INFECTION CONTROL & PREVENTION
A PEDIATRICIAN’S GUIDE

PEER-REVIEWED FEATURE

Deciphering bacterial meningitis

“When can my child return to school?”

HOSPITAL ZONE
Children’s Hospital Los Angeles’ novel facial cleft care
OUR MISSION  
Office- and hospital-based pediatricians and nurse practitioners use Contemporary Pediatrics’ timely, trusted, and practical information to enhance their day-to-day care of children. We advance pediatric providers’ professional development through in-depth, peer-reviewed clinical and practice management articles, case studies, and news and trends coverage.
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INDICATION

EMVERM (mebendazole) 100 mg chewable tablet is indicated in adults and children over 2 years of age for the treatment of Enterobius vermicularis (pinworm), Trichuris trichiura (whipworm), Ascaris lumbricoides (common roundworm), Ancylostoma duodenale (common hookworm), and Necator americanus (American hookworm) in single or mixed infections.

IMPORTANT SAFETY INFORMATION

Mebendazole is contraindicated in persons who have shown hypersensitivity to the drug.

Warnings: There is no evidence that mebendazole, even at high doses, is effective for hydatid disease. There have been rare reports of neutropenia and agranulocytosis when mebendazole was taken for prolonged periods and at dosages substantially above those recommended.

Precautions: Periodic assessment of organ system functions, including hematopoietic and hepatic, is advisable during prolonged therapy.

Adverse reactions include: Transient symptoms of abdominal pain and diarrhea with expulsion of worms in cases of massive infection; liver function test elevations [AST (SGOT), ALT (SGPT), and GGT]; and on rare occasions hypersensitivity (rash, urticaria and angioedema); rare reports of neutropenia, agranulocytosis (see WARNINGS) and hepatitis when mebendazole was taken for prolonged periods and at dosages substantially above those recommended; and very rare cases of convulsions.

Drug Interactions: Preliminary evidence suggests that cimetidine inhibits mebendazole metabolism and may result in an increase in plasma concentrations of mebendazole.

Pregnancy Category C: Mebendazole has shown embryotoxic and teratogenic activity in pregnant rats at single oral doses as low as 10 mg/kg (approximately equal to the human dose, based on mg/m²). In view of these findings the use of mebendazole is not recommended in pregnant women.

Nursing Mothers: It is not known whether mebendazole is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when mebendazole is administered to a nursing woman.

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Nursing Mothers: It is not known whether mebendazole is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when mebendazole is administered to a nursing woman.

Information for Patients:

• Patients should be informed of the potential risk to the fetus in women taking mebendazole during pregnancy, especially during the first trimester (See Pregnancy Category C).
• Patients should also be informed that cleanliness is important to prevent re-infection and transmission of the infection.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088. To report SUSPECTED ADVERSE REACTIONS contact Impax Laboratories, Inc. at 1-877-994-6729.

See full Prescribing Information at www.EMVERMHCP.com and Brief Summary on following page.
EMVERM™ (mebendazole) 100 mg Chewable Tablets

BRIEF SUMMARY: See Package Insert for full Prescribing Information

INDICATIONS AND USAGE
Mebendazole tablets are indicated for the treatment of Enterobius vermicularis (pinworm), Trichuris trichiura (whipworm), Ascaris lumbricoides (common roundworm), Ancylostoma duodenale (common hookworm), Necator americanus (American hookworm) in single or mixed infections. Efficacy varies as a function of such factors as preexisting diarrhea and gastrointestinal transit time, degree of infection, and helminth strains. Efficacy rates derived from various studies are shown in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Pinworm (enterobiasis)</th>
<th>Whipworm (trichuriasis)</th>
<th>Common Roundworm (ascarisis)</th>
<th>Hookworm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cure rates mean</td>
<td>95%</td>
<td>68%</td>
<td>98%</td>
<td>96%</td>
</tr>
<tr>
<td>Egg reduction mean</td>
<td>—</td>
<td>93%</td>
<td>99%</td>
<td>99%</td>
</tr>
</tbody>
</table>

CONTRAINDICATIONS
Mebendazole is contraindicated in persons who have shown hypersensitivity to the drug.

WARNINGS
There is no evidence that mebendazole, even at high doses, is effective for hydatid disease. There have been rare reports of neutropenia and agranulocytosis when mebendazole was taken for prolonged periods and at dosages substantially above those recommended.

PRECAUTIONS
General
Periodic assessment of organ system functions, including hematopoietic and hepatic, is advisable during prolonged therapy.

Information for Patients
Patients should be informed of the potential risk to the fetus in women taking mebendazole during pregnancy, especially during the first trimester (See Pregnancy Category C). Patients should also be informed that cleanliness is important to prevent reinfection and transmission of the infection.

Drug Interactions
Preliminary evidence suggests that cimetidine inhibits mebendazole metabolism and may result in an increase in plasma concentrations of mebendazole.

Carcinogenesis, Mutagenesis, Impairment of Fertility
In carcinogenicity tests of mebendazole in mice and rats, no carcinogenic effects were seen at doses as high as 40 mg/kg (one to two times the human dose, based on mg/m²) given daily over two years. Dominant lethal mutation tests in mice showed no mutagenicity at single doses as high as 640 mg/kg (18 times the human dose, based on mg/m²). Neither the spermatocyte test, the Fl translocation test, nor the Ames test indicated mutagenic properties. Doses up to 40 mg/kg in mice (equal to the human dose, based on mg/m²), given to males for 60 days and to females for 14 days prior to gestation, had no effect upon fetuses and offspring, though there was slight maternal toxicity.

Pregnancy
Teratogenic Effects
Pregnancy Category C
Mebendazole has shown embryotoxic and teratogenic activity in pregnant rats at single oral doses as low as 10 mg/kg (approximately equal to the human dose, based on mg/m²). In view of these findings the use of mebendazole is not recommended in pregnant women. Although there are no adequate and well-controlled studies in pregnant women, a post-marketing survey has been done of a limited number of women who inadvertently had consumed mebendazole during the first trimester of pregnancy. The incidence of spontaneous abortion and malformation did not exceed that in the general population.

In 170 deliveries on term, no teratogenic risk of mebendazole was identified.

Nursing Mothers
It is not known whether mebendazole is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when mebendazole is administered to a nursing woman.

Pediatric Use
The drug has not been extensively studied in children under two years; therefore, in the treatment of children under two years the relative benefit/risk should be considered.

ADVERSE REACTIONS
Gastrointestinal
Transient symptoms of abdominal pain and diarrhea in cases of massive infection and expulsion of worms.

Hypersensitivity
Rash, urticaria and angioedema have been observed on rare occasions.

Central Nervous System
Very rare cases of convulsions have been reported.

Liver
There have been liver function test elevations [AST (SGOT), ALT (SGPT), and GGT] and rare reports of hepatitis when mebendazole was taken for prolonged periods and at dosages substantially above those recommended.

Hematologic
Neutropenia and agranulocytosis. (See WARNINGS).

OVERDOSAGE
In the event of accidental overdosage, gastrointestinal complaints lasting up to a few hours may occur. Vomiting and purging should be induced. Activated charcoal may be given.

DOSAGE AND ADMINISTRATION
The same dosage schedule applies to children and adults. The tablet may be chewed, swallowed, or crushed and mixed with food.

<table>
<thead>
<tr>
<th></th>
<th>Pinworm (enterobiasis)</th>
<th>Whipworm (trichuriasis)</th>
<th>Common Roundworm (ascarisis)</th>
<th>Hookworm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>1 tablet, once</td>
<td>1 tablet morning and evening for 3 consecutive days</td>
<td>1 tablet morning and evening for 3 consecutive days</td>
<td>1 tablet morning and evening for 3 consecutive days</td>
</tr>
</tbody>
</table>

If the patient is not cured three weeks after treatment, a second course of treatment is advised. No special procedures, such as fasting or purging, are required.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088. To report SUSPECTED ADVERSE REACTIONS contact Impax Laboratories, Inc. at 1-877-994-6729.


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MORE TALK ON MOC

We heard from you about Dr. Andrew Schuman’s latest article “MOC reform: One year later,” June 2016, and also regarding Dr. Rachel St. John’s commentary “Pathologizing deafness,” May 2016. Here are just a few of your thoughts on these articles.

Thank you for the excellent article regarding the update on MOC. Here is a very brief summary of my opinion regarding MOC. I did research before going to medical school and became a doctor because I did not want to continue doing research. The very small amount of knowledge gleaned from the large amount of time utilized to complete MOC part 4 is not acceptable to me. I hardly have enough time in the day just to see my patients. I have no problem with examinations to assess my competency, but the rest of MOC is a huge waste of time designed by and for academicians.

—Ron Beckel, MD

****

I just finished reading the Contemporary Pediatrics article about MOC reform. I love what the ABA has done with weekly/monthly questions. I’m in for piloting that with ABP!

—Thomas D. Miller, MD

I enjoyed your recent article on the latest in MOC. There are at least 2 other things wrong with MOC, besides what you point out:

1. There is no distinction between academics and those in private practice. If one is actively engaged in teaching and research, there should be some sort of a waiver for the educational part — eg, if I publish articles and give talks, that should be proof enough that I am keeping up (at least in my area of specialization).

2. The fee schedule borders on extortion. After passing my last exam in 2012 and completing all of my MOC requirements, the ABP would not list me as board certified until I paid for the next 10 years! And the fee is nonrefundable, so if I died the next day, my widow would be out $1200.

—Ben Z. Katz, MD

****

This is very useful. I am planning to approach [my] state legislature about MOC reform to implement a similar law as Oklahoma.

—Paul G. Mathew, MD, FAAN, FAHS

Hearing You on Deafness

I respect your opinion, and I know that there [are] loud advocates from the “disabilities movement” that are getting a lot of media attention. Yet, I disagree. Would you say the same about blindness? Would you say the same about spasticity with cerebral palsy? Yes, there are hundreds of individuals that live meaningful lives despite or because of the above conditions. But these are still conditions that require prevention and accommodation.

—Francisco Enriquez, MD, FAAP

Dr. St. John’s letter was the epitomy of political correctness, unless I am totally naive after forty years of practice. Is being blind a pathological situation? We can teach Braille and getting around with a cane. Who would not want their eyesight restored? Lacking 1 of the 5 senses is a deficiency. It is fine to try to accommodate for the absence of a sense, but even better to restore it.

—Irwin H. Berkowitz, MD, FAAP

Congratulations to our Editorial Advisory Board Member, Dr. Donna Hallas, recipient of the 2016 American Association of Nurse Practitioners (AANP) Nurse Practitioner State Award for Excellence (New York), which recognizes outstanding achievements by NPs and NP advocates. Brava!
n May 2016, the US Food and Drug Administration (FDA) announced the revamping of the rules for the “nutrition facts” label box on packaged foods, the first major such overall in 20 years.

With the obesity epidemic continuing, much of the emphasis in the announcement was on things such as the FDA’s new requirement that manufacturers list “added sugars” and that they use a new format, which, among other things, will display the calories much more prominently.

Less talked about was the fact that in the 2 years since the FDA proposed the changes, there has been a massive discussion, via the agency’s regulatory process, on the many aspects of nutrition science and policy.

As 1 example, in a comment to the FDA last fall, the American Academy of Pediatrics (AAP) said it was comfortable with the proposal of a Daily Reference Value (DRV) of 25 g “for added sugars based on a 1000-calorie reference amount for children 1 through 3 years of age.”

However, the AAP said, it’s a problem that the rules would, in effect, extend the added sugar recommendations for an adult to children as young as age 4 years, which would indicate it would be okay for them to eat up to 14% of their calories in added sugar.

The FDA declined to make a change based on the AAP’s comment, saying that a separate DRV for different child age groups “could clutter the label, cause confusion, and draw attention to the added sugars declaration because more space would be required for 2 separate percent DV declarations on the label.”

In another instance, the AAP, the March of Dimes, and about 22 other groups said the change in the way the FDA will require that folic acid be listed could lead to public confusion, limit the ability to monitor intake and safety, and negatively impact birth outcomes.

The new rule would mandate the expression of the Recommended Dietary Allowance (RDA) for folate in “Dietary Folate Equivalents (DFEs).” The groups’ comments said, “Because of the difference between measuring folate/folic acid in DFEs versus micrograms, this means the RDA is lower than the [US Public Health Service] recommendation for intake among women of childbearing age.”

The FDA, however, noted that the DFE, developed by the Institute of Medicine, “accounts for the differences in bioavailability between food folate (natural folate) and folic acid, which is more bioavailable (about 1.7 times more bioavailable).”

The AAP also urged the FDA to require that foods be labeled for caffeine because of its numerous adverse effects. It noted findings from the American Association of Poison Control Centers that “more than 40% of 5156 calls about energy drinks to US poison control centers involved children younger than 6, with some suffering serious cardiac and neurological symptoms.”

In other rules related to obesity, the FDA says that because package size affects what people eat, packages that are between 1 and 2 servings must be labeled as 1 serving in terms of calories and other nutrients because people typically consume those packages in 1 sitting. Examples are a 20-ounce soda or a 15-ounce can of soup.

Large food manufacturers have 2 years to comply with all the new requirements, by July 26, 2018, and those with less than $10 million in sales have another year after that.

The FDA and the American Medical Association have announced a new continuing medical education (CME) video for physicians about discussing the nutrition facts labels with patients. For this CME, go to https://cme.ama-assn.org/Activity/4252182/Detail.aspx
new clinical decision support tool prompts clinicians to ask parents about secondhand smoke exposure, provides an electronic nicotine replacement therapy (NRT) prescription, and makes referrals for follow-up and further guidance. A study found that the tool is easy to use and has a clinical impact.

Investigators conducted the study within the Children's Hospital of Philadelphia Pediatric Research Consortium, which includes 31 practices in 2 states. The tool, which interfaces with the electronic health record (EHR), first prompts the clinician to ask the parent about smoking status and whether he or she wants to quit. An affirmative response triggers a link to an electronic NRT prescription (nicotine patch or gum) with dosing guidance. Finally, the tool prompts clinicians to refer parents to an adult tobacco treatment program and additional resources and to update the EHR.

During a 3-month period, clinicians used the tool at about three-quarters of more than 3000 visits at which 165 parents expressed interest in quitting smoking and were offered treatment. Although clinician use of the tool varied substantially, more than 75% of clinicians used the tool at more than 60% of visits. Of 24 clinicians (18 pediatricians and 6 nurse practitioners) who used the tool, 17 completed a follow-up survey. Of these, 94% reported that they were satisfied with the tool and found it helpful.

Among the tool’s advantages, ease of use, a reminder to screen all parents about smoking, and access to an electronic NRT prescription were cited by respondents. Nearly 90% of parents interested in quitting who were surveyed reported being satisfied or very satisfied with their treatment (64% received an NRT prescription and 25% had filled a prescription and were using it), and 28% noted that they were motivated to be treated because quitting was framed around helping their child (Jenssen BP, et al. Pediatrics. 2016;137[5]:e20154185).

An analysis of data on the incidence of pertussis shows that although acellular pertussis (Tdap) vaccine had a positive impact on adolescent incidence in the 4 years after it was introduced in 2005, in 2010 pertussis incidence in this age group began to increase more rapidly than it did in all other age groups. This abrupt shift in incidence occurred in the same year that 11-year-olds represented the first group of children to have received acellular vaccines for all doses of the childhood series, following the 1997 transition from

**This smoking cessation intervention works!**

**commentary**

We know that we should screen for smoke exposure in the home, offer counseling and referral to smoking cessation resources, and arrange for NRT, but, as several studies have shown, we don’t. During a short office encounter, we face obstacles all along the way. The tool described here is an example of how the EHR makes it easier to get done what we know needs to be done. It prompts the physician to screen for smoke exposure, presents information on smoking cessation, allows arrangements for a recruitment call from a smoking cessation counselor, and provides a prescription for nicotine replacement with dosing information included. By removing obstacles, this EHR application could improve health for both parents and children. —Michael G Burke, MD

**Tdap booster in teens less effective after initial acellular vaccine series**

An analysis of data on the incidence of pertussis shows that although acellular pertussis (Tdap) vaccine had a positive impact among adolescents in the 4 years after it was introduced in 2005, in 2010 pertussis incidence in this age group began to increase more rapidly than it did in all other age groups. This abrupt shift in incidence occurred in the same year that 11-year-olds represented the first group of children to have received acellular vaccines for all doses of the childhood series, following the 1997 transition from
whole pertussis to acellular vaccines. These findings indicate that a Tdap booster vaccine in adolescence has a diminished effect among those who were primed with acellular pertussis vaccine in early childhood.

The extended analysis of reported pertussis cases between 1990 and 2014 shows that pertussis incidence was highest among infants aged younger than 1 year throughout the period. Pertussis rates were comparable among all other age groups until the late 2000s when the pertussis burden increased among children aged 1 to 10 years; between 2007 and 2011, the incidence of pertussis in children in this age group was 1 to 2 times higher than in adolescents aged 11 to 18 years. However, when trends reversed in 2010, rates of pertussis among 11- to 18-year-olds increased at a faster rate than it did in all other age groups combined, and by 2014 adolescents had overtaken all but young infants in pertussis incidence (Skoff TH, et al. JAMA Pediatr. 2016;170[5]:453-458).

This means that pertussis is not going away and, despite Tdap boosters, incidence will continue to rise as more children initially vaccinated with acellular pertussis vaccine move through adolescence. In the words of the researchers, “[S]usceptible individuals will continue to accumulate in the population.” Until a new solution is devised, it is up to us to continue to think about pertussis, recognize it early, and initiate treatment to decrease spread. —Michael G Burke, MD

Mild gastroenteritis? Try dilute apple juice!

Among children with mild gastroenteritis and minimal dehydration, initial oral hydration with dilute apple juice followed by preferred fluids is more beneficial than electrolyte maintenance solution, a large study in a pediatric emergency department (ED) found.

The 647 study participants, aged 6 to 60 months, were divided into an intervention group that received half-strength apple juice and a control group that was given an apple-flavored electrolyte maintenance solution. After discharge, the apple juice group was instructed to drink whatever fluids they wished, while the electrolyte maintenance solution group replaced fluids with electrolyte maintenance solution.

At follow-up, fewer children in the apple juice/preferred fluids group received intravenous rehydration (Freedman SB, et al. JAMA. 2016;315[18]:1966-1974).

Marijuana use can trigger recurrent cyclic vomiting in teenagers. A new report points out that 1 known cause of cyclic vomiting syndrome (CVS) is chronic use of cannabis. Cyclic vomiting syndrome is a constellation of recurrent vomiting, nausea, and abdominal pain. When linked to chronic marijuana use, CVS has the unique characteristic of being temporarily relieved by frequent hot showers. The researchers recommend screening for marijuana use by history and a urine drug screen in adolescents with CVS who take hot showers for symptomatic relief (Sawni A, et al. Clin Pediatr. 2016;55[6]:560-563).

Dilute apple juice or other liquids were not only as good as electrolyte solution in this study, they were better. Perhaps IV hydration and admission were more common in the electrolyte solution group because parents had to purchase the solution after ED discharge, while those in the dilute apple juice arm of the study could be given any fluid available at home. It is important to note that this study included only patients aged at least 6 months and only those with mild dehydration; 81% of the enrolled patients had dehydration scores of 0 or 1 on an 8-point scale. Diarrhea leading to life-threatening dehydration and electrolyte disturbances is a real and scary thing, even in developed countries. Dilute apple juice may be fine for mildly dehydrated children, but in moderate to severe diarrhea I will stick with electrolyte solution. —Michael G Burke, MD
Boy with fever, cough, and oral lesions

J DAVID STERNS, MD; RIVA KAMAT, MD, FAAP

THE CASE

A previously healthy, 16-year-old Hispanic boy initially presents to the clinic with a 5-day history of tactile fevers, achy malaise, congestion, and a dry cough. He was afebrile with negative rapid strep and monospot tests, but was prescribed fluticasone, benzonatate, and ibuprofen for a presumed upper respiratory infection. He was encouraged to return if symptoms did not improve. For more on this case, turn to page 38.
Deciphering bacterial meningitis

PAT F BASS III, MD, MS, MPH

Pediatricians need to understand not only how bacterial meningitis can be prevented through vaccination, but also its risks, symptoms, workup, and treatment.

The introduction of conjugated vaccines has decreased the incidence of bacterial meningitis in children, amounting to one of the biggest public health successes in the practicing pediatrician’s career. In fact, the median age of patients successfully treated for bacterial meningitis has increased from younger than age 5 years to age 42 years and older. Improvements have been seen in every age group, except in those aged younger than 2 months. Cases of meningitis from strains of bacteria not covered by vaccination and drug-resistant strains, however, remain a concern for pediatric patients.

Etiology, epidemiology, and risk factors

The most common causes of bacterial meningitis are Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae type b (Hib; rarely a cause since the development of a vaccine), group B Streptococcus (GBS), and Listeria monocytogenes.1-3 Etiology depends on the age of the patient (Table 1).3-4 Introduction of the conjugate Hib vaccine in the 1990s almost eliminated Hib in countries in which it was introduced and decreased the overall incidence of meningitis by nearly 55%.3 This was followed by the introduction of the heptavalent pneumococcal vaccine (PCV7) in 2000, which reduced pneumococcal meningitis by nearly 60% in children aged younger than 2 years.3-5

In the years between 1998 and 2007, herd immunity continued to drop the rate of meningitis by more than 30%, from a rate of 2 cases per 100,000 to 1.38 cases per 100,000.3-6 Despite these advances,
however, case fatality rates did not change and rates of pneumococcal disease from strains not covered by the PCV7 strain began to emerge. In 2010, the 13-valent pneumococcal conjugate vaccine (PCV13) was introduced, but *S. pneumoniae* remains the most common cause of bacterial meningitis for children aged older than 1 month.3

More recently, introduction of a vaccine targeting *N. meningitidis* serogroup C disease significantly reduced invasive meningococcal disease. In Canada, the serogroup C vaccination led to a decrease in incidence from 0.07 to 0.25 per 100,000 (depending on the province) to fewer than 0.05 per 100,000 per year, a reduction of 14% per year. It is estimated that this annually decreases the burden of *N. meningitidis* serogroup C by 75 to 85 invasive meningococcal disease cases and 10 to 12 deaths.7

For the United States, the Immunization Action Coalition reports that the incidence during 2005 to 2011 was 0.3 cases per 100,000 population and decreased to an incidence of 0.18 cases per 100,000 population in 2013.8 Serogroups B, C, and Y were equally responsible for reported cases. Two quadrivalent conjugated meningococcal vaccines (MenACWY-DT and MenACWY-CRM197) are licensed in the United States, and another is licensed in Europe (MenACWY-TT).9 In the United States, there are programs for both infant and child, as well as adolescent immunization.

Despite the shifting incidence of meningitis, patients aged younger than 2 months still have the highest incidence of bacterial meningitis.

### Table 1 Causes of Bacterial Meningitis by Age

<table>
<thead>
<tr>
<th>Birth to 1-3 mo</th>
<th>3 mo-2 y</th>
<th>2-18 y</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Group B Streptococcus</em></td>
<td><em>S. pneumoniae</em></td>
<td><em>N. meningitidis</em></td>
</tr>
<tr>
<td><em>Gram-negative enteric bacilli</em></td>
<td><em>Neisseria meningitidis</em></td>
<td></td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td><em>Haemophilus influenzae</em> type b</td>
<td></td>
</tr>
</tbody>
</table>

From: Swanson D3; Whitney CG, et al.4

### Table 2 Risk Factors for Meningitis

<table>
<thead>
<tr>
<th>Neonate</th>
<th>Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low birth weight (&lt;2500 g)</td>
<td>Absent or underimmunization</td>
</tr>
<tr>
<td>Prematurity (&lt;37 wk gestation)</td>
<td>Daycare exposure (increased 1st 2 mo; declines after 6 mo)</td>
</tr>
<tr>
<td>Premature rupture of membranes</td>
<td>Age &lt;2 y</td>
</tr>
<tr>
<td>Fetal hypoxia</td>
<td>Functional or surgical absence of spleen</td>
</tr>
<tr>
<td>Traumatic delivery</td>
<td>Immunosuppressed (eg, HIV, malignancy, complement deficiency, chronic steroid use)</td>
</tr>
<tr>
<td>Urinary tract abnormalities</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>Maternal GBS infection</td>
<td>Chronic liver disease</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
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<tr>
<td>Galactosemia</td>
<td>Cochlear implant</td>
</tr>
<tr>
<td>CSF leak</td>
<td></td>
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<tr>
<td>Head trauma</td>
<td></td>
</tr>
<tr>
<td>Travel to areas with endemic meningitis</td>
<td></td>
</tr>
<tr>
<td>Live with large group in confined space (dorms, military recruits)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CSF, cerebrospinal fluid; GBS, group B *Streptococcus*; HIV, human immunodeficiency virus. From: Brouwer MC, et al.10; Hjuler T, et al.11; Revest M, et al.12
primarily associated with the different etiologies (Table 1).3,4 In this age group, GBS and *Escherichia coli* are responsible for 70% to 80% of cases. Although routine maternal GBS and intrapartum antibiotic treatment have decreased early-onset GBS disease by 86%, the incidence of late-onset disease has not changed.3

Risk factors for pediatric meningitis, which also vary by age, are presented in Table 2.10-12

**Differential diagnosis**

A number of different diseases can mimic meningitis, and not all children presenting with signs and symptoms of meningitis have the disease. In a review of 650 children undergoing a lumbar puncture, there were many diseases found to mimic meningitis symptoms such as pneumonia, otitis media, pharyngitis, and gastroenteritis. In this review study, neck stiffness was twice as likely (50% vs 25%) and a positive Brudzinski test was 3 times as likely in patients diagnosed with meningitis.13,14 Viral illness, sinusitis, and migraine were common causes of headache, with no cases of bacterial meningitis in 2 studies of patients presenting to an emergency department with headache.15,16 Although 30% of patients presenting to an emergency department with signs of meningismus had meningitis, 8% had pneumonia and 46% were diagnosed with upper respiratory tract infection or other self-limiting illnesses.17

Other causes of meningitis also can mimic bacterial meningitis such as viruses, fungi, mycobacteria, and parasites. Retropharyngeal abscess is a relatively common infectious disease process that mimics meningitis. Other infectious mimickers include brain abscess, subdural or epidural abscess, and encephalitis.3

**Presentation**

The clinical features of bacterial meningitis are often nonspecific and can vary by age. The younger the child, the less likely he or she will present with classic symptoms of fever, headache, and meningeal signs. A neonate or young infant may only present with apnea, bulging fontanel, diarrhea, fever, irritability, lethargy, poor feeding, temperature instability, or vomiting.18 Symptoms are variable, however, and the patient may have fever, hypothermia, or euthermia. Parents may describe their infant as fussy, jittery, or inconsolable.4 Seizure may be a presenting sign in 20% to 50% of cases of Hib meningitis (less in other etiologies), but neck stiffness is uncommon.

In older children, changes in mentation, fever, headaches, nausea, photophobia, and vomiting may be present. Symptoms may evolve over several days or a period of hours.3 Seizure may be the sole presenting sign in patients with pneumococcal meningitis. A positive Kernig or Brudzinski sign has low sensitivity for meningitis, and their absence does not rule out meningitis.18 Rash and petechiae are present
in about 50% of cases of invasive disease attributed to *N. meningitidis*. Symptoms of bacterial meningitis presenting in neonates and older children are listed in Table 3. Table 4 shows how different signs may display in different age groups.

**Diagnosis**
Blood cultures, a complete blood count, and electrolytes should be obtained. White blood cell (WBC) counts can be normal, high, and may be low in neonates. More than 80% of patients (the percentage is higher for Hib and lower for other causes) not pretreated with antibiotics will have positive blood cultures with bacterial meningitis. Procalcitonin levels will be elevated in bacterial meningitis, but these cannot distinguish between bacterial and viral meningitis. If petechiae or low platelet counts are present, disseminated intravascular coagulation should be considered and worked up. Syndrome of inappropriate antidiuretic hormone (SIADH) is suggested by a low sodium level and other testing.3

A lumbar puncture (LP) should be obtained unless contraindicated in patients because of:
- Hemodynamic instability,
- Increased intracranial pressure,
- Coagulopathy, or
- Neurologic findings indicating a mass lesion.

Computed tomography (CT) is not routinely needed prior to LP. The CT findings not apparent on physical exam are unlikely to change clinical management.20 Patients with coma, papilledema, and focal neurologic findings should have a CT prior to LP. The need for CT, however, should not delay obtaining blood cultures or antibiotic administration. Patients without these findings do not need a CT prior to LP.21,22 If CT is obtained, LP should be performed after CT if there are no contraindications.

Spinal fluid should be sent for:
- WBC count and differential;
- Glucose;
- Total protein; and
- Gram stain and bacterial culture.

In the bacterial meningitis patient not treated with antibiotics before presentation, elevated WBCs, low glucose, and elevated protein in the spinal fluid are suggestive of bacterial meningitis. Spinal fluid normals are based on the patient’s age. Occasionally, cerebrospinal (CSF) fluid may appear normal when the spinal tap is performed very early in a child’s illness.

The spinal tap results can be altered following a traumatic tap, making it difficult to diagnose bacterial meningitis. Following a traumatic tap, cell counts are difficult to...
interpret. The easiest formula is to subtract 1 to 2 CSF WBCs for every 1000 CSF red blood cells (RBCs)/mm³. This formula and the formula comparing the ratio of CSF WBCs to CSF RBCs to blood WBCs to blood RBCs, however, should be interpreted with caution and likely empiric antibiotics should be started pending culture results.

Pretreatment with antibiotics decreases likelihood of a positive CSF culture. Reports demonstrate a positive culture result in bacterial meningitis with oral and parenteral antibiotics of only 71% and 66%, respectively. Parenteral antibiotics sterilize the CSF within a couple of hours, but antimicrobial pretreatment does not impact the ability to diagnose bacterial meningitis using cell counts, protein, and glucose.

Although latex agglutination tests are available to assist in making a diagnosis, these rarely alter the treatment plan and the tests are not needed in most instances. In fact, such testing is no longer routinely recommended for antibiotic-pretreated patients.

**Empiric antibiotics**

The goal is to administer antibiotics as early as possible once the diagnosis of bacterial meningitis is considered. Although adverse outcomes are not associated with duration of symptoms prior to treatment, delay of antibiotic administration is associated with poor outcomes.

Empiric antibiotic therapy should target likely pathogens based on the patient’s age, underlying health conditions, and local efficacy and susceptibility patterns. Antibiotic choices should have good penetration into CSF and have bactericidal properties.

Empiric antibiotics for bacterial meningitis in the neonatal period are primarily ampicillin plus gentamicin or ampicillin plus cefotaxime. The latter regimen is more common when clinicians are concerned about increasing resistance of *E. coli* plus rifampin or vancomycin plus meropenem are options for initial therapy.

Antibiotics may be discontinued when blood and CSF cultures are negative in patients with an unremarkable CSF in which bacterial meningitis is ruled out. Children with positive blood cultures and an abnormal CSF, but a negative CSF culture, are often treated as if the CSF culture were positive. If both CSF and blood cultures are negative but the child had an abnormal CSF evaluation, consultation with a pediatric infectious diseases expert is recommended.

Total duration of antibiotic therapy will depend on the patient’s age and bacterial etiology. For uncomplicated neonatal meningitis with GBS or *S. pneumoniae*, a 14- to 21-day course of treatment is usually sufficient. Outside the neonatal period, the usual course of treatment for uncomplicated bacterial meningitis is 10 to 14 days for *S. pneumoniae* and 7 days for *N. meningitidis*.

**Dexamethasone therapy**

Steroids are believed to decrease neurologic complications in bacterial meningitis by decreasing inflammatory response and modulating mediators that are released when initial antibiotics result in the lysis of cell walls. However, dexamethasone therapy outside of treatment for *H. influenzae* (for which it is clearly indicated) remains controversial. There is also a potential concern that steroids may decrease the effectiveness of vancomycin by decreasing inflammation and further reduce its already suboptimal
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The American Academy of Pediatrics (AAP) Committee on Infectious Diseases recognizes the benefit of dexamethasone therapy in *H influenzae* type b meningitis. The AAP says clinicians can consider its use in bacterial meningitis in patients aged older than 6 weeks after considering the risks and benefits. If used, dexamethasone should be administered with the first dose of antibiotics because it has no benefit if administered more than 1 hour after the antibiotic.3,28

**Complications**

Among survivors of bacterial meningitis, 50% are reported to have at least 1 complication at 5 years. The most commonly cited bacterial cause associated with complications is *H influenzae*. Complications may be categorized as intellectual/behavioral deficits (78%), neurologic (14%), hearing loss (7%), and vision loss (3%).30,31

Examples of intellectual and behavioral deficits include:
- Cognitive impairment,
- Academic limitations, and
- Attention-deficit/hyperactivity disorder.

Intellectual disability (intelligence quotient [IQ]<70) is noted in 4% of survivors of bacterial meningitis, and studies have found lower IQ scores in survivors of bacterial meningitis compared with their siblings.30,31 In a report of 130 survivors evaluated at a single center (average age, 8 and 6 years following meningitis episode), children experiencing meningitis did worse than age-matched controls on assessments of fine motor function, IQ scores, and tests of school behavior, neuropsychologic function, and auditory figure-ground differentiation, even though the children with meningitis performed in the average range.32-34 Onset of meningitis before age 12 months is associated with poor performance on tests requiring language and executive skills 12 years after disease onset.33

The complications can extend well into adulthood. In a British cohort, survivors of meningitis at age 16 years were more likely to have attended special education (at a rate of 4 times the national average); more than 3 times as likely to not pass a General Certificate of Secondary Education (GCSE; an internationally recognized certificate in a particular subject); and twice as likely to not pass core subjects (eg, basic English, math, foreign language) on a GCSE.35 Similarly, a Danish cohort reported lifelong impairment, with meningitis cases less likely than controls to complete high school, attain higher education, or achieve economic self-sufficiency.36 Finally, mood problems, behavioral problems, socialization problems, thought problems, and attention problems are reported in multiple studies years after the initial treatment of meningitis.30,37

The pediatrician needs to be aware of the educational issues that may be facing survivors of bacterial meningitis so that parents and teachers can be on the lookout for problems and intervene as necessary and as early as possible.38 Commonly reported neurologic complications include spasticity, motor deficits, and seizure disorder.

Generalized seizures are more likely to occur at disease onset, while partial seizures are more likely to occur at several days of hospital admission. Seizures occurring early in the course that are easily controlled are not likely to lead to neurologic sequelae. Seizures occurring later in the course of treatment or that are more difficult to control are more likely to be associated with permanent neurologic sequelae.38 Hemiparesis or quadriplegia is generally associated with some sort of intracranial pathology (eg, cerebral edema), which can generally resolve over time.39

Hearing loss can be either transient or permanent. It is important to screen for hearing loss after meningitis. Risk factors for hearing loss at presentation include:
- *S pneumoniae* infection, 2 to 3 times greater compared with other etiologies;
- Ataxia;
- Symptoms for several days prior to admittance; and
- Absence of petechiae.

Interestingly, hemiparesis and subdural empyema seem to have increased in frequency after the introduction of PCV13.41

**Conclusion**

Meningitis remains a significant burden in the pediatric age group, and complications may lead to lifelong impairment. It is important for the pediatrician not only to understand how bacterial meningitis can be prevented through vaccinations but also to understand its risks, workup, and treatment.
Infection control and prevention

“When can my child return to school?”

PAT F BASS III, MD, MS, MPH

Teaching parents and educators about infection control practices can improve prevention and decrease risk of disease transmission to help keep kids in school.

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Two common questions asked of pediatricians by parents of children with infections are “When can my child return to school?” and “How long will I be staying home with my child?” Understanding when, how long, and under what conditions a pediatric patient with an infection is contagious to others is an important part of disease prevention and treatment. Similarly, the pediatrician needs to educate parents and educators about infection control practices that improve prevention and decrease risk of disease transmission.

These practices are particularly important in regard to school-aged children because inappropriate exclusion can lead to a significant number of school days missed. At times, the pediatrician may need to contact a school if a child is inappropriately excluded and provide sound reasoning as to why exclusion is not appropriate.

This article is not a complete review of communicable diseases or prevention control measures. Rather, the article reviews a number of diseases that do not require exclusion; common diseases and problems that may require some aspect of exclusion; and a number of prevention control measures.

Infections spread via respiratory routes

When children cough or sneeze, aerosolized droplets can be inhaled by individuals who are nearby, placing them at risk for an infection. A person is more commonly infected, however, when the droplet comes to rest on a surface that he or she touches, and then touches that hand to face, nose, or mouth. As a result, if a child covers a cough or sneezes into his/her hands, this may increase the risk of transmission by
contaminating surfaces with mucus from his/her nose, eyes, or throat. Children should be taught to sneeze or cough into a tissue or paper towel. If this is not available, they should be instructed to sneeze into the crook of the elbow. Children should then perform good hand-washing hygiene.

**Preventing infections via direct contact**

Children touch everything and often touch their nose, face, and mouth. Good hand hygiene prevents the risk of transmission of diseases through direct contact.

The Centers for Disease Control and Prevention (CDC) recommends a 5-step hand-washing process to avoid getting sick and spreading germs to others:

- **Wet.** Wet hands first with clean, running water and apply soap.
- **Lather.** Rub hands together to lather up, focusing on the backs of the hands, between the fingers, and under fingernails.
- **Scrub.** Scrub hands for at least 20 seconds. Asking children to sing “Happy Birthday” to themselves twice will be about the right amount of time.
- **Rinse.** Hold hands under running water and not standing water. Standing water potentially increases risk of reinfection with the germ or virus. Tell the child to think of the germ/virus as circling the drain away from him.
- **Dry.** Dry hands with a clean towel or let them air dry.

If access to hand-washing is not available, hand sanitizer is an option.

**Infections not requiring exclusion**

In general, school-aged children with the conditions presented in the Table do not need to be excluded from school if they feel well enough to participate in their regular activities, and if they do not have fever, rash, or severe illness symptoms requiring temporary exclusion.

**Specific conditions that may require exclusion**

- **Boils, abscesses, cellulitis.** Signs and symptoms include furuncles and carbuncles (boils) that occur in hairy areas and contain pus. Skin abscesses are collections of pus and may be tender, painful, and fluctuant. With cellulitis, skin is red and tender. Fever may be present with boils, abscesses, or cellulitis.

  Incubation period depends on the causative agent. It is spread through person-to-person contact, with a smaller risk of indirect spread via a contaminated surface or object.

  Staph and strep are the most common bacteria causing boils, abscesses, or cellulitis. These infections are contagious if the infected area is open and draining. The child does not need to be excluded unless there are other symptoms (eg, fever); if the draining lesion cannot be...
covered; or if drainage is significant and seeping through the bandage, contaminating other surfaces.\(^1\)

Good hand-washing is an important way to avoid the spread of infections from child to child. Infected children should be instructed not to share personal items such as towels. Having a methicillin-resistant *Staphylococcus aureus* (MRSA) infection or being a MRSA carrier is not a reason for exclusion in and of itself.

**Chickenpox** (*varicella*). Regarding signs and symptoms of chickenpox, after a prodrome that may include fever, malaise, pharyngitis, or loss of appetite, a macular rash appears that progresses to pruritic vesicles and then scabs. Eruptions occur in crops, so that a person may have findings in all 3 stages.

The incubation period is usually from 14 to 16 days. As to how it is spread, the disease is communicable from 48 hours before the appearance of the rash until the vesicles have dried and no new vesicles are forming. It is spread through aerosolized droplets or direct contact with fluid from a skin vesicle.

Although immunization has made these infections much less common in the pediatrician’s office (vaccine is \(\sim\)70% to 90% effective in preventing chickenpox), infections may still be seen in unimmunized patients, or atypical presentations seen in immunized or underimmunized populations. School exclusion is appropriate for active cases, and school systems also may exclude at-risk, unimmunized children. Children with uncomplicated varicella infections may return to school when the rash has crusted or no new lesions are present in 24 hours in an appropriately immunized child without crusts.\(^3\) This often occurs about 6 days after the start of the rash.

**Conjunctivitis** (bacterial and viral [pinkeye]). Signs and symptoms include redness of the eye and discharge. Discharge may be mucopurulent or clear. Eyes are often matted shut in the morning. Patients also may report itching, pain, burning, sandy, or gritty feeling in the eye.

The incubation period for bacterial conjunctivitis is 24 to 72 hours, whereas for adenovirus (the most common cause of viral conjunctivitis) it is 5 days. As to how it is spread, both bacterial and viral pathogens are highly contagious. Spread is via direct contact with discharge from the eye or indirect contact from a contaminated surface or object.

Although the safest preventive measure would be to exclude children until the discharge has resolved, this is not feasible. Hand hygiene is important, especially when touching the eyes, nose, or mouth. Infected individuals should not share towels, cosmetics, or other personal items. Many schools require 24 hours of antibiotics for a child with an eye discharge before the child can return to school. This is appropriate to decrease risk of infecting others with bacterial conjunctivitis, but it will not impact risk of spread of viral conjunctivitis. If concerned about school systems requiring antibiotic treatment, explaining that pinkeye is like the common cold and that exclusion is not appropriate for the common cold may get the child back in school without an unneeded treatment.\(^1\)

**Diarrheal illness**. Signs and symptoms of diarrheal illness include 3 or more large, loose (increased water content or decreased form) stools per day. Patients often have other symptoms such as nausea or vomiting.

Incubation period depends on the causative agent. It is spread by person-to-person contact via fecal-oral route.

Good hand-washing and personal hygiene are paramount in the prevention and control of diarrheal illnesses. If good hand-washing and personal hygiene are not practiced, there is an increased chance of spread of illness between children, particularly if food is contaminated and shared among students.

Most cases of diarrhea are viral, and a pathogen is never identified. An etiology for bloody diarrhea is more commonly sought and may identify a pathogen. Younger children who are not able to reliably toilet and practice good personal hygiene should stay home until diarrhea has resolved for 24 hours.

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Older children who are able to reliably toilet and practice good personal hygiene, and who do not have other symptoms requiring exclusion (eg, fever), do not need to stay home unless the diarrhea is uncontrollable.

Children who have experienced 2 or more episodes of vomiting in a 24-hour period related to acute gastroenteritis should remain excluded from school. Children may return to school when the child has no accidents using the toilet and stool frequency is no more than 2 stools per day more than the child’s normal stooling frequency.4 The National Institute for Health and Care Excellence has a more conservative recommendation and advises exclusion until 48 hours after the last episode of diarrhea.5

If an enteric pathogen is identified as the cause of diarrhea, these additional exclusions will apply:1

- **Shigella:** the child should be excluded until diarrhea resolves and 1 or more stool cultures are negative. The requirements will vary by state.
- **Shiga toxin-producing Escherichia coli:** the child should be excluded until there are 2 negative cultures 24 hours apart.

Additionally, state and local jurisdictions may have different laws governing exclusion and return to school.

**Strep throat.** Signs and symptoms of strep throat include fever; sore throat; variable throat exam that may or may not reveal visible pus spots; or tender and swollen lymph nodes.

Incubation period is 1 to 3 days. Strep throat is spread by large respiratory droplets from a child with an infection (or a carrier), or direct contact with nasal/throat secretions. Indirect transmission is uncommon.

Strep throat can cause real havoc in the lives of families with dual working parents. One parent needs to leave work early and bring a child to the pediatrician’s office, and then current guidelines and many school systems advise exclusion until the completion of 24 hours of antibiotics and avoidance of close contact with other students.4

A 2015 article published in the *Pediatric Infectious Disease Journal*, however, found that a single dose (50 mg/kg) of amoxicillin led to 91% of children having undetectable testing the next morning. This led the investigators to conclude that children with strep throat treated by 5 PM may return to school the next day if afebrile and improved.6

Infections are a common reason for school exclusion. Pediatricians need to be comfortable discussing appropriate exclusion and willing to intervene if children are being inappropriately excluded from school or daycare.

**Investigators conclude that children with strep throat treated by 5 pm may return to school the next day if afebrile and improved.**

**REFERENCES**


For additional resources, go to [ContemporaryPediatrics.com/infection-control-prevention](http://ContemporaryPediatrics.com/infection-control-prevention)
SOARS model
Risk assessment of nonsuicidal self-injury

NICHOLAS J WESTERS, PSYD; JENNIFER J MUEHLENKAMP, PHD; MAY LAU, MD, MPH

A new assessment tool helps physicians screen adolescents for self-harming behaviors, then develop a treatment plan or referral to therapy for these patients.

Medical providers, particularly pediatricians, are often the first to learn that their patients have been intentionally harming themselves.\(^1,2\) Nonsuicidal self-injury (NSSI) is defined as directly and intentionally inflicting damage to one’s own body tissue without intention of suicide and not consistent with cultural expectations or norms.\(^3\) Epidemiologic studies of community samples indicate an approximately 5.9% lifetime prevalence of NSSI among adults and 18% among adolescents, with rates even higher among psychiatric treatment-seeking youth.\(^4,5\) Nevertheless, only 1 in 4 clinicians routinely inquires about and addresses NSSI with his or her adolescent patients.\(^6\)

Several authors have provided suggestions for how healthcare providers can respond to patients who self-injure.\(^1,2,8,9\) We developed the SOARS model for medical providers to use as a brief screening and assessment of NSSI. Each letter of SOARS represents an area to assess: Suicidal ideation; Onset, frequency, and methods; Aftercare; Reasons; and Stage of change (Figure 1). Using theory, research, and consideration of real-world practice, we highlight the most important questions to ask, the reasoning for these questions, and recommendations for how to ask them. Before screening and assessing NSSI, however, an important step for medical providers is to first evaluate their own values and beliefs about NSSI.\(^1\)

Being empathic toward individuals who engage in a behavior typically considered contrary to protecting one’s health can be difficult at times. Any negative biases, misconceptions, or judgments about NSSI (eg, manipulative or done primarily for attention) may result in a poor response and lack of engagement from patients.

Dr Westers is clinical psychologist and assistant professor, Children’s Health Children’s Medical Center Dallas, Texas, and University of Texas Southwestern Medical Center, Dallas. Dr Muehlenkamp is associate professor of psychology, University of Wisconsin–Eau Claire. Dr Lau is assistant professor, Children’s Health Children’s Medical Center Dallas, Texas, and University of Texas Southwestern Medical Center, Dallas. Drs Westers and Muehlenkamp have nothing to disclose in regard to affiliations with or financial interests in any organizations that may have an interest in any part of this article. Dr Lau reports that she has ownership interest in Gilead, which does not affect her ability to be unbiased in this article.

FAST FACT
Approximate lifetime prevalence of NSSI among adolescents is 18%.\(^1\)
of empathy for patients struggling with this behavior. Providers who are aware of their own emotions and perspectives are better able to monitor them and can help their patients more effectively.8

Screening for NSSI
Providers who use the HEEADSSS assessment [Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide/depression, Safety from injury and violence] to obtain a psychosocial history from adolescents would likely find the most opportune time to screen for NSSI prior to screening for suicide.10 It may seem easiest to simply ask if they have ever hurt themselves on purpose without intending suicide. Asking about NSSI using a broad question like this, however, typically results in lower prevalence rates of the behavior than does asking about NSSI in a checklist format.5 We recommend normalizing the behavior (eg, “I know that some people who experience stressors similar to yours think about hurting themselves on purpose without intending suicide.”), asking them directly about it (“Have you ever hurt yourself on purpose without intending to end your life or attempt suicide?”), and finishing the question by listing common forms of NSSI similar to checklist format (“like cutting, biting, burning, or hitting?”). If patients disclose engaging in NSSI, providers can do a brief assessment using SOARS. Similar to asking about suicide, no iatrogenic effects have been shown from asking about NSSI.11

Assessing NSSI using the SOARS model

SUICIDAL IDEATION
Because NSSI, by nature, is not suicidal, it should not be confused with or misinterpreted as a suicide attempt. Some adolescents fear that disclosing their NSSI will unnecessarily lead to an inpatient psychiatric hospitalization. Nevertheless, immediately after screening for NSSI, and as part of the HEEADSSS assessment, it is important to assess any suicidal ideation concurrent or in tandem with NSSI.

This is important for at least 2 reasons: For those who engage in the behavior, using NSSI as a coping strategy to avoid suicide has been shown to be among the strongest risk factors for attempting suicide, and a history of NSSI has been shown to be among the strongest risk factors for future suicide attempt, and for depressed youth, even more so than a history of a past suicide attempt.12-15

How to ask. To obtain the most honest response from adolescents who engage in the behavior, using NSSI as a coping strategy to avoid suicide has been shown to be among the strongest risk factors for attempting suicide, and a history of NSSI has been shown to be among the strongest risk factors for future suicide attempt, and for depressed youth, even more so than a history of a past suicide attempt.12-15

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ONSET, FREQUENCY, AND METHODS

It is important to ask about onset of NSSI (to determine duration); how many episodes of NSSI in which adolescents have engaged (to determine frequency); and what they typically use to self-injure (to determine number of methods). Each of these characteristics has been shown to be positively associated with an increased risk for suicide.

According to the interpersonal-psychological theory of suicidal behavior (IPTS), individuals die by suicide because they have both the desire to die (based on feelings of perceived burdensomeness and perceptions of not belonging or fitting in with anyone, which are often symptoms of depression) and the capability to act on that desire. The capability for suicide is acquired over time, theoretically, as a result of exposure to painful and provocative experiences (eg, childhood maltreatment, combat exposure, past suicide attempt, and NSSI) that cause a decreased fear of death and an increased tolerance of physical pain.

According to the IPTS and NSSI research, individuals may first engage in NSSI without ever before having considered suicide. Over time, individuals who repetitively engage in NSSI have a greater risk of suicide because of pain habituation and decreased fear of death. Research suggests that risk for a suicide attempt among those who self-injure peaks between 20 and 50 lifetime episodes of NSSI and then declines afterward, likely because the NSSI has become an effective coping strategy for those individuals.

Using a greater number of methods for NSSI (eg, cutting, carving, burning, hitting) is also related to suicide attempts, especially when frequency of NSSI is high. Each type of method may elicit a different kind of pain (eg, tearing, burning, bruising) and may independently be classified as a painful and provocative experience, thereby increasing acquired capability for suicide via both habituation to various forms of pain and decreased fear of death.

How to ask.

To obtain an idea of how long an adolescent has engaged in NSSI, simply ask “When was the first time you [cut] yourself?” followed by “When was the most recent time?” Similar to assessing other high-risk behaviors using the HEEADSSS format, providers should be specific when assessing frequency and lifetime number of episodes of NSSI. Rather than asking vaguely (eg, “How often . . .”), we recommend that providers be specific and first ask “How many times a week do you self-injure?” or “How many times a month do you self-injure?” Asking about increased severity is also important, particularly because this may indicate growing tolerance for pain and acquired capability for a suicide attempt: “Have you found that you have begun to self-injure more often or more deeply than a year ago (or when you first started)?” At least 1 study found that an absence of pain during NSSI is linked to an elevated risk for suicide attempts.

To determine the number of different types of methods, providers can ask “What do you typically do or use?” If an adolescent responds that he or she cuts using a blade from a small pencil sharpener, the razor from the shower, or a piece of glass, these are all considered 1 method (ie, cutting), and providers can then ask about other methods such as those assessed during the initial screening question.

AFTERCARE

Medical providers are often in the best position to screen for NSSI and to determine severity of injury. Poor wound care can increase risk for infection and even scarring. Some individuals might hurt themselves more severely than intended and require medical attention, although some may not seek it out.

How to ask. As with all assessment questions about NSSI, it is best to use a low-key and nonjudgmental demeanor that shows a respectful curiosity. Providers can ask “How do you typically take care of the wounds afterward?” and “Have you ever hurt yourself so badly that you needed medical attention, like stitches, even if you never got it?”
Some providers have suggested that if an injury is discovered on assessment, they should ask “Do you have any other wounds?” and then state matter-of-factly “I need to assess your wounds so we can be sure to provide the proper care and avoid infection.”

**REASONS**

Individuals who engage in NSSI typically do so because it is helpful as a short-term solution or relief, or serves some particular function(s), such as to deal with stress or overwhelming emotions, in response to feeling emotional numbness, to punish themselves, or to communicate their feelings to someone (Table 1). Determining the reasons the adolescent engages in NSSI will likely be the primary focus of the assessment, particularly because this will guide providers in their brief intervention and help determine the treatment plan.

For medical providers who have limited time to spend with their patients, a brief intervention may simply mean assessing severity of NSSI and safety, followed by a referral for therapy. A follow-up telephone call or an in-person acute care follow-up visit within 2 to 3 weeks may be indicated to determine if the patient or parent has identified a therapist. For medical providers who have an additional few minutes to provide medical counsel, a brief intervention may include specific targeted advice regarding alternative coping strategies based on function of the behavior.

**For example, if the adolescent’s purpose for the behavior is to cope with overwhelming emotional distress, an important element of the brief intervention is exploring additional helpful strategies that he or she can utilize before or instead of engaging in NSSI. Focus should be on bolstering healthy coping skills rather than simply removing unhealthy ones; addition is better (and easier) than subtraction.”**

If the purpose of self-injuring is to communicate the adolescent’s feelings to parents or friends, a brief intervention may include exploring alternative strategies for effectively communicating his or her emotional needs. Essential elements in all brief medical counsel include validating that the adolescent’s NSSI seems helpful, sensitively expressing

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**TABLE 1**

<table>
<thead>
<tr>
<th>REASON FOR NSSI</th>
<th>BRIEF INTERVENTION</th>
<th>EXAMPLE RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>To reduce emotional tension and stress</td>
<td>Identifying alternative strategies to reduce emotional distress (eg, talking to a friend/parent, journaling, drawing, exercising, using relaxation techniques).</td>
<td>“What are some other ways you can manage when you’re feeling overwhelmed, even if they don’t work as quickly as self-injury?”</td>
</tr>
<tr>
<td>To feel something due to feeling numb or empty</td>
<td>Identifying alternative strategies for generating feelings (eg, taking a cold shower, eating a hot pepper) or discussing how patients might tolerate numbness for the time being (eg, accepting temporary emotional numbness).</td>
<td>“What are some other ways you can feel something when you’re feeling numb or empty, even if they don’t work as quickly as self-injury?”</td>
</tr>
<tr>
<td>To communicate with others</td>
<td>Identifying alternative strategies for communicating emotional needs (eg, asking for encouragement, advice, a hug, to sit in silence together, to do something together).</td>
<td>“How might you ask your mom/dad/friend for emotional support and help without hurting yourself or telling them that you’re going to?”</td>
</tr>
<tr>
<td>To self-punish</td>
<td>Introducing concept of self-forgiveness and acceptance of imperfections.</td>
<td>“Sounds like you’re experiencing enough of life’s punishments right now. Instead of adding more punishment to yourself, what would it be like to allow yourself some room for mistakes or self-forgiveness?”</td>
</tr>
</tbody>
</table>

Abbreviation: NSSI, nonsuicidal self-injury.
Show How Much You Care for Sensitive Skin

Dove Sensitive Skin Bar and Body Wash

- Suitable for infants and your eczema patients
- Replenish stearic acid—the fatty acid most often extracted from the stratum corneum during cleansing—at a 1-to-1 ratio
- Formulated with DEFI,* combining a mild surfactant complex with the skin-identical lipid stearic acid, to help preserve the skin barrier

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concern about the behavior, kindly advising against it for health reasons, exploring alternative strategies, and offering to make a referral for therapy. Unfortunately, many adolescents who resort to NSSI cannot readily integrate information on alternative, healthier coping strategies. In these situations, listening to them without judgment, empathizing with their emotional distress, and exploring openness to therapy may be therapeutic and the best way to respond if an adolescent is overwhelmed in the moment. Simply telling an adolescent to stop self-injuring or reacting negatively may inadvertently communicate to him or her that it is not safe to talk about the behavior, and the adolescent may choose to continue to engage in NSSI but no longer talk about it with his/her provider.

The more reasons behind engaging in NSSI, the greater the risk for suicide. Reasons for NSSI that are most strongly related to suicide attempts include: to avoid suicide, to cope with self-hatred, and to end dissociation or feel something other than emptiness or profound anxiety. Many physicians who see adolescents take confidentiality very seriously and discuss confidentiality and its limits at the beginning of the appointment. Each adolescent is unique, so breaking confidentiality about NSSI behavior is often based on the clinical judgment of the medical provider. At this point in the SOARS interview, clinicians will likely have a good idea of how safe or at risk an adolescent who self-injures is for suicidal behavior. If the purpose of an adolescent’s NSSI is to avoid suicide, we recommend that providers break confidentiality and involve parents. This is important because no one may know if or when the NSSI becomes ineffective as a strategy to avoid suicide, and then the adolescent decides to attempt suicide.

How to ask. It is important to first acknowledge how NSSI is not the true problem for those who engage in the behavior but instead a solution to feelings coming from a deeper problem. Validating that it is a helpful way to cope is not the same as agreeing with the behavior or condoning it. Thus, we recommend that providers ask about the reasons for engaging in NSSI, nonjudgmentally accepting associated distressing emotions, and engaging in alternative, healthier behavior.

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TABLE 2

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>GENERAL FOCUS</th>
<th>SNAPSHOT IN PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivational interviewing (MI)</td>
<td>Respectfully guiding individuals to engage in healthy behavioral change by</td>
<td>Exploring the pros and cons of continuing to engage in NSSI and the pros and cons of ceasing NSSI</td>
</tr>
<tr>
<td></td>
<td>resolving ambivalence and eliciting motivation for change</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cognitive behavioral therapy (CBT)</td>
<td>Modifying thoughts and behaviors to improve mood and emotions</td>
<td>Differentiating between feelings (eg, anxiety) and behaviors (eg, NSSI) and modifying the thought that one must self-injure to improve mood</td>
</tr>
<tr>
<td>Dialectical behavior therapy (DBT)</td>
<td>Mindfulness and balancing dialectical (ie, philosophy of opposing ideas)</td>
<td>Identifying reason(s) for engaging in NSSI, nonjudgmentally accepting associated distressing emotions, and engaging in alternative, healthier behavior</td>
</tr>
<tr>
<td></td>
<td>tension between acceptance and change by teaching distress tolerance,</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>emotion regulation, and interpersonal effectiveness skills</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Emotion-regulation group therapy (ERGT)</td>
<td>Addressing NSSI by learning to regulate emotions through understanding and</td>
<td>Identifying and pursuing meaningful activities in life and inhibiting impulsive behavior (eg, NSSI), even if it means experiencing negative emotions along the way</td>
</tr>
<tr>
<td></td>
<td>acceptance of emotions, control of behavior, and value-directed living (ie,</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>identifying meaningful things in life and making choices consistent with those values)</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

Abbreviation: NSSI, nonsuicidal self-injury.

strategy, tried it once or twice, found that it was unhelpful, and stopped engaging in it. Among those who have already ceased the behavior, affirming their choice of healthier coping strategies is sometimes all that is necessary to prevent future episodes.

**STATE OF CHANGE**

Although many adolescents who self-injure are not ready to stop or cannot stop their NSSI, some desire to stop their self-injury but are unsure how. Some see no need to change at all. The transtheoretical model of behavior change may be a helpful way of conceptualizing whether adolescent patients want to change or are ready to change. For those who are not yet ready to give up their NSSI, using motivational interviewing can be a helpful way of collaborating with these adolescents, guiding them toward motivation for change and exploring the pros and cons of life without NSSI (Figure 2).

**How to ask.** After an adolescent has disclosed the reasons for his or her NSSI and the functions it serves, a provider can ask, “Is this something you would like to stop?” or, “Have you ever considered stopping?” If the adolescent responds that he or she would like to stop and needs help, then referral to a mental health professional who has experience treating adolescents who self-injure is appropriate. If the adolescent responds that he or she sees no need to change, then brief medical counsel could focus on exploring the pros and cons of the behavior (eg, perhaps it is harming his/her relationship with someone important, such as parents). The adolescent’s response may also provide a sense of the likelihood that he or she will follow up with a referral to a mental health professional.

**Summary**

Clinicians can choose to spend much more time discussing and assessing NSSI, but the purpose behind the SOARS model for assessing NSSI is to be able to conduct a brief screening and assessment of NSSI by recommending what questions are most important to ask, why they are important to ask (based on empirical research and theory), and how to ask them. Primary focus should be on the reasons behind the behavior, which will inform the brief intervention or counsel medical providers may give to their adolescent patients. All brief medical counsel should validate the utility of NSSI for each patient, sensitively express concern about the behavior, kindly advise use of healthier strategies for coping (addition is better than subtraction), and offer a referral to therapy. If using the full SOARS assessment model is not realistic in a given scenario because of time constraints, an even shorter version (Suicidality, Aftercare, Reasons [SAR]) can be used that addresses the 3 most important assessment questions: Suicidality: “Are you thinking about suicide when you self-injure?”; Aftercare: “How do you take care of your injuries?”; Reasons: “In what ways is this helping you?” (Figure 2).

Although no empirically supported treatment targeted specifically for NSSI yet exists (psychotherapeutic or pharmacologic), most treatments that help patients with NSSI have a tendency to address the context in which the behavior occurs (eg, depression, anxiety, emotion dysregulation). As a result, referrals to experts with a broad background including empirically supported treatments such as cognitive behavioral therapy (CBT), dialectical behavior therapy (DBT), or emotion-regulation group therapy (ERGT) will likely be most helpful (Table 2).
Cleft lip and palate
Team approach to treatment

A multidisciplinary center for children born with cleft lip, cleft palate, or other craniofacial conditions ensures that patients emerge with little evidence of deformity.

The misconception that children born with cleft lip, cleft palate, or both need only a single surgery to address their cleft can leave patients with a lifetime of physical and emotional challenges. Pediatricians who encounter children with these facial differences should encourage parents and caregivers to pursue a focused, long-term, multidisciplinary approach to treating and managing cleft lip and/or palate because all affected children benefit.\(^1\)

Cleft lip and palate is more than a plastic surgery issue, according to Karla A. Haynes, RN, MPH, MS, CPNP, pediatric nurse practitioner, at Children’s Hospital Los Angeles Craniofacial and Cleft Center, California, one of the country’s largest multidisciplinary centers for children born with congenital facial differences, such as cleft lip, cleft palate, and other craniofacial conditions.

“The best practice is a multidisciplinary evaluation, which can be an issue because, sometimes, people who aren’t very familiar with this patient population might see craniofacial abnormalities as a plastic surgery problem. They may not understand that this is a chronic condition, and that there is a need for ongoing monitoring and care throughout childhood,” Haynes says.

Cleft lip and palate facts and figures
Occurring in about 1 in 600 live births in the United States, clefts involving the lip and/or palate are among the most common congenital anomalies affecting the craniofacial region.\(^1,2\)

Oral facial clefts vary in incidence according to gender and ethnic background. Clefting is known to occur more in males, and Asians and Native Americans have the highest birth prevalence, with 1 in 500 births. The lowest prevalence is in people of African descent.\(^2\)

Cleft palate and cleft lip often occur together. About two-thirds of those affected have clefts of the lip and palate.\(^2\) Cleft lip alone is more likely to occur than cleft palate alone, but when it does

Ms Hilton is a medical writer who has covered health and medicine for 25 years. She resides in Boca Raton, Florida. She has nothing to disclose in regard to affiliations with or financial interests in any organizations that may have an interest in any part of this article.
occur, cleft palate is more common among females.

Because many of the syndromes associated with clefting are inherited in an autosomal dominant pattern, each offspring of an affected person has up to a 50% chance of inheriting the syndrome. Recurrence of isolated cleft is low, however—around 2% to 6%. The risk increases as the number of affected persons in a family grows.

**What’s meant to happen in utero, doesn’t**

The lip normally fuses by 35 days in utero. The lip’s failure to fuse can impair subsequent closure of the palatal shelves, which typically close in the 8th to 9th week.

Although the cause of cleft lip sequence typically is a mystery, clefts occur in syndromic or isolated categories. Skeletal, craniofacial, eye, and other anomalies generally occur with syndromic clefts. Cleft-associated syndromes can originate from intrauterine exposures to alcohol, isotretinoin, cigarette smoke, and more, as well as result from genetic disorders.

Children with clefting are at higher risk for abnormal tooth development, as well as mild ocular hypertelorism, hypernasal speech, speech delay, recurrent otitis media, and hearing loss.

**Often detected in utero**

Typically, community obstetrics providers will see a fetal cleft lip on ultrasound (the cleft palate generally is not so visible), according to Haynes.

Cleft lip not detected before birth should be seen in the immediate postnatal period. Cleft palate might be diagnosed later, during a routine newborn intraoral examination, especially if the newborn has a milder variant, such as bifid uvula or submucosal clefting. Pediatricians and others who diagnose cleft palate should conduct a systemic examination because every sixth newborn that has cleft palate is at higher risk for other malformations, including...
hospital zone

congenital heart disease or urinary tract anomalies.¹

To differentiate between an isolated or syndromic cleft, the pediatrician should consult with a craniofacial team and geneticist, and take a careful family history of clefts and features of clefting syndromes, including skin disorders and speech abnormalities.² The pediatrician should also ask about prenatal exposures. In addition, assessments for vision and hearing should be done as early as possible.

Immediate concerns

Because cleft palate prevents an infant from effectively sucking, these babies have trouble with breastfeeding. Pediatricians can recommend that mothers pump their breast milk and give it to their babies using a special nipple designed to facilitate feeding infants with clefting.

The good news is breastfeeding can be successful in babies with isolated cleft lip only.² However, parents should know that these babies tend to take in more air while feeding and might require more frequent burping. With palatal openings or dysfunction, nasal regurgitation also can occur.

Pediatricians should diligently monitor these children’s growth and more because children with palatal clefts are at significantly greater risk for eustachian tube dysfunction, recurrent otitis media, and conductive hearing loss.²

According to Haynes, feeding and growth can be significantly impaired and babies can really struggle to gain weight, with a small percentage requiring admission for failure to thrive until families master the feeding techniques. This can be challenging, she says.

Takes a village

Children’s Hospital Los Angeles Craniofacial and Cleft Center features 13 subspecialty disciplines on its craniofacial team. The full list of specialty providers is plastic surgery, nurse practitioners, ears/nose/throat, audiology, speech pathology, genetics, dentistry, orthodontics, psychology, social work, pediatrics, pulmonology, and a registered dietician.

PHOTOS PROVIDED BY KARLA HAYNES, RN, MPH, MS, CPNP, CHILDREN’S HOSPITAL LOS ANGELES.

▲ FIGURE 4 Patient is now 5 years postoperative following cleft lip revision. She is aged 7 years 3 months in this photo.

▲ FIGURE 5 Patient is 6 weeks postoperative following a sphincter pharyngoplasty (not visible) to address hypernasal speech. She is aged 7 years 9 months in this photo.
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Nurse practitioners coordinate care at the center, and the surgical care is directed by a plastic surgeon who relies heavily on the input of the team members, Haynes says. “Our patients all have their own community pediatricians that do their usual well-child health surveillance and sick visits,” Haynes said. “The pediatricians on our craniofacial team monitor patients . . . looking at signs of obstructive sleep apnea or gastroesophageal reflux or some of the things that kids with cleft lip and cleft palate or other craniofacial diagnoses are more likely to have.”

The care of these patients often begins in utero, according to Haynes. “My nurse practitioner colleagues and I also do prenatal counseling in conjunction with a program at our hospital called the Institute for Maternal-Fetal Health,” she says.

A nurse practitioner and the institute’s perinatologist will meet with pregnant mothers who are referred to the institute because of a possible cleft on ultrasound. “[We] will do another anatomy scan with, in our case, the craniofacial nurse practitioner standing right beside the perinatologist, so we’re looking at the images together. And based on what the 2 providers see, the parents are counseled on the diagnosis,” Haynes says. “About half, if not more, of our babies are identified before birth.”

There are other centers of excellence focused on children with craniofacial conditions, including Seattle Children’s Hospital in Washington state, Brigham and Women’s Hospital/Children’s Hospital in Boston, Massachusetts, and Children’s Hospital of Philadelphia, Pennsylvania, according to Haynes.

At the very least, teams charged with the care of children with cleft lip and palate should include speech-language pathology, surgery, and orthodontics specialists. The core team should have ready access...
to psychology, social work, audiology, genetics, general and pediatric dentistry, otolaryngology, and pediatrics/primary care professionals. The team should also be able to refer to a neurosurgeon, an ophthalmologist, a radiologist, and a geneticist, according to the American Cleft Palate-Craniofacial Association.4

**Best practices**

Pediatric patients with cleft lip and palate require numerous surgeries throughout their childhood and into early adulthood to correct the aesthetic and functional issues associated with their diagnoses. In 1 sample of patients, the average number of surgical procedures required was 8.6.5

“For all of the facial structures and sociologic processes that are affected by craniofacial [conditions], we use different providers on our team that are looking out for all of these areas that are at risk,” Haynes says. “Sometimes, a lack of continuity of care is a problem. But definitely pediatricians should know that if there is a child who is born with a cleft, they need to be with ongoing team care.”

There are different stages in the surgery. When they’re done depends a lot on the phase of dentition, according to Haynes. She describes a potential timeline of treatment for children with cleft lip and palate: “The very first surgery that’s done is usually an initial cleft lip repair, in which the lip is repaired and the external nose, as well. That’s usually done anywhere between 1 and 3 months of age. Sometimes it can be a little later,” she says. “The second surgery is to repair the palate, which of course is the roof of the mouth, but it’s also the floor of the nose. So, it does address that second nasal component, and that’s usually done sometime around 1 year of age, ideally.”

The next surgery that many of these children need is an alveolar bone graft, which is done to repair the dental arch of the maxilla where the cleft has gone through the gums. “That can be done in several ways,” says Haynes, “but the children generally need to be in mixed dentition before they can do the orthodontics that allow them to have that surgery. That surgery literally can’t be done before they’re 7, 8, or 9 years of age.”

There are some optional surgeries, including scar revisions. “For many of our kids, once they reach skeletal maturity, they may need an orthognathic jaw procedure because one of the things that happens with kids with cleft lip and cleft palate is they often end up with a pretty significant underbite,” Haynes says. “Some of this is correctable through orthodontics, but for many kids the only way is to do a surgery that involves moving the bones in the face. And that can’t be done until kids are in their later teenaged years.”

**Care outcomes**

Children with cleft lip and palate have a poor quality of life.6 In addition, fragmented or uncoordinated care of these children leads to poor outcomes in speech and hearing.7

Haynes says the children that get their care at Children’s Hospital Los Angeles emerge with little if any evidence of their cleft deformities.

“When the proper stepwise approach is taken, children have surgeries that address each anatomic issue to ultimately result in a child with good intelligible speech, normal hearing, a stable maxilla, proper occlusion of the jaws, and symmetric facial features,” Haynes says. “For families and providers both, one of the biggest, most compelling questions that remains is ‘Why does clefting happen?’ We may be getting closer to having a better understanding of the origin of the ‘isolated’ clefts because of the relative availability of exome sequencing. We would also like to know more about the role environmental factors, such as maternal diabetes, play.”

Haynes says Children’s Hospital Los Angeles is conducting research on the incidence of postpartum depression in mothers of infants born with cleft, and investigating safe infant sleep for infants born with Pierre Robin sequence.

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**Facial clefts involving the lip and/or palate occur in about 1 in 600 live births in the United States.**1,2

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For additional information to help pediatricians discuss facial clefts with families, as well as references for this article, go to ContemporaryPediatrics.com/Hospital-Zone-facial-clefts
At home, the patient’s cough persisted with the addition of several episodes of nonbloody, nonbilious posttussive emesis. On day 9 of illness, he developed oral vesicular lesions associated with discomfort when swallowing solid foods, prompting a visit to the local emergency department (ED). There, his temperature was 102.92°F, but physical exam and chest imaging performed at that time were reassuring for a safe discharge home with close follow-up after being given a 5-day course of azithromycin for bronchitis (Figure 1).

By day 12 of his illness, the patient’s course was worsening. The vesicular oral lesions were friable and beginning to bleed. His coughing episodes were increasingly frequent and produced blood-streaked sputum. Severe odynophagia prevented him from consuming both solids and liquids. A complete physical exam by his pediatrician at follow-up revealed red, round, ulcerative lesions of the ventral penile shaft along with skin peeling and scant mucus discharge at the urethral opening. Because of his poor fluid intake and progressing symptomatology, he was quickly referred back to the ED and admitted for continued evaluation and management (Figure 2).

**History**

The patient endorsed a history of acne vulgaris for which he took minocycline daily. There was, however, no prior history of surgeries, abnormal development, or variations from a regular healthy diet. Family history was significant only for maternal allergic reaction of unknown severity to Percocet (oxycodeone hydrochloride with acetaminophen) and Motrin (ibuprofen). The patient had no known drug allergy prior to presentation, and his immunizations were up-to-date.

**Physical exam**

Upon physical examination, the patient was afebrile with normal vital signs. He appeared uncomfortable, tired, and in mild distress. His eyes were without discharge or conjunctival injection. External ear canals were normal. Nares revealed hemorrhagic crusts (Figure 3). Friable, ulcerative lesions and dried blood were found on his lips (Figure 4). The superficial buccal mucosa was sloughing and actively bleeding (Figure 5). The surface of his tongue was covered by white ulcerations posteriorly; the palate and posterior oropharynx were enthusiastically committed to playing video games. He denied illicit substance use, depressive symptoms, safety concerns, sexual activity of any kind, or suicidal ideation.
erythematous and edematous; and tonsillar exudates were appreciated bilaterally. Lung exam was somewhat limited by dry coughing upon deep inspiration, but rales were appreciated bilaterally in the lower lung fields. Mild erythema of the urethral opening along with a single ulcerative lesion of the ventral penile shaft was found. The remainder of his physical exam, including a thorough skin examination, was normal.

**Differential diagnosis**

Taking into account the patient’s presenting history and physical exam findings, the team proposed a fairly wide differential (Table). Included in the list were an atypical presentation of the autoimmune mechanisms underlying Crohn disease, absent of any associated gastrointestinal manifestations, and Behçet disease, without its characteristic ulcerative and erythematous nodules or anterior uveitis. Ingestion of a corrosive agent that might precipitate the mucocutaneous oral findings also was considered, although the patient’s age and absence of any intention for self-harm made this possibility less likely.

Infectious etiologies were postulated as well, including herpangina of an enterovirus infection or herpes simplex mucositis, most commonly seen as a reactivation event of a prior primary infection in immunocompromised patients. Even a severe drug reaction to ibuprofen, such as Stevens-Johnson syndrome (SJS), was introduced as a possibility, although the limited involvement of his pathology to the nasal-oral and genital areas lessened the team’s concern (Figure 6). In narrowing the differential, patient demographics such as age and gender, benign past medical history, absence of high-risk sexual or self-harm behavior, and context...
of presentation with corresponding respiratory symptoms, fever, and limited cutaneous findings led the team to favor an infectious etiology. What remained to be determined was the causative organism and the extent of the pathology it would instigate in the patient.

**Further testing**

Overnight, ibuprofen was discontinued for concerns of SJS and empiric acyclovir was started for suspected primary herpes simplex virus (HSV) infection. A complete blood count with manual differential and complete metabolic panel were normal. A urinalysis showed scant leukocyte esterase and 5 to 10 white blood cells per high-power field. An infectious disease consult was obtained for possible varicella-zoster virus (VZV) infection; the patient was negative for VZV IgM. A complete blood count with smear was normal. A peripheral smear showed no atypical lymphocytes. A skin biopsy was obtained to rule out other diagnoses, which revealed epidermal necrosis, spongiosis, and a mixed infiltrate consistent with SJS.

**DIFFERENTIAL DIAGNOSIS FOR PEDIATRIC MUCOSITIS**

<table>
<thead>
<tr>
<th>INFECTIOUS</th>
<th>ALLERGIC</th>
<th>DRUGS</th>
<th>POISONING</th>
<th>AUTOIMMUNE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herpangina</td>
<td>SJS</td>
<td>Chemotherapy</td>
<td>Corrosive agent</td>
<td>Aphthous stomatitis</td>
</tr>
<tr>
<td>Herpetic mucositis</td>
<td>Erythema multiforme</td>
<td>NSAIDs and ASA</td>
<td></td>
<td>Behçet disease</td>
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<tr>
<td>HIV</td>
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<td></td>
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<td>Crohn disease</td>
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<tr>
<td>Primary syphilis</td>
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<td>SLE</td>
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<td>Celiac sprue</td>
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</tbody>
</table>

Abbreviations: ASA, acetylsalicylic acid; HIV, human immunodeficiency virus; NSAIDs, nonsteroidal anti-inflammatory drugs; SJS, Stevens-Johnson syndrome; SLE, systemic lupus erythematosus.
1. Stevens-Johnson syndrome
   - Respiratory infection-like prodrome
   - Acute development of targetoid lesions
   - Minimal to extensive sloughing of the skin
   - Commonly idiopathic but sometimes associated with drugs/infections
   - Skin biopsy with full-thickness necrosis diagnostic
   - BCx/UCx for superimposed bacterial infection
   - Treated like burn patients in ICU

2. Behçet disease
   - Recurrent aphthous ulcers, genital ulcers, and uveitis; sometimes with skin involvement and arthritis
   - Most commonly affects mid-20s to mid-30s age range
   - Extensive workup to rule out disease mimics (SLE, reactive arthritis, HIV)
   - Treatment tailored to specific organ involved; multiple consultations may be necessary

1. Herpetic mucositis
   - Most commonly in the immunocompromised patient
   - Flu-like prodrome
   - Ulcerative and necrotic lesions often localized to oral mucosa but can become systemic
   - Anti-HSV titers
   - Acyclovir PO vs IV along with antibiotics if superimposed bacterial superinfection

2. Erythema multiforme
   - Infectious vs type IV hypersensitivity reaction
   - Flu-like prodrome
   - Spectrum of presentation from local cutaneous involvement (target lesions) to widespread pathology of the oral, genital, orbital, and respiratory mucosa
   - Clinical diagnosis, although HSV PCR can help confirm diagnosis and CMP can reveal electrolyte abnormalities and renal/hepatic involvement
   - Supportive care, wound dressings, and steroids if severe

1. Mycoplasma-induced rash and mucositis
   - Respiratory infection-like prodrome and fever
   - CXR with pneumonia
   - Findings limited to oral, nasal, and genital mucosa +/- localized rash
   - Mycoplasma PCR for diagnosis confirmation
   - Antibiotic (azithromycin)
   - Supportive measures with Magic Mouthwash and fluids
   - Steroids +/- IVIG if severe

2. Herpangina
   - Febrile illness with vesicular and/or ulcerative lesions
   - Usually summer months
   - Constitutional symptoms such as HA, backache, nausea, or stomach pain
   - PCR of nasopharyngeal swab for enterovirus RNA
   - Supportive care

1. Corrosive ingestion
   - Identify specific agent and time of ingestion
   - Assess and protect airway
   - CBC, CMP, ABG for baseline; repeat if suspicious for systemic toxicity
   - Consult Poison Control, GI, or Surgery if unstable
   - Psych eval if suicidal intent
   - Supportive care

2. Aphthous stomatitis
   - HIV status and CBC for assessment of neutropenia
   - Ulcer Severity Score
   - Vitamin deficiency assessment and correction
   - Negative transglutaminase assay and Tzanck smear (rule out celiac and HSV)
   - Supportive care

Abbreviations: ABG, arterial blood gas; BCx, blood culture; CBC, complete blood count; CMP, comprehensive metabolic panel; CXR, chest x-ray; GI, gastrointestinal; HA, headache; HIV, human immunodeficiency virus; HSV, herpes simplex virus; ICU, intensive care unit; IV, intravenous; IVIG, intravenous immunoglobulin; PCR, polymerase chain reaction; PO, per os; RNA, ribonucleic acid; SLE, systemic lupus erythematosus; UCx, urine culture.
10 white blood cell counts, but no red blood cells. Serum cultures, bacterial genital cultures, HSV-1 and HSV-2 polymerase chain reaction tests, culture swabs of the oral and genital lesions, and Neisseria gonorrhoeae and Chlamydia trachomatis RNA urine tests all were sent, none of which returned positive. Chest x-ray was repeated and was significant for subtle right lower lobe infiltrates.

Because initial workup in the community hospital failed to provide an identifiable etiology for the patient’s clinical course, he was transferred to the nearest pediatric tertiary care center where he was found to have Mycoplasma-induced rash and mucositis, also known as MIRM.

### Treatment and outcome

With suspicion for MIRM secondary to inadequately treated *M. pneumoniae* pneumonia, the patient was started on a second 5-day course of azithromycin along with intravenous (IV) maintenance fluids and supportive care for the oral lesions. Famotidine was begun for prophylactic treatment of presumed gastrointestinal mucositis. A telemedicine dermatology consult was utilized to help confirm the suspected diagnosis, and a 5-day course of prednisone was initiated. *Mycoplasma* immunoglobulin (Ig)G and IgM serology were ordered and returned positive after hospital discharge on his 16th day of illness. During a follow-up phone call with the mother, she noted significant improvement in his symptoms with normal oral intake and a successful return to school 3 days after leaving the hospital (Figure 7). ■

Dr Sterns is a pediatric intern at Naval Medical Center, San Diego, California. Dr Kamat is a pediatric hospitalist, Inova Children’s Hospital, Falls Church, Virginia. The authors have nothing to disclose in regard to affiliations with or financial interests in any organizations that may have an interest in any part of this article.
Nevus of Ota (also known as “congenital melanosis bulbi,” “nevus fuscoceruleus ophthalmomaxillaris,” or “oculodermal melanocytosis”) is a variant of Mongolian spot that presents with bluish-green to grey-brown pigmentation on the face. Approximately half of the cases are congenital, and the others typically are acquired in the teenaged years.

Nevus of Ota occurs most frequently in Asians, with an estimated prevalence of 0.014% to 0.034%, and it is uncommon among Caucasians.1 It also develops frequently in East Indians and African Americans, and is 5 times more common in females than males.2

Nevus of Ota is caused by the entrapment of melanocytes in the upper third of the dermis, involving the first and/or second (ophthalmic and maxillary) branches of the trigeminal nerve. Although unconfirmed, investigators suggest that nevus of Ota may occur when melanocytes arising from the neural crest do not migrate to their normal position in the basal cell layer of the epidermis during early embryologic development.3 Whereas biopsy usually is not necessary to establish the diagnosis, histology shows uniformly distributed melanocytes in the dermis. Differential diagnoses include blue nevi, café au lait spots, melasma, and cutaneous melanoma.

Nevus of Ota is usually unilateral (90%), generally involving only 1 side of the face over the cheek, nose, forehead, temple, and around the eye; however, it also can be bilateral, although rarely.4 There have been a few case reports of oral mucosal involvement, which is extremely rare.2 Given the involvement of the trigeminal nerve, it can cause discoloration of the eyelid, sclera, cornea, and/or retina. The sclera is involved in two-thirds of patients, and scleral involvement is associated with an increased risk for glaucoma, which occurs in 10% of patients.5 For this reason, all patients with a nevus of Ota that involves any structure of the eye or eyelid should be referred to ophthalmology for routine screening.

**All patients with a nevus of Ota that involves any structure of the eye or eyelid should be referred to ophthalmology for routine screening.**

Essentially, nevus of Ota is similar in pathophysiology and appearance to the Mongolian spot, but differs in location. It is a benign condition that may be managed by the primary care physician. However, monitoring should continue given its rare potential to transform into a malignant melanoma.

**REFERENCES**

Hyperpigmentation around a teen’s eye

JESSICA A GANGARAM, MD

THE CASE

An adolescent girl is referred by her pediatrician to dermatology for evaluation of a birthmark on her face. For more on this case, turn to page 43.

FIGURE Congenital hyperpigmented patch involving the right side of the face and bulbar conjunctiva.

DERMCASE diagnosis

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