



EQUIPMENT FOR AMBULANCES

AMERICAN COLLEGE OF SURGEONS
COMMITTEE ON TRAUMA

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OF EMS PHYSICIANS

PEDIATRIC EQUIPMENT GUIDELINES
COMMITTEE—EMERGENCY
MEDICAL SERVICES FOR CHILDREN
(EMSC) PARTNERSHIP FOR CHILDREN
STAKEHOLDER GROUP

AMERICAN ACADEMY
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Almost four decades ago, the Committee on Trauma (COT) of the American College of Surgeons (ACS) developed a list of standardized equipment for ambulances. Beginning in 1988, the American College of Emergency Physicians (ACEP) published a similar list. The two organizations collaborated on a joint document published in 2000, and the National Association of EMS Physicians (NAEMSP) participated in the 2005 revision. The 2005 revision included resources needed on ambulances for appropriate homeland security. All three organizations adhere to the principle that Emergency Medical Services (EMS) providers at all levels must have the appropriate equipment and supplies to optimize prehospital delivery of care. The document was written to serve as a standard for the equipment needs of emergency ambulance services both in the United States and Canada.

EMS providers care for patients of all ages, who have a wide variety of medical and traumatic conditions. With permission from the ACS COT, ACEP, and NAEMSP, the current revision includes updated pediatric recommendations developed by members of the federal Emergency Medical Services for Children (EMSC) Stakeholder Group. The EMSC Program has developed several performance measures for the Program's State Partnership grantees. One of the performance measures evaluates the availability of essential pediatric equipment and supplies for Basic Life Support and Advanced Life Support patient care units. This document will be used as the standard for this performance measure. The American Academy of Pediatrics (AAP) has also officially endorsed this list.

For purposes of this document, the following definitions have been used: a neonate is 0–28 days old, an infant is 29 days to 1 year old, and a child is >1 year through 11 years old with delineation into the following developmental stages:

Toddlers (1–3 years old)

Preschoolers (3–5 years old)

Middle Childhood (6–11 years old)

Adolescents (12–18 years old)

These standard definitions are age based. Length-based systems have been developed to more accurately estimate the weight of children and predict appropriate equipment sizes, medication doses, and guidelines for fluid volume administration.

Principles of Prehospital Care

The goal of prehospital care is to minimize further systemic insult or injury and manage life-threatening conditions through a series of well defined and appropriate interventions, and to embrace principles that ensure patient safety. High-quality, consistent emergency care demands continuous quality improvement and is directly dependent on the effective monitoring, integration, and evaluation of all components of the patient's care.

Integral to this process is medical oversight of prehospital care by using preexisting protocols (*indirect* medical oversight), which are evidence-based when possible, or by medical control via voice and/or video communication (*direct* medical oversight). The protocols that guide patient care should be established collaboratively by medical directors

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for ambulance services, adult and pediatric emergency medicine physicians, adult and pediatric trauma surgeons, and appropriately trained basic and advanced emergency medical personnel. Current Institute of Medicine (IOM) recommendations encourage each EMS agency to have a pediatric coordinator to specifically coordinate the capability of the service to care for nonadult patients.

Equipment and Supplies

The guidelines list the supplies and equipment that should be stocked on ambulances to provide the accepted standards of patient care. Previous documents regarding ambulance equipment referred to essential or minimal equipment necessary to adequately equip an ambulance. Equipment requirements will vary, depending on the certification levels of the providers, population densities, geographic and economic conditions of the region, and other factors.

The following list is divided into equipment for basic life support (BLS) and advanced life support (ALS) ambulances. ALS ambulances must have all of the equipment on the required BLS list as well as equipment on the required ALS list. This list represents a consensus of recommendations for equipment and supplies that will facilitate patient care in the out-of-hospital setting.

Required Equipment: Basic Life Support (BLS) Ambulances

A. Ventilation and Airway Equipment

1. Portable and fixed suction apparatus with a regulator (per Federal specifications; see Federal Specification KKK-A-1822F reference)
 - Wide-bore tubing, rigid pharyngeal curved suction tip; tonsillar and flexible suction catheters, 6F–16F are commercially available (have one between 6F and 10F and one between 12F and 16F)
2. Portable oxygen apparatus, capable of metered flow with adequate tubing
3. Portable and fixed oxygen supply equipment
 - Variable flow regulator
4. Oxygen administration equipment
 - Adequate length tubing; transparent mask (adult and child sizes), both non-rebreathing and valveless; nasal cannulas (adult, child)
5. Bag-valve mask (manual resuscitator)
 - Hand-operated, self-reexpanding bag; adult (>1000 ml) and child (450–750 ml) sizes, with oxygen reservoir/accumulator; valve (clear, disposable, operable in cold weather); and mask (adult, child, infant, and neonate sizes)

6. Airways
 - Nasopharyngeal (16F–34F; adult and child sizes)
 - Oropharyngeal (sizes 0–5; adult, child, and infant sizes)
7. Pulse oximeter with pediatric and adult probes
8. Saline drops and bulb suction for infants

B. Monitoring and Defibrillation

All ambulances should be equipped with an automated external defibrillator (AED) unless staffed by advanced life support personnel who are carrying a monitor/defibrillator. The AED should have pediatric capabilities, including child-sized pads and cables.

C. Immobilization Devices

1. Cervical collars
 - Rigid for children ages 2 years or older; child and adult sizes (small, medium, large, and other available sizes)
2. Head immobilization device (not sandbags)
 - Firm padding or commercial device
3. Lower extremity (femur) traction devices
 - Lower extremity, limb-support slings, padded ankle hitch, padded pelvic support, traction strap (adult and child sizes)

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4. Upper and lower extremity immobilization devices
 - Joint-above and joint-below fracture (sizes appropriate for adults and children), rigid-support constructed with appropriate material (cardboard, metal, pneumatic, vacuum, wood, or plastic)

5. Impervious backboards (long, short; radiolucent preferred) and extrication device
 - Short (extrication, head-to-pelvis length) and long (transport, head-to-feet length) with at least three appropriate restraint straps (chin strap alone should not be used for head immobilization) and with padding for children and handholds for moving patients

D. Bandages

1. Commercially-packaged or sterile burn sheets
2. Triangular bandages
 - Minimum two safety pins each
3. Dressings
 - Sterile multitrauma dressings (various large and small sizes)
 - ABDs, 10"x12" or larger
 - 4"x4" gauze sponges or suitable size
4. Gauze rolls
 - Various sizes
5. Occlusive dressing or equivalent
 - Sterile, 3"x8" or larger

6. Adhesive tape
 - Various sizes (including 1" and 2") hypoallergenic
 - Various sizes (including 1" and 2") adhesive
7. Arterial tourniquet (commercial preferred)

E. Communication

Two-way communication device between EMS provider, dispatcher, and medical control

F. Obstetrical Kit (commercially packaged is available)

1. Kit (separate sterile kit)
 - Towels, 4"x4" dressing, umbilical tape, sterile scissors or other cutting utensil, bulb suction, clamps for cord, sterile gloves, blanket
2. Thermal absorbent blanket and head cover, aluminum foil roll, or appropriate heat-reflective material (enough to cover newborn)

G. Miscellaneous

1. Sphygmomanometer (pediatric and adult regular and large size cuffs)
2. Adult stethoscope
3. Length/weight-based tape or appropriate reference material for pediatric equipment sizing and drug dosing based on estimated or known weight
4. Thermometer with low temperature capability
5. Heavy bandage or paramedic scissors for cutting clothing, belts, and boots
6. Cold packs

7. Sterile saline solution for irrigation (1-liter bottles or bags)
8. Flashlights (2) with extra batteries and bulbs
9. Blankets
10. Sheets (minimum 4), linen or paper, and pillows
11. Towels
12. Triage tags
13. Disposable emesis bags or basins
14. Disposable bedpan
15. Disposable urinal
16. Wheeled cot (conforming to national standard at the time of manufacture)
17. Folding stretcher
18. Stair chair or carry chair
19. Patient care charts/forms
20. Lubricating jelly (water soluble)

H. Infection Control*

**Latex-free equipment should be available*

1. Eye protection (full peripheral glasses or goggles, face shield)
2. Face protection (for example, surgical masks per applicable local or state guidance)
3. Gloves, nonsterile (must meet NFPA 1999 requirements found at <http://www.nfpa.org/>)
4. Coveralls or gowns
5. Shoe covers
6. Waterless hand cleanser, commercial antimicrobial (towelette, spray, liquid)
7. Disinfectant solution for cleaning equipment
8. Standard sharps containers, fixed and portable

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9. Disposable trash bags for disposing of biohazardous waste
10. Respiratory protection (for example, N95 or N100 mask—per applicable local or state guidance)

I. Injury Prevention Equipment

1. All individuals in an ambulance need to be restrained (there is currently no national standard for transport of uninjured children; see NHTSA Web site, <http://www.nhtsa.gov/> for list of EMS-approved child occupant protection devices)
2. Protective helmet
3. Fire extinguisher
4. Hazardous material reference guide
5. Traffic signaling devices (reflective material triangles or other reflective, nonigniting devices)
6. Reflective safety wear for each crewmember (must meet or exceed ANSI/ISEA performance class II or III if working within the right of way of any federal-aid highway. Visit <http://www.reflectivevest.com/federalhighwayruling.html> for more information.)

Required Equipment: Advanced Life Support (ALS) Ambulances

For EMT-Paramedic services, include all of the required equipment listed for the basic level provider, plus the following additional equipment and supplies. For EMT-Intermediate services (and other nonparamedic advanced levels), include all of the equipment for the basic level provider and selected equipment and supplies from the following list, based on local need and consideration of prehospital characteristics and budget.

A. Airway and Ventilation Equipment

1. Laryngoscope handle with extra batteries and bulbs
2. Laryngoscope blades, sizes 0–4, straight (Miller); sizes 2–4, curved, (MacIntosh)
3. Endotracheal tubes, sizes 2.5–5.5 mm uncuffed and 6–8 mm cuffed (2 each), other sizes optional
4. Meconium aspirator adaptor
5. 10-mL non-Luerlock syringes
6. Stylettes for endotracheal tubes, adult and pediatric
7. Magill (Rovenstein) forceps, adult and pediatric
8. Lubricating jelly (water soluble)
9. End-tidal CO₂ detection capability
 - Colorimetric (adult and pediatric) or quantitative capnometry

B. Vascular Access

1. Crystalloid solutions, such as Ringer's lactate or normal saline solution (1,000-mL bags x 4); fluid must be in bags, not bottles; type of fluid may vary depending on state and local requirements
2. Antiseptic solution (alcohol wipes and povidone-iodine wipes preferred)
3. IV pole or roof hook
4. Intravenous catheters 14G–24G
5. Intraosseous needles or devices appropriate for children and adults
6. Venous tourniquet, rubber bands
7. Syringes of various sizes, including tuberculin
8. Needles, various sizes (one at least 1 ½" for IM injections)
9. Intravenous administration sets (microdrip and macrodrip)
10. Intravenous arm boards, adult and pediatric

C. Cardiac

1. Portable, battery-operated monitor/defibrillator
 - With tape write-out/recorder, defibrillator pads, quick-look paddles or electrode, or hands-free patches, ECG leads, adult and pediatric chest attachment electrodes, adult and pediatric paddles
2. Transcutaneous cardiac pacemaker, including pediatric pads and cables
 - Either stand-alone unit or integrated into monitor/defibrillator

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D. Other Advanced Equipment

1. Nebulizer
2. Glucometer or blood glucose measuring device
 - With reagent strips
3. Large bore needle (should be at least 3.25" in length for needle chest decompression in large adults)

E. Medications (pre-loaded syringes when available)

Medications used on advanced level ambulances should be compatible with current guidelines as published by the American Heart Association's Committee on Emergency Cardiovascular Care, as reflected in the Advanced Cardiac Life Support and Pediatric Advanced Life Support Courses, or other such organizations and publications (ACEP, ACS, NAEMSP, and so on). Medications may vary depending on state requirements. Drug dosing in children should use processes minimizing the need for calculations, preferably a length-based system. In general, medications may include:

- Cardiovascular medication, such as 1:10,000 epinephrine, atropine, antidysrhythmics (for example, adenosine and amiodorone), calcium channel blockers, beta-blockers, nitroglycerin tablets, aspirin, vasopressor for infusion
- Cardiopulmonary/respiratory medications, such as albuterol (or other inhaled beta agonist) and ipratropium bromide, 1:1,000 epinephrine, furosemide
- 50% dextrose solution (and sterile diluent or 25% dextrose solution for pediatrics)

- Analgesics, narcotic and nonnarcotic
- Antiepileptic medications, such as diazepam or midazolam
- Sodium bicarbonate, magnesium sulfate, glucagon, naloxone hydrochloride, calcium chloride
- Bacteriostatic water and sodium chloride for injection
- Additional medications as per local medical director

Optional Basic Equipment

This section is intended to assist EMS providers in choosing equipment that can be used to ensure delivery of quality prehospital care. Use should be based on local resources. The equipment in this section is not mandated or required.

A. Optional Equipment

1. Glucometer (per state protocol)
2. Elastic bandages
 - Nonsterile (various sizes)
3. Cellular phone
4. Infant oxygen mask
5. Infant self-inflating resuscitation bag
6. Airways
 - Nasopharyngeal (12, 14 Fr)
 - Oropharyngeal (size 00)
7. Alternative airway devices (for example, a rescue airway device such as the ETDLA [esophageal-tracheal double lumen airway], laryngeal tube, or laryngeal mask airway) as approved by local medical direction.
8. Alternative airway devices for children (few alternative airway devices that are FDA

approved have been studied in children. Those that have been studied, such as the LMA, have not been adequately evaluated in the prehospital setting).

9. Neonatal blood pressure cuff
10. Infant blood pressure cuff
11. Pediatric stethoscope
12. Infant cervical immobilization device
13. Pediatric backboard and extremity splints
14. Topical hemostatic agent
15. Appropriate CBRNE PPE (chemical, biological, radiological, nuclear, explosive personal protective equipment), including respiratory and body protection
16. Applicable chemical antidote autoinjectors (at a minimum for crew members' protection; additional for victim treatment based on local or regional protocol; appropriate for adults and children)

B. Optional Advanced Equipment

1. Respirator
 - Volume-cycled, on/off operation, 100% oxygen, 40–50 psi pressure (child/infant capabilities)
2. Blood sample tubes, adult and pediatric
3. Automatic blood pressure device
4. Nasogastric tubes, pediatric feeding tube sizes 5F and 8F, sump tube sizes 8F–16F
5. Pediatric laryngoscope handle
6. Size 1 curved (MacIntosh) laryngoscope blade

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7. 3.5–5.5 mm cuffed endotracheal tubes
8. Needle cricothyrotomy capability and/or cricothyrotomy capability (surgical cricothyrotomy can be performed in older children in whom the cricothyroid membrane is easily palpable, usually by the age of 12 years)

Optional Medications

A. Optional Basic Life Support Medications

1. Albuterol
2. Epi pens
3. Oral glucose
4. Nitroglycerin (sublingual tablet or paste)

B. Optional Advanced Life Support Medications

1. Anxiolytics
2. Intubation adjuncts including neuromuscular blockers

Interfacility Transport

Additional equipment may be needed by ALS and BLS prehospital care providers who transport patients between facilities. Transfers may be done to a lower or higher level of care, depending on the specific need. Specialty transport teams, including pediatric and neonatal teams, may include other personnel such as respiratory therapists, nurses, and physicians. Training and equipment needs may be different depending on the skills needed during transport of these patients. There are excellent resources available that provide detailed lists of equipment needed for interfacility transfer

such as the American Academy of Pediatrics Guidelines for Air and Ground Transport of Neonatal and Pediatric Patients.

Appendix

Extrication Equipment

Adequate extrication equipment must be readily available to the emergency medical services responders, but is more often found on heavy rescue vehicles than on the primary responding ambulance.

In general, the devices or tools used for extrication fall into several broad categories: disassembly, spreading, cutting, pulling, protective, and patient-related.

The following is necessary equipment that should be available either on the primary response vehicle or on a heavy rescue vehicle.

Disassembly Tools

- Wrenches (adjustable)
- Screwdrivers (flat and Phillips head)
- Pliers
- Bolt cutter
- Tin snips
- Hammer
- Spring-loaded center punch
- Axes (pry, fire)
- Bars (wrecking, crow)
- Ram (4 ton)

Spreading Tools

- Hydraulic jack/spreader/cutter combination

Cutting Tools

- Saws (hacksaw, fire, windshield, pruning, reciprocating)
- Air-cutting gun kit

Pulling Tools/Devices

- Ropes/chains
- Come-along
- Hydraulic truck jack
- Air bags

Protective Devices

- Reflectors/flares
- Hard hats
- Safety goggles
- Fireproof blanket
- Leather gloves
- Jackets/coats/boots

Patient-Related Devices

- Stokes basket

Miscellaneous

- Shovel
- Lubricating oil
- Wood/wedges
- Generator
- Floodlights

Local extrication needs may necessitate additional equipment for water, aerial, or mountain rescue.

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FOOTNOTE: The evidence in children for selected prehospital care interventions or topics was reviewed in preparation for finalizing this ambulance equipment list. These topics included: (a) child safety and booster seats approved for EMS use; (b) alternative airway devices; (c) spinal immobilization devices including collars; and (d) prehospital use of cuffed endotracheal tubes. The results of this evidence evaluation including full citations will be provided in a companion article authored by the primary reviewers of the topics and the EMSC Stakeholders Group. The evidence in all ages for use of arterial tourniquets and hemostatic agents was also reviewed and will be provided in separate consensus review articles.