Contemporary PEDIATRICS®
Expert Clinical Advice for Today’s Pediatrician
DECEMBER 2019 VOL. 36 | NO. 12

Best tech for Pediatrics
Top products for your wish list

Infectious Disease
Antibiotics for preterm infants have lasting effects

Respiratory Disorders
Telehealth closes gaps in chronic asthma care

Mental Health
Does a fast food diet cause depression?

Metabolic Disorders
Toxic metals detected in nearly all baby foods

Dermatology
Girl’s leg blisters after school ski trip

Contemporary Pediatrics.com
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.
in this issue

DECEMBER 2019

practice improvement
10 Must-have medical gadgets for today’s pediatrician
It’s been an outstanding year for medical innovation. Let’s recap the top tech products for pediatric practice. Are they on your wish list? Andrew J Schuman, MD, FAAP

metabolic disorders
14 Toxic metals detected in nearly all baby foods
A new report quantifies for the first time the impact of these chemicals on infants’ neurodevelopmental health. Catherine M. Radwan, Managing Editor

pediatric pharmacology
22 Pediatric clinical trials lead to new drugs, updates 2019 has seen major advances for new medicines for children. Rachel Meyers, PHARM.D, BCPS, BCPPS, FPFA, Pooja Shah, PHARM.D, BCPS

respiratory disorders
16 Telehealth closes gaps in chronic asthma care
For children with asthma in rural, underserved communities, school-based telehealth services extend the medical home. Rachael Zimlich, RN, BSN

mental health
17 Does fast food raise risk of depression in teens?
Focusing on diet as a modifiable risk factor for depression in adolescent patients could improve their overall mental health. Miranda Hester, Editor

in addition
5 EDITORIAL ADVISORY BOARD
8 CHAIRMAN’S LETTER
28 ADVERTISING INDEX

web exclusive
ADHD guidelines update
The American Academy of Pediatrics has issued revised clinical practice guidelines for the evaluation, diagnosis, and management of attention-deficit/hyperactivity disorder (ADHD) in children—the first update since 2011. Read the article exclusively online at ContemporaryPediatrics.com/ADHD-guidelines-2019

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/2vsvN3

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/2vsvN3

The Editors welcome unsolicited manuscripts for consideration. For submission guidelines, send requests to the Content Managing Editor, cradwan@mmhgroup.com. When submitting manuscript documents as well as high-resolution digital image files and other supplemental content, send all components as separate attachments (to e-mail: cradwan@mmhgroup.com).

Contemporary Pediatrics does not verify any claims or other information appearing in any of the advertisements contained in the publication, and cannot take responsibility for any losses or other damages incurred by readers in reliance on such content.

Contemporary Pediatrics welcomes unsolicited manuscripts for consideration for publication. The submission guidelines, send requests to the Content Managing Editor, cradwan@mmhgroup.com. When submitting manuscript documents as well as high-resolution digital image files and other supplemental content, send all components as separate attachments to e-mail: cradwan@mmhgroup.com.

Library Access—libraries offer online access to current and back issues of Contemporary Pediatrics through the EBSCOhost databases. To subscribe, call toll-free 888-527-7008. Outside the U.S., call 218-740-6477.
FLARES AREN’T GOING TO PREVENT THEMSELVES

DAILY USE OF ECZEMA RELIEF BODY CREAM REDUCES THE INCIDENCE OF FLARE AND INCREASES THE TIME-TO-FLARE RECURRENCE

44% reduction in risk of flare in pediatric subjects

4 out of 5 children remained flare-free for six months

Steroid-free | Fragrance-free

Beiersdorf

©2019 Beiersdorf Inc.
Technology integrates the pediatric practice

In the 36 years since Frank A. Oski, MD, created *Contemporary Pediatrics* as a vehicle to put practical, clinical, evidence-based information from the medical field of Pediatrics into the hands of community pediatricians and pediatric healthcare providers, this publication has upheld his original mission. We identify the practical applications of new pediatric research, develop in-depth content based upon the therapeutic areas of children’s healthcare, synthesize it into a clear, concise, easy-to-read package, and offer it to busy pediatricians like you to read today and put into practice immediately.

For 32 of these 36 years, Dr. Andrew J. Schuman, our Editorial Advisory Board member and proclaimed technology adopter, has been recommending the best technology products for pediatric healthcare based on his hands-on experience with these devices in his own practice. Through his many articles, he has promoted the use of technology as a means to upgrade the pediatric office and streamline financial practices. He has encouraged pediatricians to embrace new tech products that improve patient care. He has suggested that wise use of technology in the pediatric workplace can even relieve stress and counteract practitioner burnout.

Dr. Schuman’s year-end review of the best, must-have tech products for pediatric practice in 2019 again provides first-hand, knowledgeable recommendations for the latest products that can improve the care of children. These devices, from the newest digital stethoscopes to otoacoustic screeners to innovative wound repair systems, will help you care for your patients more effectively, manage your practice more efficiently, and destress your professional life in the process. Read his reviews beginning on page 10.

You may want to add them to your wish list!

Mike Hennessy, Sr.
Chairman and Founder,
MJH Life Sciences
Perhaps it’s the flu.

CLIA-waived, lab-quality Influenza A/B, RSV and Strep A testing at the point of care.

No confirmation necessary for negative test results.

The cobas® Liat® PCR System is the only real-time PCR system with three CLIA-waived tests that can be performed in 20 minutes or less. It’s specifically designed for the point-of-care — so with just three easy steps, clinicians can get accurate, actionable results that help them make the right treatment faster.

Go to cobasliat.roche.com for more information.
EDITORS’ NOTE: The reviews presented in this article are Dr. Schuman’s and do not represent those of Contemporary Pediatrics or the editors.

It’s been an outstanding year for medical innovation—in fact, one of the best I can recall. If you want to improve the capabilities of your “high-tech office,” consider the following gadgets and gizmos that are sure to impress.

1. New stethoscopes from Ekohealth
No doubt you’ve seen advertisements from an innovative company called Ekohealth (Berkeley, California). Over the past year, Ekohealth has promoted not just 1, but 2 affordable digital stethoscopes that will improve a pediatrician’s ability to identify heart murmurs as well as detect subtle pneumonias. The $299 CORE Stethoscope gives one the ability to auscultate with a traditional analog stethoscope, or switch to digital mode with 40x amplification. If you want to keep your favorite Littman, ADC, Welch Allyn, MDF, or Medline stethoscope and want to enjoy the benefits of digital auscultation, you can just purchase the CORE Digital Attachment for $199.

The CORE system has a 9-hour rechargeable battery and connects via Bluetooth to an IOS, Android, or Windows application that displays and records a phonocardiogram. Ekohealth’s $349 DUO ECG + Digital Stethoscope produces crisp, clear heart and lung sounds with up to 60x auscultation while switching easily between 4 audio filter modes: diaphragm, bell, midrange, and extended. Users of the DUO can record and display a simultaneous electrocardiogram and phonocardiogram on a mobile device or Windows computer. Upcoming algorithms (not yet cleared by the US Food and Drug Administration [FDA] as of this writing) will provide an analysis of recordings to detect rhythm abnormalities and murmurs while reporting heart rate, QRS duration, and electromechanical activation time (EAT).

2. A better way to dispose of medical sharps
Disposing of medical sharps in a pediatric practice is a very expensive proposition. Needle bins fill up quickly and as there is little competition in the sharps disposal industry, your monthly costs of sharps removal may be considerable. Medical
Innovations (Framingham, Massachusetts) produced the first (and still only) in-office medical sharps disposal system based on a device called the Medical Waste Machine 25 years ago, and it continues to be a great alternative to utilizing a sharps removal service.

To implement the system, a practice purchases a number of locking sharps disposal metal bins that are placed in examination rooms and anywhere one needs to dispose of medical sharps. Once filled, 2 plastic discs are placed in the bin, which is then inserted into the Medical Waste Machine. The device is then locked and turned on, heating the container to 380°F, melting the plastic discs, sterilizing the sharps, and encapsulating the waste in a plastic block during a 4-hour process. This plastic block is then placed in your regular trash.

In a small practice you may need to perform this process once per week. The machine and containers are a one-time purchase, and a practice usually orders the plastic discs 2 to 3 times per year.

3. mehealth for ADHD is now free

I’ve been using mehealth for ADHD (attention-deficit/hyperactivity disorder) for several years and have been extremely pleased with this practice tool. It facilitates diagnosis of ADHD by having parents and teachers fill out online Vanderbilt forms that are scored automatically. Consequently, evaluations are completed in just a few days rather than weeks or months. Additionally, it allows pediatricians to monitor a child’s school performance, while on medication or receiving behavior therapy, by requesting periodic follow-up Vanderbilt forms from parents and teachers. The system generates assessment reports and treatment graphs that one can share with parents and integrate into the patient’s electronic health-care record (EHR). It also facilitates e-mail communication with parents and teachers.

The online tool was developed by the Cincinnati Children’s Hospital Medical Center (CCHMC) in order to improve ADHD screening and management among community pediatricians. A randomized clinical trial showed dramatic improvements in ADHD care among practices using mehealth for ADHD compared with control practices. In addition, a recent study demonstrated that practices treating children with medications who used mehealth for ADHD had greater ADHD symptom reduction compared with controls.

The CCHMC has secured funding from the National Institutes of Health (NIH) to recruit 5000 community pediatricians to adopt mehealth for ADHD to study how a variety of factors influence its use and utility. One simply goes to mehealth.com and enrolls. In addition to free access, users benefit by receiving 20 category 4 Maintenance of Certification (MOC) credits for using the tool. The tool now integrates a medication choice decision aid, and a management tool for parents and teachers that enables selection of daily and weekly rewards for achieving behavioral goals.
4. New ear irrigation system
Bionix (Toledo, Ohio) has been marketing cerumen removal products since 1984, and most pediatricians use its curettes and cerumen spoons routinely. This year, Bionix has released the OtoClear AquaBot device for ear canal irrigation. The AquaBot system provides a continuous stream of water to facilitate cerumen removal when used with OtoClear irrigation tips. Users “pump” the AquaBot container several times and a button press activates the water flow.

Bionix is also marketing the After-Swim water removal system for consumers—sculpted handheld sponges that help remove water from the ear canal to prevent otitis externa.

5. Devices to improve otitis diagnosis
Pediatricians are extremely facile with otoscopy but sometimes children squirm making visualization of the ear canal difficult, and even small amounts of cerumen can obscure our view of the tympanic membrane. Jim Berbee, an engineer-turned-emergency-department physician, founded Wisc Med (Madison, Wisconsin) and has recently introduced the $1500 Wispr Digital Otoscope. It is a video otoscope unlike any I’ve reviewed before. It can be used with otoscope handles from Welch Allyn and Heine, both battery and wall mounted.

The device features a 1-mm x 1-mm camera with a permanent antifog coating, a 90-degree field of view, and an auto exposure and focus capability between 3.5 mm and 5 cm. This means you can navigate around cerumen in the ear canal and get an extremely clear image of the canal and tympanic membrane. One can switch easily between video and picture mode, and images or videos can be captured with a click of a button. These can then be reviewed with patients and parents, merely by swiping on the device’s touchscreen. In my limited experience with the Wispr, parents and patients are very impressed with the captured images and videos. The first patient I examined with the Wispr had a previously undiagnosed tympanic membrane perforation, resulting from a tympanostomy tube placed years ago!

The device has 64 GB of memory, sufficient for 30 minutes of video at 15 frames per second. It includes a USB port so images or videos can be written to a thumb drive, which can then be used to transfer files to a computer for inclusion in the EHR. I’ve discovered that the Wispr is compatible with my 16-GB SanDisk Connect wireless USB drive, which can expedite data transfer and EHR integration. The device is fun to use, and I believe most pediatricians will be tempted to replace their traditional otoscope with the Wispr. It should be available by the time you read this.

More than 20 years ago, I used a device called the EarCheck Pro to detect middle ear effusions in children. The device was developed by a pediatrician and sonar engineer to analyze the middle ear for presence of fluid. Unlike tympanometry, which requires both a probe seal and a cooperative child to determine if a middle ear effusion is present, the EarCheck Pro required no seal and only took seconds to obtain a reading. It could be used in a screaming child and obtained readings if there was partial obstruction of the ear canal with cerumen.

The device is returning next year as the Acoustic Otoscope–PRO from Check My Ear LLC (Lincoln, Nebraska). The device consists of a handheld probe containing an acoustic speaker that emits sound bursts composed of 44 different frequencies from 1.8 kHz to 4.4 kHz at 80 dB sound level. The Acoustic Otoscope–PRO analyzes the frequency spectra of the reflected sound and presents the output as a “spectral gradient angle,” which corresponds to the probability of middle ear effusion. The device can be therefore used to quantify the middle ear effusion that helps determine if an effusion is resolving when a child returns for subsequent visits. The reimbursement for the procedure is about $20, and it should be available sometime in 2020.
6. Systems to expedite wound closure

Many years ago, Clozex Medical (Wellesley, Massachusetts) produced a wound closure system ideal for use in pediatric patients, as it did not require lidocaine infiltration or suturing—making it truly painless. The company was acquired by 3M, and although the system was always available, it was never marketed, and thus fell out of popularity. Clozex Medical (Wellesley, Massachusetts) reformed, and the Clozex Surgical Skin Closures system is slowly regaining the attention it deserves.

The Clozex system consists of adhesive strips that are applied to the cleaned and dried wound edges. By pulling on opposing adhesive plastic straps, the wound edges are approximated, and finally the straps are released to complete the process. Not only is the process painless, but wounds closed in this way are less likely to produce unsightly scars compared with those closed with sutures or staples. The Clozex closures are inexpensive and come in a variety of sizes. The company has released an over-the-counter (OTC) product, so parents can close simple lacerations without going to the emergency department, urgent care facility, or physician office.

Another painless, suture-free wound closure system comes from ZipLine Medical (Campbell, California). It was developed initially as a surgical incision closure system, but the device has been adopted by primary care providers as a method to close simple lacerations. The Zip Surgical Skin Closures system consists of an adhesive matrix of beaded plastic “zip ties” that are placed over a laceration and secured in place. One pulls on each tie to approximate wound edges then merely removes the excess with scissors—again easy, quick, painless, and less likely to scar compared with traditional suturing or stapling. Zipline Medical also produces a home-care product called ZipStitch intended to be used by patients and parents to close simple lacerations on their own.

7. Rapid diagnostics for consumers

As I’ve frequently discussed in my practice improvement articles, point-of-care rapid diagnostics for a variety of common pediatric infectious diseases are getting more accurate and less expensive. In the United States, patients can purchase home pregnancy tests, drug tests, human immunodeficiency virus (HIV) tests, and sexually transmitted disease (STD) screening tests at local pharmacies. In many parts of the world including Asia and Europe, consumers can purchase the No-Step Strep A Test from an innovative Israel-based company called Novamed Ltd. (Jerusalem, Israel).

The device uses patented technology to make the assay easy to perform as the user never comes in contact with or measures reagents. A pharyngeal swab is obtained and placed in a well in the device. By pressing a button, reagents are released, and the test initiated. The user merely repositions the swab after 1 minute and results are available 4 minutes later. Novamed is seeking FDA approval for this test as well as for a home flu test. Both should be available in US pharmacies in 2020. Both devices may help expedite evaluation and treatment for these all-too-common illnesses by pediatricians.

Conclusion

It really was another great year for medical gadgets and gizmos (and there are many more on the way). As in past years, I’ve posted video reviews of these devices on my Medgizmos.com website along with a webinar to accompany this article. As always, stay tuned!

COMMENTS? E-mail them to cradwan@mmhgroup.com

For reference, go to ContemporaryPediatrics.com/pediatric-top-tech-2019
Toxic metals detected in nearly all baby foods

CATHERINE M. RADWAN, MANAGING EDITOR

The nonprofit Healthy Babies Bright Futures has released results of its new study on commercial infant food products revealing that 95% of 168 baby foods across 61 brands tested were found to contain detectable levels of toxic metals that can permanently affect infants’ neurologic development and behavior. The neurotoxins arsenic, cadmium, lead, and mercury occur naturally in all foods, but at least 3 of these chemicals were found in 40% of baby food samples tested, with 26% of products tested containing all 4 heavy metals.

The organization says its new report quantifies for the first time the impact of heavy metals on infants’ health, giving estimates of the decline in intelligence quotient (IQ) points loss posed by heavy metals. Perchlorate contamination was recorded in 19 of 25 baby foods tested, including infant formula. The chemical, commonly used in food packaging, disrupts thyroid functions critical to brain development. Rice-based foods such as infant rice cereals, rice dishes, and rice snacks top the list for inorganic arsenic, which the study says accounts for 20% of the more than 11 million IQ points that children lose from birth to 24 months from all dietary sources.

The study also suggests simple actions that can lower babies’ exposures to heavy metals in their diet:

1. Substitute rice-free snacks for rice puff snacks.
2. Offer frozen banana or chilled cucumber slices for teething discomfort instead of teething biscuits.
3. Feed babies multigrain and oatmeal cereals in place of infant rice cereal.
4. Provide tap water instead of fruit juices.
5. Offer babies a variety of fruits and vegetables.

The problem with neurotoxin contamination of baby food surfaced 10 years ago, but new research has confirmed the continuing presence of the chemicals in all food products for babies. Children are more susceptible to such contaminants than are adults. Currently there are no limits for toxic heavy metals in baby food.

Healthy Babies Bright Futures has called upon the US Food and Drug Administration (FDA) to take immediate action on its findings: “FDA should establish and finalize health-protective standards for heavy metals, prioritizing foods that offer the greatest opportunity to reduce exposure, considering additive effects of the multiple metals detected in foods, and explicitly protecting against neurodevelopmental impacts.”

In addition, the group says the FDA should implement “a proactive testing program for heavy metals in foods consumed by babies and toddlers, similar to the Consumer Product Safety Commission’s program for children’s toys (CPSC 2019)” and also establish a health-based limit on the acceptable amount of inorganic arsenic in infant rice cereal and other rice-based foods.

COMMENTS? E-mail them to cradwan@mmhgroup.com

For reference, go to ContemporaryPediatrics.com/toxic-baby-food
As The Leader in Pediatric Education for Nurse Practitioners, we invite all pediatric-focused APRNs and students, from novice to expert skill levels in acute, primary and specialty care practice, to join us at our 41st National Conference on Pediatric Health Care. With more than 100 unique session, workshop and poster presentation opportunities, you will gain the latest evidence-based practice information, research and professional development trends to help you excel in your career and enhance your practice and the health of your pediatric patients.

**HIGHLIGHTS:**

- Earn more than 20 NAPNAP contact hours onsite plus access to select sessions on PedSCE™ after the conference
- Educational mini-tracks addressing hot topics in Acute Care Neurology, Infectious Diseases, Dermatology and Substance Use
- Opportunities to arrive early or extend your day and take a deeper dive into selected pediatric healthcare topics with intensive workshops
- In demand certification review courses for primary care, acute care and pediatric primary care mental health specialist exams—an excellent value for soon-to-be grads
- More than 100 exhibitors showcasing the latest in child health and advanced practice nursing
- Numerous social and networking events to connect with colleagues and meet child health leaders

**REGISTER NOW!** Save up to $40 by registering by February 5, 2020.
Learn more at napnap.org/national-conference or call 877-369-0994
Telehealth closes gaps in chronic asthma care

For children with asthma in rural, underserved communities, telehealth services extend the medical home.

RACHAEL ZIMLICH, RN, BSN

Telehealth programs may not be a complete solution when it comes to closing gaps in care, but they can be helpful for managing chronic conditions such as asthma.

According to a study in JAMA Pediatrics that sought to investigate whether telehealth programs could be used to improve access to care for rural patients, telehealth wasn’t particularly effective in preventing emergency department (ED) visits but it still offered health benefits to patients who used it.

The American Academy of Pediatrics (AAP) has endorsed school-based telehealth services to help close gaps in care for children with chronic pediatric diseases, particularly because asthma is associated with substantial morbidity and high rates of school absenteeism.

John Bian, PhD, associate professor at the Medical University of South Carolina (MUSC) in Charleston, and lead author of the report, says the study is the first to test and demonstrate the efficacy of school-based telehealth programs to help close gaps in care for rural and medically underserved communities.

“The reasons for the benefit to children with asthma from this telehealth program may be multidimensional. A combination of the telehealth services’ connectivity of pediatric providers to children with asthma, better medication adherence, and involvement and education of school nurses may all contribute to the success of this program,” Bian says. “In addition, the ED visits declined 35% in the third year of the program.”

South Carolina Medicaid payment policy of school-based telehealth services may also contribute to the program’s success.

Researchers studied more than 230,000 children aged 3 to 17 years who were enrolled in Medicaid across 5 rural counties in South Carolina, enrolling these children in 1 of these counties in a school-based telehealth program. One subset of the cohort with asthma was investigated to determine the use of telehealth in managing exacerbations and general health.

Children in the county where telehealth services were offered had similar ED visits as the controls. In the intervention county, mean monthly ED visits were 3.65% before the telehealth program started, and 3.87% after. In the control counties, mean visits were at 3.37% before the program started and 3.56% after. For children with asthma, mean ED visits were at 3.16% before the program and 3.38% after in the intervention county, and 3.02% and 3.9%, respectively, in the control counties. Analysis showed the asthma cohort had a reduction of 0.66 percentage points per 100 children per month in ED visits—a relative 21% decrease—and ED visits declined by 1.11 percentage points per 100 children per month—a 35% decrease—in the third year of the program.

Kathryn K. Cristaldi, MD, MHS, medical director for school-based health, assistant professor of Pediatrics at MUSC, and co-author of the report, says school-based telehealth services can benefit patients as an extension of the medical home.

“We hope that this report will inspire both increased implementation and uptake of school-based telehealth programs,” Cristaldi says. “Related policy changes to support adoption would also help to realize the ultimate goal of seeing these kinds of programs help as many children as possible.”

COMMENTS? E-mail them to cradwan@mmhgroup.com

For reference, go to ContemporaryPediatrics.com/telehealth-for-asthma
Fast food is a common element of many teenagers’ diets that has frustrated pediatric providers fighting the tide of pediatric obesity, but in a new small study from the University of Alabama at Birmingham, published in Physiological Reports, researchers suggest that another consequence could be an increased risk of depression.

Researchers looked at a sample of 84 younger teenagers aged an average of 13.36 years who had participated in the Coping with Violence Study. The sample was 50% male and 50% female, and also predominately African American (95%). The sample was socioeconomically heterogenous, but had a significant number of low-income families, with an average annual income of $20,000 to $25,000. Average parental education was some college but not a degree. The teenagers were from 4 public middle schools in low-income urban communities in Birmingham, Alabama. Free or reduced lunches were available to 83% to 87% of students at the schools included in the studies.

The 84 teenagers and their parents were interviewed by trained personnel. Following the interview, the adolescents were instructed on how to perform a 12-hour overnight urine collection to measure sodium and potassium excretion and were scheduled to complete it in the following week. They were told to follow their typical diet and physical activity on the day they collected the urine. They recorded exact times of beginning and ending urine collection. After roughly 1.5 years, 76 participants returned for another interview wave. Depression symptoms noted from 2 weeks before assessment were measured via the teenagers’ report of the Center for Epidemiological Studies Depression 10.

The researchers validated the creatinine, sodium, and potassium excretion values by comparing them with previous studies. They found that depressive symptoms were generally low and relatively stable over time (r=0.49; P<0.001), and at similar levels over time (paired t[74]=1.76; P=0.082). Researchers found that greater sodium excretion was linked with more depressive symptoms in wave 2 (r=0.30; P=0.009), but not at wave 1 (r=−0.09; P=0.450). Older age at wave 1 was tied to more depressive symptoms at wave 2 (r=0.24; P=0.038). More advanced puberty development was correlated to great potassium excretion (r=0.23; P=0.042) and more depressive symptoms in wave 2 (r=0.23; P=0.048).

Researchers concluded that a diet high in sodium could contribute to developing symptoms of depression in early adolescence and that diet could be a modifiable risk factor. Reducing sodium and increasing potassium could improve overall mental health of these teenagers, they said.

COMMENTS? E-mail them to cradwan@mmhgroup.com

For reference, go to ContemporaryPediatrics.com/fast-food-and-depression

How to strengthen PCPs’ mental health training
ContemporaryPediatrics.com/mental-health-training

Anxiety disorders in primary care
ContemporaryPediatrics.com/pediatric-anxiety-disorders

Help parents navigate adolescent challenges
ContemporaryPediatrics.com/adolescent-challenges
Pediatric clinical trials lead to new drugs, updates

The year 2019 has seen major advances for pediatric therapeutics in the quest to identify better medicines for children. Here is a summary of what is new from these last months.

RACHEL MEYERS, PHARMD, BCPS, BCPPS, FPPA; POOJA SHAH, PHARMD, BCPPS

Off-label use of medication in pediatric patients has varied from 25% to 85%.1,2 Federal legislation including the Best Pharmaceuticals for Children Act (BPCA) and the Pediatric Research Equity Act (PREA) have increased the number of clinical trials conducted in children and led to expanded labeling for these patients. This article summarizes recent (November 2018 to September 2019) labeling changes, new dosage forms, and new drugs that have potential for use in children.

Table 1 includes information on new dosage forms and Table 2 lists new biologics with pediatric indications. Table 3 lists labeling changes to existing drugs and is available online at ContemporaryPediatrics.com/pediatric-drugs-2019-changes.

New dosage forms

NAYZILAM (MIDAZOLAM NASAL SPRAY)
In May 2019, the US Food and Drug Administration (FDA) approved the first nasal spray for the acute treatment of intermittent, stereotypic episodes of frequent seizure activity that are distinct from a patient’s usual seizure pattern in patients aged 12 years and older with epilepsy.3 The nasal spray comes in a single dose of 5 mg of midazolam, and each package contains 2 spray units. The sprayer should not be primed prior to use as this will cause loss of the dose. The caregiver should administer a dose into one nostril, and if the seizure continues beyond 10 minutes, a second dose with a new spray unit may be given.

Many patients with refractory epilepsy have used intranasal midazolam compounded in compounding pharmacies; unlike Nayzilam, these products typically have multiple doses. Nayzilam is a single dose, similar to Diastat (rectal diazepam gel) that has been on the market since 1997.

BAQSIMI (GLUCAGON NASAL SPRAY) AND GVOKE (GLUCAGON AUTOINJECTOR AND PREFILLED SYRINGE)
Glucagon has been available in a subcutaneous kit for many years and has been the mainstay of emergency treatment for hypoglycemic emergencies. Recently, the FDA approved Baqsimi nasal spray (July 2019)4 and
pharmacology

the Gvoke HypoPen and Gvoke PFS (September 2019), both of which will provide glucagon in a ready-to-use form. Glucagon in liquid form was previously not stable at room temperature and the traditional kit requires the user to reconstitute the powder with a diluent using a needle and syringe. These steps can be intimidating and difficult, especially for a user who is experiencing a hypoglycemic emergency.

Baqsimi is available as a 3-mg intranasal device that contains one dose. The 3-mg dose is indicated for ages 4 years and older and is administered into one nostril. If no response is seen in 15 minutes, a second dose may be administered. Packages containing 1 or 2 devices are available.

Gvoke is available as an autoinjector (Gvoke HypoPen) and prefilled syringe (Gvoke PFS) in 2 dose strengths. Adults and children aged 12 years and older as well as children aged younger than 12 years who weigh 45 kg or greater should receive 1 mg. Children aged younger than 12 years who weigh less than 45 kg should receive 0.5 mg. Both the autoinjector and prefilled syringe should be administered subcutaneously and are single use. If no response is seen in 15 minutes, another dose should be administered. Package sizes of 1 and 2 autoinjectors or prefilled syringes are available.

Both Baqsimi and Gvoke contain instructions to call for emergency assistance immediately after administration.

New drug approvals in 2019
Legislation to improve studies of medications in the pediatric patient population has increased the number of drug studies conducted in pediatric patients. However, this data often lags behind the drug’s initial approval in adults. Whereas pediatric dosing information for these drugs may not be immediately available, it is important for practitioners caring for children to keep up-to-date with new drugs and emerging data for use in pediatric populations.

Often many of these medications are used off-label anticipating a more

NOTE FROM DR. LEE  Newly approved medicines for children in 2019 include novel compounds, new dosage forms of existing agents, and expanded/official indications for use. We will continue to provide annual updates in Contemporary Pediatrics’ December issue.
—CARLTON LEE, PHARMD, MPH, FASHP, FPPAG

### TABLE 1  NEW DOSAGE FORMS

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>THERAPEUTIC CATEGORY</th>
<th>NEW DOSAGE FORM</th>
<th>CLINICAL IMPLICATIONS</th>
</tr>
</thead>
</table>
| Mepolizumab (Nucala)⁹⁶     | Antiasthmatic        | New liquid formulation approved for subcutaneous injection via autoinjector (AI) or safety syringe device (SSD) |  ▫ Allows for easier administration at home with an autoinjector  
▪ Needle not visible for patients with needle fear |
| Glucagon (Baqsimi nasal powder)⁴ | Antihypoglycemic    | Nasal powder                              |  ▫ Improved time and ease of administration                  |
| Glucagon (Gvoke autoinjector and prefilled syringe)⁵ | Antihypoglycemic | Autoinjector and prefilled syringe       |  ▫ Improved time and ease of administration                  |
| Midazolam (Nayzilam)³      | Antiepileptic        | Nasal spray                               |  ▫ Improved time and ease of administration                  |
| Amlodipine benzoate (Katerzia oral suspension)³² | Antihypertensive     | Oral suspension 1 mg/mL                   |  ▫ Facilitate administration of weight-based dosing in pediatric patients |
| Colesevelam HCl (Welchol)⁰ | Antilipemic          | New chewable bars: 3.75 g per bar.        |  ▫ Improve compliance compared with liquid formulation        |
| Methylphenidate (Adhansia XR)³⁴ | Stimulant            | New capsule sizes (25 mg and 35 mg)       |  ▫ Facilitate administration for younger patients             |

Author created.
complete evaluation in larger clinical trials. Here we present a review of both new drugs for pediatric patients and selected new drug approvals with high potential for pediatric use.

**XENLETA (LEFAMULIN)**
Xenleta is a first in-class antibiotic approved in August 2019 for the treatment of community-acquired pneumonia in patients aged older than 18 years. It works by inhibition of protein synthesis of the 50S bacterial ribosome and preventing the binding of transfer RNA for peptide transfer. In clinical studies, it has demonstrated similar rates of clinical success in patients treated with moxifloxacin with or without linezolid. Pediatric studies are expected to be completed in 2024.

**ACCRUFER (FERRIC MALTOL)**
Accrufer is an oral capsule approved in July 2019 and used for the treatment of low iron stores in adult patients. Pediatric studies in patients aged 1 month to younger than 10 years for pharmacokinetics and pharmacodynamics to confirm the dosing used in the efficacy and safety study are expected to be completed by January 2022. Pediatric studies are expected to be completed in 2024.

**RECABRIO (IMIPENEM, CILASTATIN, RELEBACTAM)**
This antibiotic combination is approved to treat complicated urinary tract and complicated intra-abdominal infections in adult patients. An open-label, single-dose study evaluating pharmacokinetics, safety, and tolerability from birth to age 18 years is expected to be completed by 2021 and a randomized trial will be completed by 2024.

**ZOLOGENSA (ONASEMNOGENE ABEPAVVEC-XIOI)**
Zolgensma is a gene therapy indicated for treatment in children aged younger than 2 years with spinal muscular atrophy (SMA). Spinal muscular atrophy is caused by the lack of the survival motor neuron (SMN) protein due to an autosomal recessive mutation in the SMN1 gene. The lack of the SMN protein causes slow degeneration of the lower motor neurons in the spinal cord and brainstem leading to symmetric significant progressive muscle atrophy and weakness. This weakness spreads to all skeletal muscle resulting in mortality.

Onasemnogene abeparvovec-xioi is a recombinant adeno-associated virus vector-based gene therapy that delivers a normal copy of the SMN gene allowing replication of the normal protein. Unlike the alternative therapy for SMA, nusinersen, this is a one-time infusion. Significant adverse effects include acute serious liver injury, and close monitoring of liver function is recommended until 3 months after the infusion. Furthermore, there is a recommendation to administer systemic corticosteroids to all patients (prednisone 1 mg/kg/day once daily) for at least 30 days after infusion. As therapies for SMA are extremely limited, this is a life-changing op-

<table>
<thead>
<tr>
<th>TABLE 2 BIOLOGIC APPROVALS WITH PEDIATRIC INDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRUG NAME</strong></td>
</tr>
<tr>
<td>Immune globulin (Xembify)</td>
</tr>
<tr>
<td>Dengue vaccine (Dengvaxia)</td>
</tr>
</tbody>
</table>
| Immune globulin intravenous, human-sira, 10% (Asceniv)  | Intravenous immune globulin                      | · Approved for the treatment of primary humoral immunodeficiency (PI) in adults and adolescents aged 12 yr and older.  
  · Plans to investigate in the treatment of respiratory syncytial virus (RSV). |
| Recombinant antihemophilic factor (Esperoct)           | Intravenous recombinant antihemophilic factor     | Indicated for use in adults and children with hemophilia A for:  
  · On-demand treatment and control of bleeding episodes.  
  · Perioperative management of bleeding.  
  · Routine prophylaxis to reduce the frequency of bleeding episodes. |

Author created.
tion for these patients. The cost is reported to be $2.1 million per dose, making it one of the most expensive drugs on the market.\textsuperscript{14}

**EPINEPHRINE MULTIDOSE INHALER (PRIMATENE MIST)**

Primatene Mist is an over-the-counter (OTC) multidose inhaler for asthma. Many practitioners may remember this product, which was removed from the market in 2011 due to the carbonated fluorocarbons (CFCs) in the propellant. In November 2018, Primatene Mist formulated with hydrofluoroalkanes (HFAs) as a propellant was approved for OTC use for asthma.\textsuperscript{15} Its indication is for adults and pediatric patients aged 12 years and older for the temporary relief of mild symptoms of intermittent asthma. The labeling does include a warning that it is for temporary relief of mild symptoms of intermittent asthma and that patients should see a doctor if they are feeling worse, are not better in 20 minutes, need more than 8 inhalations in 24 hours, or have more than 2 asthma attacks in 1 week.

It is important to note that this product, while it contains epinephrine, is not approved for the treatment of allergic reactions including anaphylaxis, and epinephrine autoinjectors should be used in these cases. There is little published data on inhaled epinephrine in asthma, but in a statement from the FDA, data analyzed by the agency during the drug’s review indicated no serious safety concerns if the drug was used as directed.\textsuperscript{16}

**Drugs with new pediatric indications**

**LIRAGLUTIDE**

Liraglutide, originally approved in 2010 for adults with type 2 diabetes, is now approved for children aged as young as 10 years. Liraglutide is a glucagon-like peptide-1 (GLP-1) analogue which increases glucose-dependent insulin secretion, decreases inappropriate glucagon secretion, increases beta cell growth and replication, and slows gastric emptying. Results from the Ellipse phase 3 clinical trial demonstrated an average decrease in HbA$_1c$ of 0.64 over the trial period of 26 weeks.\textsuperscript{5} The dose range is identical to adults, with a starting dose of 0.6 mg subcutaneous (SQ) daily for 1 week, then titrating to 1.2 mg if needed, and further titrating to 1.8 mg if glycemic goals are not attained on the lower doses.

This pediatric approval is the first among the newer generation of type 2 diabetes treatments. Prior to the approval of liraglutide, only insulin and metformin were approved to treat children with type 2 diabetes.

**BALOXAVIR**

Baloxavir was approved by the FDA in October 2018 for patients aged 12 years and older.\textsuperscript{7} It is a single-dose polymerase acidic endonuclease inhibitor indicated for the treatment of acute uncomplicated influenza. In September 2019, Roche (Basel, Switzerland) announced positive results from their MINISTONE-2 trial, the phase III study investigating single-dose baloxavir in children aged 1 to 11 years.\textsuperscript{8} Baloxavir was given as an oral suspension in the trial. This trial randomized patients to single-dose baloxavir or usual dose oseltamivir and found “comparable” efficacy. Baloxavir was given as 2 mg/kg for patients weighing less than 20 kg or 40 mg for patients weighing 20 kg and over. The study has not yet been published and the FDA has not approved this expansion of pediatric labeling yet.

**Conclusion**

The past year has led to major advances in pediatric therapeutics. New dosage forms such as intranasal sprays and the trend toward subcutaneous parental products may be beneficial for many patients. The reintroduction of an OTC option for asthma will have to be considered by practitioners when assessing medication therapy of these patients. New antibiotics may also represent therapeutic advances in pediatric infectious diseases once pediatric data become available.

The continuing development of medications for children, better dosage forms, and pediatric dosing information all represent real progress in the quest for better medicines for children.

The authors and section editor 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.

**COMMENTS?** E-mail them to cradwan@mmhgroup.com

It is important for practitioners caring for children to keep up-to-date with new drugs and emerging data for use in pediatric populations.
Antibiotics have lasting effects for preterm infants

Using antibiotics for extended periods of time in preterm infants can affect gut microbiota.

RACHAEL ZIMLICH, RN, BSN

Antimicrobial resistance is a growing concern, and a recent study confirms that long-term antibiotic use can spur the development of drug-resistant bacteria in infants.

The study, published in *Nature Microbiology*, reveals that treating preterm infants with antibiotics for more than 20 months results in the development of multidrug-resistant gut bacteria. The study analyzed stool samples from 32 preterm infants treated with antibiotics for 21 months and compared them with stool samples of infants who received shorter courses of antibiotics or none at all.

The study, funded by the National Institutes of Health, found that infants treated with long-term antibiotics had less diverse gut microbiota, and that these bacteria were equipped with more antibiotic resistant genes. Additionally, researchers found that the infants treated with more antibiotics showed resistance to antibiotics not typically given to infants, including ciprofloxacin and chloramphenicol. The study suggests this may be due to some antibiotics triggering resistance to others, even when they are not used.

Gautam Dantas, PhD, professor of Pathology and Immunology, Washington University School of Medicine in St. Louis, Missouri, and co-author of the study, says the effects noted in the study may be long-lasting. He was particularly surprised at the duration of the microbiota response to antibiotics. The microbiota of antibiotic-treated and hospitalized infants was distinguishable from that of healthy term infants even months after discharge from the neonatal intensive care unit (NICU), he adds.

“We found that antibiotic treatment and extended hospitalization perturbs the microbiota of extremely and very preterm infants, and that this perturbation, which is characterized by persistent carriage of *Enterobacteriaceae* and an enriched antibiotic resistome, is still evident months following discharge from the NICU,” Dantas says. “This means that antibiotic exposures very early in life may have lifelong consequences in terms of microbiome health and the risk of carriage of drug resistant bacteria.”

Dantas says providers should realize the risks of prolonged antibiotic use and take action.

“The long lasting effect on gut microbial content after administering early-in-life antibiotics is sobering. This collateral ecologic damage certainly has ramifications for physicians caring for infants born preterm,” Dantas says. “Our data also raise the possibility that antibiotics similarly affect gut bacteria in other childhood populations. In any event, our findings lend additional support to worldwide efforts to use antibiotics as wisely as possible in all areas of medicine.”

“We encourage steps to limit unnecessary initiation of antibiotics and to reduce, whenever possible, the duration of such treatments.”

—GAUTAM DANTAS, PHD

The findings are particularly important for pediatricians caring for the most vulnerable infants, Dantas says.

“Neonatologists in particular should be cognizant of the collateral damage of broad spectrum antibiotic treatment. In the past, practitioners saw very little risk to using antibiotics, and antibiotic treatment is often necessary, especially in very and extremely premature infants,” Dantas says. “However, we encourage steps to limit unnecessary initiation of antibiotics and to reduce, wherever possible, the duration of such treatments.”

COMMENTS? E-mail them to cradwan@mmhgroup.com

For reference, go to ContemporaryPediatrics.com/antibiotics-for-preterm-infants
infectious disease

Influenza vaccine cuts kids’ risk of hospitalizations from flu

New data show vaccination prevents serious respiratory illness.

Catherine Radwan, Managing Editor

The Centers for Disease Control and Prevention (CDC) has released promising new data providing convincing evidence that vaccination for influenza is preventing the severity of acute respiratory illness among children, leading to fewer pediatric hospitalizations for complications from the flu.

Angela P. Campbell, MD, MPH, medical officer, Influenza Division, National Center for Immunization and Respiratory Diseases at the CDC, and colleagues looked at inpatient estimates at 7 pediatric hospitals comprising the New Vaccine Surveillance Network and analyzed how effectively the flu vaccine prevented severe respiratory outcomes, including hospitalizations, among children vaccinated against influenza.

According to the researchers’ preliminary findings, those children who were vaccinated for influenza cut their risk of hospitalization by half. Vaccine effectiveness against influenza-associated hospitalizations among vaccinated children was 49% during the 2016-2017 flu season and 51% in the 2017-2018 flu season, or a combined 50% over the 2 reporting periods. The study cohort consisted of 3630 children aged 6 months to 17 years hospitalized with laboratory-confirmed influenza in these pediatric centers over 2 flu seasons in which influenza A(H3N2) viruses were the predominantly circulating virus.

The researchers point out that their findings provide more convincing evidence to support yearly influenza vaccination for all children and adults to prevent the flu and associated serious illness and hospitalization.

Results of the study were presented at IDWeek 2019 in Washington, DC.

DERMCASE CONTINUED FROM PAGE 29

In spite of these precautions, hand and foot warmers are useful tools for protecting hands and feet from cold injury and are generally regarded as safe. There are few references in the medical literature regarding injuries related to disposable chemical hand or foot warmers. One case report notes burns sustained by a diver using foot warmers while using nitrox as a breathing gas.2 Another series of reports involve ingestion of chemical disposable warmers by 4 elderly patients.3 These patients did not experience any serious consequences from the ingestion. However, no case reports were identified involving a pediatric injury from one of these warmers.

The patient in this case had apparently placed the warmer inside her sock next to the plantar surface of her foot, and it subsequently migrated to the thinner skin along the lower leg. Burns can be classified as superficial (first degree), partial thickness (second degree), or full thickness (third degree). Burns are also classified as minor, moderate, or severe. A minor burn in a pediatric patient is a superficial or partial thickness burn that involves less than 5% of the total body surface area (TBSA) in a patient aged younger than 10 years; is an isolated injury; does not involve the face, hands, perineum or feet; is not circumferential; and does not cross a major joint line.4

Patient outcome

This patient had a minor burn and was a good candidate for outpatient care. Silvadene cream (silver sulfadiazine) was applied and the area was bandaged. The burn healed gradually without complications.

Dr Seidenberg is a board-certified pediatrician and assistant professor in the Family Medicine Department, Pennsylvania State University College of Medicine, University Park Regional Campus, State College, Pennsylvania.

Dr Cohen, section editor for Dermcase, is professor of Pediatrics and of Dermatology, Johns Hopkins University School of Medicine, Baltimore, Maryland. The author and editor have nothing to disclose in regard to affiliations with or financial interests in any organizations that may have an interest in this article.
Pediatric Equipment Bargains

www.medicaldevicedepot.com

Tools for Increased Reimbursement and Office Efficiency at Discount Prices

MA 1 Handheld Audiometer
List Price: $715.00
Our Price: $640.00
You save $75.00!

MA 25 Audiometer
List Price: $935.00
Our Price: $852.00
You save $83.00!

plusoptIK S12R Mobile Vision Screener without Wireless Connection
Our Price: $5,385.00

Welch Allyn Spot Vision Screener
List Price: $7,600.00
Our Price: $6,557.00
You save $1,043.00

Hausmann Pediatric Exam Table (Digital Scale)
List Price: $2,829.00
Our Price: $2,111.00
You save $718.00!

Clinton Select Series Pediatric Scale/Treatment Exam Table
List Price: $2,632.13
Our Price: $1,909.00
You save $723.13!

Amplivox Otowave 102-1 Tympanometer
List Price: $2,995.00
Our Price: $2,261.00
You save $734.00!

Welch Allyn MicroTym 4 Portable Tympanometer
List Price: $4,275.00
Our Price: $3,248.00
You save $1,027.00!

MI 24 touchTym Tympanometer Screener
List Price: $3,475.00
Our Price: $2,540.00
You save $935.00!

-CDC Compliant Refrigerators and Freezers for Vaccines (Pharmacy Grade) -
1.3 Cu Ft ABS Premier Countertop Laboratory Freezer
List Price: $1,548.75
Our Price: $1,007.37
You save $541.38!

HemoCue Hb 801 Hemoglobin Analyzer w/ 200 Microcuvettes
List Price: $1,670.55
Our Price: $1,088.18
You save $582.37!

Amico Pediatric Diagnostic Stations
- The Pediatric Diagnostic Station Wall Boards save on energy, consumables and space.
- Various Combos starting at $1,090.00

Astra 300 Spirometer, DXR Compatible software included
List Price: $1,954.00
Our Price: $898.00
You save $1,056.00!

Welch Allyn 39590 OAE Hearing Screeners
List Price: $5,090.00
Our Price: $4,464.00
You save $626.00!

Place a recruitment ad in Contemporary Pediatrics®

Joanna Shippoli
National Account Manager, Healthcare Careers
(440) 891-2615 • jshippoli@mmhgroup.com

Advertising Index

BEIERSDORF
Eucerin.................................................................7
www.eucerinus.com

BIOFIRE DIAGNOSTICS
................................................................................CV4
www.biofiredx.com

CALMOSEPTINE
................................................................. Loose Insert

MEDICAL DEVICE DEPOT
........................................................................28
www.medicaldevicedepot.com

MERCK
Nexplanon..................................................18-21
www.nexplanon.com

NAPNAP
..............................................................................15
https://www.napnap.org/

ROCHE DIAGNOSTICS
................................................................. 9

TRIS PHARMA
ADHD Franchise........................................CV2-4
www.TrisADHD.com
A 9-year-old girl presents with a painful blistering patch on her right leg noted when her mother picked her up from school following an after-school ski club trip.

When the mother helped the girl remove her boot to check the leg, she noticed a bright erythematous patch with blistering to the lateral distal lower extremity that had been covered by her sock. Her mother noticed that the girl had a disposable toe warmer in her sock, next to her bare skin. The girl had activated the toe warmer and placed it inside of her sock near her toes prior to putting on her boots and skis. She did not experience any pain until after she was done skiing, about 2 hours later.

Examining the patient, the area was erythematous, minimally tender, and blanching. The diagnosis was made based on history of exposure to a toe warmer, inspection of the lower leg revealing an intact bulla and vesicles, and absence of acute distress and her vital signs were normal. She described her pain level in the right leg as 5 out of 10. The right, lateral distal lower extremity had an area of mild erythema with a central, intact, round 1.5-cm bulla and grouped, smaller adjacent vesicles proximal to the lateral malleolus. The area of erythema was blanching and minimally tender. She had full range of motion of the right ankle and foot, and her gait was intact.

The patient was diagnosed with a second-degree burn triggered by the disposable toe warmer in her sock.

Discussion
Disposable chemical hand or foot warmers generally are composed of iron, activated carbon, salt, and vermiculite. When the iron is exposed to oxygen, it begins to oxidize and produce heat. Salt helps catalyze the reaction; the activated charcoal helps disperse the heat; and the vermiculite helps insulate the heat. These warmers can reach temperatures as high as 165°F if exposed to an oxygen-rich environment, such as shoes with ventilator holes.

Precautions for the warmers advise that they should not be exposed to free-flowing air, applied directly to bare skin, and used in shoes for vigorous activity such as running, or burns may occur. Supervision is advised for use in children or the elderly, who have relatively thin skin and may not apply them properly.1

FOR MORE ON THIS CASE, TURN TO PAGE 27.
Faster answers. Relieved parents.

The results pediatricians need now, with infectious disease testing in your office from BioFire.

Deciphering the cause of varied symptoms while communicating with kids and anxious parents can be a challenge. A molecular syndromic test—simultaneously testing for several pathogens in about one hour—can help identify the underlying cause, fast. Help kids get better faster and relieve parents sooner.

**Improve Operational Efficiency**

The easy-to-use panels take just two minutes of hands-on time. And with results in about one hour, you can diagnose patients faster, treat them onsite, and possibly reduce further medical follow-up care.

**Reduce Unnecessary Testing**

The BioFire® FilmArray® Respiratory EZ (RP EZ) Panel is accurate. With 96.8% sensitivity and 99.5% specificity, it identifies more than just Flu A and B. Similarly, the BioFire® FilmArray® Gastrointestinal (GI) Panel detects pathogens that can be missed by traditional culture with 98% sensitivity and 99% specificity.

**Prescribe the Right Treatment**

The BioFire GI Panel has been proven to help doctors prescribe targeted therapy sooner—reducing unnecessary antibiotics.

biofiredx.com

---

**BioFire® FilmArray® Panels**

1. **BioFire® Respiratory EZ Panel**
   - 1 Test / 14 Targets / ~1 Hour

2. **BioFire® Gastrointestinal Panel**
   - 1 Test / 22 Targets / ~1 Hour

---

**Syndromic Testing: The Right Test, The First Time.**