Pediatric Obesity and the pandemic

Respiratory Disorders
IV magnesium sulfate for patients with asthma

Developmental Health
Kangaroo care for infants

Dermatology
Diffuse erythematous rash in a healthy newborn
INDICATION
Qelbree is indicated for the treatment of Attention-Deficit/Hyperactivity Disorder (ADHD) in pediatric patients ages 6 to 17.

IMPORTANT SAFETY INFORMATION

WARNING: SUICIDAL THOUGHTS AND BEHAVIORS
In clinical studies, higher rates of suicidal thoughts and behaviors were reported in pediatric patients with ADHD treated with Qelbree than in patients treated with placebo. Closely monitor all Qelbree-treated patients for clinical worsening and for emergence of suicidal thoughts and behaviors.

CONTRAINDICATIONS
• Concomitant administration of a monoamine oxidase inhibitor (MAOI), or dosing within 14 days after discontinuing an MAOI, because of an increased risk of hypertensive crisis
• Concomitant administration of sensitive CYP1A2 substrates or CYP1A2 substrates with a narrow therapeutic range

WARNING & PRECAUTION
• Suicidal Thoughts and Behaviors: Closely monitor all Qelbree-treated patients for clinical worsening and emergence of suicidal thoughts and behaviors, especially during the initial few months of drug therapy, and at times of dosage changes.

REFERENCE:

Abbreviation: NCE, new chemical entity.
Qelbree™ (viloxazine extended-release capsules), for oral use

BRIEF SUMMARY OF FULL PRESCRIBING INFORMATION
For full prescribing information see package insert.

WARNING: SUICIDAL THOUGHTS AND BEHAVIORS

In clinical studies, higher rates of suicidal thoughts and behavior were reported in pediatric patients with ADHD treated with Qelbree than in patients treated with placebo. Closely monitor all Qelbree-treated patients for clinical worsening, and for emergence of suicidal thoughts and behaviors.

CONTRAINDICATIONS

Qelbree is contraindicated in patients receiving concomitant treatment with monoamine oxidase inhibitors (MAOI), or within 14 days following discontinuing an MAOI, because of an increased risk of hypertensive crisis.

Qelbree should not be taken when receiving concomitant administration of sensitive CYP1A2 substrates or CYP1A2 substrates with a narrow therapeutic range.

WARNINGS AND PRECAUTIONS

Suicidal Thoughts and Behaviors (See Above)

Among 1019 patients exposed to Qelbree 100 mg to 400 mg in short-term trials, a total of nine patients (0.9%) reported suicidal ideation (N=6), behavior (N=1) or both (N=2). Eight patients reported suicidal ideation or behavior on the Columbia Suicide Severity Rating Scale (C-SSRS), a validated scale that assesses suicide risk. An additional patient treated with Qelbree reported suicidal behavior during the clinical trials, but did not report it on the C-SSRS. Among 463 patients treated with placebo in these studies, two patients (0.4%) reported suicidal ideation on the C-SSRS. No patients treated with placebo reported suicidal behavior. No completed suicides occurred in these trials.

Patients treated with Qelbree had higher rates of insomnia and irritability. Although a causal link between the emergence of such symptoms and the emergence of suicidal impulses has not been established, there is a concern that these and other symptoms such as depressed mood, anxiety, agitation, akathisia, mania, hypomania, panic attacks, impulsive behavior, and aggression may represent precursors to emerging suicidal ideation or behavior. Thus, patients being treated with Qelbree should be observed for the emergence of such symptoms.

Consider changing the therapeutic regimen, including possibly discontinuing Qelbree, in patients who are experiencing emerging suicidal thoughts and behaviors or symptoms that might be precursors to emerging suicidal ideation or behavior, especially if these symptoms are severe or abrupt in onset, or worsen in a patient who is already being treated. Advise family members or caregivers of patients to monitor for the emergence of suicidal ideation or behavior, and to report such symptoms immediately to the healthcare provider.

Effects on Blood Pressure and Heart Rate

Qelbree can cause an increase in heart rate and diastolic blood pressure.

In a clinical study in patients 6 to 11 years of age, 34/154 (22%) of patients treated with Qelbree ≥200 mg daily had a ≥20 beat per minute (bpm) increase in heart rate at any time point in the clinical trial, compared to 15/159 (9%) of patients who received placebo. This finding was observed in 64/268 (31%) who received the 200 mg dose, compared to 39/262 (15%) of patients in the placebo group, and in 28/100 (28%) of patients who received the 400 mg dose, compared to 24/103 (23%) of patients who received placebo.

In a clinical study in patients 12 to 17 years of age, 22/99 (22%) of patients treated with Qelbree 200 mg daily had a ≥20 bpm increase in heart rate at any time point in the clinical trial, compared to 15/104 (14%) of patients who received placebo. This finding was observed in 69/205 (34%) who received the 400 mg dose, compared to 35/201 (17%) of patients in the placebo group.

In patients ages 12 to 17 years, 52/205 (25%) of patients treated with Qelbree 400 mg daily had a ≥15 mmHg increase in diastolic blood pressure at any time in the clinical trial, compared to 26/201 (13%) of patients in the placebo group. Assess heart rate and blood pressure prior to initiating treatment with Qelbree, following increases in dosages, and periodically while on therapy.

Activation of Mania or Hypomania

Noraadrenergic drugs, such as Qelbree, may induce a manic or mixed episode in patients with bipolar disorder. Prior to initiating treatment with Qelbree, screen patients to determine if they are at risk for bipolar disorder; such screening should include a detailed psychiatric history, including a personal or family history of suicide, bipolar disorder, and depression.

Somnolence and Fatigue

Qelbree can cause somnolence and fatigue. In the short-term, placebo–controlled clinical trials in pediatric patients with ADHD, somnolence (including lethargy and sedation) was reported in 16% of Qelbree-treated patients compared to 4% of placebo-treated patients. Fatigue was reported in 6% of Qelbree-treated patients compared to 2% of placebo-treated patients.

Patients should not perform activities requiring mental alertness, such as operating a motor vehicle or operating hazardous machinery until they know how they will be affected by Qelbree.

ADVERSE REACTIONS

Clinical Trials Experience

The safety of Qelbree has been evaluated in 1118 patients (6 to 17 years of age) with ADHD exposed to one or more doses in short-term (6 to 8 week), randomized, double-blind, placebo-controlled trials. A total of 692 pediatric patients were treated for at least 6 months, and 347 pediatric patients for at least 12 months with Qelbree.

The data described below reflect exposure to Qelbree in 826 patients who participated in randomized, double-blind, placebo-controlled trials with doses ranging from 100 mg to 400 mg. The population (N=826) was 65% male, 35% female, 54% White, 41% Black, 4% multiracial, and 1% other races.

Adverse Reactions Leading to Discontinuation of Qelbree Treatment

Approximately 3% of the 826 patients receiving Qelbree in clinical studies discontinued treatment due to an adverse reaction. The adverse reactions most commonly associated with discontinuation of Qelbree were somnolence, nausea, headache, irritability, tachycardia, fatigue, and decreased appetite.

Most Common Adverse Reactions (occurring ≥5% and at least twice the placebo rate for any dose): somnolence, decreased appetite, fatigue, nausea, vomiting, insomnia, and irritability.

Listed here are adverse reactions that occurred in at least 2% of patients treated with Qelbree and more frequently in the Qelbree-treated patients than in the placebo-treated patients. Data represents pooled data from pediatric patients ages 6 to 17 years who were enrolled in randomized, placebo-controlled trials of Qelbree.

Adverse Reactions Reported in ≥2% of Pediatric Patients (Ages 6 to 17 Years) Treated with Qelbree and at a Greater Rate than Placebo-Treated Patients in Placebo-Controlled ADHD Studies Placebo (N=463); All Qelbree (N=826)


The following terms were combined: Somnolence: somnolence, lethargy, sedation; Headache: headache, migraine, migraine with aura, tension headache; Upper respiratory tract infection: nasopharyngitis, pharyngitis, sinusitis, upper respiratory tract infection, viral sinusitis, viral upper respiratory tract infection; Abdominal pain: abdominal discomfort, abdominal pain, abdominal pain lower, abdominal pain upper; Insomnia: initial insomnia, insomnia, middle insomnia, poor quality sleep, sleep disorder, terminal insomnia.

Effects on Weight: In short–term, controlled studies (6 to 8 weeks), Qelbree-treated patients 6 to 11 years of age gained an average of 0.2 kg, compared to a gain of 1 kg in same-aged patients who received placebo. Qelbree-treated patients 12 to 17 years of age lost an average of 0.2 kg, compared to a weight gain of 1.5 kg in same-aged patients who received placebo. In a long-term open-label extension safety trial, 1097 patients received at least 1 dose of Qelbree. Among the 339 patients evaluated at 12 months, the mean change from baseline in weight-for-age z-score was -0.2 (standard deviation of 0.5). In the absence of a control group, it is unclear whether the weight change observed in the long-term open-label extension was attributable to the effect of Qelbree.

DRUG INTERACTIONS

Drugs Having Clinically Important Interactions with Qelbree

Monoamine Oxidase Inhibitors (MAOI)

• Clinical Impact: Concomitant use of Qelbree with an MAOI may lead to a potentially life-threatening hypertensive crisis.

• Intervention: Concomitant use of Qelbree with an MAOI or within 2 weeks after discontinuing an MAOI is contraindicated.

• Examples: Selegiline, isocarboxazid, phenelzine, tranylcypromine, sarafloxan, moclobemide.

Sensitive CYP1A2 Substrates or CYP1A2 Substrates with a Narrow Therapeutic Range

Clinical Impact: Viloxazine is a strong CYP1A2 inhibitor. Concomitant use of viloxazine significantly increases the total exposure, but not peak exposure, of sensitive CYP1A2 substrates, which may increase the risk of adverse reactions associated with these CYP1A2 substrates.

• Intervention: Coadministration with viloxazine is contraindicated.

• Examples: Alosoten, duloxetine, ramelteon, tamsulosin, tiagabine, theophylline.

Moderate Sensitive CYP1A2 Substrate

Clinical Impact: Viloxazine is a strong CYP1A2 inhibitor. Concomitant use of viloxazine significantly increases the total, but not peak, exposure of sensitive CYP1A2 substrates, which may increase the risk of adverse reactions associated with these CYP1A2 substrates.

• Intervention: Not recommended for coadministration with viloxazine. Dose reduction may be warranted if coadministered.

Antidepressants

• Clinical Impact: Concomitant use of Qelbree with an antidepressant is generally safe and well tolerated.

• Intervention: Minimal interaction is anticipated.

• Examples: Escitalopram, citalopram, fluoxetine, fluvoxamine, paroxetine, sertraline, venlafaxine.

Antipsychotics

• Clinical Impact: Concomitant use of Qelbree with an antipsychotic may lead to a potentially life-threatening hypertensive crisis.

• Intervention: Concomitant use of Qelbree with a typical or atypical antipsychotic is contraindicated.

• Examples: Haloperidol, olanzapine, quetiapine, risperidone, ziprasidone.
Drugs Having Clinically Important Interactions with Qelbree (continued)

Moderate Sensitive CYP1A2 Substrate (continued)

- Examples: Clozapine, pirenidone

CYP2D6 Substrates

- Clinical Impact: Viloxazine is a weak inhibitor of CYP2D6, and increases the exposure of CYP2D6 substrates when coadministered.

- Intervention: Monitor patients for adverse reactions and adjust dosages of CYP2D6 substrates, as clinically indicated.

- Examples: Atomoxetine, desipramine, dextromethorphan, nor-tyrphine, metoprolol, nebivolol, perphenazine, tolterodine, venlafaxine, and risperidone

CYP3A4 Substrates

- Clinical Impact: Viloxazine is a weak inhibitor of CYP3A4 which increases the exposure of CYP3A4 substrates when coadministered.

- Intervention: Monitor patients for adverse reactions and adjust dosages of CYP3A4 substrates, as clinically indicated.

- Examples: Alfentanil, avanafil, buspirone, conivaptan, darifenac, darunavir, ebastine, everolimus, brunilin, Iomtapidine, kovastatin, midazolam, naloxegol, nisoldipine, saquinavir, simvastatin, srolimus, tacrolimus, tipranavir, trizolam, vardenafil, and lurasidone

USE IN SPECIFIC POPULATIONS

Pregnancy

Pregnancy Exposure Registry
Report pregnancies to the National Pregnancy Registry for Psychiatric Medications at 1-866-961-2388, and at the website (www.womensmentalhealth.org/jemc).

Risk Summary
Based on findings from animal reproduction studies, viloxazine may cause maternal harm when used during pregnancy. Discontinue viloxazine when pregnancy is recognized unless the benefits of therapy outweigh the potential risk to the mother. Available data from case series with viloxazine use in pregnant women are insufficient to determine a drug-associated risk of major birth defects, miscarriage or adverse maternal outcomes.

In animal reproduction studies, oral administration of viloxazine to pregnant rats and rabbits during the period of organogenesis did not cause significant maternal toxicity but caused fetal toxicities and delayed fetal development in the rat at doses up to 2 times the maximum recommended human dose (MRHD) of 400 mg, based on mg/m². In the rabbit, viloxazine caused maternal toxicity without significant fetal toxicities at doses ≥ 7 times the MRHD based on mg/m². The no observed adverse effect levels (NOAELs) for fetal toxicity are approximately equal to or 11 times the MRHD, based on mg/m² in the rat and rabbit, respectively. Oral administration of viloxazine to pregnant rats and mice during pregnancy and lactation caused maternal toxicities and deaths at doses approximately 2 and 1 time the MRHD, based on mg/m², respectively (see Data). At these maternally toxic doses, viloxazine caused offspring toxicities. The NOAEL for maternal and developmental toxicity is approximately equal to or less than the MRHD, based on mg/m², in the rat and mouse, respectively (see Data).

Data

Animal Data

Viloxazine was administered orally to pregnant rats during the period of organogenesis at doses of 13, 33, and 82 mg/kg/day, which are less than, equal to, and 2 times the MRHD of 400 mg, based on mg/m², respectively. Viloxazine did not cause maternal toxicity at doses up to 62 mg/kg/day. Viloxazine at 81 mg/kg/day caused early and late resorption, delayed fetal development, and possibly caused low incidences of fetal malformations or anomalies (craniorachischisis, missing cervical vertebrae, and morphological changes associated with hydrencephaly). The NOAEL for fetal toxicity and malformation is 33 mg/kg/day, which is approximately equal to the MRHD, based on mg/m².

Viloxazine was administered orally to pregnant rabbits during the period of organogenesis at doses of 43, 87, and 130 mg/kg/day, which are approximately 4, 7, and 11 times the MRHD of 400 mg, based on mg/m², respectively. Viloxazine decreased maternal body weight, weight gain, or food consumption at doses ≥ 87 mg/kg/day but did not cause fetal toxicity at doses up to 130 mg/kg/day. The NOAELs for maternal and fetal toxicity is 43 and 130 mg/kg/day, respectively, which is approximately 4 and 11 times the MRHD, based on mg/m², respectively.

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Viloxazine was administered orally to pregnant mice during gestation and lactation at doses of 43, 67, and 217 mg/kg/day, which are approximately 1, 2, and 5 times the MRHD of 400 mg, based on mg/m², respectively. Viloxazine caused maternal toxicity of decreased body weight, weight gain, and food consumption at doses ≥ 87 mg/kg/day and maternal deaths near term at 217 mg/kg/day. At these maternally toxic doses, viloxazine caused lower live birth, decreased viability, and delayed growth and sexual maturation without affecting learning and memory in the offspring. The NOAEL for maternal and developmental toxicity is 43 mg/kg/day, which is approximately equal to the MRHD, based on mg/m².

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The unofficial new year

September is often considered the unofficial new year, especially for those in the pediatric community—a new season, a new school term, and a new visit to the doctor. And, as we all know how markedly different this school year will look compared with 2020, we also hope that all our pediatric health care provider’s offices look a lot different too. Children will be coming in for routine physicals, immunizations (and immunization catch-ups); and likely, questions about how to tread this fall, especially in those school districts that have not mandated official mask policies for schools.

On August 5, the White House put out an “additional action” list to help get children back to school safely, which included incorporating COVID-19 vaccinations into sports physicals for eligible students and sending pediatricians to “back to school nights” to get communities vaccinated.¹

These good initiatives will prompt questions from parents. They may be asking, “Should my child be wearing a mask at school? If so, when?” “If my child has been vaccinated, is it safe for them to be unmasked all day long?” “How worried should I be about my child in school full time with these multiple variants spreading?”

As the health guardian of the family’s children, the pediatrician is looked upon as the first line of defense for these concerns. With that in mind, we would love to hear from you about how your fall season is going in this regard. Have you been getting more traffic in your waiting rooms? Have you been faced with these questions? Have you found yourself finding it difficult to answer some questions as information on COVID-19 and all its variants continues to evolve, and science tries desperately to keep up with its epidemiology?

We want to hear about all of it: the good, the bad, and the I-just-don’t-know.

Please feel free to email our editor, Lois Levine, (llevine@mjhlifesciences.com) and share your experiences as you help prepare your patients for a happy, productive, and—all fingers and toes crossed here—healthy new year!

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The editors of Contemporary Pediatrics are delighted to announce that the “Racism in Pediatric Health” article, published in the February 2021 issue of Contemporary Pediatrics®, won an Apex Grand Award for publication excellence. Read it here: bit.ly/3ik7Tje

THE EDITORS ARE PLEASED TO ANNOUNCE the availability of our new parent company’s continuing education activities. We’ve picked this one especially for our Contemporary Pediatrics® readers. Go to: bit.ly/3gJY8bP

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With kids home and parents looking for things to do that include “social distancing,” more families will take to the outdoors. The only thing, ticks don’t play by the same rules, so Lyme disease could end up on the rise. When patients aren’t feeling well, anxiety levels could be especially high – and now more than ever they’ll ask to be tested. Sofia 2 Lyme FIA uses a finger-stick whole blood sample to provide accurate, objective and automated results in as few as 3 minutes, getting practitioner and anxious patient on a path to treatment much sooner.

- IgM and IgG differentiated results
- CLIA waived
- Point-of-care testing
- Less than 1 minute hands-on-time
- Accuracy comparable to laboratory testing methods

For more information contact Quidel Inside Sales at 858.431.5814
Or go to our website at Sofia2Lyme.com
Greetings! I hope everyone had an enjoyable summer and a chance to refresh and recharge as a new school year begins. Over the past month, the delta variant of SARS-CoV-2 has spread throughout the United States, especially in unvaccinated populations. This has caused a surge of COVID-19 infections and a significant increase in COVID-19 hospitalizations among children, with hospitalization rates, as of this writing, 4.6 times higher than they were a month ago. It is important to remember that the COVID-19 pandemic is not over. Please encourage everyone in your offices, hospitals, and elsewhere to continue to wear a mask and follow protective protocols to slow the spread of the virus.

This month’s journal has a number of must-read articles that address frequently encountered issues in pediatric practice. They include:

 Our cover story addresses the growing problem of obesity in children—an epidemic in the United States, with an estimated 20% of the pediatric population meeting the criteria—and its exacerbation by the COVID-19 pandemic. This resource reviews the history, diagnosis, and treatment of obesity and covers the screening recommendations for prediabetes and diabetes in obese children.

 The Infectious Diseases section offers a comprehensive review of croup and the “barking cough.” Given the unusual timing of this year’s respiratory season, this article is especially useful.

 The Pediatric Pharmacology report explains how to use fall allergy medications and distinguish between allergy and COVID-19 symptoms.

 Developmental Health describes kangaroo care’s positive effect on infants.

 Not to be missed: One of our own editorial advisory board members, Andrew Schuman, MD, shares his vision of the pediatrician’s office of the future and how the latest in medical technology may be incorporated to improve patient care.

Thank you for providing outstanding care to your patients during these rapidly changing times. As Ralph Watson stated, “Being positive in a negative situation is not naïve, it’s leadership.”

As always, I welcome your suggestions, comments, and questions.

With warmest regards,
Tina Q. Tan

email: titan@luriechildrens.org

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A 2021 observational study conducted in Portugal found that Kingella kingae has displaced Staphylococcus aureus as the most common causative organism of acute septic arthritis (SA). The investigation also revealed that older children with comorbidities are at increased risk of SA sequelae.

Investigators analyzed data of children admitted to a hospital with SA from 2003 through 2018. Diagnosis of acute SA and osteomyelitis was based on classical clinical findings plus suggestive imaging. Investigators identified 247 children with the diagnosis, almost 60% of whom were male, with a median age of 2 years. During the last 5 years of the study period, annual incidence increased 1.7-fold, and diagnosis occurred at a lower median age. Respiratory tract infection (23.5% of patients) most often preceded diagnosis, followed by trauma, cutaneous wounds, and chickenpox. The most common clinical presentations were pain and range of motion limitations, followed by fever, local inflammatory signs, and toxic appearance. Hip joints were affected most often (38.9% of patients), followed by knee, ankle, elbow, and shoulder joints.

Before 2014, 37% of SA cases were caused by a pathogen. The most common was S aureus (65.3% of those with microbiologic etiology), followed by Streptococcus pyogenes (12.2%), and Streptococcus pneumoniae (10.2%). K kingae, Haemophilus influenzae b, Neisseria meningitidis, Escherichia coli, Streptococcus mitis, and Salmonella spp each accounted for 2% of SA cases. After 2014, a causative pathogen was found in 49% of cases, led by K kingae (found in 51.9% of those with microbiologic etiology), followed by S aureus (19.2%), S pyogenes (9.6%), S pneumoniae (5.8%), N meningitidis (5.8%), H influenzae b (1.9%), Enterobacter spp (3.8%), and Brucella (1.9%). In the last 5 years of the study period, children tended to be treated intravenously for fewer days than earlier (10.7 vs 13.2) but had more complications (20.6% vs 11.4%). Risk factors for complications were C-reactive protein (CRP) ≥ 80 mg/L and S aureus infection, and for sequelae at 6 months being 4 years or older, having underlying chronic disease, and a CRP ≥ 80 mg/L.

I don’t believe I heard of this bacterium at all during medical school, only subsequently with osteomyelitis (but at first just in patients with sickle cell anemia disease). Not surprisingly, we now recognize it as a major cause of septic arthritis. Remember to cover for it (note that vancomycin and clindamycin are not effective) while waiting for culture results.

**Long-term video EEG monitoring has range of benefits in epilepsy**

Long-term video electroencephalogram monitoring (LVEM) is beneficial not only from a medical perspective but also is helpful for children with epilepsy and their families, even when patients are ineligible for epilepsy surgery, according to study findings. The retrospective study, conducted in Germany, included 163 patients who underwent LVEM sessions with a mean duration of 5.4 days. LVEM confirmed a diagnosis of epilepsy in 147 patients (90.2%) and excluded the diagnosis in 16 (9.2%). Overall, LVEM results altered the diagnosis of 37.4% of patients, 20.8% of presurgical patients, and 52.3% of those not slated for surgery. In 64% of patients deemed ineligible for surgery, the clarification of epilepsy syndromes through LVEM resulted in medication adjustments. Three months after undergoing LVEM or surgery, 81 patients (45.4%) reported having either no or fewer seizures. In response to a questionnaire, three-quarters of families indicated that they considered LVEM helpful, with 45.8% reporting that the patient’s illness had improved since undergoing the monitoring.

**Fever without source (FWS) was the first sign of SARS-CoV-2 infection in infants.**

Fever without source (FWS) was the first sign of SARS-CoV-2 infection in 40% of infants younger than 90 days old who were included in a study conducted in Spain. Sixty-seven infants were included, and of the 27 who had FWS and SARS-CoV-2 (the cause of COVID-19), 59% had household contact with a confirmed COVID-19 case. Five of the 27 children (15%) had comorbidities: Two were born preterm and the other 3 had congenital heart disease, phenylketonuria, and Shwachman-Diamond syndrome, respectively. Blood culture, urine culture, and lumbar puncture were performed in some of the infants, revealing that 2 of the 27 whose FWS was the first manifestation SARS-CoV-2 infection had bacterial infections—1 with urinary tract infection (UTI) and bacteremia and 1 with UTI. C-reactive protein was more than 20 mg/L in 2 children (1 with bacterial coinfection), and procalcitonin was normal in all. Outcomes were good overall, although 1 child was admitted to the pediatric intensive care unit because of apnea episodes. Investigators concluded that standardized markers to rule out serious bacterial infection seem to remain useful in this population and recommended that practitioners rule out COVID-19 in infants with FWS in areas with community transmission of SARS-CoV-2.

**THOUGHTS FROM DR FARBER**

The pandemic has forced us to reconsider the value of some hospital stays. Here is another area where home appears to be better: lower cost, less stress for families, and a longer period of monitoring are 3 obvious benefits, without apparently sacrificing quality.


A female aged 13 years with morbid obesity (body mass index, 56.7 kg/m²) and recent hospitalization for pyelonephritis presented to the pediatric emergency department with abdominal pain, tachycardia, and shortness of breath. She completed a course of oral antibiotics for the pyelonephritis about 4 days prior and initially felt well. Two days later, she started to experience diffuse abdominal pain accompanied by nonbloody, nonbilious emesis and watery diarrhea. The patient also complained of increased thirst and new bowel and bladder incontinence. That morning she developed difficulty breathing with tachypnea and a generalized feeling of weakness, which prompted her presentation to the pediatric emergency department. She denied fever, dysuria, or malodorous urine since completing the above antibiotics. She also denied being sexually active. She had operative pinning for a slipped capital femoral epiphysis about 3 months earlier, for which she has no residual pain or swelling, but she still uses crutches and has been sedentary since the procedure.

**Physical exam**

Triage vital signs show a temperature of 36.6 °C with a heart rate of 177 beats per minute; blood pressure, 104/84 mmHg; respiratory rate, 30 breaths per minute; pulse oximetry, 98% on room air; and capillary refill time of 3 seconds. She is generally ill appearing and moaning in pain. Her exam is also notable for dry mucous membranes and otherwise significant for tachycardia without murmurs, tachypnea with clear breath sounds, and a soft and nondistended but diffusely tender abdomen. She has no rashes, joint swelling, or swelling of lower extremities.

**Patient evaluation**

Immediate interventions to treat the tachycardia and early signs of shock include intravenous (IV) fluid resuscitation with improvement in heart rate, cap refill time, and blood pressure. A blood culture was drawn followed by administration of empiric IV ceftriaxone and metronidazole. Antibiotics were selected for broad-spectrum coverage in this patient who fits systemic inflammatory response syndrome criteria and for additional polymicrobial coverage for possible intraabdominal infection (Table 1). An electrocardiogram (ECG) was obtained to evaluate for right heart strain, and ischemia was notable for sinus tachycardia. Computed tomography angiogram (CTA) of chest and CT abdomen/pelvis with IV contrast imaging were ordered.

**Laboratory testing**

Given the patient’s ill appearance, abnormal vital signs, and multiple sources for possible infection, the following broad laboratory work-up was pursued. An initial glucometer reading was 119 mg/dL. Additional results returned as follows: complete blood count with leukocytosis of 30 K/mm³
puzzler

with 8% bands; hemoglobin, 10.7 g/dL; hematocrit, 33.6 g/dL; platelets, 649 K/mm³; C-reactive protein, 56 mg/dL (<0.5 mg/dL); lactate, 2 mmol/L (normal <2.3 mmol/L). D-dimer was elevated at 19 mg/L FEU (normal <0.5 mg/dL FEU). A comprehensive metabolic panel, venous blood gas, troponin, lipase, urinalysis and urinary pregnancy test were all within reference range.

Differential diagnosis

**PULMONARY EMBOLUS**

The greatest initial concern and most immediately life-threatening diagnosis was a pulmonary embolus (Table 2). Although less common in the pediatric than adult population, the patient had several risk factors, including obesity, minimal ambulation for the past several months, surgical procedure, and recent hospitalization. A high index of suspicion is also needed for patients on oral contraceptive therapy, recent travel, malignancy, or a family history of hypercoagulability. The physical exam of acute distress, tachypnea with clear breath sounds, and significant tachycardia supported this possibility. No unilateral leg pain or swelling was seen, although this can be difficult to assess in patients with an obese body habitus. Patients typically present with chest pain, but abdominal discomfort can also be referred. ECG findings may be normal or demonstrate sinus tachycardia, right bundle branch block, ST-segment elevation in V1 and aVR, and low amplitude QRS complexes. The Simplified Wells Score and Pulmonary Embolism Rule-Out Criteria (PERC) are often used to risk-stratify patients with possible pulmonary embolism. The Wells Score rates patients on symptoms, likelihood of diagnosis, and history of hypercoagulability; patients with more than 1 risk factor should have immediate imaging. Those with a score of 1 or less can then be further assessed via PERC. PERC applies some of the same factors as Wells and also accounts for medication use and physical exam. If there are no PERC criteria met in addition to a Wells score of less than 2, no further evaluation is indicated. If any PERC signs are present, further stratification with D-dimer testing is suggested. Although this can be helpful to supplement clinician decision-making, both have not been validated for patients less than 18 years old. Thus, these should be used only as a guide and not to replace physical exam and clinical suspicion.

**INTRA-ABDOMINAL INFECTION**

Although the patient had no reported fevers, sepsis must always be considered in a patient with persistent tachycardia. She had many possible intra-abdominal sources for sepsis, most notably a recurrent pyelonephritis complicated by a renal abscess. Her body habitus limited physical exam localization of pain to a specific abdominal quadrant; additional possible CONTINUED ON PAGE 14
INTRODUCING A

Therapeutic OTC Eczema Regimen

Complement your therapeutic approach by recommending clinically proven solutions for Eczema-prone skin

NEW Eucerin® Baby Eczema Relief

Cream Body Wash

• Statistically significant improvement in itching (55%), erythema (46%), and dryness (44%) at Week 1 vs baseline
• 2% Colloidal Oatmeal*, Ceramide NP, gentle cleansing system
• Gentle, non-foaming body wash

Eucerin Baby Eczema Relief Cream

• 44% reduction in risk of flare
• 4 out of 5 children remained flare free for 6 months
• 1% Colloidal Oatmeal*, Ceramide NP, Licochalcone A

* A skin protectant
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HYPEROSMOLAR HYPERGLYCEMIC STATE
A history of new onset polydipsia and urinary incontinence raised the suspicion of an endocrine etiology. Although the patient was an adolescent, her body habitus suggested an increased risk of type 2 diabetes mellitus with resulting hyperosmolar hyperglycemic state (HHS). HHS is a consequence of hyperglycemia, significantly elevated serum osmolarity, and severe dehydration. It is typically a complication of uncontrolled type 2 diabetes or may be triggered by an underlying infection leading to dehydration. It can lead to fatal cerebral edema and cardiovascular collapse. HHS is diagnosed by clinical findings of dehydration, lethargy, and altered mental status. Laboratory evaluation includes elevated glucose greater than 600 mg/dL, elevated plasma osmolarity of 320 mOsm/L or higher, and no ketoacidosis. Management requires aggressive IV hydration at twice the maintenance rate and administration of only subcutaneous insulin rather than a continuous infusion.

MYOCARDITIS
Unexplained tachycardia in the pediatric population may also indicate myocarditis. Myocarditis is an inflammation of the cardiac muscle usually caused by a recent viral infection. Additional signs and symptoms include tachypnea, fatigue, vomiting, hepatomegaly, and an S3 gallop on exam. ECG may show sinus tachycardia and elevated ST segments. Lab work-up usually is associated with an elevated troponin. A chest x-ray may show an enlarged cardiac silhouette and pulmonary edema. Patients typically do not tolerate IV fluids well and should be emergently transferred to a facility with pediatric cardiology services.

Actual diagnosis
Radiographic testing revealed the diagnosis of the patient. A CTA chest was negative for pulmonary embolus, and the CT abdomen/pelvis with and without IV contrast demonstrated a large fluid collection in the right lower quadrant (Figure) that was most consistent with a TOA. There was also extensive reactive bowel inflammation that likely caused her associated diarrhea and incontinence.

Patient course
Upon diagnosis of TOA, general pediatric surgery service was consulted. The patient was admitted to the pediatric intensive care unit following the surgical procedure. Pediatric infectious disease and gynecology services were consulted to guide IV antibiotic therapy. Antibiotics were then further broadened to vancomycin and piperacillin-tazobactam. Blood cultures remained negative. Her intra-abdominal culture grew multiple organisms. Gonorrhea and chlamydia polymerase chain reaction were negative. The patient had a prolonged hospital course of several weeks. She required 2 additional operative interventions for repeat drain placement and ultimately a right salpingectomy. She was discharged with multidisciplinary follow-up, including physical therapy and weight loss clinic. The patient continuously denied any sexual activity or sexual abuse. Her infection was attributed to a combination of recent urinary system infection and poor genitourinary hygiene.

Discussion
TOA is an intra-abdominal infection that usually results as a late complication of pelvic inflammatory disease (PID). It typically presents with abdominal pain, vaginal discharge, adnexal mass, and leukocytosis in sexually active females of reproductive age. Up to 50% of infected patients may be afebrile with an ill appearance. As the infection is caused by ascension of bacteria from the lower genital tract, etiology of microorganism is usually polymicrobial. The predominant cause is anaerobic bacteria rather than Neisseria gonorrhoeae or Chlamydia trachomatis. Organisms include Escherichia coli, Bacteroides fragilis, other Bacteroides species, Peptostreptococcus, Peptococcus, and aerobic streptococci. Risk factors for TOA are reproductive age, intrauterine device use, multiple sexual partners, and past PID infections.

Physical exam usually notes pelvic tenderness, often with evidence of peritonitis. Bimanual exam may reveal cervical motion tenderness and...
### TABLE 2 DIFFERENTIAL DIAGNOSIS: ABDOMINAL PAIN WITH TACHYCARDIA AND TACHYPNEA

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>RELEVANT STUDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary embolus</td>
<td>Tachycardia, Tachypnea, Hypoxia, Chest pain, Shortness of breath</td>
<td>Elevated D-dimer, Electrocardiogram with evidence of right heart strain, Echocardiogram with bowing of interventricular septum, CT angiogram of chest, Ventilation-perfusion scan</td>
</tr>
<tr>
<td>Intra-abdominal infection</td>
<td>Fever, Abdominal pain, Nausea, Vomiting, Diarrhea (watery or bloody)</td>
<td>Rebound and guarding, Abdominal distention, Discomfort with ambulation, Leukocytosis, Increased bands, Elevated C-reactive protein, Abnormal radiographic imaging (ultrasoundography or CT imaging)</td>
</tr>
<tr>
<td>Hyperosmolar hyperglycemic state</td>
<td>History of type 2 diabetes or diabetes risk factors, Tachycardia, Polyuria</td>
<td>Polydipsia, Confusion, Fatigue, Dry mucous membranes, Serum glucose &gt;600, Serum osmolarity &gt;319, Absence of ketonuria</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>Tachycardia, Chest pain, Palpitations, Abdominal pain, Fatigue, Presyncope, Orthopnea and lower extremity edema in older patients</td>
<td>Poor feeding and poor weight gain in infants, New murmur and/or S3 gallop, Decompensation after intravenous fluid resuscitation, Electrocardiogram with ST segment elevations, Elevated troponin, Elevated pro-B-type natriuretic peptide, Chest x-ray with enlarged cardiac silhouette and/or pulmonary edema, Echocardiogram with decreased ejection fraction and dilated left ventricle</td>
</tr>
</tbody>
</table>

**Management**

TOA can be managed both medically and surgically. All patients should be admitted to the hospital with a gynecology consult. If the TOA has not yet ruptured, antibiotics can be trialed. The initial recommended regimen includes IV cefotetan or IV cefoxitin and IV doxycycline, IV ampicillin with IV gentamicin loading dose followed by IV clindamycin, or IV ampicillin-sulbactam and IV doxycycline. IV medications can be transitioned to oral once patients have defervesced, resolution of leukocytosis, clinical improvement in pain, and improvement in size of abscess on imaging.

Surgery may be pursued as source control for unstable patients, large abscess size, or failure of antibiotics. If patients have worsening symptoms or no improvement after 2 weeks of oral therapy, surgery is recommended. Surgical options include interventionally radiologic percutaneous drainage or laparoscopy/laparotomy for drainage and possible salpingectomy.

Given the significant associated complications, TOA prevention is important when it comes to adolescent health. Health care team members should counsel patients on safe sex practices, PID, and TOA risk factors before a patient develops these conditions.

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**For references,** go to [ContemporaryPediatrics.com/puzzler-0921](https://www.ContemporaryPediatrics.com/puzzler-0921)

Julianne Lapsa is a pediatric emergency fellow at Johns Hopkins Children’s Center in Baltimore, Maryland.

Thuy Ngo is an assistant professor of pediatrics at Johns Hopkins University School of Medicine.

The authors have nothing to disclose.

adnexal tenderness and/or mass. Radiographic testing will confirm the diagnosis, and multiple modalities are acceptable including ultrasonography, CT scan, and MRI.

Although TOA is almost always caused by further ascension of bacteria from PID, it can result spontaneously without history of sexual activity and as a complication of hysterectomy. In the pediatric population, it has been rarely seen as a sequela of inflammatory bowel disease. There are also case reports of TOA in adolescents resulting from a combination of obesity, constipation, recurrent urinary tract infection, and poor hygiene.

After initial recovery, later complications include chronic pelvic pain, infertility, ectopic pregnancy, ovarian vein thrombosis, and recurrent PID.
As variants of SARS-CoV-2 continue to emerge, much of the world has returned to some sense of normalcy. School bells are ringing, and children—some masked, some not—are back to in-person learning. All this begs the question “How will COVID-19 affect the fall allergy season, and are there any new tools in the pediatrician’s arsenal?”

Predictions for fall
Stanley M. Fineman, MD, a pediatric immunologist at Atlanta Allergy and Asthma in Georgia and a spokesperson for the American College of Allergy, Asthma, and Immunology, says back-to-school season is always a struggle as kids come together and fall allergies and the cold and flu season meet.

“The kids last year were social distanced, and most were not in school or wearing masks, so the incidence of upper respiratory infections went way down,” Fineman said. Even some patients who normally had pollen-type allergies reported fewer symptoms, potentially also from masking, he added.

No one knows how bad the pollen season will be this fall, but children with severe respiratory allergies will be in the same boat they’ve always been in—at a higher risk of other respiratory infections, more asthma flare-ups, and increased hospitalizations.

“Those are serious concerns we have,” Fineman said. “We just have to be extra cautious and warn our patients. They need to know what their allergies are, and you should have a skin test if you are at risk.”

Skin tests are the best way to pinpoint allergens, Fineman said, and most allergists agree that knowing one’s triggers and following local pollen counts are essential to managing allergy flare-ups.

Rachel Dawkins, MD, medical director of the pediatric and adolescent medicine clinics at Johns Hopkins All Children’s Hospital in St Petersburg, Florida, agrees that it’s shaping up to be a more difficult fall allergy season than usual. “As pediatricians, we are seeing a very rough fall. Students are back in school in person and, in many cases, unmasked in the classroom,” Dawkins said. “On top of that, we are seeing outbreaks of respiratory syncytial virus (RSV) and COVID-19, as well as other viral illnesses. It is going to be tough to decide what is viral vs allergic in the office and how to decide who to send back to school and who to tell to quarantine.”

Dawkins encourages her patients with known seasonal allergies to restart their antihistamines as fall approaches rather than until they have symptoms.

“It especially in our younger or unvaccinated patients, they will likely need to be tested for COVID-19 if symptomatic prior to returning to school even if they have a history of seasonal allergies,” she said. “In areas like mine [Florida], where community testing sites have closed, the volume of sick children needing to be seen and tested will be a challenge.”

Allergies or COVID-19?
The biggest challenge in the upcoming allergy season may be trying to differentiate between respiratory allergy symptoms and infectious diseases like COVID-19.

“If there’s a family or personal history of allergies, then it’s possible it’s allergies,” Fineman said. “But in the school setting, if they have a fever, all bets are off.”

The presence of a fever is a major red flag in differentiating allergies from infections, he explained, adding that good assessment skills can

Fall allergies: Medications remain stable, but a lot has changed

With COVID-19 still at large, pediatricians should prepare for a tough allergy season.

RACHAEL ZIMLICH, BSN, RN

As variants of SARS-CoV-2 continue to emerge, much of the world has returned to some sense of normalcy. School bells are ringing, and children—some masked, some not—are back to in-person learning. All this begs the question “How will COVID-19 affect the fall allergy season, and are there any new tools in the pediatrician’s arsenal?”

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help clinicians be judicious in testing for illnesses such as influenza and COVID-19.

The COVID-19 pandemic has had interesting effects in terms of allergies and other infectious diseases, according to Mitchell H. Grayson, MD, chief of the Division of Allergy and Immunology at Nationwide Children’s Hospital in Columbus, Ohio. For example, a massive RSV season is under way, even though it’s not the normal season for the virus, he said: “RSV clearly has the ability to not stick to its seasonal barriers, but I wonder about influenza.”

Masking has helped reduce the spread of respiratory viruses and maybe even some pollen, but building protection requires exposure. “We saw a dramatic decrease in kids’ exposure to allergens and exacerbations a year ago, presumably due to masking and not gathering,” Grayson said. “I’m guessing that masking in the fall would have similar results.”

Most areas began dropping mask mandates in the spring, which is when there was an increase in both allergic exacerbations and viral illnesses, he said. It makes sense that masking helps reduce the amount of pollen and other allergens that are taken into the body, but not much has changed in terms of indoor allergies. Many other factors could be coming into play, Grayson said, but masks seem to be the primary reason for the reduction of allergy, illness, and asthma problems last year. Fewer office visits could have played a role, but not to the extent that most areas saw, he said: “I find it hard to believe that people with asthma were having severe exacerbations and riding out at home [during the pandemic].”

Dawkins’ practice got ahead of the fall allergy season by creating a list of frequently asked questions for the call center and triage nurses. This guide will help staff keep caregivers updated on any recommendations from organizations such as the Centers for Disease Control and Prevention, American Academy of Pediatrics, and local governments. “This way we have a united message for families,” Dawkins said.

Asymptomatic children who have been exposed to COVID-19 are referred to community testing sites, and Dawkins said her practice has decided not to write mask exemption letters and is encouraging all children who are able to get the vaccine. Treatment strategies

There are no new medications on the horizon for seasonal relief, but Fineman noted that in recent years, there has been a greater push toward using inhaled nasal steroids as a first-line treatment for upper respiratory allergies. These should be initiated 3 to 4 weeks before the new allergy season begins.

For patients who prefer oral antihistamines, second-generation options are preferred. These medications, such as loratadine and cetirizine, are highly effective and rapid acting and don’t cross the blood-brain barrier, Fineman said. This means that, unlike medicines such as diphenhydramine, they don’t have the sedating effects on the central nervous system.

Currently, there is a lot of research into biologics and immunology trickling down from adult medicine to pediatric practice, Grayson said. Fineman stressed the benefit of immunotherapy, especially in children with severe allergies. “We know that kids who have significant allergies are benefiting from allergen immunotherapy,” he said. Children with upper respiratory allergies may be predisposed to lower or reactive asthma, and immunotherapy can reduce that risk, Fineman explained.

Although pediatricians can manage a lot in general practice, Fineman emphasized that children who experience severe allergies would be best served with a referral to an allergist and possibly immunotherapy to reduce symptoms and complications.

**COMMENTS?** Email them to llevine@mjhlifesciences.com

**Rachael Zimlich** is a freelance medical writer in Cleveland, Ohio. She has nothing to disclose.
Does IV treatment for asthma lead to hospitalization?

Intravenous magnesium sulfate is recommended for treating refractory pediatric asthma, but is it linked to consequent hospitalization?  

MIRANDA HESTER

A study in JAMA Network Open looked at whether receiving intravenous magnesium sulfate therapy for refractory pediatric asthma was linked to subsequent hospitalization.1

Investigators performed a post hoc secondary analysis of a double-blind randomized clinical trial of children who had acute asthma and were treated from 2011 to 2019 in 7 Canadian tertiary care pediatric emergency departments. Children with Pediatric Respiratory Assessment Measure scores that were 5 points or higher following initial treatment with systemic corticosteroids and inhaled albuterol with ipratropium bromide were randomized to receive 3 nebulized treatments of albuterol plus IV magnesium sulfate (40-75 mg/kg) or 3 nebulized treatments of albuterol plus an IV 5.5% saline placebo.

There were 816 children in the study; 364 hospitalized. Factors linked to hospitalization included an increase in Pediatric Respiratory Assessment Measure score at disposition (per 1-U increase: odds ratio [OR], 2.24; 95% CI, 1.89-2.65; \( P < .001 \)), utilization of additional albuterol (OR, 5.94; 95% CI, 3.52-10.01; \( P < .001 \)), and receiving intravenous magnesium sulfate from 2011 to 2016 (OR, 22.67; 95% CI, 6.26-82.06; \( P < .001 \)) as well as from 2017 to 2019 (OR, 4.19; 95% CI, 1.99-8.86; \( P < .001 \)). Administration of intravenous magnesium sulfate was linked to hospitalization in children who had a disposition Pediatric Respiratory Assessment Measure score of 3 or lower (OR, 8.52; 95% CI, 2.96-24.41; \( P < .001 \)).

Investigators concluded from this study that receiving IV magnesium sulfate therapy after an initial asthma treatment in the emergency department was linked to subsequent hospitalization.

REFERENCE

Flu shot offers protection against COVID-19

The influenza shot reduced the number of patients with COVID-19 who required treatment from an emergency department or the intensive care unit (ICU). KEITH A. REYNOLDS

A study at the University of Miami Miller School of Medicine looked at the records of 74,754 patients and found that the annual flu shot reduced the risk of stroke, sepsis, and deep vein thrombosis in patients with COVID-19.

Specifically, the analysis found that patients with COVID-19 who had not received the flu shot were up to 20% more likely to have a stroke, up to 40% more likely to have deep vein thrombosis, up to 45% more likely to develop sepsis, up to 58% more likely to have a stroke, up to 40% more likely to have deep vein thrombosis. Although the study suggests the flu vaccine may protect against severe effects of COVID-19, the authors strongly recommend people receive the COVID-19 vaccine as well as their annual influenza shot.

The authors also note that a prospective randomized control trial would be needed to better understand the protections, but the flu shot could be used in the future to provide some protection in regions where the COVID-19 vaccines are unavailable.

“Continued promotion of the influenza vaccine has the potential to help the global population avoid a possible ‘twindemic’—a simultaneous outbreak of both influenza and [COVID-19],” medical student Susan Taghioff, co-lead author of the study, says in the release. “Being able to conserve global health care resources by keeping the number of influenza cases under control is reason enough to champion efforts to promote influenza vaccination worldwide.”

REFERENCE
Until now, opioids have been the mainstay in pediatric pain management because alternative, long-lasting non-opioid options were not yet approved for the pediatric population. As a surgeon who treats both children and adults, I take postsurgical pain management very seriously, especially for my pediatric patients, which can often be the first time adolescents are exposed to opioids. Even further, the risks and complications of many opioid-based pain management approaches may be heightened in children, including potential only dangerously and life-threatening risks and side effects such as respiratory depression, nausea, and persistent use. And while pain management and a comfortable recovery remain a top priority among surgical patients and their families, I have found success in achieving both goals while minimizing, or in some cases eliminating, the use of opioids in my pediatric tonsillectomy cases.

Surgery for young patients can be a significant life event, and the pediatric population is an especially vulnerable one. A 2019 study found that only 20% of tonsillectomy patients received multimodal medication in addition to their opioid prescription, with some patients receiving opioids for up to 26 days. Given that opioids can be attributed to 50% of postsurgical respiratory failure events in children and may also hinder recovery, extend hospital stay, and negatively impact both patient and parent experience; I am especially diligent in the pain management methods I utilize for pediatric patients.

About five years ago, I was introduced to a safe and effective, non-opioid option called EXPAREL® (bupivacaine liposome injectable suspension), which I swiftly incorporated into my multimodal pain management protocol in my adult patients. With its recent approval in pediatric patients ages 6 and older, I now utilize EXPAREL, a long-acting local analgesic, for all of my adult and pediatric tonsillectomy patients. Prior to the procedure, I have a discussion with my pediatric patients and their families about the pain management plan, and how their pain will be controlled through a combination of non-opioid options including EXPAREL. EXPAREL is injected into the surgical site during surgery and provides pain relief for the first few days following the procedure, when pain is usually at its worst, by slowly releasing bupivacaine using DepoFoam®, an innovative drug delivery technology, to extend analgesia.

Since implementing EXPAREL in my practice for pediatric patients, I have seen a remarkable difference. Patients are reporting less pain postoperatively. Even our post anesthesia care unit (PACU) nurses have witnessed children moving through recovery faster and transitioning more quickly to liquid pain medication. The current shift to non-opioid options is long overdue in pediatrics, and the approval of EXPAREL fills a gap in doctors’ pain management armamentarium. While the progress is encouraging, we must continue to expand access to safe and effective non-opioid options.

I am passionate about raising awareness of non-opioid options like EXPAREL among pediatric surgeons and anesthesiologists and am hopeful that the field will continue to embrace the increased use of non-opioid pain management options well into the future.


As we begin to emerge from the national lockdown due to the COVID-19 pandemic, many pediatricians may find that the already widespread problem of youth-onset obesity is worse than ever. SHEELA N. MAGGE, MD, MSCE

Social distancing, virtual school, more screen time, and less physical activity have all contributed to increased weight gain among youth. Moreover, the pandemic has magnified and exacerbated many of the preexisting racial and socioeconomic disparities in health care. Whether visits are in person or via telemedicine, the recognition, management, and treatment of obesity in youth by primary care providers is more important than ever.

**Epidemiology**

Adiposity is measured using body mass index (BMI) or weight (kg)/height (m²). Because of growth and development during childhood, BMI percentiles for age and sex as defined by the Centers for Disease Control and Prevention are used to estimate adiposity, with overweight defined as 85th to less than 95th percentile, obesity 95th percentile or greater, and extreme obesity, 120% of the 95th percentile or at least 35 kg/m².

Overweight and obesity disproportionately affect racial and ethnic minority groups, particularly Hispanic and non-Hispanic Black youth, and obesity prevalence is also associated with poverty. The latest data from the National Health and Nutrition Examination Survey show that from 1999-2000 to 2017-2018, obesity prevalence increased from 15.8% to 19.3% in children aged 6 to 11 years. Among adolescents aged 12 to 19 years, obesity rose from 16% to 20.9% and severe obesity went from 5.3% to 7.6%, the latter largely driven by increases in non-Hispanic Black and Mexican Americans. Of note, these numbers do not account for the disparities intensified during the pandemic, the results of which will become evident in the future.

Obesity prevalence data tell only part of the story because early-onset obesity increases future risk. The Early Childhood Longitudinal Study of 2014 illustrated that overweight 5-year-olds were 4 times as likely as normal-weight peers to become obese at 14 years, with a 9-year cumulative incidence of 31.8% vs 7.9%. Moreover, obesity during adolescence raises incident risk of severe obesity as an adult. Multiple studies have shown the relationship between obesity during adolescence and dyslipidemia, hypertension, and type 2 diabetes mellitus (T2DM) as an adult.

**Etiology and natural history**

The etiology of pediatric obesity is multifold, a combination of genetics and environment. In addition to family history, the “thrifty gene hypothesis,” proposed by David Barker, states that undernutrition in utero causes adaptive metabolic changes in the fetus, such as insulin resistance, that do not match the postnatal extraterine environment, which has excess calories with decreased physical activity. This concept of
fetal origins of adult disease has been implicated in the association of intrauterine growth restriction and small for gestational age, with increased later cardiometabolic risk. Epigenetics has also been implicated, with DNA methylation changes and posttranslational histone modifications causing inheritable genetic changes, potentially programming later diseases. Early hypernutrition can also be a risk factor, with rapid weight gain in the first 4 to 6 months of life associated with obesity later in childhood.

In rare cases, genetic syndromes, such as Prader-Willi, Alstrom, and Bardet-Biedl syndromes, and monogenic mutations, such as MC4R, LEP, and POMC mutations, can cause severe obesity, usually characterized by obesity onset before age 5 years. Some syndromes involve intellectual disability and often involve hyperphagia. Endocrinologic causes such as hypothyroidism and Cushing Disease are also less common, and generally involve attenuated height or height velocity in addition to excess weight, in growing youth. Numerous environmental factors contribute to excess weight gain during childhood: dietary factors, such as consuming more sugar-sweetened beverages, eating larger portions, skipping meals, decreasing intake of fruits and vegetables (which can be related to food insecurity), and consuming more fast food. Other significant contributors include reduced physical activity, increased sedentary activity (even before the pandemic), and dysregulated sleep.

**Assessment**

Clinical assessment includes BMI measurement and a thorough physical exam. Genetic testing is recommended for youth with early-onset obesity before age 5 years. After recognition of excess weight for height, screening for comorbidities is critical, with referral to subspecialists as indicated. A detailed family history should also be obtained for these comorbidities. Cardiovascular complications of obesity include hypertension and dyslipidemia. Blood pressure should be measured with the appropriate cuff size and assessed using percentiles specific for age, sex, and height. Fasting lipids are used to detect dyslipidemia. Typically, metabolic dyslipidemia includes a pattern of elevated triglycerides, decreased high-density lipoprotein cholesterol, and increased small dense low-density lipoprotein (LDL) particles. LDL cholesterol is often normal or only slightly elevated. Headaches can be a symptom of hypertension but also of pseudotumor cerebri, a comorbidity diagnosed by fundoscopic exam.

Endocrinologic complications include prediabetes, T2DM, and polycystic ovarian syndrome (PCOS). Diabetes can elicit a history of polyuria, polydipsia, and nocturia but can also be asymptomatic. Skin examination may demonstrate acanthosis nigricans, indicative of insulin resistance. Screening can be done using glycated hemoglobin A1c (HbA1c), fasting glucose, and/or oral glucose tolerance test, as described in the Table. Diabetes diagnosis or a prediabetes diagnosis should initiate a referral to a pediatric endocrinologist. Studies have indicated that youth-onset T2DM progresses faster than adult-onset T2DM and can present with complications at the time of diagnosis. Aggressive diabetes screening and treatment are indicated as per guidelines of the American Diabetes Association. A menstrual history, as well as history and physical examination for acne and hirsutism, should be obtained to screen for PCOS, which also increases cardiometabolic risk.

Nonalcoholic fatty liver disease (NAFLD), a chronic hepatic liver disease, is associated with increased adiposity and insulin resistance. It results from excess adipose deposition in the liver; in the United States, NAFLD has become the most common liver disease in youth. Pediatricians should screen for NAFLD in overweight and obese youth by measuring alanine transaminase and aspartate transaminase.

Another significant comorbidity of pediatric obesity is obstructive sleep apnea. History obtained may include snoring, audible apnea, restless sleep, headaches, and daytime sleepiness. On physical examination, the child may have enlarged tonsils and adenoids. If sleep apnea is suspected, diagnostic polysomnography should be ordered. Depending on the situation, treatment can include tonsillectomy and/or adenoidectomy, as well as continuous positive airway pressure. Musculoskeletal disorders, such as Blount disease and slipped capital femoral epiphysis, may present with joint pain, and are associated with overweight/obesity because of the greater mechanical force placed on the joints. Physical examination may also indicate flatfeet, which can be treated with orthopedic shoe inserts.

Mental health concerns, such as depression and anxiety, are also significant potential comorbidities of...
Treatment

The mainstay of treatment for pediatric obesity involves behavior modification through increased physical activity, improved nutrition, and decreased sedentary activity. Intensive lifestyle modification is challenging, but can be effective if family-based and age/culturally appropriate, both very important.18, 30 Nutritional modifications include consuming less fast food, sugar-sweetened beverages, added sugars, and saturated fats and consuming more fruits, vegetables, whole grains, and fiber. Youth should avoid skipping meals, which often leads to overeating later in the day, as well as avoid snacking throughout the day. Eating slower and recognizing satiety cues is essential because many individuals eat when bored or emotionally upset. Decreasing portions is also important. The US Department of Agriculture’s MyPlate resources can help demonstrate appropriate amounts of various types of foods to make up one’s plate.31 Meeting with a pediatric nutritionist, if available, can be a significant resource for families.

Physical activity can help maintain weight loss as well as improve insulin sensitivity and dyslipidemia. Gradually increasing moderate to vigorous physical activity, with a minimum of 20 minutes/day and a goal of 60 minutes/day, is recommended.18 Setting specific, realistic goals can help avoid discouragement. Tracking progress and providing non-food-related rewards can also be helpful. Other goals include limiting sedentary activity and nonacademic screen time to 1 to 2 hours per day. The COVID-19 pandemic has caused the amount of time youth spend in front of screens to explode, with deleterious effects on sleep and mood. The provider should also encourage the child to get an age-appropriate amount of sleep on a reasonable day-night schedule.

If lifestyle modification does not result in adequate weight loss, pharmacotherapy is an option. Several new obesity medications have been approved by the US Food and Drug Administration for adults (eg, lorcaserin, phentermine plus topiramate, bupropion plus naltrexone) and are considered appropriate for individuals 16 years or older with a BMI of either 30 kg/m² or higher or at least 27 kg/m² with at least 1 obesity comorbidity.18 Until recently, only orlistat, a lipase inhibitor blocking fat absorption, had been approved for weight loss in children 12 to 16 years, but its use was limited because of its adverse effects (AEs) of oily spotting, flatulence, and abdominal pain. Recently, liraglutide, a receptor agonist of the incretin glucagon-like peptide-1 (GLP-1), was shown to effectively cause weight loss in conjunction with lifestyle modification in 12- to 18-year-olds.32 Contraindications include a history of pancreatitis, a family history of medullary thyroid cancer, or multiple endocrine neoplasia type 2. AEs include nausea, abdominal pain, vomiting, and diarrhea, which tend to improve with use. Liraglutide is given as a daily subcutaneous injection, and it increases endogenous insulin production, decreases gastric transit time, and suppresses appetite. Liraglutide was also recently approved for the treatment of youth-onset T2DM, at a lower dose than that used to treat obesity.33 Finally, for a subset of patients, bariatric surgery is also a valid consideration (see online article for details).

The pandemic has magnified the problem of pediatric obesity and its complications. We have yet to truly understand the long-term effects of quarantine and isolation on a child’s mental and physical health. It will be critical to address the physical, mental, and social implications of pediatric obesity.

For references and the full article, including when to suggest bariatric surgery, go to ContemporaryPediatrics.com/pediatric-obesity-and-covid-19

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**TABLE SCREENING FOR PREDIABETES AND DIABETES**

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<td>of 100-125 mg/dL (impaired fasting glucose)</td>
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<tr>
<td><strong>2-hour blood glucose</strong></td>
<td>of 140-189 mg/dL (impaired glucose tolerance)</td>
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**Note:** In the absence of symptoms of hyperglycemia, a repeat, confirmatory measure should be obtained. In the presence of obvious hyperglycemia, a random blood glucose of ≥200 mg/dL is sufficient for the diagnosis.

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<tr>
<td><strong>fasting blood sugar</strong></td>
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<td><strong>2-hour blood glucose</strong></td>
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**Note:** In the presence of obvious hyperglycemia, a random blood glucose of ≥200 mg/dL is sufficient for the diagnosis.
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**THE CASE**
You are called to the emergency department to evaluate a healthy 9-day-old girl with erosions near her eyes, nose, and skin creases on the arm. She also has a positive Nikolsky sign (Figures 1, 2).

The newborn is crying and uncomfortable, but is still feeding well. Upon examination, she is red from head to toe and has widespread erosions and crusting. The patient is afebrile with clear mucous membranes.

**Diffuse erythematous rash in a healthy, afebrile infant**

EMILY MA, MS2; AND BERNARD A. COHEN, MD

**STAPHYLOCOCCAL SCALDED SKIN SYNDROME (SSSS)**

**Differential diagnosis for diffuse erythema with erosions**

Given these clinical skin findings, initial differential diagnoses include Stevens-Johnson syndrome/toxic epidermal necrolysis (SJS/TEN) and bullous impetigo. A history of drug intake or viral infection typically precedes SJS/TEN. Additionally, SJS/TEN involves the mucous membranes of the conjunctiva, mouth, trachea, esophagus, anus, and genitalia. Bullous impetigo is characterized by small superficial blistering lesions with expanding crusts that are localized to...
Pemphigus foliaceus (PF) is rare in children but presents with similar superficial blisters as seen in staphylococcal scalded skin syndrome (SSSS). The adhesion molecule desmoglein-1 in the superficial epidermis is the target of both the autoantibodies in PF and SSSS toxins. PF can be confirmed with an immunohistochemical study to detect the presence of skin autoantibodies.

A hot water burn is another differential to be considered given the reddening, blistering, and sloughing of the skin.

**Discussion**

SSSS is a reportedly rare, but likely more common than described, exfoliative disease of the skin mediated by epidermolytic toxins A and B produced by *Staphylococcus aureus*. The disease predominantly occurs in neonates of 3 to 15 days of age, children aged younger than 5 years, and adults with various comorbidities. Children are at greater risk due to their immature renal system and lack of immunity. In young children, the lack of prior exposure to SSSS-produced toxins triggers the development of antibodies to the causative agents, which protects against recurrence of SSSS in healthy patients. However, on first exposure, the toxins bind to and disrupt the adhesion molecule desmoglein-1 that is present in keratinized skin, but not in the mucous membranes. Between 2010 and 2014, SSSS incidence increased 81% among infants younger than 1 year.

Key clinical features of SSSS include a brief prodromal phase where there may be fever and/or irritability, followed by diffuse erythema with superficial blistering and crusting that tends to be most prominent in areas of skin rubbing, such as the mucocutaneous junction and skin creases. Skin appears reddish and scalded after blisters rupture, and the Nikolsky sign (the easy separation of skin layers upon horizontal pressure to the skin) is present. Diagnosis of SSSS can be reached clinically and confirmed with bacterial culture. If in doubt, SSSS can be confirmed via skin biopsy, which shows superficial subgranular intraepidermal cleavage without necrosis.

**Management**

Treatment of SSSS consists of antistaphylococcal antibiotics, temperature regulation, maintaining fluid and electrolyte balance, and skin care. SSSS-associated strains of *Staphylococcus aureus* are usually methicillin-sensitive, so penicillinase-resistant beta-lactams, or cephalosporins, are favored for empiric management of SSSS. Vancomycin can be considered if a patient fails to improve following several days of treatment and methicillin-resistant strains of *Staphylococcus aureus* (MRSA) is suspected.

Clindamycin, a ribosomal inhibitor, is often recommended as a first-line agent to decrease SSSS toxin production, but up to 50% or more of triggering organisms may be resistant to clindamycin, and toxin binding may already be maximized at the time of diagnosis.

Thick moisturizers are important to protect the skin and decrease pain. In particular, moisturizers for the lips, which usually become crusty and painful, are essential to help with continued feeding in infants as their oral cavity remains unaffected by SSSS.

There is not an identifiable primary infection in many children with SSSS, but colonization can be demonstrated by obtaining bacterial cultures from sites of colonization, such as the medial canthi, nasopharynx, moist umbilical cord, and diaper area.

**Patient outcome**

The patient was diagnosed with SSSS and treated with parenteral ceftriaxone and clindamycin. Bacterial cultures from her nares grew MRSA and the clindamycin was discontinued. The rash improved dramatically over the subsequent 36 hours followed by diffuse desquamation. The patient was discharged from the ICU 2 days later, on oral cephalexin.
Kangaroo care in the neonatal intensive care unit

According to the World Health Organization (WHO), over 15 million babies are born preterm—before 37 weeks’ gestation—every year worldwide. Preterm birth complications are the leading causes of death for children under the age of 5. In 2019, 47% of all deaths under the age of 5 occurred in the newborn time period of the first 28 days of life. One-third of those deaths occurred on the day of birth, and three-fourths were the first week of life.¹

JENNIFER ORAHOOD, BSN, RNC-NIC, NTMNC

One of the WHO’s many recommendations to improve survival and health outcomes in small and preterm infants is kangaroo care.² Starting kangaroo care early and performing it often has proven to be a safe, low-cost, and effective intervention for preterm and low-birth weight infants.³ Also called kangaroo mother care and skin-to-skin contact, this is when the mother and baby have continuous skin-to-skin contact. These infants need interventions for hypothermia, better glucose levels, better regulation of blood pressure, and reducing stress hormone levels.⁴

During kangaroo care, a mother or father holds their baby’s chest to their chest, skin to skin, for a minimum of 1 hour per day. For a healthy term infant, this begins immediately after birth. For an infant who is preterm or low birth weight or had complications at birth, kangaroo care begins once the infant is stable. While the minimum time frame is 1 hour per day, the recommended time for kangaroo care is 2 to 4 hours per day.² For an infant in the neonatal intensive care unit (NICU), health care workers including respiratory therapists and nurses can help with the placement of the infant on the mother’s chest. Infants who are intubated and have intravenous catheters can still be eligible for kangaroo care.⁴

Kangaroo care initiated early and done often provides many benefits to mothers and infants. Mothers who practice kangaroo care report enhanced attachment and bonding, more confidence in caring for their infant, increased milk production, and more success at breastfeeding. Research from Vittner et al shows that kangaroo care is associated with an increase in oxytocin levels, which leads to decreased stress.⁵ Mothers who practice kangaroo care report breastfeeding their infants for a longer period of time each day at 1 month and at 6 months after discharge from the hospital.⁶ Additionally, fathers who participate in kangaroo care report enhanced bonding to their infant and more confidence in providing care and in providing for their infant.⁶ Importantly, both fathers and mothers experience decreased levels of anxiety during kangaroo care, and infants have decreased stress response regardless of which parent is holding them.⁶

Infants in the NICU need kangaroo care as much as healthy newborns. Research shows that infants in the NICU who participate in kangaroo care have a reduced mortality rate, a better sleep-wake cycle, fewer incidents of infections, and increase in weight gain.³ Infants who are in the NICU and are stable tolerate kangaroo care well by keeping vital signs the same or having improved vital signs.³ Mothers, fathers, and caregivers of both term and preterm infants are encouraged to participate in kangaroo care to provide infants with the benefits of skin-to-skin contact.³

COMMENTS? Email them to llevine@mjlifesciences.com

For references, go to ContemporaryPediatrics.com/kangaroo-care

Jennifer Orahood is a RN IV clinical expert in the neonatal intensive care unit at the University of Arkansas for Medical Sciences in Little Rock and is co-chair of the NICU Unit Council. She also serves as a medical advisor for WaterWipes. This does not prevent her from delivering an unbiased presentation.
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- Calling for Reinforcements: Staffing and Workforce Management
- Telehealth Basic Training
- Deciphering the Morse Code of Medical Malpractice
- Tales from the Trenches: A Concierge Medicine Roundtable

**Friday, October 8th 9:00 AM – 1:00 PM**
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Croup in the COVID-19 era

The pandemic has increased awareness for many infectious diseases, including croup.

RACHAEL ZIMLICH, BSN, RN

Cough is one of the most common complaints brought to the pediatric practice, resulting in nearly 30 million outpatient visits each year.1 Although many cases of cough involve the upper airway and are caused by viruses, they are not all the same in terms of severity.

Upper airway obstruction—caused by inflammation and swelling in the larynx, trachea, and bronchi—creates a loud “barking” cough that is a telltale sign of croup. Although the management of many diseases has evolved over the years, not much has changed when it comes to croup. However, the COVID-19 pandemic has increased awareness—and paranoia—surrounding respiratory infections.

Here is the latest guidance for managing croup, and how to differentiate this condition from other respiratory illnesses.

What is croup?

Croup is a respiratory condition based on clinical findings, such as hoarseness, a barking cough, or stridor. The condition is most common in the fall and winter, and viruses are to blame for 80% of cases.2 The most common viral causes of croup are:

- Parainfluenza virus 1
- Parainfluenza virus 2 and 3
- Influenza A
- Influenza B
- Adenovirus
- Respiratory syncytial virus
- Rhinovirus
- Enterovirus

Less often, bacterial infections like Mycoplasma pneumonia and Corynebacterium diphtheria may also result in croup.

Most cases (85%) are mild, but about 1% end up severe. In severe cases, croup can lead to stridor and hypoxia. Up to 5% of all children with severe croup may end up hospitalized, but only between 1% and 3% ever require intubation.2

Symptoms often get worse at night, especially when a child is emotionally distressed by their symptoms. The illness usually peaks in 24 to 48 hours, resolving in about a week, in most cases.2

Making a diagnosis

The sudden onset and loud nature of a croup cough can be concerning, especially now, when concern for COVID-19 variants are at an all-time high. However, there’s no definitive test to diagnose croup. Croup is mostly diagnosed by clinical symptoms, although infection with a particular virus or bacteria can be confirmed with lab testing.

In most cases, however, it’s less a matter of what is causing that croup than how bad of a case it is, says Mike Patrick, MD, an emergency medicine and general practice pediatrician at Nationwide Children’s Hospital in Columbus, Ohio. Patrick has covered croup and several other issues in his podcast, PediaCast, a pediatric podcast for parents.

The first step in diagnosing croup is to assess the child’s symptoms and determine how severely the croup has presented, he says. The increased use of telehealth since the COVID-19 pandemic can help in this regard, since it’s now easier than ever for pediatricians to connect visually with their patients who are at home.

If it’s a patient you know, Patrick suggests making a judgment on their individual health history and reports from caregivers. Children who present simply with hoarseness or a barking cough can usually be managed at home, but those who experience stridor or difficulty breathing should be seen immediately in an urgent care center or emergency department, in most cases.

Management and treatment

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CROUP CARE & SYMPTOMS

Symptoms of viral croup may include:
- Twelve to 72 hours of a low-grade fever
- Inflammation in the nasal cavity and around the eyes
- Narrowing of the larynx
- Stridor
- Increased respiratory rate
- Retractions
- Barking cough

Some common differential diagnoses for croup-like illness include:
- Thermal injury or smoke inhalation
- Bacterial tracheitis
- Epiglottitis
- Foreign body aspiration
- Hemangioma
- Large airway lesions
- Neoplasm
- Peritonsillar abscess
- Retropharyngeal abscess

The standard of care for croup has been set for quite some time, and includes:
- Supportive care
- Corticosteroids
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or day care environment, testing may be required more for isolation purposes than anything else, he says.

There have been some cases noted where COVID-19 and croup have occurred together, but Patrick says this isn’t all that surprising.

“If they are positive [for COVID-19], kids can have multiple viruses going at once. Whether COVID-19 is with croup or other viruses isn’t the issue,” Patrick says. “Which virus is less important than addressing the case based on croup severity.”

Perhaps what is more important than what virus is causing croup symptoms, is what other illnesses or conditions the child may have. Certain groups are at a higher risk in terms of both COVID-19 and croup, he says. This group mostly includes children who are immunocompromised either from immune disorders or medications, such as chemotherapy. Interestingly, Patrick says there doesn’t appear to be much of an association between children with asthma and COVID-19 severity, but children who already have breathing problems may require special attention when it comes to croup.

Regarding croup and high-risk children, Patrick says that he tries to get a sense of how severe their symptoms are before making a recommendation on where to receive care.

“You don’t want to miss the kid who is getting worse, but you also don’t want to increase exposure,” he says.

Children who have a history of breathing problems or who are immunocompromised may be best served staying at home with mild croup symptoms, but a worsening clinical picture could outweigh any infectious disease risks that occur with emergency department or office-based care, Patrick says.

One way COVID-19 may be increasing the risk—at least anecdotally—is in increased respiratory illness overall, he adds. This may be more of a result of COVID-19 mitigation strategies, such as masking and social distancing, than the virus itself, he adds, pointing to a drop last year in influenza cases. “It’s crazy how much cough we are seeing right now [in early August] in bronchiolitis,” Patrick says. “The pandemic in general has shifted epidemiology for viruses.”

Reduced exposure—especially in young children, over the past 18 months—may be limiting their natural immune defenses against respiratory viruses and making them more susceptible to infection as they interact with more people.

Recovery and prevention
Just as masking, social distancing, and hand hygiene have been used to try to prevent the spread of COVID-19—and potentially other respiratory diseases—croup may be avoided through the same strategies. Families should be encouraged to avoid areas where there are sick people in close quarters, to stay home if they are sick themselves, and to be vigilant with personal hygiene and hand washing when seasonal viruses are rampant.

Recovery from croup usually takes several weeks, and Patrick warns that parents and caregivers may need some reassurance. It’s not uncommon for a cough to last for several weeks after a viral illness, he says, and the key is that the cough gradually improves over time. If the cough worsens or lasts too long, clinicians may want to re-examine the child to rule out pneumonia or other differential diagnoses.

Although new research may be placing age-old remedies, such as steam, into doubt, when it comes to croup, there isn’t much that can hurt in terms of supportive care. The primary method for managing croup is to treat the child based on their clinical presentation. Hospitalization and medications, such as corticosteroids and epinephrine, may help in mild to severe cases, but treatment is largely based on symptom severity, not the source of infection, regardless of the fact that there is an ongoing respiratory virus pandemic.

Therefore, in most cases, caregiver reassurance and education on emergency symptoms is enough to manage croup.

**COMMENTS?** Email them to llevine@mjhlifesciences.com

Rachael Zimlich is a freelance medical writer in Cleveland, Ohio. She has nothing to disclose.

For references, go to ContemporaryPediatrics.com/croup-in-the-COVID-19-era
The future of the pediatric practice

During the 4 decades that I have practiced pediatrics, our specialty has evolved in many ways. Thirty years ago, we gave epinephrine injections for children coming to the office with asthma attacks, recommended ipecac for poison ingestions, and often would perform septic workups in the office prior to hospitalizing febrile babies.

ANDREW J. SCHUMAN, MD

During this time, pediatricians made rounds at the hospital, attended Cesarean section deliveries, and were frequently paged during days and nights on call. After an office visit, parents would pay at the time of service and submit receipts for reimbursement. We performed strep and urine cultures in the office. In all, it was far less complicated than it is today.

What does the future hold for pediatric practice?

I wrote my predictions for the future of pediatric practice over 20 years ago in the January 2000 issue of Contemporary Pediatrics.1 I correctly predicted that pediatricians would adopt electronic health records (EHRs) and patient portals. However, this did not occur until the enactment of the Health Information Technology for Economic and Clinical Health Act (HITECH), which was part of the American Recovery and Reinvestment Act (ARRA) of 2009.2 Likewise, I predicted touch-/stylus-enabled computer screens and the ability of computers to populate fields in an EHR, either via patient or staff input, and the ability of “connected” devices to rapidly take vital signs and perform patient screens. I also correctly predicted the use of biometrics to confirm the identity of patients—although few practices have implemented this—and the availability of a nasal vaccine (which was introduced

I predict that in 10 years...

- Febrile children over 2 years of age will wear masks to minimize the spread of infections.
- Innovations in vaccine development and delivery systems will reduce, but not eliminate common ailments like strep throat, upper respiratory infections, gastroenteritis, and many pediatric and adult cancers.
- Our understanding of immunity will reduce the incidence of diabetes, asthma, and inflammatory bowel disease. Immune modulators will figure prominently in our ability to treat and even prevent these conditions.
- We will use office-based 3D printers to fashion splints for sprained ankles and broken bones as well as helmets for young children with plagiocephaly.
- We will perform handheld ultrasounds in our offices, enabling us to detect fractured bones, ligament tears, and pneumonias, dramatically reducing the number of x-rays we order.
- Our point-of-care tests will slowly transition to systems where a patient breathes into a device and within minutes will have a printout of the causative organism, along with the sensitivities to antibiotics or antivirals. Other point-of-care technologies will facilitate diagnosis of sexually transmitted infections, pneumonias, and urinary tract infections.
- We will be able to detect biomarkers at the point of care and use this technology to identify patients not only with genetic syndromes, but also with anxiety, depression, or attention-deficit/hyperactivity disorder.
- Artificial intelligence (AI) will figure prominently in enabling physicians to improve medical care. Voice and vision-enabled AI systems will observe your visit and write your office note for you. In addition, clinical decision support systems embedded in EHRs will suggest diagnoses as well as appropriate workup and treatment for these.
for influenza in 2003).[^1]

However, I was incorrect in predicting that people would begin carrying a medical card containing their health care related data. At the time, I did not foresee the impact of smart devices on health care, the rise of cloud computing, and how patients would utilize patient portals to make office visits, ask questions, and pay their bills.

Additionally, like so many others, I certainly never saw a global pandemic coming, or that insurance companies would continue to wreak havoc on health care. I’d like to think that the COVID-19 pandemic will lead to an overhaul of our present health care system, and hopefully expedite much needed health care reform.

Looking forward
As an optimist who has seen how technologies have slowly improved health care over the course of many years, I believe that future pediatricians will have many new tools at their disposal that will improve patient care. For example, we will see Drs Alexa, Siri, and Google evolve and have the ability to remind diabetic patients to measure and record their sugars, suggest healthy eating habits and exercise for children who are overweight, and remind families of upcoming health care visits. They will facilitate booking appointments and facilitate telehealth visits, if needed. Translation systems are improving and soon will let you converse with foreign language-speaking patients in real time, with both users merely wearing headphones. (For more on current technologies, see the “2021 Best Tech” supplement).

I am hopeful that in the future we will have a patient-focused health care system where government involvement has been minimized and providers can direct patient care with limited oversight by insurance companies.

Clearly, the best is yet to come.

COMMENTS? Email them to llevine@mjlifesciences.com

For references, go to ContemporaryPediatrics.com/future-of-pediatric-practice

[^1]: For influenza in 2003.
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