Stanford Children's Health | Lucile Packard Children's Hospital Stanford

Hospital Outreach Program (HOP)

What We Learned From the Impact of COVID-19 on RSV and Influenza

—By Alan Schroder, Hospital Medicine and Critical Care, and Andy Wen, MD, Critical Care

The pandemic has changed the way our children interact with the world, and this has led to unexpected consequences. Respiratory syncytial virus (RSV) and influenza seasons typically cause outbreaks from late fall to early spring, with regional variation, and severe RSV disease primarily affects infants younger than 6 months during their first fall and winter seasons of life. Due to pandemic-related changes such as the implementation of strict masking policies, social distancing guidelines, and decreased participation in school and day care, RSV activity remained low through the traditional fall-winter season of 2020–2021. Following subsequent relaxation of public health measures, a dramatic and atypical increase in RSV infections was observed during the summer months of 2021 as reported by the California Department of Public Health (CDPH).

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In this issue

CDC Recommends Pediatric COVID-19 Vaccine for Children 5 to 11 Years

—By Hayden Schwenk, MD, Infectious Diseases

Approximately 1.9 million COVID-19 cases and 8,300 hospitalizations among U.S. children aged 5 to 11 had been reported to the Centers for Disease Control and Prevention (CDC) as of Oct. 10, 2021. In addition, children aged 5 to 11 represent a growing proportion of new COVID-19 cases reported to the CDC, accounting for 10.6% of infections for the week of Oct. 10, 2021, although children aged 5 to 11 represent 8.7% of the population.

On Aug. 23, 2021, the Food and Drug Administration (FDA) approved a Biologics License Application for use of the Pfizer-BioNTech COVID-19 vaccine, marketed as Comirnaty (Pfizer Inc.), in persons aged ≥16 years. The Pfizer-BioNTech COVID-19 vaccine is also recommended for adolescents aged 12 to 15 years under an Emergency Use Authorization (EUA). All persons aged ≥12 years are recommended to receive two doses, administered three weeks apart. As of Nov. 2, 2021, approximately 248 million doses of the Pfizer-BioNTech COVID-19 vaccine had been administered to persons aged ≥12 years in the United States.

On Oct. 29, 2021, the FDA authorized the emergency use of the Pfizer-BioNTech COVID-19 vaccine for the prevention of COVID-19 to include children 5 through 11 years of age. On Nov. 2, 2021, the CDC director, Rochelle P. Walensky, MD, MPH, endorsed the recommendation of the Advisory Committee on Immunization Practices (ACIP) for the use of the Pfizer-BioNTech COVID-19 vaccine in this age group. The EUA was based on an evaluation of the data, including input from independent advisory committee experts. Key points for parents and caregivers are described below.

Immunization schedule

- The Pfizer-BioNTech COVID-19 vaccine for children aged 5 through 11 is administered as a two-dose primary series, three weeks apart.
- The Pfizer-BioNTech vaccine for children aged 5 through 11 is a lower dose (10 micrograms) than that used for individuals 12 years of age and older (30 micrograms).
- The formulation for use in children aged 5 through 11 is different from that for adults/adolescents 12 years and older. The storage requirements for this vaccine formulation are also different. The adult/adolescent formulation has a purple vial cap, and the pediatric formulation has an orange vial cap.

Effectiveness

- The vaccine was found to be >90% effective in preventing COVID-19 in children aged 5 through 11.
- Immune responses of children aged 5 through 11 were comparable to those of individuals aged 16 through 25.

Safety

- The vaccine's safety was studied in approximately 3,100 children aged 5 to 11 who received the vaccine, and no serious side effects related to the vaccine have been detected in the ongoing study.
- Commonly reported side effects in the clinical trial included injection site pain (sore arm), redness and swelling, fatigue, headache, muscle and/or joint pain, chills, fever, swollen lymph nodes, nausea, and decreased appetite. More children reported side effects after the second dose than after the first dose.

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Although traditionally the American Academy of Pediatrics (AAP) does not recommend routine viral testing in bronchiolitis, the CDPH has issued an advisory urging health care providers to consider testing patients who present out of season with fever, cough, congestion, and rhinorrhea for additional respiratory pathogens besides SARS-CoV-2, including RSV. In September 2021, the AAP issued interim guidance (to be regularly reviewed and presumed to expire on Dec. 31, 2021) stating that given the atypical interseasonal surge in RSV cases, the AAP strongly supports consideration for use of palivizumab in high-risk infants and young children in regions experiencing high rates of RSV, as long as the atypical interseason trends resemble those more characteristic of the fall-winter season. They also caution that this interim guidance should be reassessed at least monthly and is not meant to supplant typical seasonal palivizumab administration guidance.

Similarly, influenza activity was historically low in summer 2020 and remained low through most of 2021. The CDC suggests that the resultant low population immunity could lead to an early or severe influenza season and recommends that children ages 6 months or older, who do not have contraindications, get vaccinated, as this may reduce symptoms that might otherwise be confused with those of COVID-19. The Centers for Disease Control and Prevention recommends that all eligible children 6 months and older begin receiving the flu vaccine. **Visit our website** for more information on obtaining flu shots.

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- Side effects were generally mild to moderate in severity and occurred within two days after vaccination, and most went away within one to two days.
- Reactogenicity symptoms were generally less frequent in children aged 5 to 11 years than in persons aged 16 to 25 years.
- The FDA and CDC safety surveillance systems have previously identified increased risks of myocarditis (inflammation of the heart muscle) and pericarditis (inflammation of tissue surrounding the heart) following vaccination with the Pfizer-BioNTech COVID-19 vaccine, particularly following the second dose, with the observed risk highest in males 12 through 17 years of age. The risk of myocarditis after vaccination in children aged 5 to 11 is unknown. There were no cases of myocarditis among the >3,000 children 5 to 11 years old enrolled in the phase II/III study. Myocarditis after vaccination of children aged 5 to 11 is likely lower than rates seen in 12-to-17-year-olds, since myocarditis due to other causes is more common in children 12 to 17 years of age, and the dose used in 5-to-11-year-olds is a third that used in children aged 12 and over.
- Pfizer Inc. has updated its safety monitoring plan to include evaluation of myocarditis, pericarditis, and other events of interest in children 5 through 11 years of age. In addition, the FDA and the CDC have several systems in place to continually monitor COVID-19 vaccine safety and allow for the rapid detection and investigation of potential safety problems.

References

U.S. Food & Drug Administration (October 2021)
https://www.fda.gov/news-events/press-announcements/fda-authorizes-pfizer-biontech-covid-19-vaccine-emergency-use-children-5-through-11-years-age
Centers for Disease Control and Prevention
https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/children-teens.html
https://www.cdc.gov/mmwr/volumes/70/wr/mm7045e1.html

Coronary Artery Aneurysms in Kawasaki Disease

—Seda Tierney, MD, Cardiology

Typically, Kawasaki disease develops in children before they turn 5 years old. The cause of Kawasaki disease is unknown, but physicians and scientists are investigating whether viruses or bacteria may play a role. Children who have Kawasaki disease may show the following symptoms: fever that persists for at least five days; dry, cracked, and red lips; swollen lymph nodes; swollen or peeling skin on the hands or feet; rash; or a swollen and red tongue.

Children who are diagnosed with Kawasaki disease should be given immediate treatment to reduce the inflammation in the body, which could cause long-term heart or blood vessel damage. The disease can weaken the walls of the coronary arteries and cause a portion of the artery to bulge or balloon, which is known as an aneurysm. Coronary artery aneurysms occur in about 15% to 25% of patients with untreated Kawasaki disease.

Patients at higher risk to develop coronary artery aneurysms are male patients, patients of Asian descent, patients who are younger than 3 years of age, and patients with resistance to the initial round of treatment, where it is crucial to escalate treatment.

Kawasaki disease is a leading cause of acquired heart disease in the United States, with an estimated incidence of 9 to 20 per 100,000 children under 5 years of age. In this age group, the hospitalization rate is approximately 20%.

Seda Tierney, MD, is director of the Kawasaki Disease Clinic at Stanford Children's Health's Betty Irene Moore Children's Heart Center, where she and her colleague Staff Grady, MD, provide short- and long-term follow-up care for patients diagnosed with Kawasaki disease and coronary artery aneurysms.

> "It is important not to only diagnose Kawasaki patients in a timely fashion and treat them immediately, but also to escalate treatment soon when we encounter high-risk patients."

Introducing the American Academy of Pediatrics Neonatal Resuscitation Program (NRP) 8th Edition

—By Robert Castro, MD, Neonatology

The new NRP 8th Edition Guidelines are now available, and Bay Area hospitals and birthing centers have started utilizing the material in educational programs or may wait until the required implementation deadline of Jan. 1, 2022. The official go-live date at Lucile Packard Children's Hospital Stanford was Sept. 1, 2021, and Stanford University School of Medicine pediatric faculty (Lou Halamek, MD; Henry Lee, MD; and Arun Gupta, MD) remain important contributors as NRP Steering Committee members and assistant textbook editors. For newborn health care providers, the biggest 8th Edition changes are the two curriculum levels and methods of delivering educational content, making it easier for learners to master the cognitive, technical, and behavioral skills most relevant to their practice.

In addition to new sections on innovative Resuscitation Quality Improvement (RQI), there are updated appearance and minor changes to the NRP algorithms, which include the following:

1. Pre-birth questions.
2. Initial steps.

A neonatal resuscitation simulation.

3. Earlier ECG monitor application for assessing heart rates (when alternative airway is used).
4. Clarification of epinephrine dosing/flush volume.
5. Cessation of resuscitation recommendation.

An overview of NRP 8th Edition practice changes can be found here.

Fevers in the Congenital Heart Population—Higher Risk for Infective Endocarditis

—By Liz Dorwart, DO, Critical Care

Endocarditis in otherwise healthy pediatric patients is a zebra, but patients with repaired congenital heart disease have a higher incidence of endocarditis, and fevers should be taken seriously. Prosthetic material has a higher risk of bacterial seeding. For example, patients with tetralogy of Fallot with and without pulmonary valve replacement (PVR) are at elevated risk for endocarditis compared with healthy patients (0.8% for controls, 1.7% without PVR, 3.5% with PVR). Apart from a typical pediatric workup for fever, such as viral swabs, and evaluation for UTI, acute otitis, or pneumonia, **this population should ALWAYS have blood cultures drawn**, and consultation with pediatric cardiology is needed to determine whether the patient warrants admission for observation or to coordinate antimicrobial coverage as an outpatient until their blood culture results return.

We educate congenital heart disease patients and parents about the risk of fevers and the need to take them seriously. You can save a life by asking these questions:

1. Has your child had a cardiac surgery or cath in the past?
2. Has your child had a prosthetic heart valve placed?

Even if the parents don't recall the specific surgical procedures or congenital defect, the cardiology team at Lucile Packard Children's Hospital Stanford can assist in triaging the risk and clarifying the surgical history.

> "Patients with repaired congenital heart disease have a higher incidence of endocarditis, and fevers should be taken seriously. Prosthetic material has a higher risk of bacterial seeding."

Stanford Children's Health Infection Prevention & Control (IPC) Team

-Amy Valencia, CHSP, CIC

Preventing infections in health care is a team sport; we are all responsible for doing our part: washing our hands, cleaning and disinfecting equipment and surfaces, wearing appropriate PPE, and communicating to others when a patient has a contagious infection. However, most people don't know that infection prevention and control is also a specific role in health care. Infection preventionists work behind the scenes every day to prevent practices that can cause infections in patients and staff and to control the spread of infectious diseases within health care. We are trained as nurses, physicians, public health professionals, lab technicians, etc., and are board certified in Infection Control. We collaborate with infectious disease physicians but have a very different role.

Our job varies every day, depending on the current needs of the hospital and clinics:

1. We identify, report to the CDC, and track certain health care–associated infections, such as central line–associated bloodstream infections (CLABSIs) and surgical site infections (SSIs).
2. We educate and audit to ensure that hospital staff are supported in following evidence-based policies and procedures shown to limit the spread of infection-causing organisms.
3. We help prepare the hospital for a possible infectious outbreak or pandemic.
4. When one occurs, like COVID-19, we are the subject matter experts who translate CDC and public health guidance into a plan for operations.
5. We help identify who is at risk in the event of an infectious disease exposure and ensure that they receive proper care.
6. When a possible outbreak is identified, we work with the unit/clinic to implement measures to prevent any further spread.
7. We help keep the air safe for patients during construction and after water leaks.
8. Additionally, we help hospital leaders put reliable, evidence-based systems in place, using human factors engineering and other methodologies, to make it easier for staff and patients to stay safe.

At Stanford Children's Health, we have a team of six infection prevention and control specialists assigned to different areas of the hospital and clinics. We are available 24/7 to help advise staff on all infection control matters.

Arteriovenous Malformation (AVM)

—By May Casazza, c-ACPNP, and Kelly Mahaney, MD, Pediatric Neurosurgery

An arteriovenous malformation (AVM) is a tangle of blood vessels with abnormal connection between high-pressure arteries and lower-pressure veins, without normal intervening capillaries (Figure 1). The normal systemic circulation carries oxygenated blood from the left ventricle of the heart through arteries to capillaries in the tissues. Deoxygenated blood returns to the heart through the venous system. AVMs result in bypass of tissue capillaries, which can lead to tissue damage and cell death due to vascular steal. Vessel walls can become weakened and cause hemorrhage, resulting in stroke and brain damage. A ruptured AVM is a life-threatening condition and requires swift transfer to a facility with specialty services: Neurosurgery, Neurointerventional Radiology, Neurology, and ICU care teams. AVMs are thought to be congenital and can develop within the brain or spinal cord during childhood. Depending on the location of an AVM, symptoms may include motor or sensory impairment, cognitive decline, gait disturbances, weakness, headache, seizure, speech impairment, or visual disturbances. Symptoms can manifest at any age. An acute hemorrhage can result in an abrupt alteration in mental status.

Various imaging techniques may be necessary to properly diagnose and treat a brain or spinal cord AVM. CT scan can capture hemorrhage in acute situations. Current MRI techniques can demonstrate in detail the anatomy of an AVM and can show subtle changes in adjacent neurological tissues, as well as indicate vascular shunting. Magnetic resonance angiography (MRA) with contrast can give very detailed images of blood vessels and blood flow through the brain. However, catheter cerebral angiography (digital subtraction angiography, or DSA) is the gold standard for diagnosing a brain or spinal cord AVM, as it allows for real-time visualization of blood flow through the malformation and demonstrates the anatomy of vascular shunting. In some cases, treatment of the AVM with embolization can also be performed at the time of the diagnostic DSA.

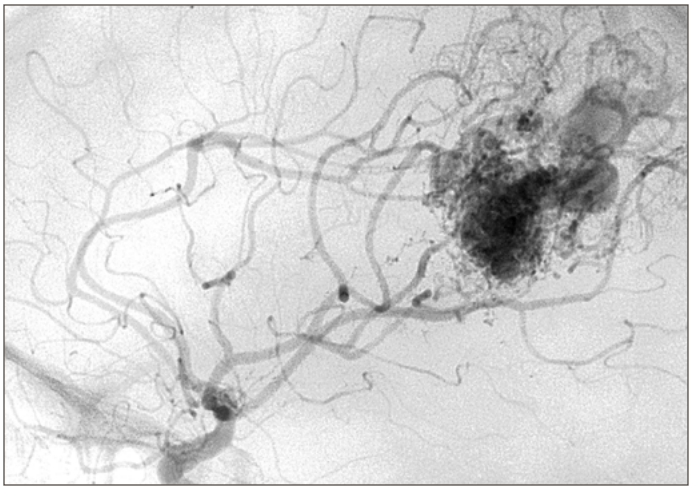

Figure 1

The Spetzler-Martin grading scale is commonly used to predict surgical outcomes of patients with AVMs. Using three categories—size, venous drainage, and eloquence of adjacent brain region, an AVM is graded on a scale from 1 to 5 (Figure 2). A special category, grade 6, is defined as "inoperable," in which surgical resection is likely to result in devastating neurological disability or death.

There are several available treatment methods for AVMs: surgical resection, endovascular embolization, radiosurgery, or a combination of two or more of these options. Surgical resection is recommended when an AVM is superficially located within the brain or spinal cord and is

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relatively small in size and in non-eloquent brain cortex. Endovascular embolization utilizes catheter angiogram as a route to treat an AVM from the lumen of the vessel by injecting an embolic substance or platinum coils into the center (the nidus) of the AVM. By reducing the blood flow to the AVM nidus, this can encourage further thrombosis of the AVM. Endovascular embolization is often an adjunct to surgical excision or radiosurgery to definitively treat the AVM. Stereotactic radiosurgery applies a small dose of highly precise radiation directly on the nidus, and over one to three years the AVM slowly shrinks, closes off, and either is significantly reduced in size or obliterated.

At Stanford Children's Health, we have an experienced team of pediatric neurosurgeons, neurointerventional radiologists, radiation oncologists, and pediatric neuro-intensive care providers who work together to provide exceptional care for children with brain and spinal cord AVMs.

Spetzler-Martin AVM Grading Scale	Points
Size	
0-3 cm	1
3.1-6.0 cm	2
>6 cm	3
Location	
Noneloquent	0
Eloquent*	1
Deep venous drainage	
Not Present	0
Present	1
AVM Total Score	1-5

The Spetzler-Martin AVM Grading Scale is based on size, location, and venous drainage of intracerebral AV malformation. The score is calculated by adding the points for each category. The range is 1 to 5. The lower score, the better the outcome.

* **Eloquent locations-** areas of sensorimotor, language, visual, thalamus, hypothalamus, internal capsule, brain stem, cerebellar peduncles, and deep cerebellar nuclei

Figure 2

"A ruptured AVM is a life-threatening condition and requires swift transfer to a facility with specialty services: Neurosurgery, Neurointerventional Radiology, Neurology, and ICU care teams."

References
https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Fact-Sheets/Arteriovenous-Malformation-Fact-Sheet#:~:text=Cavernous%20malformations%20are%20usually%20well%20defined%20enough%20for,posed%20to%20individuals%20largely%20on%20a%20case-by-case%20basis.https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/children-teens.html

https://stanfordhealthcare.org/medical-conditions/brain-and-nerves/arteriovenous-malformation/symptoms.html

Administering Fluid Boluses in Children

—By Lynda Knight, REVIVE team

Objective(s)

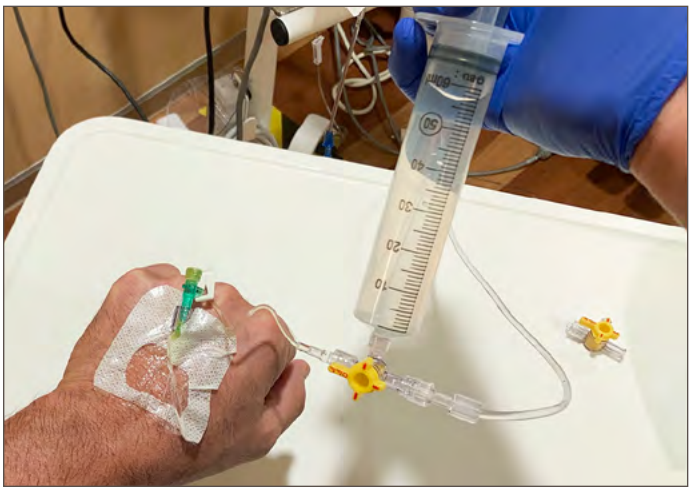
To **provide emergent fluid resuscitation in a patient > 10 kg requiring > 500 ml** upon the recognition of septic shock or hypotension using the push-pull method.

Overview Statement

The push-pull method provides fluid boluses quickly (within five to 15 minutes) to a patient during resuscitation emergencies.

Key Educational Points

- **Do NOT use for patients < 10 kg.**
- **Not to be used for rapid medication administration.**
- Utilize straight line tubing (#1908) or blood extension tubing (#1918 and #1502) or both if needed a longer distance, stopcock, syringes (10 ml, 30 ml, or 60 ml—dependence on resistance of IV or I/O).
- Careful ongoing reassessment to ensure that there are no signs of volume overload.
- Remove push-pull system once tissue perfusion is restored.
- Priming tips: Prime tubing > attach stopcock > prime stopcock > attach to patient.



Attach tubing with stopcock off to patient and pull from bag.

Push to patient with stopcock off to tubing.

References

Davis, A. L., Carcillo, J. A., Aneja, R. K., Deymann, A. J., et al. (2017). American College of Critical Care Medicine clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock. *Critical care medicine*, 45(6), 1061–93.

Schexnayder, S., Hazinski, M., Meeks, R., Knight, L., et al. American Heart Association. Pediatric Advanced Life Support Provider Manual. Dallas, Texas (2016).

Innovation at Stanford: Teleguided Ultrasound

—By Marjan Ghazi Askar, MD, Pediatric Emergency Medicine

At Stanford, we are fortunate to have access to the newest innovative technology that enables us to foster precision medicine in our community—delivering the right care to the right patient at the right time. One of the most exciting and far-reaching applications is teleguided ultrasound, particularly when treating patients with complex medical histories who may present to other care facilities with acute conditions.

Tele-ultrasound experts can guide novice physicians in remote hospital or prehospital settings to successfully obtain ultrasound images that change the clinical course and management for the patient, virtually. A portable ultrasound device connected to a smartphone is also connected with a clinician's computer miles away. Off-site experts in point-of-care ultrasound then collaborate with on-site providers in performing an ultrasound exam.

For example, our physicians can guide prehospital providers to position the ultrasound probe on a patient's chest to allow for diagnosis of congestive heart failure in a pediatric patient with a history of cardiac surgery or perform an Extended Focused Assessment with Sonography in Trauma (EFAST) exam on a trauma victim in the field. In the absence of an on-site radiologist or radiology technician, the provider in a remote emergency department can be directed via teleguidance from our physicians to diagnose a child with intussusception or appendicitis.

The clinician can then use augmented reality signs to position, move, and rotate the ultrasound probe while talking to the individual performing the exam and seeing what they are seeing.

Dr. Marjan Ghazi Askar, a pediatric emergency physician at Stanford University, utilizing teleguided ultrasound as a teaching tool.

The images obtained are relayed to the clinician in real time, enabling the clinician to offer guidance and direction immediately during the examination.

On the education front, Stanford emergency medicine physicians are able to teach select point-of-care ultrasound applications to our community and even credential the providers. And sessions can also be recorded as reference for future encounters and further teaching. The increase in utilization of point-of-care ultrasound and remote guidance expands the capacity of providers everywhere to improve quality of care for all patients, reducing barriers to health care access and improving outcomes.

For collaboration or inquiries, please contact **Marjan Ghazi Askar, MD**, director of tele-ultrasound services and director of pediatric ultrasound education, at zghazi@stanford.edu.

Evaluating a Child With a Tracheostomy

—By Douglas Sidell, MD, Pediatric Otolaryngology

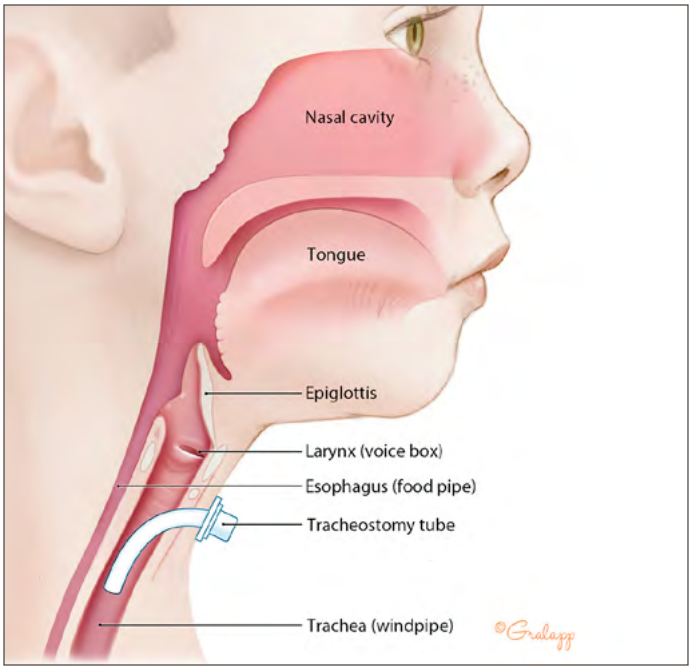
Although tracheostomy management varies considerably across institutions, there are several key principles that should be considered for patients presenting to the emergency room with a tracheostomy in place. It is important to remember that even when tracheostomy-related issues are not the reason for presentation, problems associated with the airway may arise at any time. The importance of gathering appropriate tracheostomy-related information thus applies to all patients with a tracheostomy. The information below provides a simplified overview.

General management principles

In the general description of a patient with a tracheostomy, one should, at a minimum, document the size of the tracheostomy tube, the position and condition of the stoma, and the presence or absence of secretions or bleeding. It is important to discuss with a caregiver the frequency of tracheostomy tube changes, any history of difficult tracheostomy tube changes, and the timing of the most recent tracheostomy tube change. Finally, it is important to establish an accidental decannulation plan and to have a thorough understanding of the tracheostomy.

What is the reason for the tracheostomy?

Being able to identify patients who are unlikely to be maskable and/or intubatable trans-orally using standard techniques is imperative. Much of this information can be gathered by understanding the reason for tracheostomy placement. Children who receive a tracheostomy for chronic ventilator dependence may have an otherwise normal airway. In the event of an emergency, the patient may be able to be mask ventilated, or intubated readily. In contrast, patients with anatomic abnormalities such as those with micrognathia, a head and neck mass (such as a lymphatic malformation or neoplasm), or subglottic stenosis may have significant obstructive pathology.



Lateral view depicting the tracheostomy tube, entering the airway typically two to three rings below the cricoid cartilage.

When was the tracheostomy performed?

Following the placement of a tracheostomy, the skin of the anterior neck heals to form a tract to the airway. This process often occurs within the first one to two weeks and continues to become a more established fistula over subsequent weeks to months. If a patient presents with a recent or "fresh" tracheostomy, it may be more difficult to replace the tracheostomy tube if it is removed or if the patient accidentally decannulates. It is necessary to have a same-size and down-size (typically one-half size smaller, numerically) tracheostomy tube available at all times. In the event of an emergency, an endotracheal tube may be placed in the stoma.

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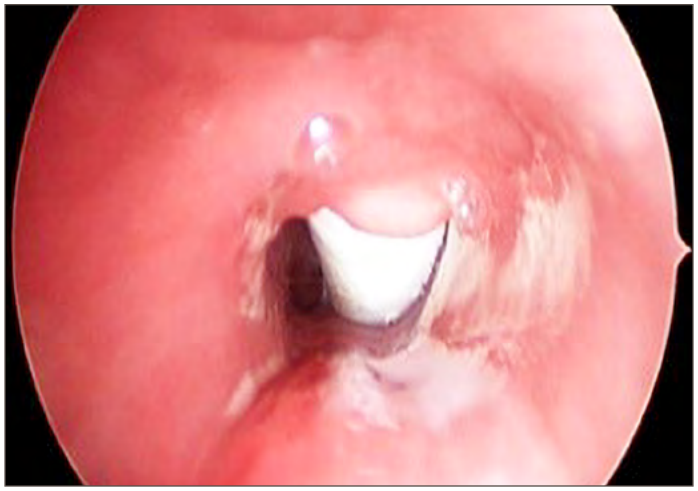
What is the size of the tracheostomy tube? Although other nomenclature may exist, often dependent on the manufacturer, pediatric tracheostomy tubes are frequently described based on their inner lumen diameter (numerically), their length (pediatric or neonatal), and the presence or absence of a cuff. Different cuff types exist, not limited to "tight to shaft (TTS)" water-filled cuffs, standard air cuffs, and foam cuffs. The only difference between pediatric and neonatal tracheostomy tubes is the length of the tube, with pediatric tubes being longer than neonatal tubes. It is important to note that although a tracheostomy tube's length frequently increases as the inner diameter increases, the difference in length is not as great as the difference between neonatal and pediatric tracheostomy tubes. For example, if a patient has a 4.0 neonatal tube and needs a longer tube, this is best achieved by replacing it with a *4.0 pediatric* tube rather than upsizing to a *4.5 neonatal* tube.

Have there been excessive secretions or bleeding?
Excessive secretions may indicate a recent infection, aspiration, or chronic airway pathology. A culture may be obtained if indicated and should be done after placing a new tube in the stoma if possible. Bleeding may occur secondary to inflammation or infection, from trauma due to irritation from deep suctioning, or due to a more serious complication, such as impending tracheal-vascular fistula. Tracheal-vascular fistulas are rare events that may be preceded by short bursts of bright red blood known as "sentinel bleeds." If it is identified early, intervention is frequently possible and successful. In contrast, failure to identify tracheal-arterial (e.g., tracheoinnominate) fistula prior to acute massive hemorrhage is often fatal. As a result, bleeding from the tracheostomy tube must always be evaluated.



Bronchoscopic image demonstrating a cuffless tracheostomy tube entering the airway.

Does the tracheostomy tube need further assessment?
If any questions arise associated with the tracheostomy itself, or if further assessment of secretions or bleeding is necessary, we welcome an otolaryngology evaluation with endoscopic evaluation of the airway at any time.

> "Being able to identify patients who are unlikely to be maskable and/or intubatable trans-orally using standard techniques is imperative."

Pediatric Trauma Imaging Guide

CONSIDER HEAD CT

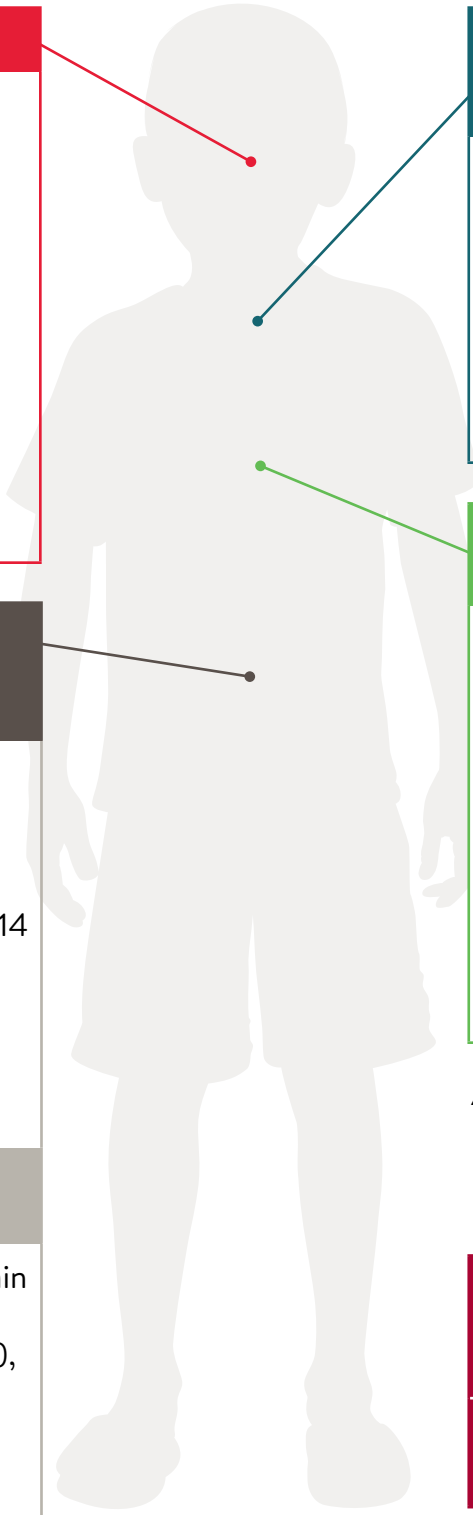
- Altered mental status (GCS 14 or less)
- Non-frontal scalp hematoma
- Loss of consciousness
- Severe injury mechanism
- Palpable skull fracture
- Signs of basilar skull fracture
- Persistent vomiting
- Severe headache with trauma mechanism
- Abnormal neurologic finding (focal deficit, new seizure)

CT ABDOMEN/PELVIS WITH IV CONTRAST IS INDICATED
(Do not give PO contrast)

- Positive FAST
- Abdominal tenderness
- Complaints of abdominal pain
- Risk of intra-abdominal injury with distracting injury or GCS <14
- Abdominal wall bruising/seat belt sign
- Thoracic wall trauma
- Decreased breath sounds
- Unexpected decrease in H&H

Avoid Abdominal CT if the below criteria is met:

- No complaints of abdominal pain
- No abdominal wall trauma (i.e., seat belt sign, ecchymosis), tenderness or distention
- CXR is normal
- AST is <200
- Lipase normal



IF UNABLE TO CLINICALLY CLEAR CERVICAL SPINE USING NEXUS CRITERIA

- CT C-spine
- If any imaging finding is positive or neurological deficit is present, contact pediatric neurosurgeon for further recommendations
- Refer to the latest PECARN recommendations

CHEST CT WITH IV CONTRAST IS INDICATED

- External signs of chest trauma
- Abnormal CXR
  - Hemothorax/Pneumothorax
  - Ruptured diaphragm
  - Bilateral rib fracture
- High force mechanism (MVA rollover, ejection, fatality, struck ped/bicyclist)

If strong suspicion of aortic injury, consider CTA.

Always use dose reduction techniques.

For assistance with transfers or consults, contact the Pediatric Transfer Center

(877) Go-4-LPCH (464-5724)

Sources

Pediatric Trauma Imaging guidelines, The Children's Hospital at OU Medical Center; Identifying Children at Very Low Risk for Blunt Intra-Abdominal Injury in Whom CT of the Abdomen Can Be Avoided Safely. Streck, Christian J. et al; American College of Surgeons, 2017, pages 449-458; Vol. 224, No. 4, April 2017; ACS TQIP Best practices guidelines in imaging. Content courtesy of Children's Minnesota.

Pediatric Pain Management Services

—Rita Agarwal, MD, FAAP, FASA
Genevieve D'souza, MD, FASA

Fifteen-year-old David was riding his bike when he was hit by a car. He sustained multiple injuries, including several rib fractures, an open femur fracture, and liver laceration. He has been stabilized by the ED, ICU, and surgical teams and undergone several operations, and he is now recovering. Unfortunately, he still has a long recovery ahead of him. One of the biggest challenges he faces is that of ongoing pain. Luckily, Lucile Packard Children's Hospital Stanford is home to one of the best pediatric pain services in the country. The inpatient pain management team provides pain and symptom management 24 hours a day, 7 days a week, with a variety of approaches, including multimodal medication therapy with opioids and nonopioid medications, regional anesthesia, nonpharmacologic techniques, acupuncture, physical therapy, occupational therapy, and cognitive behavioral therapy as necessary.

If pain becomes chronic or recurrent, persists after hospital discharge, or develops into complex regional pain syndrome, the Outpatient Pain Management Service can help manage David's symptoms. The initial clinic evaluation is conducted by a multidisciplinary team that includes a physician, a nurse practitioner, a child psychologist, and a physical therapist. The clinic provides a full spectrum of nonpharmacologic methods, such as acupuncture, acupressure, pain psychology, biofeedback, relaxation training, and medical hypnosis, in addition to conventional medical management with medication management and interventional pain procedures.

Stanford Children's Health pediatric pain team.

If pain persists, the Pediatric Rehabilitation Program (PReP) is an intensive day treatment program that runs over multiple weeks dedicated to treating children and adolescents suffering from debilitating chronic pain conditions. The main goal of PReP is to improve the child's quality of life by increasing his or her function and pain management.

The Pediatric Pain Clinic also runs the Comfort Ability workshop for youth and their parents/caregivers to help them learn strategies to better manage their pain and improve their function. More information is available at TheComfortAbility.com. For more information about our services, please **visit our website**.

Inpatient Consults and Transfers

The Transfer Center at Lucile Packard Children's Hospital Stanford is standing by to help with inpatient consultations and interfacility transfers. Our team of transfer center specialists are available 24/7 to assist in coordinating neonatal, pediatric, and obstetrical transfers, as well as inpatient consultation needs.

To initiate a patient transfer and/or to consult with a Packard Children's specialist, please call **(650) 723-7342.**

Please have the following information available with the initial request:

- Patient's name and location
- Date of birth
- Chief complaint or diagnosis
- Referring physician's full name and best contact number
- Face sheet ready and available for faxing upon request to **(650) 498-6229**

Questions or concerns about the Lucile Packard Children's Hospital Stanford Transfer Center? Please contact:

Kat Cueto, MSN, RN-BC, CNS
Director of Clinical Access
(650) 721-5770
kcueto@stanfordchildrens.org

For questions or concerns related to our COVID-19 plan, please see our web page. Information is updated daily and includes content for families and providers. Covid.stanfordchildrens.org