the child in a vehicle other than an emergency ground ambulance using a size-appropriate child restraint system that complies with FMVSS No. 213. Consult child restraint manufacturers' guidelines to determine optimal orientation for the child restraint (i.e., rear-facing or forward-facing) depending on the age and size of the child.

SITUATION 2. For a child who is ill and/or injured and whose condition does not require continuous and/or intensive medical monitoring and/or interventions

IDEAL SOLUTION. Transport the child in a size-appropriate child restraint system that complies with the injury criteria of FMVSS No. 213— secured appropriately on cot.

SITUATION 3. For a child whose condition require3restraint manufacturers' guidelines to determine optimal orientation for the child restraint (i.e., rear-facing or forward-facing) depending on the age and size of the child.

IDEAL SOLUTION.

1. If possible, for multiple patients, transport each as a single patient according to the guidance shown for Situations 1 through 4.
2. Transport in the forward-facing EMS provider's seat /captain's chair, which is currently rare in the industry) in a size-appropriate child restraint system that complies with FMVSS No. 213.
3. For mother and newborn, transport the newborn in an approved size-appropriate child restraint system that complies with the injury criteria of FMVSS No. 213 in the rear-facing EMS provider seat /captain's chair) that prevents both lateral and forward movement, leaving the cot for the mother. Use a convertible seat with a forward-facing belt path). Do not use a rear-facing only seat in the rear-facing EMS provider's seat. You may also use an integrated child restraint system certified by the manufacturer to meet the injury criteria of FMVSS No. 213.

PLEASE NOTE: A child passenger, especially a newborn, must never be transported on an adult's lap or bench seat. Newborns must always be transported in an appropriate child restraint system. Never allow anyone to hold a newborn during transport.

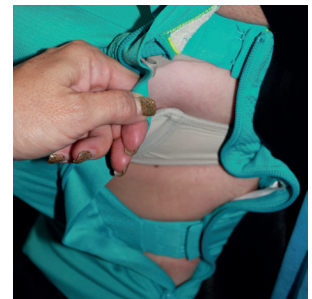
PHOTO GALLERY



X-Static silver thread thermoregulatory properties help maintain newborn's optimal body temperature and help reduce the risk of hypothermia.



Nanoguard provides neck and head support. Newborn's face is visible to transport team.



Zipper and two sets of eye hook fasteners on the left side closest to the transport team provide quick access.



When newborn is removed from AEGIS, mother's chest is covered in tube top style wrap.



AEGIS does not interfere with tubes/lines for assessments, treatments and monitoring



AEGIS is a compact single use item. No need for cleaning, or sanitizing which reduces loss of equipment.

BACKGROUND

The award-winning **AEGIS Neonate Medical Wrap** was originally designed for in-hospital use to:

1. Facilitate the safe hands-free skin to skin bonding for mother and newborn immediately after birth, throughout the hospital stay, and continued through the 28-day neonate phase.
2. Safely positions the newborn exactly as the American Academy of Pediatrics recommends for safe skin to skin bonding of healthy newborns.
3. Reduce the risk of accidental infant falls, suffocations, and sudden unexpected postnatal collapse (SUPC).



- FDA General Wellness Product/Medical Device
- JPMA Innovative Product of the Year - 2017
- Designed and Developed by EMT, Ambulance, and Labor and Delivery Healthcare Professional
- U.S. Women Owned Business
- Current clinical trials with OR, Postpartum, NICU, and US Special Forces

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