The Pennsylvania Traffic Injury Prevention Project &
Department of Transportation present:

Pediatric Safe Transport in Ambulances

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Moderator: Dr. Mary Ann Rigas, MD, FAAP, UPMC Cole Pediatrics

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I have no relevant financial relationships to disclose

Any products that are shown or discussed are only for educational value and attendee understanding of different products available on the market. I do not promote any specific product.

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Objectives

- An overview of child passenger safety issues in ambulances
- An overview of different types of child seats and how they are used based on the size of the child.
- An understanding of Pennsylvania Statewide EMS Guideline #124: Safe Transportation of Children in Ground Ambulances
- An understanding of the common child seat misuses and the injuries which may occur

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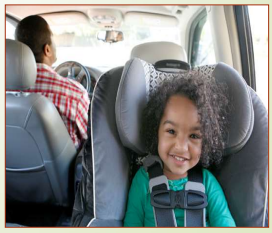
Scope of the Problem

Motor Vehicle Crashes (MVC) are the leading cause of death for children younger than age 13

- Of the 775 children ages 14 and under who died in MVCs in 2015, 274 (39%) were not restrained by an age-appropriate device such as infant car seat, booster seat, or seat belt
- This age group was responsible for 15% of all childhood motor vehicle fatalities



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Big Questions?

- How best to transport children in ambulances from the scene of a traffic crash to a hospital or other facility?
- How or if to use a child safety seat on a stretcher?
- How to properly secure EMS equipment?
- What are the protocols for placement and restraint of injured, ill, or uninjured children in emergency response vehicles?

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National Statistics

Approximately 6.2 million patients are transported by ambulance each year in the US and 10% are pediatric transports. (NHTSA & EMSC)

Each year, approximately 4,500 to 5,000 ambulance crashes occur, 1,000 of those crashes involve the pediatric population (Glatfelters Insurance, 2019)

Frontal impact occurs in 79% of ambulance crashes (NIOSH)

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Pennsylvania Specific Statistics

Total number of patients transported by EMS in 2024 was 2,352,421

Number of pediatric patients transported by EMS in 2024 was 101,068

Pediatric patients are transported in greater numbers with each year

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Pediatric Transport Guidelines

What is the law in Pennsylvania that governs child passenger safety systems in EMS vehicles?

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PA Child Passenger Safety Law

- All drivers are responsible for having children secured in an appropriate child restraint system.
- All children from birth to age four (4) must be secured in an approved child passenger restraint system.
- Children under age two (2) must be secured rear facing in a car seat but should stay rear facing, until the child outgrows the maximum weight and height limits per the car seat manufacturer.

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PA Child Passenger Safety Law

- All children ages four (4) to eight (8) must be secured in a child booster seat with an appropriate seat belt system.
- All children ages eight (8) to eighteen (18) must be secured in an appropriate seat belt system.

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PA Child Passenger Safety Law

- All drivers are responsible for securing children in the appropriate child restraint system.
  - Birth to age four (4) - Car Seat
  - Under age two (2) – Rear facing
  - Age four (4) to eight (8) – Booster
  - Age eight (8) to eighteen (1)8 – Seat Belt
- A child passenger restraint system and a child booster seat shall be used as designated by the manufacturer of the system in motor vehicles equipped with seat safety belts and shall meet the Federal Motor Vehicle Safety Standard (FMVSS 213).

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What does a car seat do?

1. Prevents ejection.
2. Contacts the strongest parts of the body.
3. Spreads forces over a wide area of the body.
4. Helps the body to “ride down” the crash.
5. Protects the head and spinal cord.

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Conventional Child Restraint Types

- Rear-Facing Only
- Convertible
  (Rear or Forward Facing)
- Forward-Facing Only
- Belt Positioning Booster
- Vehicle Seatbelts
- Special Needs Restraints

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Rear Facing Only Car Seats

- Supports entire head, neck & back reducing stress to neck and spine in a crash.
- 5-point harness carrier with a detachable base.
- Infant insert for a better fit.
- More reclined for newborns.

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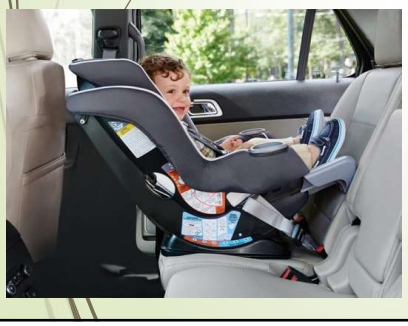
Convertible Car Seat

- Converts from rear facing to forward facing
- 5-point harness system
- Has a forward facing and rear facing belt patch



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Basic Anatomy of a Car Seat

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Combination Car Seat

- Forward facing with 5-point harness then becomes a high-back booster and sometimes a backless booster as well
- Sometimes referred to as two in one or three in one

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Belt Positioning Booster Seat

- Used when a child outgrows a 5-point harness child restraint.

- Two Types
  1. High back
  2. Backless

NEVER use with lap only seat belt

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Booster Seat Transition

All children whose weight or height is above the forward-facing limit should use a belt-positioning booster seat until the vehicle lap and shoulder belt fit properly.

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Seatbelt Use

Lap and shoulder belt should be used for optimal protection.

All children younger than 13-years-old should be restrained in the rear seats of the vehicle for optimal protection.

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Lap and shoulder belt vs. Unrestrained

Seatbelts reduce the risk of serious injury or death by 40% for children ages four (4) to fourteen (14).

If 100% of passengers ages eight (8) to fifteen (15) were properly restrained by a lap and shoulder belt:

45% less deaths would occur
32% less hospitalizations would occur

Lap and shoulder belt vs. lap belt only

For children placed in the center rear, there is 81% less risk of injury with lap and shoulder belt vs. lap belt only

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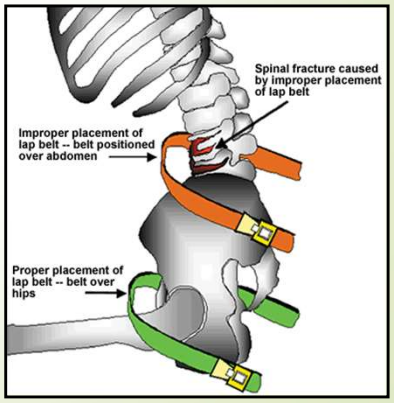
Injury Complex of Improperly placed Seatbelts

Spinal cord or soft tissue damage due to:

- Improper placement of lap belt over the abdomen.

- Lap belt that rides up onto abdomen.



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Seatbelt Syndrome

Lap Belt Ecchymosis

Ruptured Intestine

Source: Crash Injury Research & Engineering Network (CIREN) Project
Children's National Medical Center

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Side Impact Collisions

1 in 4 car crashes involving children are side impact collisions

Most deadly type of collision for children, accounting for **1 in 3** child fatalities.

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Children riding in the front seat are 40 to 70% more likely to be injured than those riding in the rear

Children are 62% less likely to be injured when riding in the center seat

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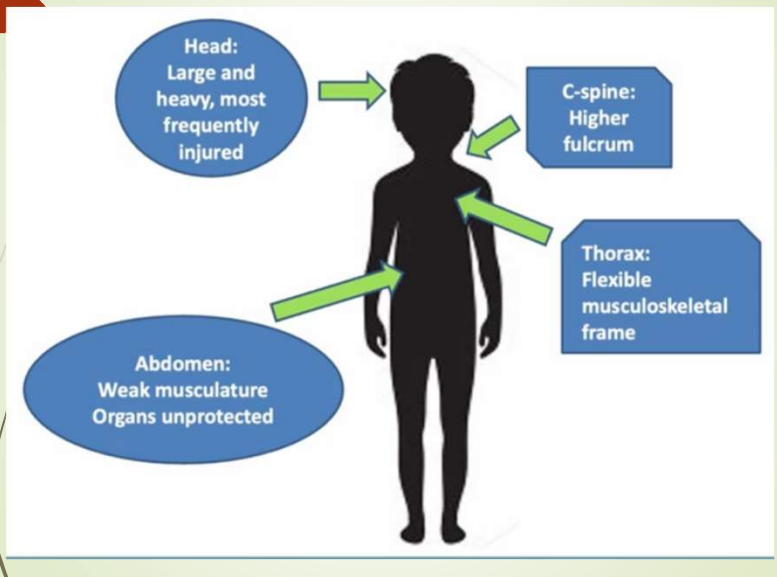

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A **child's head** is the most vulnerable to serious and fatal injuries, accounting for **95 percent** of all injuries sustained whether it is a frontal, lateral, or rear impact crash

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MVC Mechanism of Injury

How is the child secured in the car seat?

- Is the child still in the car seat?
- Is the harness snug?
- Is the seat tethered?
- Is the seat damaged?
- Are the harness straps at the right level?
  - At or just above the shoulders for forward-facing
  - At or just below the shoulders for rear-facing
- Is the retainer clip placed at armpit level?
- What belt path is being used?

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MVC Mechanism of Injury

What else do we want to know?

- Is the car seat tightly secured by seatbelt or lower anchors?
- Which seating position is the car seat in?
- Is it in front of an airbag?

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Child's Car Seat or Other Device

Except for a minor motor vehicle crash (i.e. "fender bender") and when possible, avoid transporting children in their own safety seats if the seat was involved in a motor vehicle crash

Use of the child's own seat can be considered if no other restraint systems are available and the seat shows no visible damage/defect

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Ambulance vs. Passenger Vehicles

- Ambulances are generally larger in size and weigh more
- Built with different materials. Construction is different
- Different crash dynamics
- Different "rules"
- Child restraints for one don't necessarily work in the other
- Retractors may be ELR and not switchable

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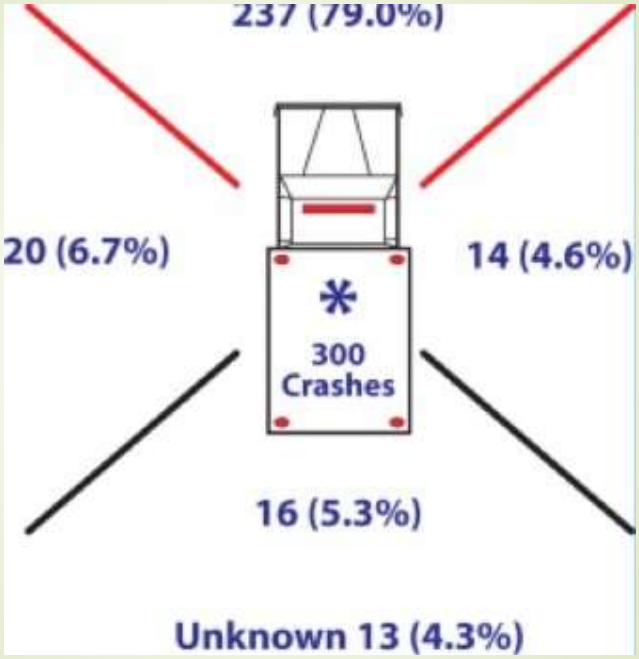

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Ambulance cot and fastener systems should meet vehicle crash conditions of at least 10g

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Crash Testing

- Crash test methodologies are in developmental stages for commercial vendors to test their equipment
- Situations to be tested
  - Supine pediatric patients
  - Seated pediatric patients or child passengers
  - Supine neonatal patients

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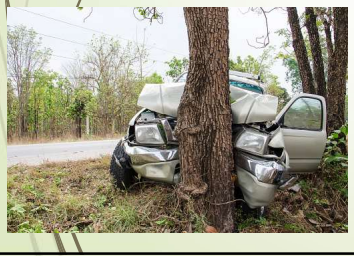
Four Stages of a Crash



- Stage 1. Vehicle strikes object
- Stage 2. Occupant strikes the interior of the vehicle
- Stage 3. Internal organs strike bony structures within the body
- **Stage 4. Projectiles in the vehicle strike the occupant**

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NHTSA's "Solutions to Safely Transport Children in Emergency Vehicles"

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"Solutions to Safely Transport Children in Emergency Vehicles"

Objective 1: Build consensus in the development of a uniform set of recommendations for the safe and appropriate transportation of children (injured, ill, or uninjured) from the scene of a crash or other incident in an ambulance.

Objective 2: Foster the creation of best practice recommendations after reviewing the current practices being used to transport children in ambulances.

Objective 3: Provide consistent national recommendations that will be embraced by Local, State and National EMS organizations, enabling them to reduce the frequency of emergency transport of ill, injured or uninjured children who may be transported in an unsafe or inappropriate manner.

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Pennsylvania Department of Health, Bureau of EMS

Pediatric Safe Transport Guidance

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Pediatric Safe Transport Devices
EMS Information Bulletin 2017-11

Effective: July 5, 2017

- "This device could be for use on an ambulance litter with at least two (2) attachment points to the litter and should incorporate a multi-point restraint system, or as a built-in product in the patient care compartment seat"
- "The Bureau of EMS will require the device have a **minimum weight range of between 10 and 99 pounds (4.5- 45 kg).** "

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PA Statewide BLS Guideline

These guidelines apply to every EMS response resulting in the need to transport pediatric patients who are of an age/weight that require the use of a child safety seat from the scene of an emergency.

BLS Guideline #124

Effective July 7, 2015
Updated July 1, 2017 & September 1, 2019

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2017 BLS Guideline 124:

- The child's age and weight shall be considered when determining an appropriate restraint system

- Child seat models offer a wide range of age/weight limits, so each individual device must be evaluated to determine the appropriateness of use

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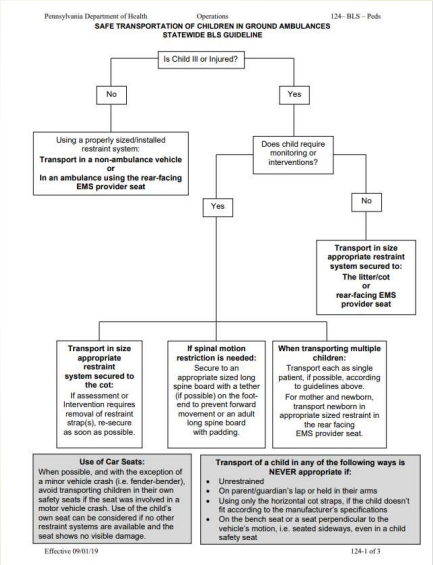
BLS Guideline 124



Pennsylvania Department of Health Operations 124 – BLS – Peds

SAFE TRANSPORTATION OF CHILDREN IN GROUND AMBULANCES
STATEWIDE BLS GUIDELINE

Is Child Ill or Injured?

No

Using a properly sized/installed restraint system:
Transport in a non-ambulance vehicle
or
In an ambulance using the rear-facing EMS provider seat

Yes

Does child require monitoring or interventions?

Yes

Transport in size appropriate restraint system secured to:
The cot
or
rear-facing EMS provider seat

No

Transport in size appropriate restraint system secured to the cot:
If assessment or Intervention requires removal of restraint strap(s), re-secure as soon as possible.

If spinal motion restriction is needed:
Secure to an appropriate sized long spine board with a tether (if possible) on the foot-end to prevent forward movement or an adult long spine board with padding.

When transporting multiple children:
Transport each as single patient, if possible, according to guidelines above.
For mother and newborn, transport newborn in appropriate sized restraint in the rear facing EMS provider seat.

Use of Car Seats:
When possible, and with the exception of a minor vehicle crash (i.e. fender-bender), avoid transporting children in their own safety seats if the seat was involved in a motor vehicle crash. Use of the child's own seat can be considered if no other restraint systems are available and the seat shows no visible damage.

Transport of a child in any of the following ways is NEVER appropriate if:
- Unrestrained
- On parent/guardian's lap or held in their arms
- Using only the horizontal cot straps, if the child doesn't fit according to the manufacturer's specifications
- On the bench seat or a seat perpendicular to the vehicle's motion, i.e. seated sideways, even in a child safety seat

Effective 09/01/19 124-1 of 3

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Best Practices for Ambulance Transport by Situation

Situation #1- When the child is ***not*** injured or ill.

Situation #2 - When the child is ill and/or injured but whose condition does ***not*** require continuous and/or intensive medical monitoring or intervention.

Situation #3 – When the child is ill or injured and who does require continuous and/or intensive monitoring or intervention.

Situation #4 – When the child requires spinal motion restriction and/or lying flat.

Situation #5 – Multiple patient transport (newborn with mother, multiple children, etc.)

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Situation #1

When the child is not injured or ill

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When the child is not injured or ill
1st Choice

The first and best choice is to use acceptable alternative transportation to transport the child to the hospital should appropriate childcare not be available.

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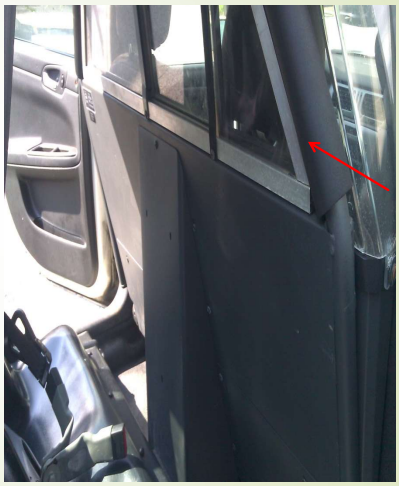
When the child is not injured or ill

NOTE: Do *not* place children in a police car with a prisoner screen or molded seats.



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When the child is not injured or ill
2nd Choice

Transport the child in a size-appropriate child seat on the rear-facing EMS provider (airway) seat.

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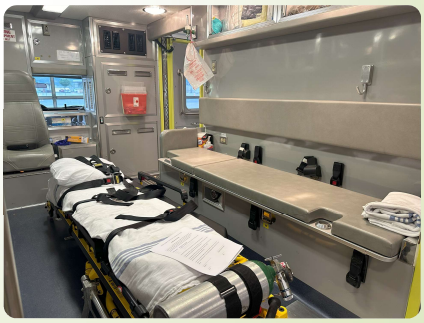
If adjustable, the EMS provider airway seat should be locked into a rear-facing position only when a car seat is secured in that seat.



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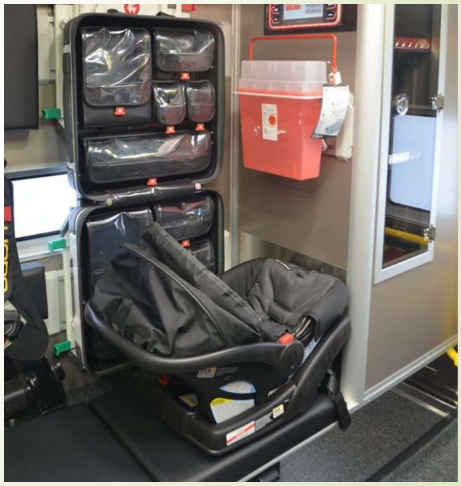
Rear-facing child seat should not face the cab of the ambulance.



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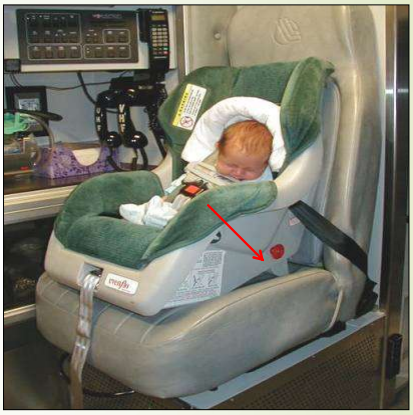
Infant Positioning



Notice the infant's head movement with the kickstand in the up and down positions.

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Integrated Child Seats

- Built into the airway chair.
- Usually for children 20-40 pounds.

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Guardian Safety Seat

This 3-in-1 seat can be ordered to accommodate the needs of the EMS Provider, the toddler and the infant.

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When the child is not injured or ill
3rd Choice

Consider delaying the transport of the child until additional vehicles are available without compromising other patients on the scene.

Consult medical command if necessary

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Situation #2

When the child is ill and/or injured but whose condition does *not* require continuous and/or intensive medical monitoring or intervention.

56

Child is ill or injured but not critical
1st Choice

Transport the child in a size-appropriate child restraint system secured appropriately to the cot.

Conventional CSS or other device that meets FMSS 213

57

Child is ill or injured but not critical
Conventional CSS

Transport the child in a convertible car seat on the stretcher with the child facing the rear/back of the ambulance.

Lift the back of the stretcher up.

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When the child is not injured or ill
EMS Specific Devices

Any other device besides car seats that are used to attach a child to the stretcher when possible, should meet FMVSS 213 standard.

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Ambulance Specific Transport Devices

Quantum EMS Ambulance Child Restraint (ACR)
- 4-99 Pounds
- Can be supine or in fowler's position

Ferno Pedi-Mate Plus
- 10-99 Pounds
- HOB 15-45 degrees

Ferno KangooFix

Ferno Pedi-Mate
- 10-40 Pounds

Ferno Neo-Mate
- 5-15 Pounds

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Ferno Pedi-Mate Plus Pediatric Restraint System

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Ambulance Specific Transport Devices

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Quantum EMS ACR4 System

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Ambulance Specific Transport Devices

These devices are for transportation only and should not be used as a backboard for potential spinal cord injuries

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Pediatric Cot Mounted Restraint

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Child is ill or injured but not critical
2nd Choice

Transport the child in a size-appropriate child seat on the rear-facing EMS provider (airway) seat.

66

Child is ill or injured but not critical
3rd Choice

If the first and second choice are not available and a car seat or other device is not available, secure the child sitting on the stretcher using the three (3) horizontal straps (chest, waist, & knees) and one (1) vertical restraint across each shoulder.

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Situation #3

When the child is ill or injured and who does require continuous and/or intensive monitoring or intervention.

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When child is ill or injured requiring continuous monitoring or intervention

1. Transport in size-appropriate restraint system secured appropriately to the stretcher.

2. Secure the child on the stretcher using the three (3) horizontal straps (chest, waist, & knees) and one (1) vertical restraint across each shoulder. If assessment or intervention requires the removing of strap(s), be sure to re-secure as quickly as possible.

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If the situation changes and the patient needs to be moved to a different location

Stop the ambulance and secure the child in another device (i.e.. Pedi-Mate, Peds Board) to perform ALS interventions such as advanced airway maneuvers

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While it is imperative that assessment and intervention of potentially life-threatening medical events are addressed, it is a priority that the pediatric patient remain secured in the best means possible utilizing Pennsylvania Statewide BLS Guideline 124.

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Situation #4

Child who requires spinal immobilization

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Child who requires spinal immobilization

1. Secure the child with a size-appropriate spine motion-restriction device to the stretcher with a tether at the foot end, if possible. Secured with three (3) horizontal straps (chest, waist, & knees) and one (1) vertical restraint across each shoulder.

2. Secure the child to a standard spine board with padding as necessary and secured using the same configuration as above.

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Situation #5

Children requiring transport as part of a multiple patient transport.

(Newborn with mother, multiple children, etc.)

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Children requiring transport as part of a multiple patient transport

1st Choice

Transport each as a single patient according to the guidance of Situations 1 through 4.

For mother and newborn, transport newborn in an approved size-appropriate restraint system in the rear-facing EMS provider seat with a belt-path that prevents both lateral and forward movement, leaving the cot for the mother.

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Children requiring transport as part of a multiple patient transport

2. Consider the use of additional units to accomplish safe transport, remembering that non-patient children should be transported in non-EMS vehicles, if possible.

3. When available resources prevent meeting the criteria for situations 1 through 4 for all child patients, transport using space available in a non-emergency mode, exercising extreme caution and driving at a reduced speed.

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Even with childbirth in the field, it is **NEVER** appropriate to transport a child held in another's arms or on another's lap.

77

Should you need to separate mother and newborn, how will you ensure appropriate identification and reunification?

78

NEVER TRANSPORT A CHILD ON A BENCH SEAT!

Forward facing – Child seat should not face the cab of the ambulance.

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Do not forget to document your child restraint in the medical record to include using the dropdown boxes

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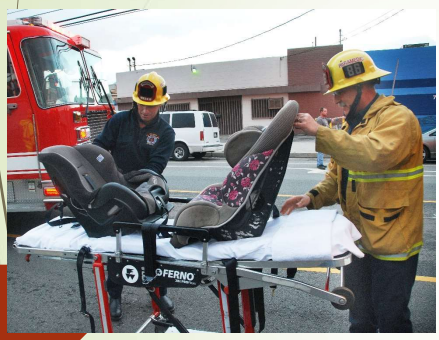
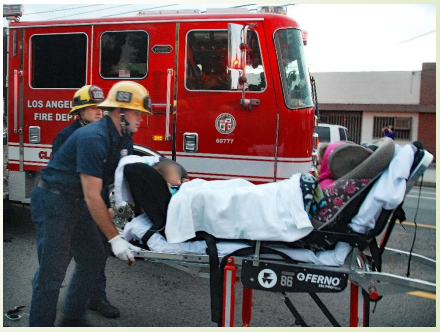
It is NEVER recommended to transport two (2) patients on the same stretcher at the same time





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Thank you!!

- Josh Stuart, Past EMSC Chair
- Bob Hrabar, EMSC Member
- Kathy Strotmeyer, PA-TIPP Western PA Coordinator (R)

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Pediatric Safe Transport in Ambulances

Thank you to our speaker, Bob Carpenter and to our moderator, Dr. Mary Ann Rigas!

Please type questions in the Q&A

Proof of attendance and credit information will be emailed from Zoom tomorrow

A recording of this webinar and documents will be available on www.pakidstravelsafe.org

EMS:
This webinar is approved for a total of 1.0 EMS CE:
0.5 CPC and 0.5 Other CE hours. Must complete evaluation:
https://www.surveymonkey.com/r/PedSafeTxAmbulances
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