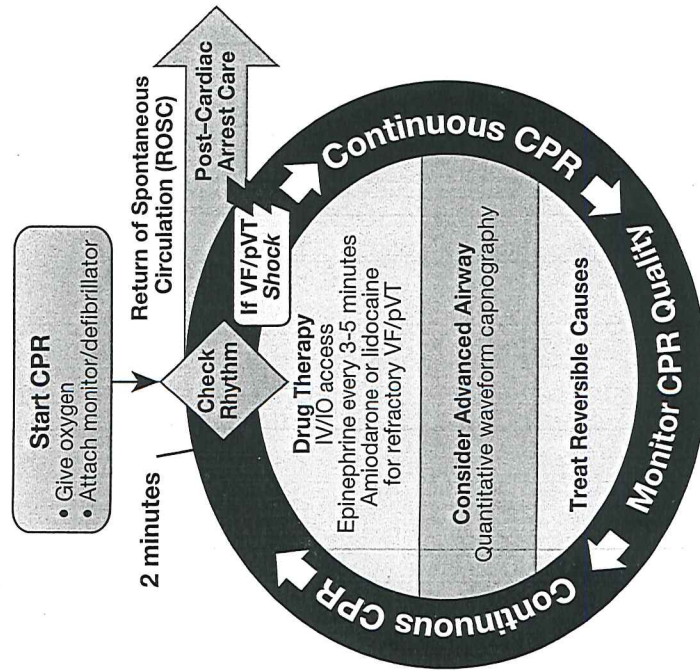




ACLS

Cardiac Arrest, Arrhythmias, and Their Treatment

Cardiac Arrest Circular Algorithm — 2018 Update

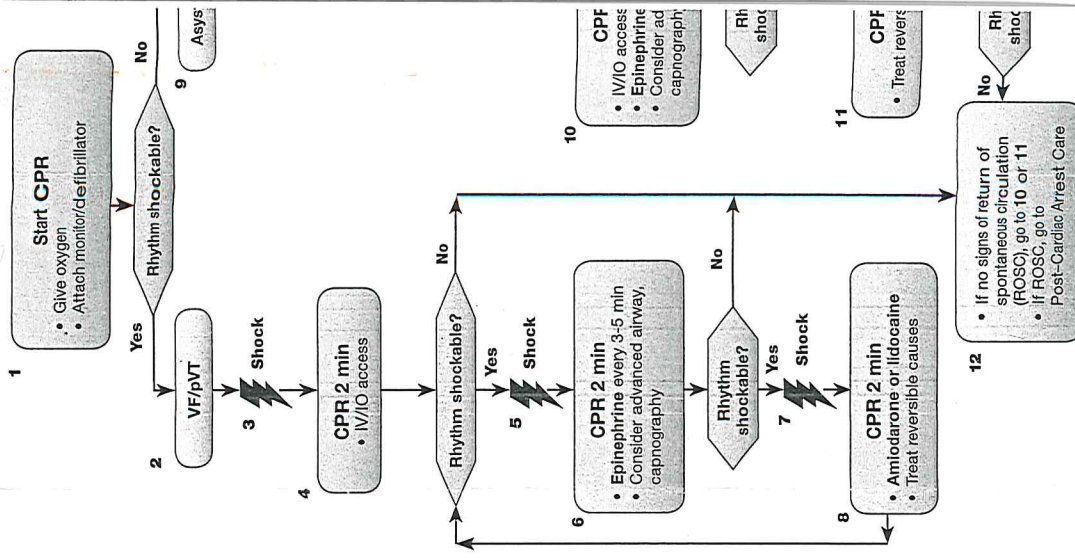


Doses/Details for the Cardiac Arrest Algorithms

CPR Quality	Advanced Airway
<ul style="list-style-type: none"> • Push hard (at least 5 cm [2 inches]) and fast (100-120/min) and allow complete chest recoil. • Minimize interruptions in compressions. • Avoid excessive ventilation. • Change compressor every 2 minutes, or sooner if fatigued. • If no advanced airway, 30:2 compression-ventilation ratio. • Quantitative waveform capnography <ul style="list-style-type: none"> – If $PEtCO_2$, <10 mm Hg, attempt to improve CPR quality. – Intra-arterial pressure <ul style="list-style-type: none"> – If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality. 	<ul style="list-style-type: none"> • Endotracheal intubation or supraglottic advanced airway • Waveform capnography or capnometry to confirm and monitor ET tube placement • Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions
Shock Energy for Defibrillation	Return of Spontaneous Circulation (ROSC)
<ul style="list-style-type: none"> • Biphasic: Manufacturer recommendation (e.g., initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered. • Monophasic: 360 J 	<ul style="list-style-type: none"> • Pulse and blood pressure • Abrupt sustained increase in $PEtCO_2$ (typically >40 mm Hg) • Spontaneous arterial pressure waves with intra-arterial monitoring
Drug Therapy	Reversible Causes
<ul style="list-style-type: none"> • Epinephrine IV/IO dose: 1 mg every 3-5 minutes • Amiodarone IV/IO dose: First dose: 300 mg bolus. Second dose: 150 mg. -OR- • Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose 0.5-0.75 mg/kg. 	<ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary

Advanced Airway	Return of Spontaneous Circulation (ROSC)
<ul style="list-style-type: none"> • Endotracheal intubation or supraglottic advanced airway • Waveform capnography or capnometry to confirm and monitor ET tube placement • Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions 	<ul style="list-style-type: none"> • Pulse and blood pressure • Abrupt sustained increase in $PEtCO_2$ (typically >40 mm Hg) • Spontaneous arterial pressure waves with intra-arterial monitoring
Reversible Causes	Reversible Causes
<ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary 	<ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary

Cardiac Arrest Algorithm — 2018 Update

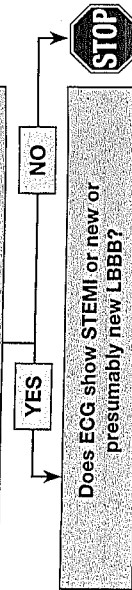


Fibrinolytic Therapy for STEMI

Fibrinolytic Checklist for STEMI*

Step 1

Has patient experienced chest discomfort for greater than 15 minutes and less than 12 hours?



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Step 2

Are there contraindications to fibrinolysis? If ANY one of the following is checked YES, fibrinolysis MAY be contraindicated.

- Systolic BP >180 to 200 mm Hg or diastolic BP >100 to 110 mm Hg YES NO
- Right vs left arm systolic BP difference >15 mm Hg YES NO
- History of structural central nervous system disease YES NO
- Significant closed head/ facial trauma within the previous 3 months YES NO
- Stroke >3 hours or <3 months YES NO
- Recent (within 2-4 weeks) major trauma, surgery (including laser eye surgery), GI/GU bleed YES NO
- Any history of intracranial hemorrhage YES NO
- Bleeding, clotting problem, or blood thinners YES NO
- Pregnant female YES NO
- Serious systemic disease (e.g., advanced cancer, severe liver or kidney disease) YES NO

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Step 3

Is patient at high risk? If ANY one of the following is checked YES, consider transfer to PCI facility.

- Heart rate \geq 100/min AND systolic BP <100 mm Hg YES NO
- Pulmonary edema (rales) YES NO
- Signs of shock (cool, clammy) YES NO
- Contraindications to fibrinolytic therapy YES NO
- Required CPR YES NO

*Contraindications for fibrinolytic use in STEMI are viewed as advisory for clinical decision making and may not be all-inclusive or definitive. These contraindications are consistent with the 2004 ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction.

†Consider transport to primary PCI facility as destination hospital.

Contraindications for fibrinolytic use in STEMI consistent with ACC/AHA 2007 Focused Update*

Absolute Contraindications

- Any prior intracranial hemorrhage
- Known structural cerebral vascular lesion (e.g., arteriovenous malformation)
- Known malignant intracranial neoplasm (primary or metastatic)
- Ischemic stroke within 3 months EXCEPT acute ischemic stroke within 3 hours
- Suspected aortic dissection
- Active bleeding or bleeding diathesis (excluding menses)
- Significant closed head trauma or facial trauma within 3 months

Relative Contraindications

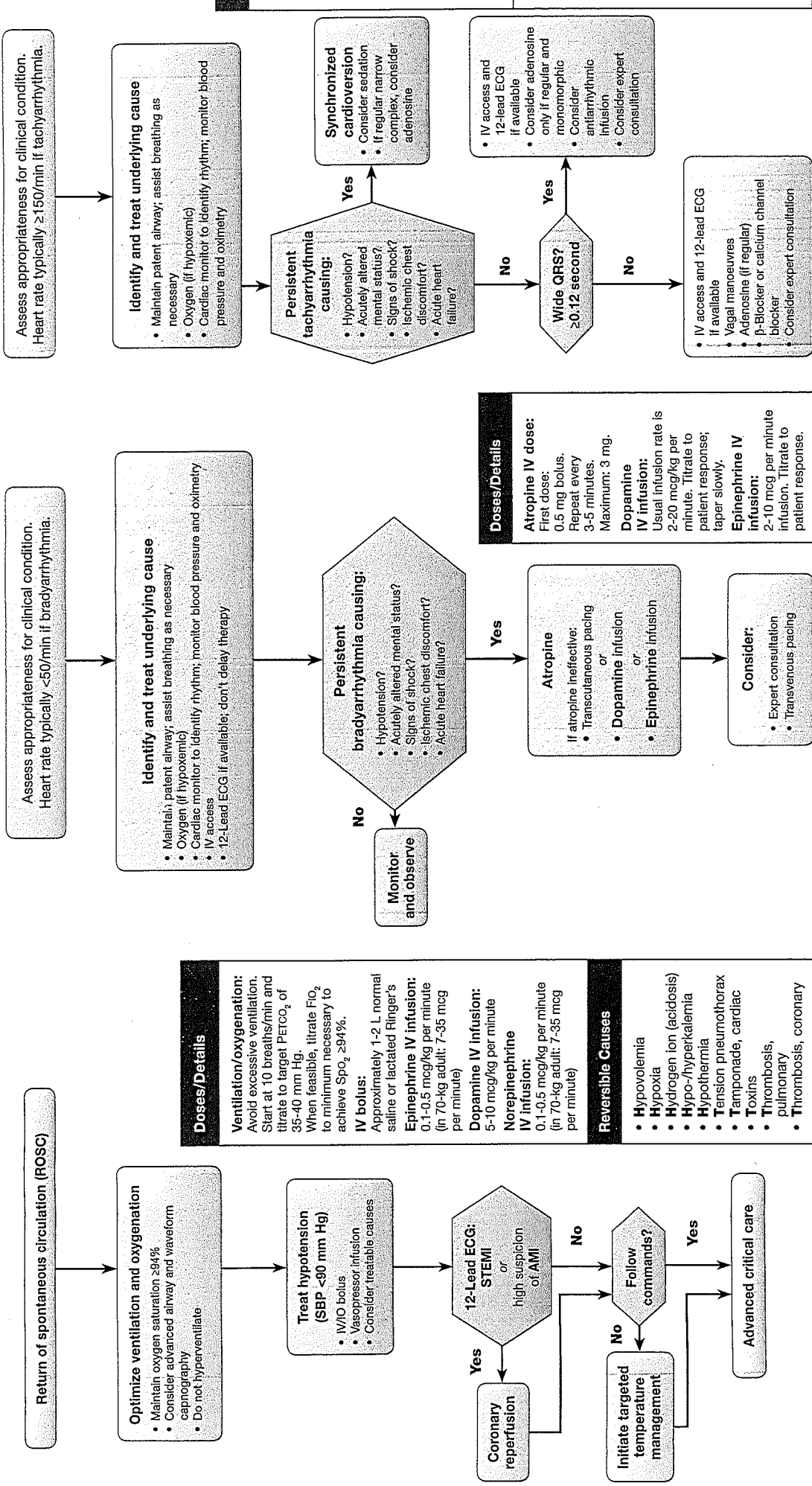
- History of chronic, severe, poorly controlled hypertension
- Severe uncontrolled hypertension on presentation (SBP >180 mm Hg or DBP >110 mm Hg)†
- History of prior ischemic stroke >3 months, dementia, or known intracranial pathology not covered in contraindications
- Traumatic or prolonged (>10 minutes) CPR or major surgery (<3 weeks)
- Recent (within 2 to 4 weeks) internal bleeding
- Noncompressible vascular punctures
- For streptokinase/anistreplase: prior exposure (>5 days ago) or prior allergic reaction to these agents
- Pregnancy
- Active peptic ulcer
- Current use of anticoagulants: the higher the INR, the higher the risk of bleeding

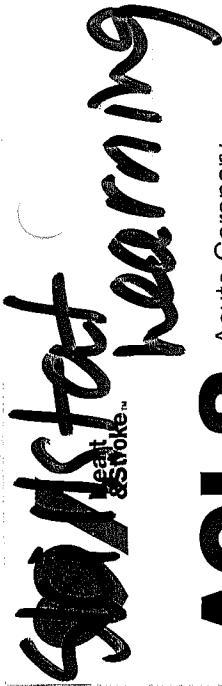
*Viewed as advisory for clinical decision making and may not be all-inclusive or definitive.
†Could be an absolute contraindication in low-risk patients with myocardial infarction.

Immediate Post-Cardiac Arrest Care Algorithm — 2020 Update

Bradycardia With a Pulse Algorithm

Tachycardia With a Pulse Algorithm

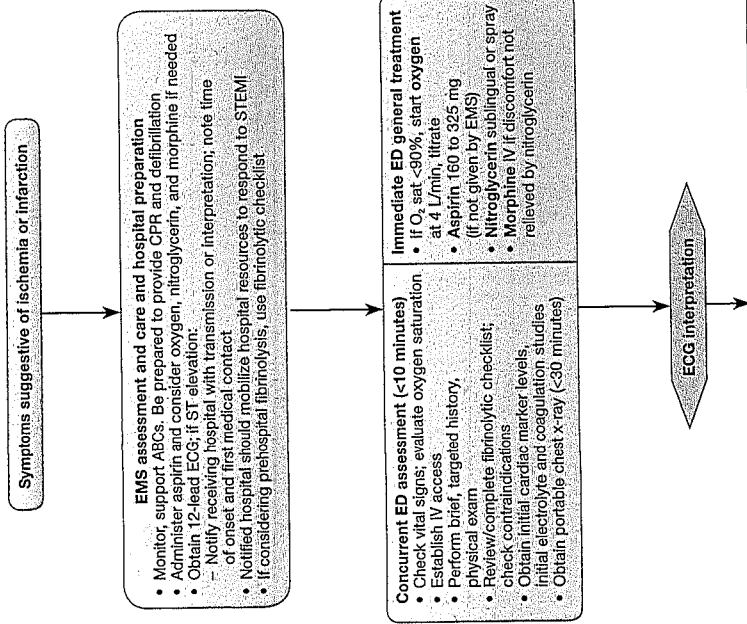




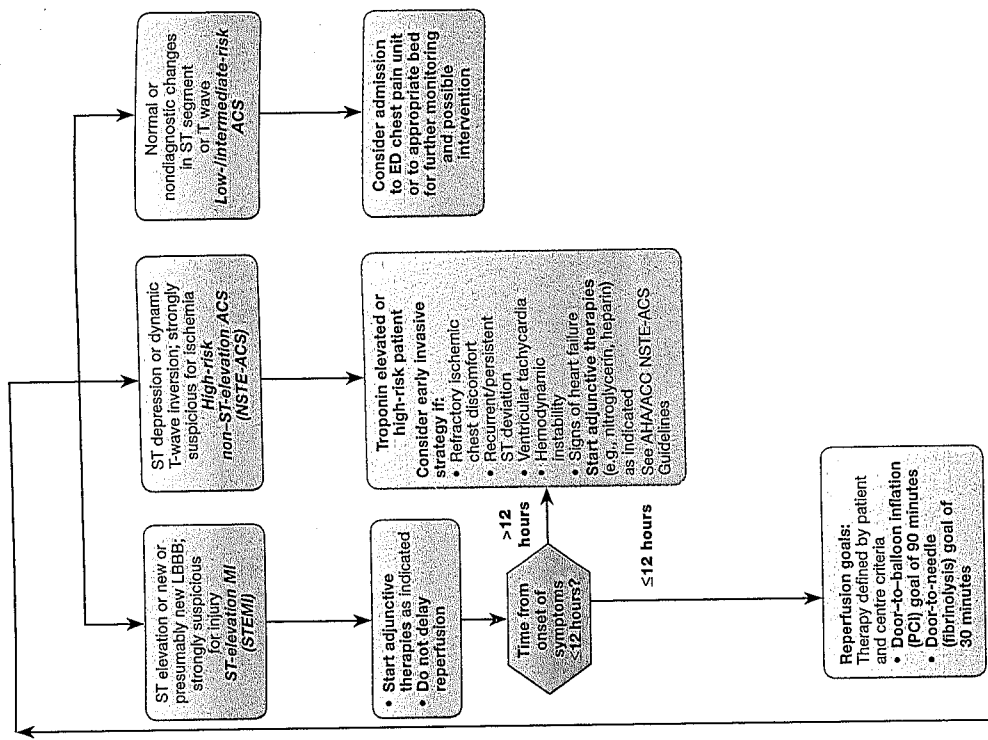
ACLS

Acute Coronary Syndromes and Stroke

Acute Coronary Syndromes Algorithm—2015 Update

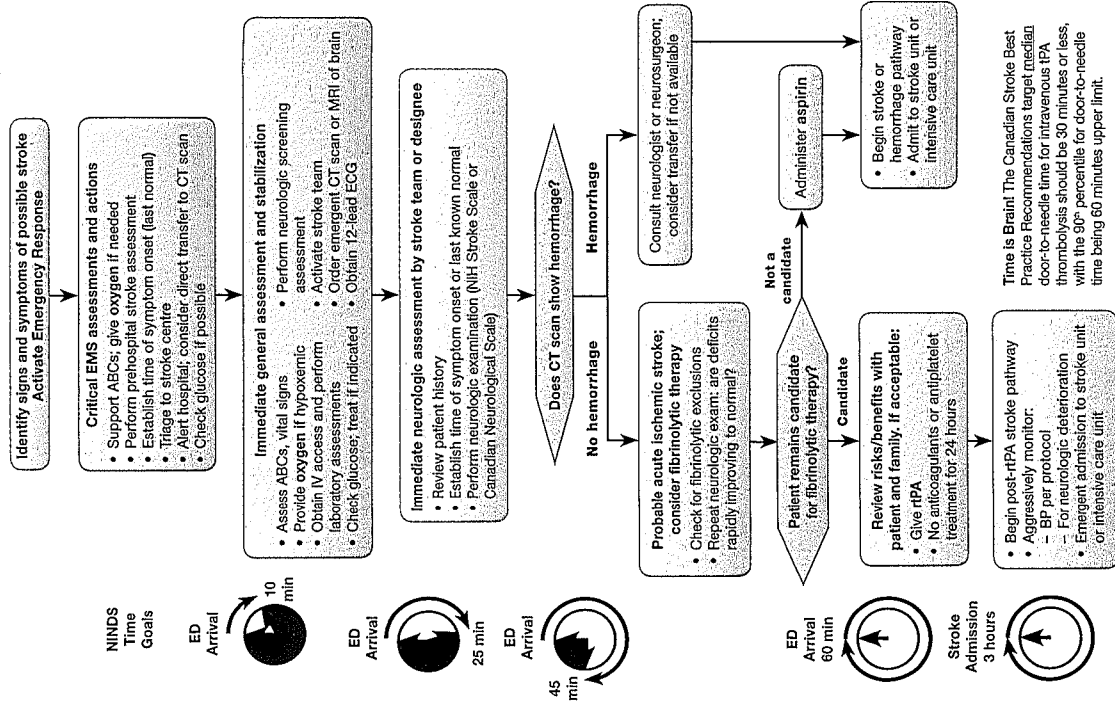


Acute Coronary Syndromes Algorithm (Continued)



Suspected Stroke Algorithm

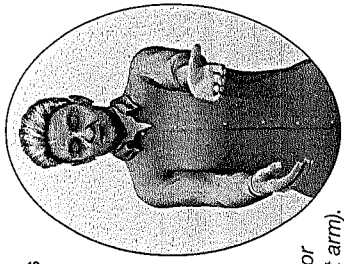
Stroke Assessment



Facial droop (have the patient show teeth or smile):

- Normal—both sides of face move equally
- Abnormal—one side of face does not move as well as the other side

Stroke patient with facial droop (right side of face).



Arm drift (patient closes eyes and extends both arms straight out, with palms up, for 10 seconds):

- Normal—both arms move the same or both arms do not move at all (other findings, such as pronator drift, may be helpful)
- Abnormal—one arm does not move or one arm drifts down compared with the other

One-sided motor weakness (right arm).

Abnormal speech (have the patient say “you can’t teach an old dog new tricks”):

- Normal—patient uses correct words with no slurring
- Abnormal—patient slurs words, uses the wrong words, or is unable to speak

Interpretation: If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%. The presence of all 3 findings indicates that the probability of stroke is greater than 85%.

Modified from Kothari RU, Pancioli A, Liu T, Brott T, Broderick J, Cincinnati Prehospital Stroke Scale: reproducibility and validity. *Ann Emerg Med.* 1999;33(4):373-378. With permission from Elsevier.

Use of IV rtPA for Acute Ischemic Stroke: Inclusion and Exclusion Characteristics

Patients Who Could Be Treated With rtPA Within 3 Hours From Symptom Onset

- Inclusion Criteria**
 - Diagnosis of ischemic stroke causing measurable neurologic deficit
 - Onset of symptoms <3 hours before beginning treatment
 - Age ≥18 years
- Exclusion Criteria**
 - Significant head trauma or prior stroke in previous 3 months
 - Symptoms suggest subarachnoid hemorrhage
 - Arterial puncture at noncompressible site in previous 7 days
 - History of previous intracranial hemorrhage
 - Intracranial neoplasm, arteriovenous malformation, or aneurysm
 - Recent intracranial or intraspinal surgery
 - Elevated blood pressure (systolic >185 mm Hg or diastolic >110 mm Hg)
 - Active internal bleeding
 - Acute bleeding diathesis, including but not limited to
 - Platelet count <100 000/mm³
 - Heparin received within 48 hours, resulting in aPTT greater than the upper limit of normal
 - Current use of anticoagulant with INR >1.7 or PT >15 seconds
 - Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (such as aPTT, INR, platelet count, and ECT; T₁ or appropriate factor Xa activity assays)
 - Blood glucose concentration <2.7 mmol/L (50mg/dL)
 - CT demonstrates multilobar infarction (hypodensity >¼ cerebral hemisphere)
- Relative Exclusion Criteria**

Recent experience suggests that under some circumstances—with careful consideration and weighing of risk to benefit—patients may receive fibrinolytic therapy despite 1 or more relative contraindications. Consider risk to benefit of rtPA administration carefully if any one of these relative contraindications is present.

 - Only minor or rapidly improving stroke symptoms (clearing spontaneously)
 - Pregnancy
 - Seizure at onset with postictal residual neurologic impairments
 - Major surgery or serious trauma within previous 14 days
 - Recent gastrointestinal or urinary tract hemorrhage (within previous 21 days)
 - Recent acute myocardial infarction (within previous 3 months)

Notes

- The checklist includes some US FDA-approved indications and contraindications for administration of rtPA for acute ischemic stroke. Recent AHA/ASA guideline revisions may differ slightly from FDA criteria. A physician with expertise in acute stroke care may modify this list.
- Onset time is either witnessed or last known normal.
- In patients without recent use of oral anticoagulants or heparin, treatment with rtPA can be initiated before availability of coagulation study results but should be discontinued if INR is >1.7 or PT is elevated by focal laboratory standards.
- In patients without history of thrombocytopenia, treatment with rtPA can be initiated before availability of platelet count but should be discontinued if platelet count is <100 000/mm³.

Patients Who Could Be Treated With rtPA From 3 to 4.5 Hours From Symptom Onset

- Inclusion Criteria**
 - Diagnosis of ischemic stroke causing measurable neurologic deficit
 - Onset of symptoms 3 to 4.5 hours before beginning treatment
- Exclusion Criteria**
 - Age >80 years
 - Severe stroke (NIHSS >25)
 - Taking an oral anticoagulant regardless of INR
 - History of both diabetes and prior ischemic stroke

Stroke: Treatment of Hypertension

Potential Approaches to Arterial Hypertension in Acute Ischemic Stroke Patients Who Are Potential Candidates for Acute Reperfusion Therapy*

- Patient otherwise eligible for acute reperfusion therapy except that blood pressure is >185/110 mm Hg:
- Labetalol 10-20 mg IV over 1-2 minutes, may repeat x 1, or
 - Nicardipine IV 5 mg per hour, titrate up by 2.5 mg per hour every 5-15 minutes, maximum 15 mg per hour; when desired blood pressure is reached, adjust to maintain proper blood pressure limits, or
 - Other agents (enalaprilat 1.25 mg IV over 5 min, hydralazine 5-20 mg IV given at 5mg/min) may be considered when appropriate
- If blood pressure is not maintained at or below 185/110 mm Hg, do not administer rtPA.

Management of blood pressure during and after rtPA or other acute reperfusion therapy: Monitor blood pressure every 15 minutes for 2 hours from the start of rtPA therapy, then every 30 minutes for 6 hours, and then every hour for 16 hours. If systolic blood pressure 180-230 mm Hg or diastolic blood pressure 105-120 mm Hg:

- Labetalol 10 mg IV followed by continuous IV infusion 2-8 mg per minute, or
- Nicardipine¹ IV 5 mg per hour, titrate up to desired effect by 2.5 mg per hour every 5-15 minutes, maximum 15 mg per hour

If blood pressure not controlled or diastolic blood pressure >140 mm Hg,

- enalaprilat 1.25 mg IV over 5 min
- hydralazine 5-10 mg IV over 2 min

Approach to Arterial Hypertension in Acute Ischemic Stroke Patients Who Are Not Potential Candidates for Acute Reperfusion Therapy*

Consider lowering blood pressure in patients with acute ischemic stroke if systolic blood pressure >220 mm Hg or diastolic blood pressure >120 mm Hg.

Consider blood pressure reduction as indicated for other concomitant organ system injury:

- Acute myocardial infarction
- Congestive heart failure
- Acute aortic dissection

A reasonable target is to lower blood pressure by 15% within the first 24 hours.

Abbreviations: aPTT, activated partial thromboplastin time; CT, computed tomography; ECT, ecarin clotting time; FDA, Food and Drug Administration; INR, international normalized ratio; NIHSS, National Institutes of Health Stroke Scale; PT, prothrombin time; rPA, recombinant tissue plasminogen activator; T₁, thrombin time.

*Jauch EC et al. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2013;44(3):970-947.

¹del Zopelo GJ et al. Extension of the time window for treatment of acute ischemic stroke with intravenous tissue plasminogen activator: a science advisory from the American Heart Association/American Stroke Association. *Stroke*. 2009;40(8):2945-2948.

*At time of print: Nicardipine is not currently available in Canada. Must be approved for use by Health Canada via the Special Access Program.

Pediatric Colour-Coded Length-Based Resuscitation Tape



Vital Signs in Children

Normal Heart Rates* (beats/min)		Normal Respiratory Rates (breaths/min)	
Age	Awake Rate	Age	Rate
Neonate	100-205	Infant	30-53
Infant	100-180	Toddler	22-37
Toddler	98-140	Preschooler	20-28
Preschooler	80-120	School-aged child	18-25
School-aged child	75-118	Adolescent	12-20
Adolescent	60-100		

Normal Blood Pressures

Age	Systolic Pressure (mm Hg) ¹	Diastolic Pressure (mm Hg) ¹	Mean Arterial Pressure (mm Hg) ²
Birth (12 h, <1000 g)	39-59	16-36	28-42 ³
Birth (12 h, 3 kg)	60-76	31-45	48-57
Neonate (96 h)	67-84	35-53	45-60
Infant (1-12 mo)	72-104	37-56	50-62
Toddler (1-2 y)	86-106	42-63	49-62
Preschooler (3-5 y)	89-112	46-72	58-69
School-aged child (6-9 y)	97-115	57-76	66-72
Preadolescent (10-11 y)	102-120	61-80	71-79
Adolescent (12-15 y)	110-131	64-83	73-84

*Always consider the patient's normal range and clinical condition. Heart rate will normally increase with fever or stress.
¹Systolic and diastolic blood pressure ranges assume 50th percentile for height for children 1 year and older.
²Mean arterial pressures (diastolic pressure + 1/3 difference between systolic and diastolic pressure/3) for 1 year and older, assuming 50th percentile for height.
³Approximately equal to postconception age in weeks (may add 5 mm Hg).
 Reproduced from Hazinski MF: Children are different. In: Hazinski MF, ed. *Nursing Care of the Critically Ill Child*. 3rd ed. St. Louis, MO: Mosby; 2013:1-16, copyright Elsevier. Data from Gemelli M, Mangano R, Marni C, De Luca F. Longitudinal study of blood pressure during the 1st year of life. *Eur J Pediatr*. 1990;149(5):318-320; Versmold HT, Kitterman JA, Phibbs RH, Gregory GA, Tooley WH. Aortic blood pressure during the first 12 hours of life in infants with birth weight 610 to 4,220 grams. *Pediatrics*. 1981;67(5):607-613; Haque IU, Zaritsky AL. Analysis of the evidence for the lower limit of systolic and mean arterial pressure in children. *Pediatr Crit Care Med*. 2007;8(2):138-144; and National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. *The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents*. Bethesda, MD: National Heart, Lung, and Blood Institute; 2005. NIH publication 05-5267.

Equipment	Resuscitation	Oxygen mask (NRB)	Oral airway (mm)	Laryngoscope Blade (size)	ET tube (mm) ¹	ET tube (cm)	Insufflation length (cm)	BP cuff (Neonatal #5/Infant)	IV catheter (ga)	IO (ga)	NG tube (F)	Urinary catheter (F)	Chest tube (F)
GREY 3-5 kg	Infant/child	Pediatric	50	1 Straight	3.0 Uncuffed	10.5-11	4 kg 9.5-10	8	22-24	18/15	5-8	5	10-12
PINK 6-7 kg	Infant/child	Pediatric	50	1 Straight	3.5 Uncuffed	10.5-11	3 kg 9-9.5	8	22-24	18/15	5-8	5	10-12
RED 8-9 kg	Infant/child	Pediatric	50	1 Straight	4.0 Uncuffed	11-12	5 kg 10-10.5	8	22-24	18/15	5-8	5	10-12
PURPLE 10-11 kg	Child	Pediatric	60	1 Straight	4.5 Uncuffed	13.5	18.5-19.5	10	20-24	18/22	8-10	8-10	16-20
YELLOW 12-14 kg	Child	Pediatric	60	2 Straight	5.0 Uncuffed	14-15	17-18	10	18-22	18-20	10	10	20-24
WHITE 15-18 kg	Child	Pediatric	60	2 Straight	5.5 Uncuffed	16.5	17-18	10	18-20	18-20	10	10	20-24
BLUE Child 15-23 kg	Child	Pediatric	70	2 Straight or curved	6.0 Cuffed	18.5	17-18	10	18-20	18-20	10	10	20-24
ORANGE Large Child 24-29 kg	Child	Pediatric	80	2 Straight or curved	6.5 Cuffed	18.5-19.5	17-18	10	18-20	18-20	10	10	20-24
GREEN Adult 30-35 kg	Adult	Pediatric/Adult	80	3 Straight or curved	6.5 Cuffed	18.5-19.5	17-18	10	18-20	18-20	10	10	20-24

Abbreviations: BP, blood pressure; ET, endotracheal; F, French; IO, intraosseous; IV, intravenous; NG, nasogastric; NRB, nonrebreathing.
¹For grey column, use Pink or Red equipment sizes if no size is listed.
²For 2010 AHA Guidelines, in the hospital cut-off or uncuffed tubes may be used (see Estimating Endotracheal Tube Size on the reverse side of this card).
 Adapted from *Broselow™ Pediatric Emergency Tape*. Distributed by Armstrong Medical Industries Inc., Lincolnshire, IL. Copyright 2007 Vital Signs Inc. Courtesy and permission, Dickinson and Company. Reprinted with permission.



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- 3-25
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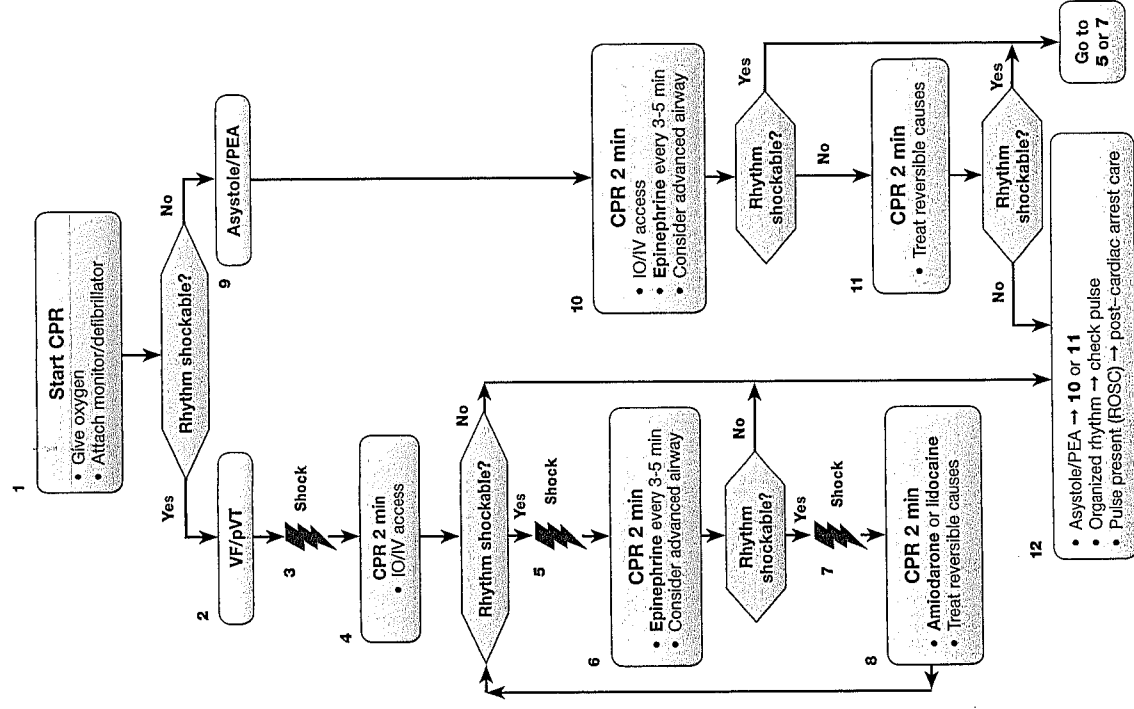
In Canada

Drug	Indications/Posages
Adenosine	SVT • 0.1 mcg/kg IV/IO rapid push (max 6 mg), second dose 0.2 mg/kg IV/IO rapid push (max 12 mg)
Amiodarone	SVT, VT (with pulses) • 5 mg/kg IV/IO load over 20 to 60 minutes (max 300 mg), repeat to daily max 15 mg/kg (2.2 g in adolescents) Pulseless arrest (i.e., VF/pulseless VT) • 5 mg/kg IV/IO bolus (max 300 mg), repeat to daily max 15 mg/kg (2.2 g in adolescents)
Atropine sulfate	Bradycardia (symptomatic) • 0.02 mg/kg IV/IO (max single dose 0.5 mg), may repeat dose once in 3 to 5 minutes, max total dose child 1 mg, max total dose adolescent 3 mg • 0.04 to 0.08 mg/kg ET Toxins/overdose (e.g., organophosphate, carbamate) • <12 years: 0.05 mg/kg IV/IO initially; then repeated and doubling the dose every 5 minutes until muscarinic symptoms reverse • >12 years: 1 mg IV/IO initially; then repeated and doubling the dose every 5 minutes until muscarinic symptoms reverse
Calcium chloride 10%	Hypocalcemia, hyperkalemia, hypermagnesemia, calcium channel blocker overdose • 20 mg/kg (0.2 mL/kg) IV/IO slow push during arrest, repeat PRN
Calcium gluconate	Hypocalcemia, hyperkalemia, hypermagnesemia, calcium channel blocker overdose • 60 mg/kg (0.6 mL/kg) IV/IO slow push during arrest; repeat PRN
Dexamethasone	Group • 0.6 mg/kg PO/IM/IV (max 16 mg)
Dextrose (glucose)	Hypoglycemia • 0.5 to 1 g/kg IV/IO (D ₅ W 2 to 4 mL/kg; D ₁₀ W 5 to 10 mL/kg)
Dobutamine	Heart failure, cardiogenic shock • 2 to 20 mcg/kg per minute IV/IO infusion; titrate to desired effect
Dopamine	Cardiogenic shock, distributive shock • 2 to 20 mcg/kg per minute IV/IO infusion; titrate to desired effect
Epinephrine	Pulseless arrest, bradycardia (symptomatic) • 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration) IV/IO q 3 to 5 minutes (max single dose 1 mg) • 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration) ET q 3 to 5 minutes Hypotensive shock • 0.1 to 1 mcg/kg per minute IV/IO infusion (consider higher doses if needed) Anaphylaxis • IM autoinjector: 0.3 mg (for patient weighing ≥30 kg) or IM junior autoinjector: 0.15 mg (for patient weighing 10 to 30 kg) • 0.01 mg/kg (0.01 mL/kg of the 1 mg/mL concentration) IM q 15 minutes PRN (max single dose 0.3 mg) • 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration) IV/IO q 3 to 5 minutes (max single dose 1 mg) if hypotensive • 0.1 to 1 mcg/kg per minute IV/IO infusion if hypotension persists despite fluids and IM injection
Etomidate (Etomidate-lipid emulsion formulation)	Asthma • 0.01 mg/kg (0.01 mL/kg of the 1 mg/mL concentration) subcutaneously q 15 minutes (max 0.3 mg or 0.3 mL) Group • 0.25 to 0.5 mL racemic solution (2.25%) mixed in 3 mL NS via inhalation • 3 mg (3 mL of the 1 mg/mL concentration) epinephrine mixed with 3 mL NS (which yields 0.25 mL racemic epinephrine solution) via inhalation
Hydrocortisone	RSI • 0.2 to 0.4 mg/kg IV/IO infused over 30 to 60 seconds (max 20 mg) will produce rapid secretion that lasts for 10 to 15 minutes • Avoid in patients with soy or peanut allergy Adrenal insufficiency • 2 mg/kg IV bolus (max 100 mg)

Drug	Indications/Dosages
Ipratropium bromide	Asthma • 250 to 500 mcg via inhalation q 20 minutes PRN x 3 doses
Lidocaine	VF/pulseless VT, wide-complex tachycardia (with pulses) • 1 mg/kg IV/IO bolus • Maintenance: 20 to 50 mcg/kg per minute IV/IO infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus) • 2 to 3 mg/kg ET
Magnesium sulfate	Asthma (refractory status asthmaticus), torsades de pointes, hypomagnesemia • 25 to 50 mg/kg IV/IO bolus (max 2 g) (pulseses VT) or over 10 to 20 minutes (VT with pulses) or slow infusion over 15 to 30 minutes (status asthmaticus) [VT with pulses] • Load: 2 mg/kg IV/IO/IM (max 60 mg); only use acetate salt IM • Maintenance: 0.5 mg/kg IV/IO q 6 hours (max 120 mg/d)
Methylprednisolone	Myocardial dysfunction and increased SVR/PVR • Loading dose: 50 mcg/kg IV/IO over 10 to 60 minutes followed by 0.25 to 0.75 mcg/kg per minute IV/IO infusion
Naloxone	Narcotic (opioid) reversal • Toxic reversal required (for narcotic toxicity secondary to overdose): 0.1 mg/kg IV/IO/IM/subcutaneous bolus q 2 minutes PRN (max 2 mg) • Total reversal not required (e.g., for respiratory depression associated with therapeutic narcotic use): 10 mcg/kg IV/IO/IM/subcutaneous; titrate to desired effect • Maintain reversal: 0.002 to 0.10 mg/kg per hour IV/IO infusion
Nitroglycerin	Heart failure, cardiogenic shock • Initiate at 0.25 to 0.5 mcg/kg per minute IV/IO infusion; titrate by 1 mcg/kg per minute q 15 to 20 minutes as tolerated. Typical dose range 1 to 5 mcg/kg per minute (max 10 mcg/kg per minute) • In adolescents, start with 5 to 10 mcg per minute (not per kilogram per minute) and increase to max 200 mcg per minute
Nitroprusside	Cardiogenic shock (i.e., associated with high SVR), severe hypertension • 0.3 to 1 mcg/kg per minute initial dose; then titrate up to 8 mcg/kg per minute PRN
Norepinephrine	Hypotensive (usually distributive) shock (i.e., low SVR and fluid refractory) • 0.1 to 2 mcg/kg per minute IV/IO infusion; titrate to desired effect
Procainamide	SVT, atrial flutter, VT (with pulses) • 15 mg/kg IV/IO load over 30 to 60 minutes (do not use routinely with amiodarone)
Prostaglandin E ₁ (PGE ₁)	Ductal-dependent congenital heart disease (all forms) • 0.05 to 0.1 mcg/kg per minute IV/IO infusion initially; then 0.01 to 0.05 mcg/kg per minute IV/IO
Sodium bicarbonate	Metabolic acidosis (severe), hyperkalemia • 1 mEq/kg IV/IO slow bolus Sodium channel blocker overdose (e.g., tricyclic antidepressant) • 1 to 2 mEq/kg IV/IO bolus until serum pH is >7.45 (7.50 to 7.55 for severe poisoning) followed by IV/IO infusion of 150 mEq NaHCO ₃ L solution titrated to maintain alkalosis
Salbutamol (Albuterol)	Asthma, anaphylaxis (bronchospasm), hyperkalemia • MDI: 4 to 8 puffs via inhalation q 20 minutes PRN with spacer (or ET if intubated) • Nebulizer: 2.5 mg/dose (wt <20 kg) or 5 mg/dose (wt >20 kg) via inhalation q 20 minutes PRN • Continuous nebulizer: 0.5 mg/kg per hour via inhalation (max 20 mg/h)
Salbutamol IV	Asthma (status asthmaticus), hyperkalemia • Initial load of 7.5 mcg/kg IV over 2-5 min, then 1 mcg/kg/min IV infusion titrate by 0.5 mcg/kg/min (maximum 3mcg/kg/min)
Vasopressin	Catecholamine-resistant hypotension • 0.0002 to 0.002 unit/kg per minute (0.2 to 2 millunits/kg per minute) continuous infusion

Pediatric Cardiac Arrest Algorithm —2015 Update

Doses/Details for the Pediatric Cardiac Arrest Algorithm



<p>CPR Quality</p> <ul style="list-style-type: none"> • Push hard (≥½ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil. • Minimize interruptions in compressions. • Avoid excessive ventilation. • Rotate compressor every 2 minutes, or sooner if fatigued. • If no advanced airway, 15:2 compression-ventilation ratio. 	<p>Advanced Airway</p> <ul style="list-style-type: none"> • Endotracheal intubation or supraglottic advanced airway • Waveform capnography or capnometry to confirm and monitor ET tube placement • Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions
<p>Shock Energy for Defibrillation</p> <p>First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose</p>	<p>Return of Spontaneous Circulation (ROSC)</p> <ul style="list-style-type: none"> • Pulse and blood pressure • Spontaneous arterial pressure waves with intra-arterial monitoring
<p>Drug Therapy</p> <ul style="list-style-type: none"> • Epinephrine IO/IV dose: 0.01 mg/kg (0.1 mL/kg of the 0.1mg/mL concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration). • Amlodarone IO/IV dose: 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT. • Lidocaine IO/IV dose: Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy). 	<p>Reversible Causes</p> <ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypoglycemia • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary

Estimating Endotracheal Tube Size

The formula for estimation of proper endotracheal tube size (internal diameter [i.d.]) for children 2 to 10 years of age, based on the child's age:

Uncuffed endotracheal tube size (mm i.d.) = (age in years/4) + 4

The formula for estimation of a cuffed endotracheal tube size is as follows:

Cuffed endotracheal tube size (mm i.d.) = (age in years/4) + 3.5

Typical cuffed inflation pressure should be <20 to 25 cm H₂O.

Pediatric Septic Shock Algorithm

Pediatric Septic Shock Algorithm (continued)

Initial stabilization

Identify Signs of Septic Shock (as below or per protocol)

- Altered mental status (irritability or decreased level of consciousness)
- Altered heart rate (tachycardia or, less commonly, bradycardia)
- Altered temperature (fever or hypothermia)
- Altered perfusion (prolonged or "flash" capillary refill; cool or very warm extremities; plethoric appearance, mottled colour or pallor; possible ecchymosis or purpura; decreased urine output)
- Hypotension: May or may not be present

Immediate (10-15 min)

Initial Stabilization

- Monitor and support airway, breathing, and circulation
- Monitor heart rate, blood pressure, and pulse oximetry
- Establish vascular access (IV or IO); draw blood for culture and additional laboratory studies, including glucose and calcium — do not delay antibiotics or fluid therapy
- Antibiotics: Give broad-spectrum antibiotics
- Fluid boluses: Give 20 mL/kg isotonic crystalloid boluses (10 mL/kg for neonates and those with pre-existing cardiovascular compromise). Assess carefully after each bolus. Repeat as needed to treat shock. Stop if rates, respiratory distress, or hepatomegaly develops.
- Give antipyretics if needed

Goals of therapy: Improved mental status, normalization of heart rate and temperature, adequate systolic and diastolic blood pressure, improved perfusion (see box above)

Do signs of shock persist? (see box above)

No

Consider critical care consultation

Yes

- Obtain expert/critical care consultation
- Initiate and titrate vasoactive drugs:
 - Cold extremities, delayed capillary refill, and/or low blood pressure: Epinephrine (use dopamine if epinephrine is not available)
 - Warm extremities, "flash" capillary refill, and/or low (typically diastolic) blood pressure: Norepinephrine (use higher dose of dopamine if norepinephrine is not available)

Therapies intended for the critical care environment and expertise

- Establish central venous and intra-arterial pressure monitoring
- Continue epinephrine/norepinephrine (as above) and bolus fluid therapy as needed to treat shock
- Verify adequate airway, oxygenation, and ventilation
- Evaluate cortisol if at risk for relative adrenal insufficiency; consider stress-dose hydrocortisone

Critical care goals of therapy: ScvO₂ ≥70%, adequate BP, normalized HR, adequate cardiac output/index and organ perfusion

Yes

No

is ScvO₂ ≥70%?

ScvO₂ <70%
With poor perfusion and cold extremities despite epinephrine administration

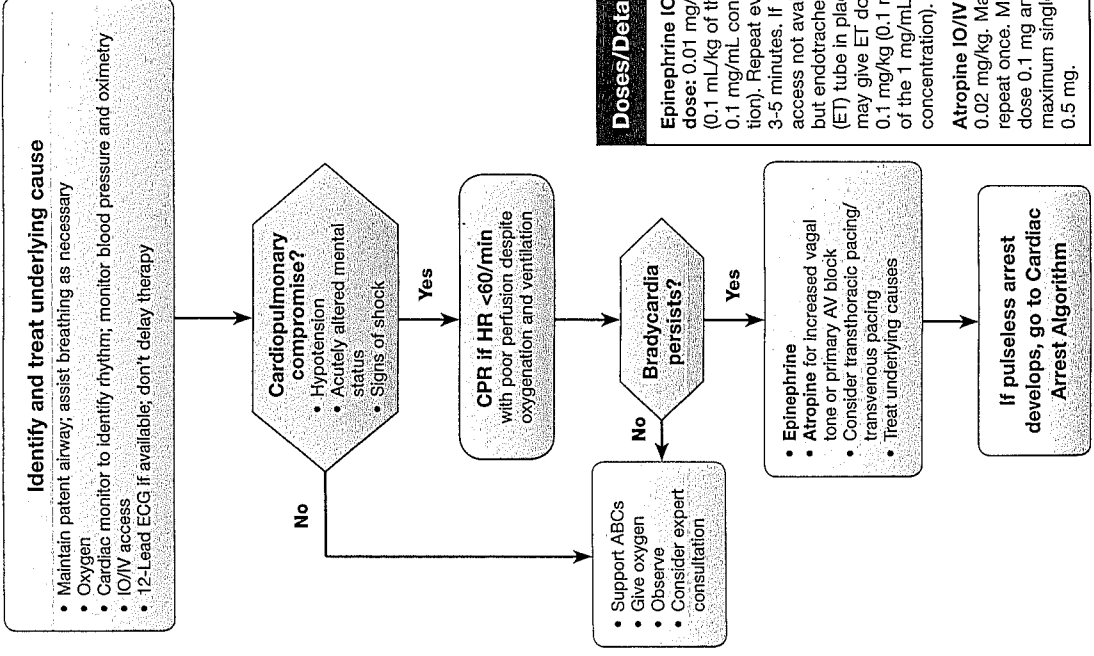
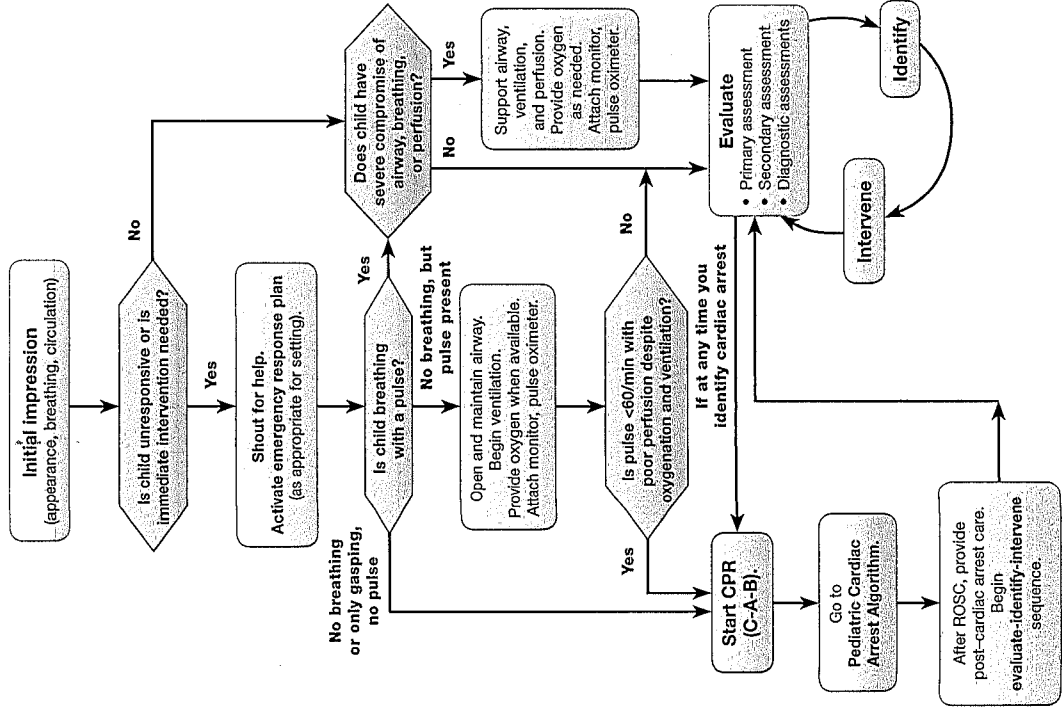
- Provide additional fluid boluses as needed
 - Transfuse if Hgb <100g/L
 - Continue epinephrine therapy
 - If BP low: Add norepinephrine if diastolic BP low; consider additional inotropic and vasoactive drug therapy as needed
 - If BP adequate: Add milrinone and/or additional vasodilator therapy; consider adding inotropic drug
 - Support organ function
- Goals of care: Improved ScvO₂, normalized HR and BP, adequate cardiac output/index and organ perfusion

ScvO₂ ≥70%
With poor perfusion extremities despite norepinephrine administration

- Provide additional fluid boluses as needed
 - Continue norepinephrine therapy
 - Add additional vasopressor therapy and inotropic therapy as needed
 - Support organ function
- Goals of care: Improved ScvO₂, normalized HR and BP, adequate cardiac output/index and organ perfusion

ScvO₂ ≥70%
Signs of shock resolved

- Monitor in ICU
- Support organ function
- Treat infection source
- Evaluate septic shock prevention, detection, and therapy

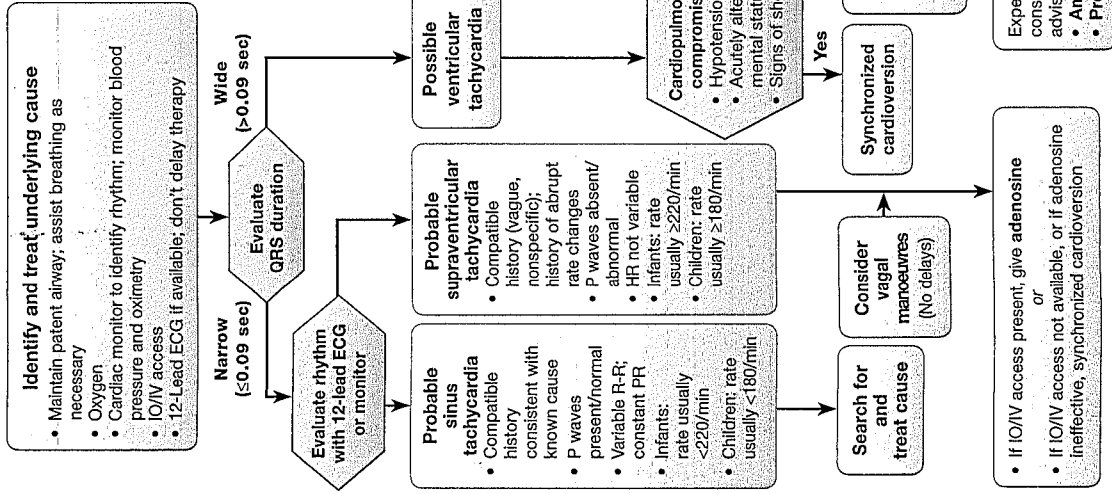


Doses/Details

Epinephrine IO/IV dose: 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Repeat every 3-5 minutes, if IO/IV access not available but endotracheal (ET) tube in place, may give ET dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration).

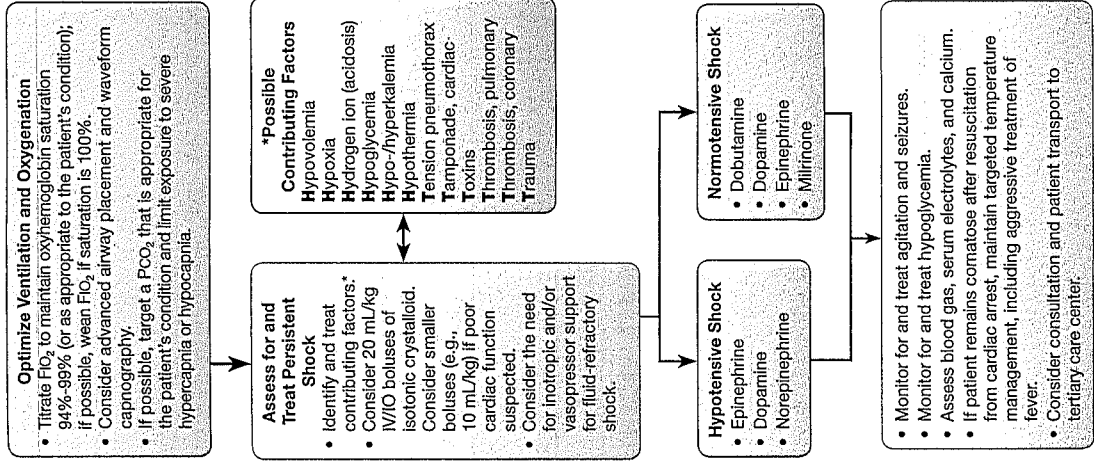
Atropine IO/IV dose: 0.02 mg/kg. May repeat once. Minimum dose 0.1 mg and maximum single dose 0.5 mg.

Pediatric Tachycardia With a Prolonged QT Interval and Poor Perfusion Algorithm



Doses/Details
<p>Synchronized Cardioversion</p> <p>Begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg. Sedate if needed, but don't delay cardioversion.</p>
<p>Drug Therapy</p> <p>Adenosine IO/IV dose: First dose: 0.1 mg/kg rapid bolus (maximum: 6 mg). Second dose: 0.2 mg/kg rapid bolus (maximum: 12 mg).</p> <p>Amiodarone IO/IV dose: 5 mg/kg over 20-60 minutes or Procainamide IO/IV dose: 15 mg/kg over 30-60 minutes Do not routinely administer amiodarone and procainamide together.</p>

PALS Management of Shock After ROSC Algorithm



Estimation of Maintenance Fluid Requirements

- Infants <10 kg:** 4 mL/kg per hour
- Example:* For an 8-kg infant, estimated maintenance fluid rate = 4 mL/kg per hour × 8 kg = 32 mL per hour
- Children 10-20 kg:** 40 mL per hour + 2 mL/kg per hour for each kg above 10 kg
- Example:* For a 15-kg child, estimated maintenance fluid rate = 40 mL per hour + (2 mL/kg per hour × 5 kg) = 50 mL per hour
- Children >20 kg:** 60 mL per hour + 1 mL/kg per hour for each kg above 20 kg
- Example:* For a 28-kg child, estimated maintenance fluid rate = 60 mL per hour + (1 mL/kg per hour × 8 kg) = 68 mL per hour

After initial stabilization, adjust the rate and composition of intravenous fluids based on the patient's clinical condition and state of hydration. In general, provide a continuous infusion of a dextrose-containing solution for infants. Avoid hypotonic solutions in critically ill children; for most patients, use isotonic fluid such as normal saline (0.9% NaCl) or lactated Ringer's solution with or without dextrose, based on the child's clinical status.