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Florida Chapter of the American Academy of Pediatrics, Inc.
1400 Village Square Blvd #3-87786, Tallahassee, FL 32312 | 850-224-3939 | info@fcaap.org

Editor's Note

Dear Readers,

As you read this note, we would hopefully be at the nadir of the Omicron surge in Florida. What a start to 2022. It seems almost everyone had COVID. Ideally, no one should contract COVID; however, the Omicron variant seems to be less virulent of named variants, especially if you are vaccinated and boosted. COVID went through my family, including family members visiting from Canada, Germany, and other parts of United States. Those vaccinated and boosted got the infection but it was, at worse, a mild cold. Those vaccinated but not boosted contracted a slightly worse illness. Thankfully, no one was seriously ill. Now, fortunately, everyone was vaccinated.

My own experience was that the disease was like a viral infection and not even a bad one. I was using rapid tests to test everyone who had any symptoms and those asymptomatic at regular intervals. I got a fever and tested positive after several days of testing negative, which was the same experience as several other family members. While we starting by quarantining the infected, we ended up quarantining the uninfected since there were only two left in the uninfected category. Thankfully, those two still have not been infected.

What is the point of this story? The point is that this unscientific household study, which included people as young as two years of age to as old as seventy years of age with various comorbidities like diabetes and excess fat, almost all got the infection but because they were vaccinated their illnesses were not serious.

I wish that no one gets COVID, but vaccines clearly work if one does get COVID. SO PLEASE GET VACCINATED. Now that vaccine will be available for everyone 6 months of age or older we have an opportunity to finally get out of the pandemic.

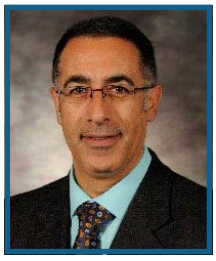
Since the initial outbreak, everyone has recovered. Some have experienced a dry cough we cannot shake off and at least one person is overly tired.

One other thing: the system for traveling internationally needs rational changes. The international testing regime should not rely solely on a PCR positive or negative test to determine if someone can get on a plane. If one gets COVID, we know sometimes that a PCR test can yield positive results for days to weeks, and I know of some incidents where positive results can last for months. These rules were established early on in the pandemic when we were testing people to prove negative results before they can return to work. Thank God we don't do that anymore. There should be some caveats for travel after someone recovers from COVID and is asymptomatic, just as we do for healthcare workers.

Overall, it was an interesting experience to say the least. However, it was certainly I could do without!

Mobeen H. Rathore, MD, CPE, FAAP, FPIDS, FSHEA, FIDSA, FACPE
Editor, The Florida Pediatrician

Editorial Board



Editorial Board

REVIEW ARTICLE

Application of Fluoride Varnish by Non-Dental Providers

Puneet Tung, DO
Clinical Assistant Professor, Department of General Academic Pediatrics, University of Florida College of Medicine

Childhood dental disease remains one of the most common chronic childhood illnesses.[1] Childhood oral health lays the foundation for adult oral health, and untreated dental disease negatively impacts a child's quality of life, including being linked to failure to thrive, malnutrition and poor school performance.[2] Untreated caries alone is responsible for more than 50 million lost school hours per year in the United States.[3] Optimal oral health is necessary for overall health and the presence of dental disease can impact systemic medical conditions such as cardiovascular disease and diabetes.[4] The association between dental disease and cardiometabolic diseases is due to the direct effects of the imbalance of oral microbes or indirectly by inflammation. The link between oral health status and cardiovascular diseases can be mediated by lifestyle and dietary choices.[5]

The adverse effects of dental disease can be observed in both the individual as well as in the community, having health and financial consequences. The incidence and prevalence of dental caries disproportionally affects the poor, young, and minority populations.[3,6] Young children encounter psychosocial, structural, and cultural barriers to dental care.[7] In addition, there are multiple known lifestyle factors that increase a child's risk for developing caries, including certain cariogenic dietary and oral hygiene practices.[6]

In 2010, the American Academy of Pediatrics (AAP) released the Medical Expenditure Panel Survey which revealed that while 89% of children have routine primary care office visits during their first year of life, only 1.5% receive preventative dental care.[6,8] Drawing from these data, it can be concluded that the primary care setting is a unique one in which to provide early access to preventative education and care.[8]

Dental caries is a multi-factorial disease that develops and progresses as a dynamic process. This process involves the interaction between a susceptible tooth surface, specific cariogenic bacteria, and carbohydrates. Over time, the interaction between these factors leads to a breakdown of the tooth structure by the prolonged exposure to acid from metabolized sugar by oral bacteria.[9] Protective factors, including fluoride exposure, help to re-mineralize and strengthen enamel after acid exposures. Additional

preventive measures include limiting the frequency of dietary sugars/carbohydrates, selecting foods that are less cariogenic, maintaining good oral hygiene practices, and receiving routine preventive dental care.[10, 11] Cariogenic foods include those high in refined carbohydrates, sugars, and starches and promote the development of plaque and acid. These foods include pastries, cookies, crackers, white bread, sweetened cereal, chips, crackers, cakes, granola bars, ice cream, flavored, and sweetened milk, sweet yogurt, certain alcohols and other beverages that contain sugar.

Fluoride is available through many sources and can be divided into three categories: fluoridated water, dentifrices (toothpaste or toothpowder), and concentrated topical application. Foods and beverages washed or processed with fluoridated water are also considered sources of fluoride.[11] The introduction of fluoride in 1945 has proven efficacious in the prevention of caries and oral disease progression.[5] Community water fluoridation is considered to be one of the top ten public health achievements of the 20th Century by the Centers for Disease Control and Prevention.[3] Fluoride works to prevent caries topically and systemically via three processes: preventing tooth demineralization, promoting remineralization, and preventing bacterial metabolism. Data in the medical literature support a decrease in oral bacteria adherence after the application of fluoride.[12] Topical applications of fluoride varnish provides the majority of the benefit to harden the tooth enamel and make the teeth more resistant to demineralization.[6,13]

The AAP, American Dental Association (ADA), and American Academy of Pediatric Dentistry (AAPD) recommend dietary fluoride supplements for children who do not have an adequate fluoride concentration in their drinking water (> 0.7 parts per million).[6,14] The AAP also recommends fluoride mouth rinses for children over age 6 years that are at higher risk for dental caries.[3,6] It is recommended that fluoridated toothpaste be used starting at the first eruption of teeth in infancy. Fluoride-free or "training toothpaste" is not recommended. The professional societies recommend applying a "smear" of toothpaste, or the amount equivalent to a grain of rice to a toothbrush and brushing two times a day during a child's first three years. For children 3 years of age and older, or when the child can effectively spit, the recommended amount is the size of a pea.[6]

Fluoride varnish is a highly concentrated form of fluoride that is applied in a clinical setting.[6] The fluoride is applied using a small brush. It sets once in contact with saliva. This procedure is well tolerated by young children and can be applied by both dental and non-dental health providers in a variety of settings.[15] The concentration of fluoride varnish is 22,600 ppm (2.26%) sodium fluoride. The application of varnish during an oral screening is a benefit to children, especially those with limited access to dental care. Pediatricians perform over fourteen well-care visits before a child's fifth birthday. These encounters are ideal opportunities to perform oral screenings and provide preventive dental education. The AAPD recommends applying fluoride varnish every 3 to 6 months in high caries-risk populations and every 6 months in the low to moderate risk population.[16]

Fluoride varnish should only be applied in a healthcare or clinical setting by a dentist, dental auxiliary professional, physician, nurse practitioner, or physician assistant.[6] In many states, trained individuals are able to instruct pediatric staff on application of fluoride varnish, and there are designated AAP Chapter Oral Health Advocates who educate pediatric offices on fluoride varnish application, provide support, and answer questions. Fluoride varnish should not be dispensed to families to take home. Instructional training videos on proper fluoride varnish application can be viewed online on the National Smiles for Life: A National Oral Heath Curriculum website (https://www.smilesforlifeoralhealth.org).[17] The AAP recommends that all medical providers interested in applying fluoride varnish complete this course. Once this course is completed providers can obtain a certificate documenting their training.

It is imperative for medical professionals to integrate fluoride varnish application into the clinical workflow during well-child visits. An optimal time to perform this procedure is during the oral health screening exam and dental risk assessment. The child is evaluated on the exam table if they are cooperative or, if they are younger, can be examined on the parent's lap using the knee-to-knee technique with the provider (https://www.smilesforlifeoralhealth.org/topic/knee-to-knee-oral-exam). The teeth are dried with a 2-inch square gauze and the varnish is applied to the surfaces of the teeth. Parents or caregivers are instructed to allow their child to drink or eat soft foods immediately afterwards. They are also advised not to brush their child's teeth that evening in order to maximize the fluoride's contact time with the teeth. Regular brushing twice daily may be resumed the following day. In addition, the child is referred to a dental home. All non-dental providers should be trained to assess and treat both high-risk and medium to low-risk dental caries populations.

There are challenges associated with implementing topical fluoride varnish in the non-dental setting as a result of varying prescribing guidelines from professional organizations. While the AAP and USPSTF recommend fluoride supplements for all children in fluoride deficient settings, the AAPD and ADA only recommend dietary fluoride supplementation in high-risk caries populations and those who drink fluoride deficient water.[18-20] The discrepancies in recommendations and messaging between medical and dental providers create a challenge for primary care providers in communicating this information to their patients. Plus, many families still fear fluorosis—the rare occurrence where teeth exposed to high concentrations of fluoride

present with permanent mottling or white streaks. However, this fear can be alleviated by ensuring parents or caregivers that risk of fluorosis is reduced if they supervise their children during tooth brushing, assuring that their children do not use too much toothpaste or swallow the toothpaste. The risk is also decreased if physicians do not prescribe fluoride supplementation to patients with adequately fluoridated water. There are several other fears and myths associated with fluoride, including that it causes low IQ's or malignancies. The AAP recommends that healthcare providers introduce families to the website: ilikemyteeth.org to promote valid and accurate fluoride information. Several effective strategies to approach fluoride-resistant families include engaging in motivational interviewing and patient-specific risk assessment

A Cochrane Collaboration review and several research studies have demonstrated a decrease in caries in both primary and permanent teeth ranging from 18-59 % due to fluoride applications.[21-23] Fluoride varnish application is a safe and effective procedure that is now reimbursed by Medicaid in all 50 states and by most private insurance companies.[23] Both topical and systemic fluoride remain essential in caries prevention and progression. Primary care providers are essential in the primary prevention of dental caries and should be aware of a child's risk for developing caries, the fluoride modalities available for children at each age group, and how to apply fluoride varnish in their offices. Consistent messaging between the medical and dental community can alleviate misconceptions relating to fluoride and increase its utilization among at-risk populations.

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REVIEW ARTICLE

Medical Legal Partnerships: A Novel Way to Help Address Health-harming Legal Needs and Social Determinants of Health in Pediatric Patients with Asthma

Rachel M. Coleman, MD, Chelsea Dunn, JD, Esq., Debra A. McDonald, MA

AAP	American Academy of Pediatrics
FMLA	Family Medical Leave Act
HHLN	Health Harming Legal Needs
MLP	Medical Legal Partnership
SDOH	Social Determinants of Health
SES	Socioeconomic Status

Table of Abbreviations

ABSTRACT

Medical-legal partnerships (MLP) are a novel way to help address social determinants of health (SDoH), which are conditions, including education, neighborhood, and socioeconomic status (SES), that shape how people live, work, and age.[1] They also significantly predict health outcomes in children and adults. By embedding lawyers on medical teams, MLPs can help patients resolve health-harming legal needs (HHLN) related to SDoH. Within the last two years, we have built a MLP within the

Severe Asthma Clinic in Gainesville, Florida, to promote children's access to high quality care, address their legal needs, and reduce chronic stress levels[2], which can worsen asthma. In fall 2018, we began to screen patients, and found that out of 76 legal needs, the most commonly identified (31) were education-related. For example, parents needed help acquiring public school resources, such as an on-site nurse, for their child with asthma. Other common HHLN included issues related to housing (17) and income maintenance (16). Since program implementation, we have observed that MLPs may lower healthcare costs for both patients and healthcare institutions. We have also encountered three challenges to helping patients: *opaque legal language in Florida law*, *a high number of education-related HHLN* among patients, and *a knowledge gap among medical providers* about patient legal advocacy. In the next phase of our program, we will address these challenges, and, after completing a program evaluation, we will expand the program to other patient populations, including children with diabetes and children who are transgender or gender-nonconforming. Given our MLP's success and the endorsement of the AAP[3], pediatric providers should consider adding an MLP to their practice to address their patients' HHLN.

BACKGROUND

Medical legal partnerships (MLPs) embed lawyers on medical teams to help patients resolve *health-harming legal needs (HHLN)*, which are legal needs that can harm patient health. Studies show that MLPs are effective ways for clinicians to help patients reduce debt, access benefits, and avoid utility shutoffs[4], and that patients who receive these legal services report less stress[5,6], as well as fewer asthma complications, ED visits, and hospitalizations.[4] By solving problems related to social determinants of health (SDoH), MLPs may reduce health disparities and improve health outcomes in vulnerable patient populations.[7] MLPs may also train medical providers to appropriately screen for and address patients' HHLN.

History of Medical Legal Partnerships in the United States

The first unofficial medical legal partnership was created in 1967 by Dr. Jack Geiger, who hired a lawyer to help address his patients' food and housing concerns.[8] His success prompted the creation of similar programs in the 1980s, mostly to help AIDS patients who needed legal assistance. However, it was not until 1993 that Dr. Barry Zuckerman formed the first official MLP when he added a full-time lawyer to his medical team. His goal was to prevent power outages in the homes of his pediatric patients suffering from asthma. An article published in 2001 in the New York Times[9] popularized the MLP model, and now over 400 MLPs exist in 48 states.[10]

History of Medical Legal Partnerships in Florida

Currently, 19 active MLPs exist in Florida, most of which serve children.[10] One of the oldest MLPs in Florida serves the medically complex pediatric population in Jacksonville, Florida[11], and another MLP serves patients via mobile health clinics in Miami, FL.[12] In 2017, a Statewide MLP Collaborative was established to help MLPs in Florida share best practices, pathways for funding, and strategies for success.[13] This collaborative, which has recently expanded to become a Southeastern MLP Collaborative, has led to the development of four new MLPs in Florida in the last three years.

The Establishment of the Medical Legal Partnership at the Severe Asthma Center in Gainesville, Florida

In 2017, the Children's Miracle Network provided funding to help establish an MLP in Gainesville, Florida. After a local needs assessment revealed high rates of emergency department visits and hospitalizations related to asthma, our medical team decided the MLP should serve pediatric patients with the condition. Next, we formed a partnership with Southern Legal Counsel and began to screen patients in the Severe Asthma Clinic for HHLN. Since fall 2018, we have screened 42 patients and have identified 76 unique legal issues: 31 education-related issues, 17 housing issues, 16 income maintenance issues, 5 family law issues, 3 Medicaid issues, 2 employment issues (FMLA), and 1 immigration issue (see Table 1).

FINANCIAL BENEFITS OF MLPS

Since we implemented the program in 2018, we have observed that MLPs have a potential role in lowering healthcare costs. Indeed, MLPs may financially benefit patients by helping them maintain cash assistance benefits, acquire insurance coverage, and access routine care, which is less costly than emergency care. Likewise, MLPs can financially benefit healthcare institutions by reducing the number of ED visits and increasing revenue from stable insurance coverage. In a nationwide review of MLPs, results showed that MLPs recovered $692,000 for healthcare partners, and one MLP in Illinois reported a 150% return on investment for its services.[14] Given these findings, we plan to incorporate a financial benefit analysis in our upcoming program evaluation, and use results to increase the financial benefits of our MLP for all participants.

PRIMARY CHALLENGES

Since the implementation of the MLP in our Severe Asthma Clinic, we have encountered three primary challenges to helping pediatric patients with asthma and HHLN: *opaque legal language* that prevents us from immediately implementing needed interventions; *a high number of education-related needs among patients* and not enough experts to support our families; and *a knowledge gap among medical providers*, who have not received training related to patient legal advocacy.

Opaque Legal Language in Florida Law

One challenge we encounter is opaque legal language in Florida law, which allows certain actions but does not indicate how these actions should be performed. For example, our MLP would like schools to keep albuterol and Epi-pens stocked in their clinics so that children with asthma or life-threatening allergic reactions can access vital medications. To address this problem, we plan to clarify legal language in state regulations that would enable schools to stock these medical supplies. After we implement this intervention, we will solicit feedback from our patients and school partners to evaluate its success as well as discover areas for further improvement.

A High Level of Education-Related Needs Among Patients

In addition to opaque legal language, we also frequently encounter a high number of education-related HHLN among our patients. To address this problem, we have created a novel partnership with the Anita Zucker Center for Excellence in Early Childhood Education, which will connect graduate students in education with children and families in our MLP who have encountered a barrier to school resources. The graduate students will target children aged 0-5 years to help ensure these young students can properly begin their education. We hope that the number of graduate students who participate will be enough to meet the needs of patients in our MLP. However, if we do not have enough graduate students, we will engage pro bono attorneys or other advocates in the community to help families with education-related HHLN.

A Knowledge Gap Among Medical Providers

A final challenge we encounter is the lack of knowledge among medical providers about patient legal advocacy. Uur MLP trains medical providers to identify and help address the HHLN of patients to fill this knowledge gap. For example, we teach doctors about the importance of informing parents about school accommodations that are available for children with asthma. We also provide examples of letters they can send to schools to request an evaluation for special education services. In our MLP training sessions, we have found that health care providers are highly receptive to learning about patient legal advocacy, and most importantly, implementing what they have learned. Given the positive feedback from our trainees, we plan to increase the number of training sessions that we offer to medical providers about patient legal advocacy as well as make the sessions accessible via livestream. Finally, we will make the MLP referral form and screening tools available in the Electronic Health Record.

FUTURE OF THE MEDICAL LEGAL PARTNERSHIP IN GAINESVILLE, FL

Over the next year, we will expand our MLP to other patient populations, including those in the UF Health Diabetes Institute and the Youth Gender Program. We also plan to design and conduct a rigorous program evaluation to assess progress towards improving patient health. We hope the results of the evaluation will demonstrate the benefits of the MLP and enable us to apply for institutional funding, which will allow us to hire a full-time attorney and make the program sustainable long-term.

SUMMARY

Medical legal partnerships are an effective tool for clinicians to use in addressing patients' HHLN and reduce the negative effects of the social determinants of health. By embedding lawyers on medical teams, clinicians may improve the health outcomes of pediatric patients with asthma as well as reduce the chronic stress of their caregivers. In addition, MLPs have the potential to benefit both patients and institutions financially by ensuring that patients have stable benefits, insurance coverage, and access to routine care. Finally, MLPs can train medical providers to appropriately screen for and help address patients' HHLN. In these ways, MLPs can help institutions create a more complete medical home for patients who may be affected adversely by the social determinants of health.

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ORIGINAL RESEARCH

Correlation of Meningitis/Encephalitis PCR Panel Results with CSF Pleocytosis

Sophia Hassor, MD, Alison Payson, MD, Beatriz Franyie-Ladd, MD
Nicklaus Children's Hospital, Miami, FL

ABSTRACT

Background

This study investigates the correlation between CSF pleocytosis and the results of a Meningitis/Encephalitis PCR Panel (ME panel). We hypothesize that CSF pleocytosis is not a predictive marker of disease in aseptic CNS infections.

Methods

A retrospective chart review was completed of 147 patients who underwent lumbar puncture over 1 year at a large, tertiary pediatric hospital. Ages, CSF cell counts, and ME panel results were obtained. The clinical usefulness of using pleocytosis (WBC>5cells/mcL) as a predictive marker for CNS infections was analyzed.

Results

Of the 147 patients included, 99 patients (67%) were noted to have negative pleocytosis, while 48 patients (33%) were noted to have pleocytosis. Of the 48 with pleocytosis, 18 (38%) had a positive ME panel, while 30 (62%) had a negative ME panel. In the 99 patients with negative pleocytosis, 9 (9%) had positive ME panel, and 90 (91%) had negative ME panel. The sensitivity and specificity of CSF pleocytosis as a marker for disease was 67% and 75%, respectively, with a positive predictive value of 38% and a negative predictive value of 91%. In patients with a positive ME panel with a confirmed viral source, there was a statistically significant lower percentage of CSF pleocytosis in infants <12 months of age compared with older children (p =.002).

Conclusions

This chart review demonstrates that CSF pleocytosis is not a good indicator of CNS infection, especially in cases due to viral etiologies. This is important in younger infants who may not be able to mount an appropriate inflammatory response against viral pathogens in CSF. The ME panel can quickly identify viral pathogens thereby decreasing antibiotic treatment and hospital stays. We recommend the routine use of ME panels, particularly in young infants, regardless of initial CSF cell counts.

INTRODUCTION

Aseptic meningitis is a common pediatric diagnosis, classically defined as acute onset of meningeal signs or symptoms with fever and cerebrospinal fluid (CSF) pleocytosis in the absence of a positive bacterial culture and gram stain.[1] Because of this traditional definition of meningitis, it has largely remained a diagnosis associated with pleocytosis, defined as CSF WBC > 5 cells/mcL. The most common etiology of aseptic meningitis is usually viral, and although usually self-limited and self-resolving, may sometimes be associated with significant morbidity, particularly in infants less than one year of age. Infants may present with excessive obtundation, signs of increased intracranial pressure, focal seizures, and other focal neurological sequelae.[2] CSF Gram stain and culture have been the diagnostic "gold standard" for acute meningitis for nearly a century. However, both methods have a limited sensitivity that may be further reduced in patients who have received antibiotics or in patients with a viral source. Molecular assays have the potential to have a more rapid turnaround time, are potentially less affected by prior antimicrobial therapy, and have higher diagnostic yield.[3] A FilmArray Meningitis/Encephalitis (ME) panel has recently been developed which rapidly tests for 14 common organisms (bacterial, viral, and fungal) causing central nervous system (CNS) infections via multiplex polymerase chain reaction (PCR).[4] Because of the increased sensitivity of PCR testing and rapid availability of results, it is possible to identify many organisms responsible for aseptic meningitis that heretofore remained undefined, which in turn may affect length of stay, judicious treatment choices, and duration of therapy[5] With such a sensitive molecular test available to identify CNS infection, it is possible to diagnose meningitis, which in the absence of pleocytosis, may cause significant morbidity in this vulnerable population. The hypothesis of this study is that CSF WBC count *alone* is an unreliable marker of infection. Hence, the purpose of this retrospective study is to investigate the correlation between CSF cell counts and the results of a recently implemented ME panel at a large tertiary pediatric hospital.

METHODS

We conducted a retrospective study at a 289-bed, freestanding, children's hospital in the Southeastern US from May 2016 to March 2017. Initially, all children who underwent lumbar puncture with a concurrent FilmArray ME panel were reviewed. Study inclusion criteria included any patient who had a lumbar puncture performed with CSF cell counts and culture in addition to a FilmArray ME panel with available results. The population evaluated included pediatric patients, ages 1 day to 18 years of age. There were no predefined restrictions in the study based on gender, age, or race. Initial review included 189 patients that met inclusion criteria, however those with resultant traumatic lumbar punctures (as defined by CSF red blood cell count >500 cells/mcL) were excluded, leaving 147 charts to be reviewed. Patients' ages, CSF cell counts, and FilmArray ME panel PCR results were obtained. Statistical analysis, including a Fisher Exact Test, were performed to analyze the clinical usefulness of using pleocytosis (WBC >5 cells/mcL) as a predictive marker for CNS infections and the subsequent utility of the FilmArray ME panel. This chart review was approved by the institutional review board at the participating children's hospital.

RESULTS

Of the 147 patients included in the study, 99 (67%) were noted to have negative pleocytosis, while 48 (33%) were noted to have pleocytosis (Table 1). Of those 48 patients with pleocytosis, 18 (38%) had a positive ME panel, and 30 (62%) had a negative ME panel. In the 99 patients with negative pleocytosis, 9 (9%) had a positive ME panel, while 90 (91%) had a negative ME panel. In the patients with a positive ME panel without pleocytosis (n=9), 8 (89%) were due to viral etiologies, the majority of which were in patients <12 months of age (6/8, [75%]), and 1 patient had a positive ME panel for *Escherichia coli* with negative pleocytosis. Of the viral cases without pleocytosis (n=8), 4 (50%) cases were secondary to parechovirus, 2 (25%) to enterovirus, and 1 (13%) each to HHV-6 and HSV-1 (Table 2).

In the group with pleocytosis and a positive ME panel (n=18), 14 patients (75%) demonstrated viral etiologies detected on the ME panel. Only 1 (7%) of these 14 viral cases occurred in a patient <12 months of age. There were 13 (93%) cases of enterovirus and 1 (7%) case of HHV-6.

When comparing infants younger than 12 months of age with viral meningitis/encephalitis diagnosed by the ME panel with their older counterparts, there is a statistically significant lower percentage of CSF pleocytosis in infants as a marker for

RESULTS ME PANEL	POSITIVE PLEOCYTOSIS	NEGATIVE PLEOCYTOSIS	TOTAL
POSITIVE	12% (18/147)	6% (9/147)	27
NEGATIVE	20% (30/147)	61% (90/147)	120
TOTAL	48	99	

Table 1: Prescence of pleocytosis according to Film Array Meningitis Encephalitis Panel

RESULT	ME PANEL POSITIVE (NO. PATIENTS)	POSITIVE PLEOCYTOSIS	NEGATIVE PLEOCYTOSIS
POSITIVE	27	18	9
Haemophilus influenzae	2	2	0
Escherichia coli	1	0	1
Streptococcus pneumoniae	1	1	0
Parechovirus	4	0	4
Enterovirus	15	13	2
Human herpesvirus 6	2	1	1
Herpes simplex virus 1	1	0	1
Cryptoccocus neoformans	1	1	0
NEGATIVE	120	30	90

Table 2: Association of organism-specific PCR results with pleocytosis

disease, (Fisher Exact Test; p=.002). The overall sensitivity and specificity of CSF pleocytosis as a marker for disease was 67% and 75%, respectively, with a positive predictive value of 38% and a negative predictive value of 91%.

DISCUSSION

The initial purpose of this study was to investigate the correlation between the presence of CSF pleocytosis and the results of a FilmArray Meningitis/Encephalitis PCR Panel at a large tertiary pediatric hospital. This chart review demonstrates that presence or absence of CSF pleocytosis is not a good indicator of CNS infection, especially in cases due to viral etiologies. Our findings indicate that the ME panel has a high negative predictive value (91%), which supports the likelihood that a negative ME panel is an accurate predictor of truly negative results. Additionally, in all the patients that had a negative ME panel, regardless of the presence of pleocytosis, all corresponding CSF cultures and gram stains were also negative. In cases of viral etiologies in infants <12 months of age, there was a statistically significant difference (p=.002) in the presence of CSF pleocytosis. Younger infants were less likely to have pleocytosis despite demonstrating positive viral sources in the ME panel. This is a particularly important distinction for clinicians, since due to age and possible lack of immune maturity, infants may not be able to mount an appropriate inflammatory response in the CSF against viral pathogens.[6] Due to the absence of pleocytosis, the diagnosis of aseptic meningitis, in this age group may be delayed or missed, hence highlighting the diagnostic utility of a PCR test.

In a study by Precit et al[7], they investigated if the presence of certain clinical parameters, including CSF pleocytosis provided diagnostic accuracy for positive ME panel results in pediatric patients. They restricted ME panel testing to patients with abnormal CSF findings (pleocytosis, abnormal protein, and glucose levels in the CSF). Among positive ME panel specimens, sensitivity and positive predictive values were <90% for all biomarkers. CSF pleocytosis and abnormal glucose/protein were poor predictors of ME panel positivity, and they concluded that ME panels should not be restricted to patients with abnormal CSF parameters.

In a prospective cohort study conducted by Posnakoglou et al[8], children with suspected CNS infection and CSF pleocytosis were randomized 1:1 to a group undergoing ME panel testing or to a cohort group conducting separate molecular CSF microbiological tests. A total of 71 cases were included, and a pathogen was detected in 37(52.1%) of children when the

ME panel was used and in 16(22.5%) in the control group ($p < .001$). In aseptic meningitis cases, a virus was detected in 27/61(44.2%) patients with ME and in 11/66(16.7%) of controls ($p<.001$). These findings reflect that the ME panel detected significantly more CNS pathogens, both bacterial and viral, than in the cohort group.

We identified several limitations in our study. First, the chart review included patients from a single center, thus introducing the possibility that the patient population had inherent differences, whether culturally or geographically, from the entire population, and therefore was not wholly representative or reflective. Second, at the time of the chart review, the ME panel was a fairly new test, having only been released one year prior. Given how recent the test was at the time, we could not conclude if the test was always ordered despite signs of CSF pleocytosis on initial CSF studies and/or signs of clinical meningitis/encephalitis. This fact may have affected the conclusions' extension from the study conducted on a sample population to a larger population. Third, in one of the patients with a positive ME panel with negative pleocytosis (n=9), a bacterial etiology, *E.coli*, was demonstrated in the PCR. Upon chart review, this patient was a 2-week-old male infant who presented with low-grade fever and URI symptoms, secondary to RSV infection. During admission, his urine culture grew 2,000 CFU/mL of *E.coli*, after which, due to his age, the decision was made to perform lumbar puncture. CSF studies were within normal ranges, including negative CSF culture and Gram stain, but ME panel was positive for *E.coli*. Given the well-appearance of the patient, the confirmed respiratory viral source of symptoms, the insufficient growth on urine culture of the pathogen, and negative CSF culture and Gram stain, we believe that there exists the possibility that the CSF PCR result was a possible contaminant.

Aseptic meningitis refers to meningeal inflammation in which a bacterial source is not identified. Of the recognizable viral pathogens, we note that non-polio enteroviruses are the leading cause of aseptic meningitis in the population studied. Although not studied in this chart review, it is accepted that prognosis, in terms of morbidity, largely depends on the age of the child, infectious agent, and immune status. While the majority of cases of pediatric viral meningitis can expect a complete recovery, some infants and children younger than 2 years of age have been shown to experience acute neurological sequelae as a result of infection, such as complex seizures, increased intracranial pressure, coma, or long-term behavioral changes.[2] While CSF culture and gram stain remain the gold standard for diagnostic purposes, the rapid detection of an etiologic agent via the FilmArray ME panel, not only aids in timely diagnosis, but has the potential to decrease adverse outcomes, prolonged hospitalizations, and unnecessary antibiotic treatment. While further studies are needed to determine the cost effectiveness and clinical parameters of this new test, we suggest the routine use of ME panels, particularly in young infants, regardless of initial CSF cell counts, in conjunction with traditional diagnostic CSF studies.

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RESIDENT CASE REPORT

Paenibacillus dendritiformis Hemorrhagic Meningoencephalitis in an Infant: Case Report and Literature Review

Meryam Jan, MD[1], Issa Hanna, MD[2], Nizar Maraqa, MD[3]

[1]Resident (PGY2), Department of Pediatrics, University of Florida College of Medicine – Jacksonville, Jacksonville, FL

[2]Resident (PGY3), Department of Pediatrics PGY3, University of Florida College of Medicine – Jacksonville, Jacksonville, FL

[3]Associate Professor, Division of Pediatric Infectious Diseases and Immunology, Department of Pediatrics, University of Florida College of Medicine – Jacksonville, Jacksonville, FL

ABSTRACT

There is sparse literature on *Paenibacillus* species causing human infections, particularly in the pediatric population with only few case reports of neonatal sepsis with variable outcomes. To our knowledge, however, there are no existing reports of *Paenibacillus dendritiformis* species causing infection in humans. We present a case of a 31-day-old infant who presented with fever and was found to have hemorrhagic meningoencephalitis secondary to *Paenibacillus dendritiformis*.

ABBREVIATIONS

CSF: cerebrospinal fluid
ED: emergency department
EEG: electroencephalogram
EVD: extraventricular drain
IV: intravenous
MIC: minimum inhibitory concentration
MRI: magnetic resonance imaging
RBC: red blood cell
rRNA: ribosomal ribonucleic acid
WBC: white blood cell

INTRODUCTION

The Paenibacilli species are a recently classified but important bacteria that affect humans, animals, and plants. The species is well-known within the field of agriculture, often thought to promote crop growth for plants.[1] They are a facultatively anaerobic endospore-forming, rod-shaped bacteria thought to be Gram-positive to Gram-variable and frequently identified based on 16S rRNA.[2] Recent literature suggests that Paenibacilli have become a rare human pathogen with potentially fatal outcomes, particularly in immunocompromised adults and premature infants.[2-4]

CASE REPORT

A 31-day-old male infant, born prematurely after 33 weeks gestation and 5 days as a dichorionic diamniotic twin, presented to a local emergency department (ED) with fever, irritability, and decreased oral intake. Perinatal maternal group B streptococcus status was unknown, but the mother received ampicillin adequately prior to delivery. All other maternal infectious screening tests were unremarkable. After an uneventful caesarean delivery, the neonate required management in the neonatal unit for 10 days due to respiratory distress after birth. He received empiric antibiotic coverage with intravenous (IV) ampicillin and gentamicin, which were discontinued after 48 hours as blood cultures remained without growth. He was discharged home in stable condition.

On presentation to the ED, the infant had a fever of 38.4°C but was otherwise well appearing and well perfused. Cerebrospinal fluid (CSF) studies showed a white blood cell (WBC) count of >2,000 cells/µL (normal for age 0-6 cells/µL) with 74% neutrophils and 15% lymphocytes, glucose of 1 mg/dL (normal for age 34-119 mg/dL), protein of 415 mg/dL (normal for age 58 ±17 mg/dL), and a red blood cell (RBC) count of 107 cells/µL. The CSF Gram stain showed no organisms. Urinalysis was normal. Blood, CSF, and urine cultures were obtained. He received meningitis dosing of IV ampicillin and ceftriaxone as well as gentamicin and was then transferred to our pediatric hospital for further management.

At our facility, vancomycin and acyclovir were initiated upon admission. Shortly thereafter the patient developed brief eye twitching which self-resolved, but was then noted to have arching of the back and clonus in the lower extremities. An electroencephalogram (EEG) demonstrated excessive discontinuity and multifocal interictal epileptiform abnormalities arising from within both hemispheres independently. Lorazepam was administered and antiepileptic therapy with levetiracetam and phenobarbital was initiated. Subsequent brain magnetic resonance imaging (MRI) with contrast revealed findings consistent with meningitis, encephalitis and developing abscesses involving the supratentorial region (Figure 1). Neurosurgical intervention was deemed unnecessary at the time. The patient received IV acyclovir until CSF *Herpes simplex* virus PCR test was negative and the CSF culture returned positive for *Paenibacillus dendritiformis*. A repeat lumbar puncture was performed to ensure the organism was not a contaminant. It showed CSF WBC count of 940 cells/µL, RBC 35 cells/µL, glucose <10 mg/dL, protein 824 mg/dL, and repeated growth of *P.* dendritiformis on culture.

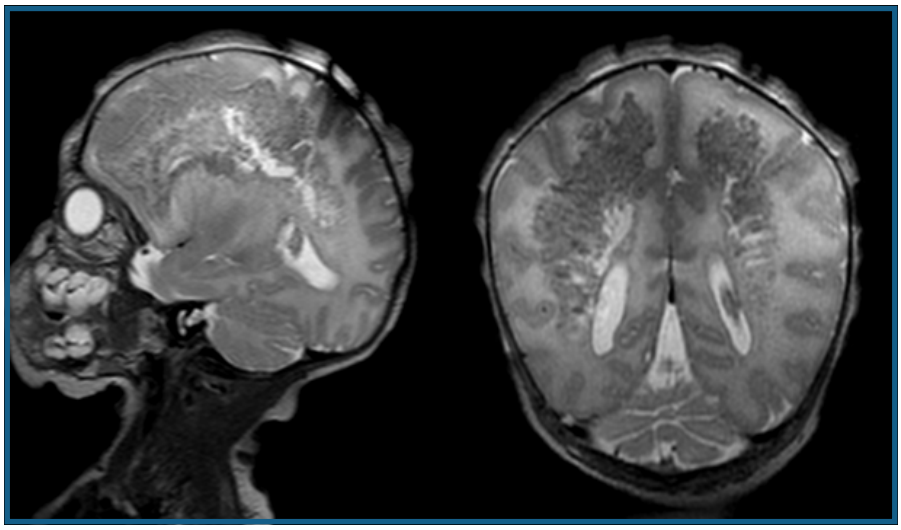

Figure 1
Brain MRI with contrast on admission: axial and sagittal views showing extensive bilateral abnormal signal in the supratentorial brain with restricted diffusion and hemorrhagic products. There is also extensive meningeal and parenchymal enhancement with large areas of peripheral enhancement involving the white matter bilaterally.

Ten days after admission, the infant had excessive crying, persisting fevers and a bulging anterior fontanel. A repeat brain MRI shown demonstrated an interval increase in ventricle size due to encephalomalacia, splaying of the cranial sutures, development of cystic spaces concerning for cerebral abscesses and findings consistent with hemorrhagic meningoencephalitis (Figure 2). Neurosurgery performed an urgent craniectomy for endoscopic fenestration of the ventricle and multiple infected cerebral cysts as well as placement of an external ventricular drain (EVD). The patient was continued on ceftazidime and vancomycin until the organism was shown to be susceptible to ampicillin (minimum inhibitory concentration [MIC]= 0.19 ug/mL). He was then switched to and maintained on high-dose IV ampicillin monotherapy for 6 weeks.

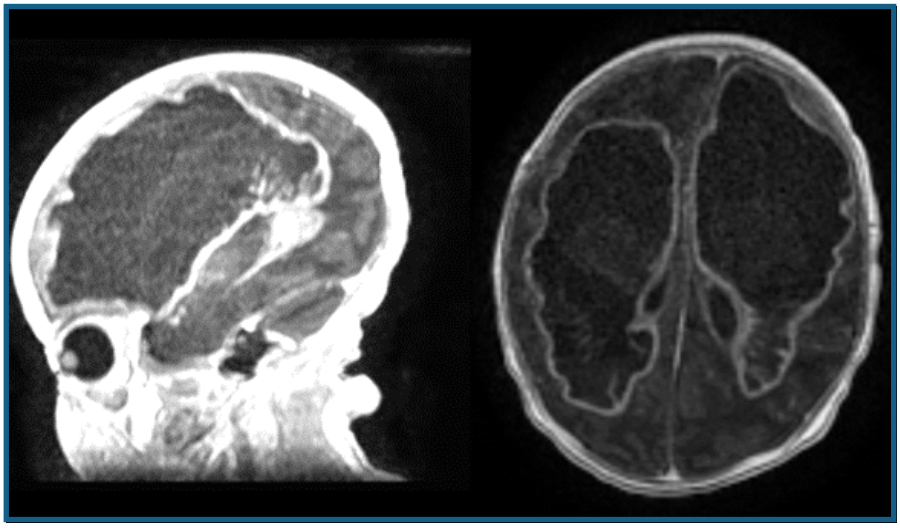

Figure 2
Brain MRI with contrast 10 days after admission: axial and sagittal views showing interval development of necrosis of the white matter bilaterally with peripheral enhancement and a central area showing restricted diffusion. There is enhancement of the meninges and ventricular lining bilaterally.

DISCUSSION

Paenibacillus dendritiformis and related species are rarely reported in the literature as human pathogens. *Paenibacillus polymyxa* has been shown to colonize the intestinal tract of termites, which are a relatively common household pests.[5] While a history of termite infestation in our patient's household was reported after further questioning of the family, we can only propose that the *Paenibacillus* species causing his infection may have originated from the intestinal flora of these pests.

Among the reported cases in the literature, *Paenibacillus* species have been isolated from human wound infections, gingiva, blood, urine, and CSF.[3,6-9] However, in several of these cases the organism was thought to be a contaminant.[3,9] Importantly, an apparent outbreak of *Paenibacillus macerans* was reported in a neonatal intensive care unit in 1999, which was eventually determined to be contaminated blood culture bottles.[10] One case report identified recurrent soft tissue *Paenibacillus* infection in a healthy adult, eventually requiring indefinite therapy with trimethroprim-sulfamethoxazole.[11] There is little consensus on susceptibility interpretation and preferred antibiotic therapy because of limited and anecdotal data on this organism.. Saez-Nieto et al. examined 138 *Paenibacillus* species isolated from human and environmental sources and found that 25% of the isolates represented true infections.[12] Antimicrobial susceptibility testing showed 95.6% of isolates were resistant to ampicillin, 44% were resistant to cotrimoxazole, 20-30% were resistant to cefotaxime and vancomycin and 13% were resistant to rifampicin and erythromycin.[12] Our patient had *Paenibacillus dendritiformis* that was susceptible to ampicillin (MIC= 0.19 ug/mL), gentamicin (MIC= 2 ug/mL), penicillin (MIC < 0.03 ug/mL), rifampin (MIC <= 1 ug/mL) and vancomycin (MIC= 4 ug/mL).

Three reports exist of neonatal sepsis attributed to a *Paenibacillus*. Two of the neonates described had poor neurologic outcome despite adequate antibiotic therapy, and one had a favorable outcome with similar therapy.[2,4,13] All three cases involved neonatal fever and seizures, commonly expected in neonates with meningoencephalitis. Our patient's clinical course was complicated by the need for neurosurgical drainage and EVD placement in addition to antiepileptic therapy. He was discharged home in stable condition following completion of his antibiotic therapy course. Currently, at the age of 21 months, he has not had any recurrent infection or the need for additional neurosurgical intervention. He has significantly delayed language and gross motor development for which he receives physical therapy.

To our knowledge, *Paenibacillus dendritiformis,* as was isolated from our patient's spinal fluid, has not been previously reported in the literature. Pediatric providers should be aware of the potential of serious neonatal infection with this organism, its possible relationship to termites in the patient's environment, and spectrum of outcomes.

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ORIGINAL RESEARCH

Temporal and Environmental Trends in Pediatric Submersion: A Year-round Phenomenon

James F. Buscher, MD[1], Jennifer N. Fishe, MD[2], Phyllis L. Hendry, MD[3], Andrew M. Bertrand, BSH, CPT[4], Andrew C. Schmidt, DO, MPH[5], Haytham Helmi, MD, MPH[6]

[1]Pediatric Emergency Medicine Fellow, Department of Emergency Medicine, University of Florida College of Medicine-Jacksonville, Jacksonville, FL

[2]Assistant Professor of Emergency Medicine, Associate Medical Director, Pediatric Emergency Department, Department of Emergency Medicine, University of Florida College of Medicine-Jacksonville, Jacksonville, FL

[3]Professor of Emergency Medicine and Pediatrics, Associate Chair of Research, Department of Emergency Medicine , University of Florida College of Medicine-Jacksonville, Jacksonville, FL

[4]Department of Emergency Medicine, University of Florida College of Medicine-Jacksonville, Jacksonville, FL

[5]Assistant Professor of Emergency Medicine, Department of Emergency Medicine, University of Florida College of Medicine-Jacksonville, Jacksonville, FL

[6]Assistant Director of Clinical Research, Department of Emergency Medicine, University of Florida College of Medicine-Jacksonville, Jacksonville, FL

ABSTRACT

Submersion is a leading cause of death for those age 14 years and younger in the United States. Our objective was to describe the trends and patient characteristics surrounding pediatric submersions in North Central and Northeast Florida. This study is a sub-analysis of data submitted as part of a multicenter Pediatric Submersion Score Study. We conducted a retrospective chart review of children 0-18 years of age with unintentional submersion injuries. Demographic, prehospital, hospital, and environmental data were abstracted. A total of 183 children were included, with data being analyzed using descriptive statistics. A significant proportion of submersions (19%) occurred during the fall and winter months, accounting for 46% of total deaths. One out of four submersions occurred in an open body of water. Emergency medicine and pediatric providers should be prepared to treat, educate, and advocate regarding pediatric submersion year-round, especially in warmer climates with open bodies of water.

INTRODUCTION

Submersion is the leading cause of death for children age 1-4 years and the second leading cause of death for children age 14 years and younger in the United States (US).[1] Worldwide, it is the third leading cause of unintentional death.[2] Children younger than 5 years of age, especially males, are at greatest risk for submersion injury[3,4] which also has a higher incidence in African Americans and Hispanics.[5] It is estimated that for every submersion death in the US, five additional patients are treated in the Emergency Department (ED) for non-fatal submersion injuries.[6] While the fatality rate has decreased[7], more than 50 percent of submersion injuries seen in the ED require hospitalization.[8]

Although submersions in the US occur year-round, most occur during the summer months.[9] Additionally, submersions occur in a variety of locations. For children 0-4 years old, 50% of fatal and 65% of non-fatal submersions occur in swimming pools.[3] Infant submersions tend to occur in bathtubs or buckets and toddlers in pools[7,10], while those 5 years and older tend to drown in open water areas.[11]

Significant prevention efforts have focused on submersion events, yet it remains a leading cause of morbidity and mortality for the pediatric population. In 2017, the World Health Organization (WHO) published recommendations to decrease submersions worldwide.[12] Those recommendations focus on barriers, safe places away from water to play, teaching children over six years old to swim, bystander intervention, managing flood risks, and safe boating/shipping/ferry regulations. In May 2019, the American Academy of Pediatrics (AAP) updated its policy statement regarding the prevention of submersion injury based on new information and research.[7] The interventions emphasized are 4-sided pool fencing, life jackets, swim lessons, supervision, lifeguards, and other interventions discussed, including bystander CPR.

Despite those efforts, Florida leads the country in submersion deaths of children ages 1-4 years.[13] In addition to the warm climate, Florida is a peninsula and has easy accessibility to water with a total area of 18.5% water within the state.[14] Therefore, we sought to describe submersion injury patterns in Florida to discern if further enhancements to injury prevention efforts should be made to prevent more fatal and non-fatal submersion injuries.

METHODS

Study Design

This study is a sub-analysis of a retrospective multicenter study from the Pediatric Emergency Medicine Collaborative Research Committee (PEM CRC). Permission for the sub-analysis was granted by the principle investigator of the PEM CRC multicenter study. Children aged 0-18 years who presented to the pediatric EDs of two hospitals in North Central and North Eastern Florida following an unintentional submersion event between the years 2010 to 2017 were included.

Study Setting

Jacksonville has a population of approximately 900,000 persons, with 31% being African American and 15.9% of the population living in poverty.[15] The national poverty level[16] is 10.5%. The academic hospital ED treats 15,000 pediatric patients annually and patients requiring critical care are transferred to a local children's hospital. Gainesville has a population of 133,857 persons, with 21.4% African Americans and 31.4% living in poverty.[17] The academic hospital ED treats 25,000 pediatric patients annually and has a 24-bed pediatric ICU with advanced care capabilities, including ECMO.

Data Abstraction and Statistical Analysis

Pediatric victims of unintentional submersions were identified from hospital medical records using ICD-9 and ICD-10 codes. Patients were excluded if the submersion was intentional or was secondary to an act that led to submersion (e.g., motor vehicle crash). Prehospital, scene submersion characteristics, and hospital data were abstracted through manual chart review. Both the multicenter study and sub-analysis were approved by the University of Florida Institutional Review Board.

Study data were collected and managed using REDCap™ (Research Electronic Data Capture) electronic data capture tools hosted at University of Florida. REDCap™ is a secure, web-based application designed to support data capture for research studies. Descriptive statistics were used to describe data that was normally and non-normally distributed, respectively.

Patient and Public Involvement

It was not appropriate or possible to involve patients or the public in the design, conduct, reporting, or dissemination plans of our research

RESULTS

A total of 342 charts were obtained. After review, 35 were the incorrect year, 120 were not submersions, 1 was trauma, 3 were duplicate records; 183 encounters were included (Figure 1).

Table 1 describes patient characteristics and demographics. Patients were mostly male (62%) and children younger than four years of age comprised 69% of the total encounters. Most injuries, (77%) occurred in pools or bathtubs. A total of 71% of the patients were admitted. Surprisingly, 41.5% of patients received CPR prior to hospital arrival, with 58% reported to have received some bystander resuscitative support (e.g., abdominal thrusts, back blows, rescue breaths, chest compressions). A total of 13 deaths were recorded, with ten occurring in children age four years and younger.

In all children, more than 60% were ages 1-2 years, and 71% were admitted to the hospital. Sixty-seven percent of those admitted were injured in a pool with 20% occurring in open bodies of water. Only one death occurred in an open body of water. Interestingly, more than 85% reported being supervised, but less than 35% witnessed the submersion. For the children age five years and older, 65% occurred in pools and 13% in bathtub.

Table 2 describes the patient characteristics for events occurring in open bodies of water and shows a total of 39 submersions occurred in open bodies of water (free-flowing water, river, stream, ocean, lake, etc.), of those, 82% of these children were admitted to the hospital, and almost 64% occurred in children four years and younger.

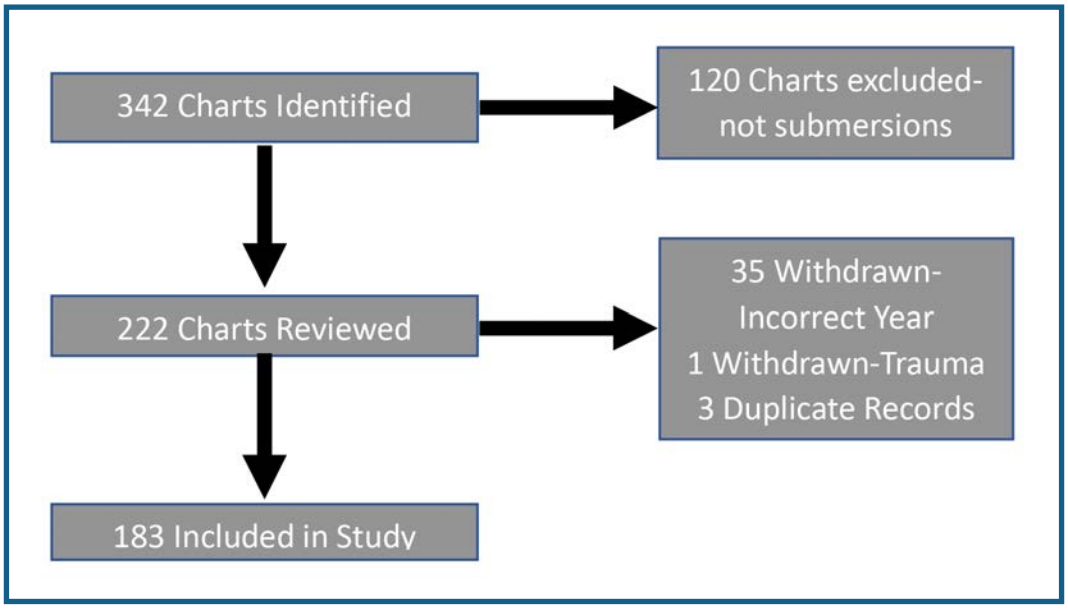

Figure 1: Submersion data flowsheet

DISCUSSION

This study provides a regional description regarding pediatric submersion injuries in Florida. We observed similarities and differences compared with previously published national data regarding pediatric submersion injury. As with prior studies, our data demonstrates a male predominance and children aged four years and younger continue to have the highest incidence. Of that age group, pools/hot tubs remain the most likely location for the submersion to occur. However, we did not further subdivide the data to assess for event locations for those younger than 4 years of age. Based on our findings, one out of every five submersions occurred in an open body of water. Unlike previous research, we found a high rate of open bodies of water submersions in children aged four and younger.

Even with submersion injuries decreasing across the United States, the number of children hospitalized remains highest in the West and South.[18] While some studies report that more than half of submersion injuries evaluated in the emergency department (ED) require hospitalization[19], our patient population had a higher rate of admission at 71% as well as a high rate of CPR before arrival (41.5%). When compared to other states, the death rate per 100,000 people for pediatric submersions in Florida is above the national average. In addition, many other coastal states have higher than average rates such as North Carolina and South Carolina, while many midwestern states, such as Nebraska and Minnesota are below the average.[20]

Although severity is a cause for hospitalization, factors related to poverty have been previously noted by organizations such as the AAP.[7] In addition, 90% of worldwide submersions occur in middle to low-income countries.[9] That increased rate of admission for our patients may have been based on the severity of illness or patient demographics. Other factors may have played a role such as lack of a medical home, decreased knowledge regarding water safety, decreased supervision (access to lifeguards), or even bystander knowledge of CPR. Another factor that may have led to a higher proportion of admission is the need to transfer children evaluated in community emergency departments to UF Gainesville tertiary care center for a higher level of care.

Public vigilance for submersion prevention is usually highest during spring and summer months, as are prevention campaigns. However, we found that one out of every five submersions occurred during the fall and winter seasons. Additionally, parents report that submersion injury information is useful and are able to recall the information.[21] Recent literature has emphasized the

		TIME OF YEAR			
	Total N=183	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec
	N (%)	N (%)	N (%)	N (%)	N (%)
DEMOGRAPHICS					
GENDER					
Male	113 (62%)	17 (9%)	48 (26%)	40 (22%)	8 (4%)
Female	70 (38%)	5 (3%)	31 (17%)	30 (16%)	4 (2%)
Age					
< 1 year	11 (6%)	3 (2%)	5 (3%)	3 (2%)	0 (0%)
1-4 years	116 (63%)	14 (8%)	49 (27%)	43 (23%)	10 (5%)
5-12 years	42 (23%)	3 (2%)	21 (11%)	17 (9%)	1 (1%)
13 – 17 years	14 (8%)	2 (1%)	4 (2%)	7 (4%)	1 (1%)
RACE					
White	110 (59%)	15 (8%)	43 (23%)	42 (23%)	10 (5%)
Black	53 (28%)	4 (2%)	29 (16%)	18 (9%)	2 (1%)
Asian	3 (2%)	0 (0%)	1 (1%)	2 (1%)	0 (0%)
Other	7 (4%)	0 (0%)	2 (1%)	5 (3%)	0 (0%)
Unknown	10 (7%)	3 (2%)	4 (2%)	3 (2%)	0 (0%)
DISPOSITION					
ADMIT					
Yes	130 (71%)	16 (9%)	56 (31%)	48 (26%)	10 (5%)
No	53 (29%)	6 (3%)	23 (13%)	22 (12%)	2 (1%)
Deaths					
< 1 year	1 (1%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)
1-4 years	9 (5%)	2 (1%)	2 (1%)	5 (3%)	0 (0%)
5-12 years	1 (1%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
13 – 17 years	2 (1%)	1 (1%)	1 (1%)	0 (0%)	0 (0%)
WATER TYPE					
Swimming Pool	123 (67%)	10 (5%)	57 (31%)	51 (28%)	5 (3%)
Bathtub	18 (10%)	6 (3%)	2 (1%)	6 (3%)	4 (2%)
Hot tub/Jacuzzi	1 (1%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
Open body of water	36 (20%)	6 (3%)	17 (9%)	10 (5%)	3 (2%)
Free flowing/river/stream/bayou	3 (2%)	0 (0%)	1 (1%)	2 (1%)	0 (0%)
Other/Blank	2 (1%)	0 (0%)	1 (1%)	1 (1%)	0 (0%)

Table 1: Patient demographic and epidemiological characteristics

OPEN WATER SUBMERSIONS					
	N (%)	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec
GENDER					
Male	27 (69%)	4	11	9	3
Female	12 (31%)	2	7	3	0
Age					
< 1 year	0 (0%)	0	0	0	0
1-4 years	25 (64%)	5	10	8	2
5-12 years	6 (15%)	0	4	2	0
13 – 17 years	8 (21%)	1	4	2	1
RACE					
White	27 (69%)	6	11	7	3
Black	8 (20%)	0	3	5	0
Asian	0 (0%)	0	0	0	0
Other	1 (1%)	0	1	0	0
Unknown	3 (1%)	0	3	0	0
Admit					
Yes	32 (82%)	5	14	10	3
No	7 (18%)	1	4	1	1
DEATHS					
< 1 year	0 (0%)	0	0	0	0
1-4 years	1 (1%)	1	0	0	0
5-12 years	1 (1%)	0	1	0	0
13 – 17 years	2 (1%)	1	1	0	0
WATER TYPE					
Open body of water	36 (92%)	6	17	11	2
Free flowing/river/stream/bayou	3 (8%)	0	1	2	0

Table 2: Patient characteristics for open bodies of water submersions

regional nature of open water submersions as well as the associated decrease in submersions with an increase in regulations.[6,11] Given the high number of our occurrences in open bodies of water, further regulations could be encouraged.

Limitations

This study has limitations that merit consideration. First, this was a retrospective chart review of patients admitted to two health care systems in Florida, and results may not be generalizable to all regions. Information provided by emergency medical services and the electronic medical record may be limited or have variability in recorded history. Finally, the data do not account for patients that were pronounced deceased in the field did not obtain medical care at our institutions.

CONCLUSION

Submersion prevention is emphasized during summer, yet this study found nearly one-quarter of submersions occurred in fall and winter. We also found a significant number of submersions in open bodies of water. Submersion injury prevention legislation and advocacy should adapt to year-round guidance and more specific preventative measures regarding open bodies of water, while medical providers should also be prepared to educate and treat patients for these injuries year-round. In addition, further research should be performed looking into pediatric submersions including the socioeconomic factors related to the rates of submersions and need for admission.

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RESIDENT ARTICLE

Telemedicine Surge in the Midst of the COVID-19 Pandemic: Residents' Perspectives on Incorporating Telemedicine Training

Krina Amin, DO[1], Rita Tatiana Abi Younes, MD[2], Avni Bhatt, PhD[3], Lindsay A. Thompson, MD, MS[4], Nicole Paradise Black, MD, Med[5], Melissa Fitzgerald, MD[6]

[1]Resident Physician, Department of Pediatrics, College of Medicine, University of Florida
[2]Pediatric Critical Care Fellow, Department of Pediatric Critical Care, Mass General Hospital for Children
[3]Clinical Research Coordinator, Department of Pediatrics, College of Medicine, University of Florida
[4]Professor of Pediatrics, Department of Pediatrics, College of Medicine, University of Florida
[5]Professor of Pediatrics, Pediatric Residency Program Director, Department of Pediatrics, College of Medicine, University of Florida
[6]Professor of Pediatrics, Department of Pediatrics, College of Medicine, University of Florida

SETTING AND PROBLEM

The development of community spread SARS-CoV-2, the virus known to cause COVID-19, poses health risks to our patients and healthcare workers, including residents and fellows, herein referred to as "trainees." A sustainable method is needed to continue providing patient care and maintaining trainee education while reducing risk of exposure to the virus.

Telemedicine is a useful and now commonplace technology for the delivery of healthcare in the pediatric setting and is an important resource in the response to emergencies, such as the COVID-19 pandemic.[1,2] The pandemic catalyzed the implementation of telemedicine at University of Florida (UF) Health to address the issue of continuing patient care and reducing viral exposure, the daily count of telemedicine visits increased from approximately 20 per day to more than 1,000 per day between March 23 and April 16, 2020. Although telemedicine was not previously incorporated in our trainee education, we hypothesized trainees would quickly learn to conduct virtual encounters and perform them effectively in response to the pandemic.

INTERVENTION

In a single, large pediatric department, a system was developed to rapidly implement telemedicine visits into our trainees' clinics. This involved enabling the appropriate technology at clinic sites, setting up algorithms for patient scheduling, and ensuring that all trainees were registered for our telemedicine platform. Trainees helped develop and disseminate PDF and video guides on conducting visits, appropriate "screen-side manner," best practices, documentation, and billing. Approximately one month after the implementation of telemedicine encounters, an online and Institutional Review Board (IRB) approved survey of pediatric trainees was conducted to assess their experiences with telemedicine encounters and attitudes towards incorporating telemedicine into trainee education.

OUTCOMES TO DATE

A review of our aggregate pediatric visits from March 23 to April 23, 2020, showed 19% of visits were performed through telemedicine. Of the total 88 pediatric trainees, 51 (58%) responded to the pediatric trainee experience survey from April 30 to May 2, 2020, (41 residents and 10 fellows responded; Table 1) A total of 77% of respondents had not performed a telemedicine visit prior to March 23, 2020, but 78% had performed at least one visit since its onset. Of those who had performed telemedicine (Table 2), only 40% agreed or strongly agreed that they received adequate telemedicine training. Moreover, 75% stated that they see themselves incorporating telemedicine into their future and 75% agreed that telemedicine was an effective use of their clinical time. Of the respondents who had not performed telemedicine to date, all agreed or strongly agreed they would be interested in observing or participating in telemedicine visits in the future. Furthermore, 82% of respondents indicated that telemedicine usually or always allowed them to provide effective patient care and 77% stated that they usually or always received positive feedback from patients/families at the end of the encounter. Lastly, 85% of those who had performed telemedicine and 80% of respondents who had not performed telemedicine agreed or strongly agreed that a formal telemedicine curriculum for trainees would be beneficial.

DISCUSSION

Given the rapid adoption of telemedicine at our institution as telemedicine laws and policies shifted in response to the COVID-19 pandemic, we anticipate a permanent presence of telemedicine in pediatrics in the future. Thus, telemedicine should be included in pediatric trainee education to prepare for independent clinical practice. Our survey of pediatric trainees indicates significant interest in a formalized telemedicine curriculum, and a largely positive reception of telemedicine as a clinical modality by both trainees and patients. Resident respondents largely felt that more telemedicine education was needed and desired. We plan to develop, implement, and evaluate a formal telemedicine curriculum for pediatric trainees in order to provide comprehensive and standardized education on this method of healthcare delivery.

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LEVEL OF TRAINING	PGY-1	PGY-2	PGY-3	Fellow	Total	
Respondents / # of trainees per level of training	13/18 (72.2%)	16/18 (88.9%)	12/16 (75%)	10/36 (27.7%)	51/88 (58%)	
PREVIOUS PARTICIPATION IN TELEMEDICINE	Yes	No				
	40 (80%)	10 (20%)				
TELEMEDICINE SETTINGS	Before COVID	After COVID				
Acute Clinic	0	8 (100%)				
After Hours Clinic	0	6 (100%)				
Continuity Clinic	1 (2.9%)	33 (97.1%)				
Subspectialty Clinic	2 (11.2%)	15 (88.2%)				
In Patient Setting	0	7 (100%)				
Other	3 (75%)	1 (25%)				
NUMBER OF TELEMEDICINE ENCOUNTERS DURING TRAINING	None	1 - 5	6 - 10	11 - 15	16 - 20	20 +
Before COVID	26 (78.8%)	7 (21.2%)	0	0	0	0
After COVID	0	16 (41%)	4 (10.3%)	2 (5.1%)	3 (7.7%)	14 (35.9%)

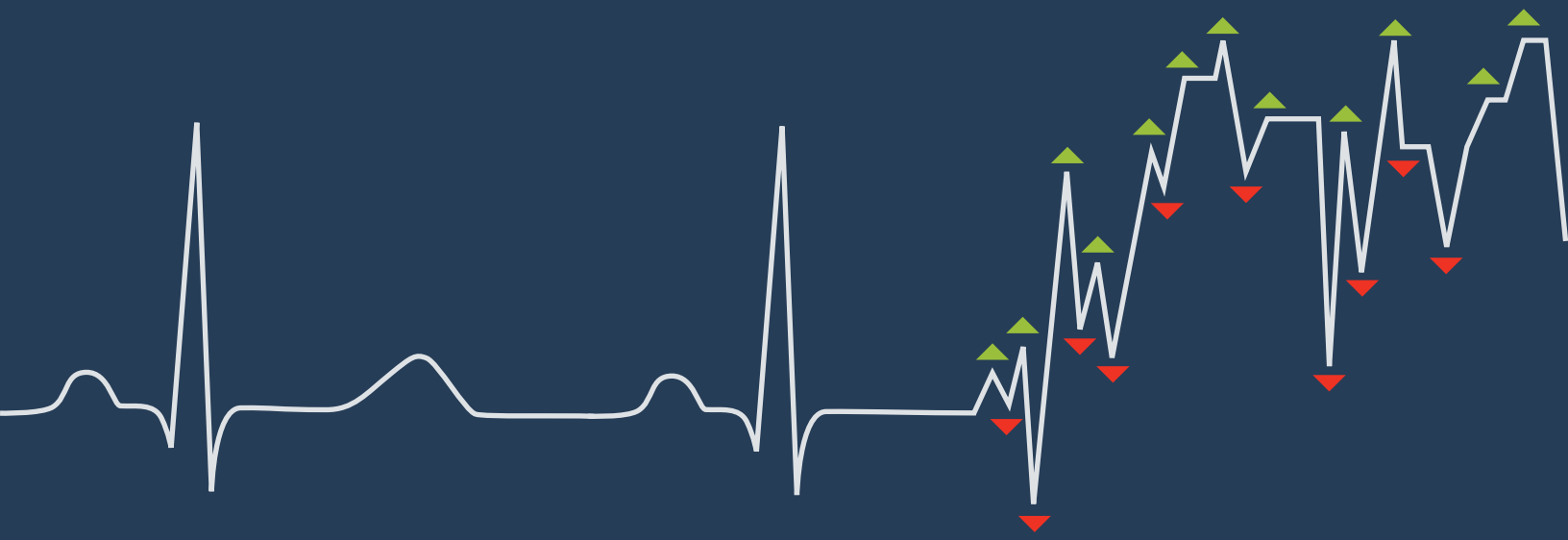
Table 1: Demographics and Responses of Resident Survey Participants

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I received adequate training/education when I began performing telemedicine visits.	3 (7.5%)	9 (22.5%)	12 (30%)	13 (32.5%)	3 (7.5%)
I received adequate guidance (e.g., troubleshooting) when I began performing telemedicine visits.	1 (2.5%)	3 (7.5%)	14 (35%)	18 (45%)	4 (10%)
The technology involved in telemedicine enhanced my learning experience.	3 (7.5%)	3 (7.5%)	9 (22.5%)	17 (42.5%)	8 (20%)
Incorporating telemedicine visits into my clinical practice was a seamless experience.	1 (2.5%)	8 (20%)	9 (22.5%)	20 (50%)	2 (5%)
I feel comfortable using telemedicine without direct supervision (ie. supervisor attended telemedicine visit with you).	0	2 (5%)	1 (2.5%)	24 (60%)	13 (32.5%)
I feel confident training others on the use of telemedicine.	0	7 (17.5%)	9 (22.5%)	14 (35%)	10 (25%)
I see myself incorporating telemedicine into my future clinical practice.	1 (2.5%)	2 (5%)	7 (17.5%)	16 (40%)	14 (35%)
A formal telemedicine curriculum for pediatric trainees would be beneficial. (respondents are trainees who performed at least 1 telemedicine encounter to date)	0	1 (2.5%)	5 (12.5%)	17 (42.5%)	17 (42.5%)
A formal telemedicine curriculum for pediatric trainees would be beneficial. (respondents are trainees who have not performed a telemedicine encounter to date)	0	0	2 (20%)	5 (50%)	3 (30%)
Evaluation of Telemedicine	Never	Seldom	About Half the Time	Usually	Always
Participating in telemedicine encounters was an effective use of my clinical training time.	0	6 (15%)	4 (10%)	16 (40%)	14 (35%)
The supervision I received with the telemedicine visits was similar to supervision on in-person visits.	0	4 (10%)	4 (10%)	14 (35%)	18 (45%)
Telemedicine allowed me to provide effective patient care.	1 (2.5%)	2 (5%)	4 (10%)	23 (57.5%)	10 (25%)
The technology used during telemedicine visits worked well.	0	0	5 (12.5%)	26 (65%)	9 (22.5%)
I have received positive feedback from patients/ families at the end of my telemedicine visit.	1 (2.6%)	5 (12.8%)	3 (7.7%)	19 (48.7%)	11 (28.2%)

Table 2: Trainee Satisfaction with Telemedicine

WHOSE INTERESTS

does your malpractice insurer have at heart?



Yet another of Florida's medical liability insurers has transitioned from focusing on doctors to focusing on Wall Street. This leaves you with an important question to ask: Do you want an insurer that's driven by investors? Or do you want an insurer that's driven to serve you—one that's already paid $120 million in awards to its members when they retire from the practice of medicine?

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