New York American College of Emergency Physicians

Empire State EPIC

VOL 38-04:21

EMERGENCY PHYSICIANS' INTERIM COMMUNIQUE

Barclays Center Recognizes New York ACEP Emergency Physicians

Barclays Center honors New York ACEP emergency physicians who have shown the world what it means to be "New York Tough".

New York ACEP leaders, Kurien Mathews, DO, Erik Blutinger, MD, Nicole Berwald, MD FACEP and Laura Melville, MD MS (pictured below) represented New York ACEP at Friday's Brooklyn Nets game.

PRESIDENT'S MESSAGE

Keith E. Grams, MD FACEP
Chair, Emergency Medicine
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Time for a Field Trip

It has been quite some time since elementary school and I can only remember a few lessons that far back. Of those few lessons, most are from the school's big field trip - essentially a fifth-grade tradition. Pretty impressive that something that long ago can still be recalled (even more so with my limited faculties). There really is something special about an immersive learning environment which really imprints the subject matter for future recall. What I thought was just a great excuse to get out of school, was just an ingenious way to create a unique vantage point and drive home the lesson.

We are now finally getting through the latter stages of this pandemic (fingers crossed), with the ability to move onto the next challenge. In our region, we are dealing with a slow return to volume mixed with an "interesting" hospital financial situation. This past year's decreased revenue, increased supply costs outside our control and decreased staffing levels are creating a perfect storm. One that we weather, continuing to advocate for needed resources to care for our patients. If you are anything like us, sprinkle in some nearly crippling hospital capacity issues and it gets really fun.

Our hospital administration teams work hard and I do not envy their position as they try to balance it all. Though it is nearly impossible to understand the full situation reviewing spreadsheets and emails. Perhaps it is time to update our meeting format. It might be good to build on the field trip framework, getting folks out of their virtual offices and back into the departments to directly observe our new norms. This may create that immersive experience where we can highlight challenges, celebrate our teams, more accurately display concerns and demonstrate what is faced daily.

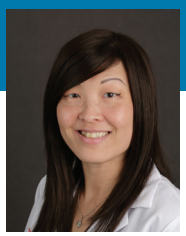
Might I suggest that our next finance review or operational meeting take place in the middle of the emergency department. This would require a quick trip past all the patients in our rooms, hallways, outhouses, doghouses, henhouses, etc. I would suggest that navigational challenge - just for a basic meeting - might impress and provide a picture of what we are trying to do with the available resources. Along with the added benefit in visibility to our team, actively demonstrating the hospital's support behind them. Many are fatigued and need a bit more encouragement as we move forward.

It might be good to build on the field trip framework, getting folks out of their virtual offices and back into the departments to directly observe our new norms. This may create that immersive experience where we can highlight challenges, clebrsate our teams, more accuratley display concerns and demonstrate what is faced daily.

It's time for a reminder.
It's time for immersive learning experience.
It's time for a field trip.

WHAT'S INSIDE

SOUND ROUNDS



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Atraumatic Left Hip Pain

Case Presentation

A 14-year-old male with past medical history of hemophilia B presented to the Emergency Department (ED) with three days of atraumatic left hip pain and a limp. The patient receives weekly infusions of factor IX and has not missed any doses; his last dose being the day prior to presentation. The pain awoke him from sleep. He described the pain as sharp and radiating to his mid-anterior thigh, exacerbated by walking or leg movement. He tried multiple home remedies, including ice, heat and acetaminophen without relief. His hematologist directed the patient to the ED for evaluation. Upon arrival, the patient's vital signs were BP 121/76, HR 156 bpm, RR 20 BR/min, T 37.7 C and O2 98%. He appeared uncomfortable. Physical exam revealed tenderness over the left hip joint, without deformity, swelling or erythema. The patient held his left leg in flexion, with pain on passive extension.

Differential diagnosis included legg-calve-perthes, slipped capital femoral epiphysis, septic arthritis, fracture, transient synovitis and psoas abscess. Due to the patient's history of hemophilia B, psoas hematoma versus hemarthrosis were higher on the differential. Bloodwork was obtained. Bedside point-of-care ultrasound (POCUS) was performed which revealed a fluid collection within the psoas muscle with an echotexture consistent with hematoma (Figures 1 and 2). Hematology was consulted and recommended repletion of factor IX. The patient's pain was treated with morphine 2mg.

A radiology performed ultrasound confirmed a complex mass consistent with hematoma overlying the left hip, measuring 8.5 x 5.7 x 3.7 cm. No hip effusion was seen. Blood work consisted of WBC 15.7, hemoglobin 14, platelets 423, neutrophils 69.2%, PT 13.5, INR 1.05 and APTT 47.3.

The patient's ED course was complicated by a fever of 38.1 C, persistent tachycardia and oxygen requirement of 2L O2 via nasal cannula. There was concern for sepsis in the setting of tachycardia, leukocytosis, with the psoas abscess as the source. Blood cultures were obtained and ceftriaxone and flagyl were initiated to cover for intra-abdominal organisms. CT abdomen pelvis with IV contrast was obtained which revealed probable hematoma in the iliopsoas and iliacus muscle without definitive evidence of abscess.

The patient was admitted for factor IX repletion, monitoring and strict bed rest. Blood cultures were negative and antibiotics were discontinued. The patient's heart rate improved with pain control and resolution of the fever. Repeat ultrasound demonstrated a resolving hematoma and the patient was discharged on factor IX BID, wheelchair and walker, with physical therapy.

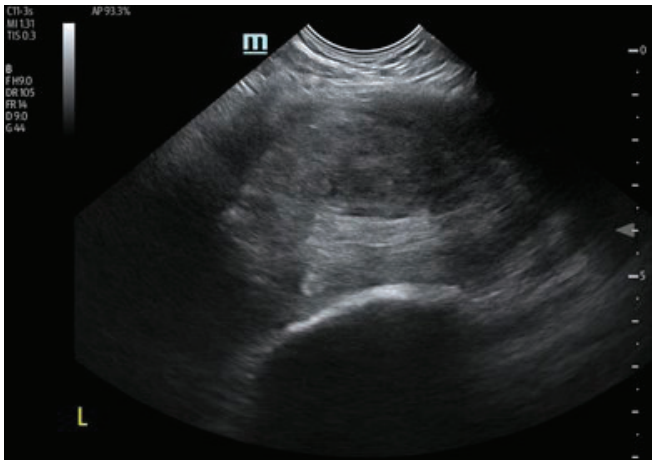

Figure 1. Ultrasound image with curvilinear transducer of a sagittal view of the left psoas hematoma.

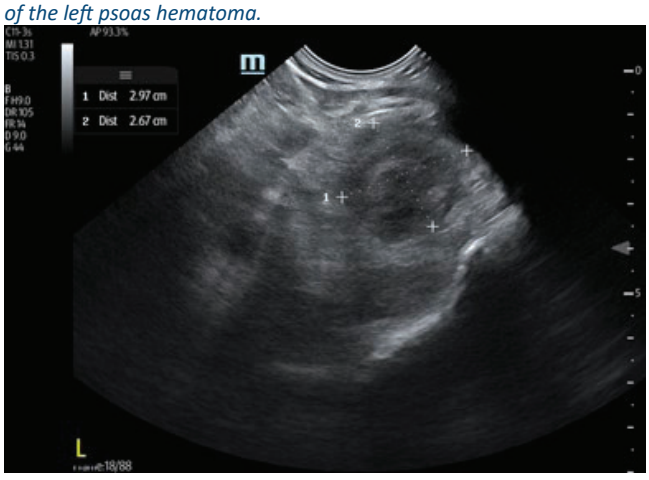

Figure 2. Ultrasound image of a transverse view of the left psoas hematoma.

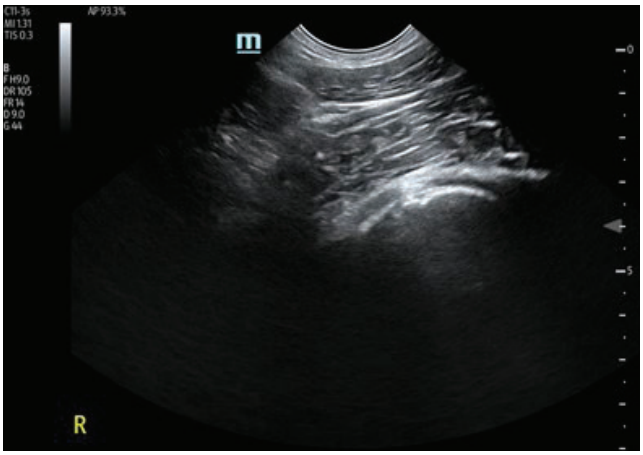

Figure 3. Ultrasound image with curvilinear transducer of a normal psoas muscle, with hyperechoic striations, overlying the right iliac crest (yellow arrows).

Discussion

Hemophilia A and B are hereditary disorders due to the deficiency or dysfunction of coagulation factors VIII and IX, respectively.[1] The prevalence of hemophilia A and B is 1 in 5-10,000 males and 1 in 25-30,000 females respectively.[6] The annual incidence of a psoas hematoma is estimated at 2.9/1,000 patients with moderate or severe hemophilia A.[2] Hemophilia is classified as severe, moderate or mild. Patients with a coagulation factor level less than 1% are classified as severe.[1] The risk of hemorrhage depends on both the severity of the disease and the patient's activity. In severe hemophilia, spontaneous muscle hemorrhage may occur. Prophylactic factor replacement therapy can help to decrease the occurrence of bleeding by replenishing the deficient factors. Prophylaxis is long term and requires weekly infusions. During a hemorrhagic episode, treatment replaces the clotting factors at the time of bleeding in order to diminish the morbidity and mortality.

While rare, psoas hematomas account for 10-25% of all bleeding complications in patients with severe hemophilia.[3] Complications can range from life threatening bleed, femoral nerve compression, myositis ossificans, pseudotumor formation, flexion contractures of the hip and lumbar lordosis. Prompt diagnosis is key in order to emergently replete the deficient clotting factors. POCUS is a rapid, readily available, excellent modality to expedite the diagnosis at the bedside without ionizing radiation. Early POCUS integration may expedite the lifesaving intervention of clotting factor repletion as well as decrease complications in this special patient population.

Discussion of Technique

- Place a curvilinear or phased array transducer in the midaxillary line at the level of the xiphoid process with the marker pointing longitudinally towards the patient's head. Consider rotating the probe slightly oblique, parallel to the ribs, to decrease artifact from the rib shadow.[7]
- The normal psoas muscle has hyperechoic striations on a hypoechoic background between the kidney and the vertebral column (Figure 3).[4]
- Continue to scan down the muscle towards the iliac crest.
- Hematoma can appear as a heterogenous echo-textured area on top of or within the muscular linear striations (Figures 1 and 2).

Acknowledgements

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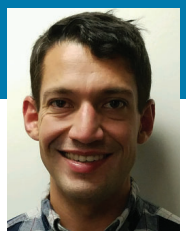

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A Case of Facial Swelling in a 10-Year-Old Child

A 10-year-old girl with a history of atopic dermatitis, hyper-IgE syndrome, and recurrent MRSA skin infections was referred to our pediatric emergency department by her dermatologist who was evaluating her for recurrent facial swelling. The dermatologist was concerned about Gleich syndrome, a rare disease characterized by recurrent, self-limited angioedema. Prior to the patient's arrival we prepared by learning more about this unusual syndrome and placing orders for a multitude of tests requested by our dermatology and immunology colleagues. We were intrigued and excited to see a patient with an unfamiliar and unusual diagnosis and focused on the appropriate work-up.

When the patient arrived, mom reported the patient had a two-month history of episodic swelling initially limited to the face but now involving her abdomen and arms. The child had been evaluated on three separate occasions by outpatient dermatology and urgent care providers for identical episodes. Each time, she was diagnosed with an allergic reaction and treated with steroids and diphenhydramine with prompt improvement in her symptoms only to relapse several days after completion. On this occasion, symptoms had been progressively worsening in the three days prior to this visit prompting the dermatology visit. She had no history of recent febrile illnesses and denied cough, dyspnea, chest pain, nausea, vomiting, diarrhea or abdominal pain.

On physical examination, the patient appeared comfortable, in no acute distress. Her vital signs were notable for elevated blood pressure (127/80 mmHg), heart rate 104 bpm, respiratory rate 20/min, temperature 35.8°C, and oxygen saturation 99%. She had significant periorbital edema and injected conjunctivae. There was no swelling of her tongue, lips or oropharynx and no stridor or evidence of airway compromise. Her lungs were clear to auscultation; heart sounds normal without murmur. She had 2+ pitting edema of her bilateral lower extremities and a tense, distended, non-tender abdomen without organomegaly. After obtaining this additional history and completing our exam, we broadened our differential diagnosis and altered our diagnostic approach.

Facial swelling is a common chief complaint in the pediatric population presenting to the emergency department with a number of causes encompassing many organ systems (Table 1). Children presenting with facial swelling should be promptly evaluated as several life-threatening causes of facial swelling require immediate intervention. In the absence of need for resuscitation, a thorough history and careful physical examination will often make the diagnosis apparent or at least narrow the differential diagnosis considerably. When considering the differential diagnosis for facial swelling, one of the first distinctions to make is whether edema is truly limited to the face or represents a component of a generalized process.

Localized Swelling/Edema

Localized swelling or edema has a very broad differential diagnosis, particularly in children. Common etiologies include infections, trauma, allergic/immunologic responses and environmental hazards. Less common causes include benign and malignant masses, congenital malformations and venous obstruction (e.g. superior vena cava syndrome)[1-3]. A case of traumatic swelling is often apparent from the history and examination. Similarly, infectious swelling is likely to present with the cardinal signs of erythema, warmth, swelling and pain as well as secondary signs such as fever. A thorough history might also suggest an odontogenic or sinus infection which often present with localized facial swelling overlying the affected area. A history of exposure to environmental hazards such as botanical irritants or a recent insect sting/bite should be obtained. Conditions that cause bilateral facial swelling are less common but include midface infections, bilateral parotitis and local allergic reaction/contact dermatitis.

The most critical cause of localized swelling that must be promptly recognized is angioedema due to the potential for acute airway obstruction. Angioedema can be classified as acquired or hereditary. Acquired angioedema is typically the consequence of a type 1 hypersensitivity reaction mediated by vasoactive substances (substance P, bradykinin, histamine) with inflammation and endothelial permeability resulting in swelling at the level of the dermis and subcutaneous tissue. Angioedema is commonly attributed to medications such as ACE inhibitors which are less frequently used in children. Hereditary angioedema is the result of an inherited or acquired deficiency or dysfunction of C1 esterase inhibitor. Angioedema may be further divided into histamine- and bradykinin-mediated.[1,4] The classic presentation of angioedema is asymmetric swelling of the face, lips, mouth, larynx, uvula and potentially the extremities, genitalia and bowel wall occurring over the course of minutes to hours. Due to similar mechanisms, there may be some overlap with symptoms of allergic reaction. Diagnosis is based on typical clinical features and management is primarily supportive with intravenous fluids, analgesics and a low threshold for definitive airway placement in addition to the relevant targeted interventions based on type.[1,4,5]

As mentioned in our patient's vignette, part

of our discussion with her outpatient dermatologist raised concern for Gleich Syndrome, a rare syndrome initially described by Gleich et al., in 1984 as "recurrent episodic, non-allergic, angioedema, urticaria, fever, weight gain, and eosinophilia." A diagnosis of this syndrome may be suspected in a patient with recurrent episodes of facial/limb swelling with predominant eosinophilia, though may only be made upon exclusion of other causes of both angioedema and eosinophilia. Based on the relatively few cases which have been described, patients with Gleich syndrome respond particularly well to steroids and appear to have a very favorable prognosis.[6]

Similar to angioedema, allergic or anaphylactic reactions may present with predominant cutaneous symptoms including swelling. History may reveal exposure to a known or potential allergen and physical exam should be conducted with attention to patient's airway and circulatory status as in the case of anaphylaxis. The mainstay of treatment is epinephrine, corticosteroids, and antihistamines.[1,2,5]

Generalized Edema

There are fewer causes of generalized edema in children. They include nephrotic syndrome, protein losing enteropathy, heart failure, liver disease, generalized allergic reaction and medications. Once again, the history and physical exam will often reveal a likely diagnosis which can be confirmed with targeted diagnostic testing available in the emergency department. A history of facial swelling which is worse upon awakening and improves throughout the day is suggestive of dependent edema. In some cases, improvement in facial swelling may be attributed to antihistamines or other local treatments administered for suspected allergic swelling, neglecting the fact that dependent edema around the eyes will appear to improve as it is redistributed with position change. This highlights the importance of differentiating localized from generalized edema which may be challenging in children. Careful examination with attention to the eyes, scrotum or labia, and distal extremities is very important as edema in children is often subtle and these may be the only areas where edema can be appreciated.

The most common cause of generalized edema in children is nephrotic syndrome. The nephrotic syndrome describes the clinical manifestation of a variety of disease processes of the glomerulus which may be primary, secondary or congenital. The diagnosis of nephrotic syndrome relies on the recognition of its key clinical and laboratory features. The most common presenting symptom is edema including periorbital edema which may mimic allergic reaction or angioedema, though typically gravity-dependent edema is present as well. These children may also present with abdominal ascites, pleural effusions or pulmonary edema as additional signs of third-spacing of fluid. Typical laboratory manifestations include hypoproteinemia, hyperlipidemia, and massive proteinuria (defined at > 50 mg/kg/day). There are a number of potential complications of nephrotic syndrome including infection, thrombosis (due to urinary loss of immunoglobulins and coagulation factors, respectively) and hypovolemia which underline the importance of its recognition in the emergency department.[1,2,7,8]

A child with protein losing enteropathy (PLE) would be expected to present similarly to those with nephrotic syndrome due to loss of protein through the gastrointestinal tract. PLE is a secondary condition and can be divided into two categories – loss of protein-rich lymph (i.e. intestinal lymphangiectasia) or damage to intestinal mucosa leading to excess protein loss (e.g. milk protein allergy, eosinophilic gastroenteritis, celiac disease, giardiasis, shigellosis, Ménétrier's disease, IBD, etc.). Clinical findings in PLE would include generalized pitting edema, hypoalbuminemia in the absence of proteinuria, in addition to findings characteristic of the primary disease. The screening test of choice is stool testing for alpha-1 antitrypsin.[9,10] Similarly, patients with protein malnutrition (i.e. Kwashiorkor) may present with dependent edema with cranial progression. These children would also present with a multitude of additional symptoms related to malnutrition.

Acute heart failure may also manifest as generalized edema. In children, this is most often related to congenital heart disease resulting in a syndrome of acute heart failure though additional consideration is given to pericarditis, myocarditis and cardiomyopathy. In contrast to the adult with heart failure, the clinical presentation of a child may be subtle. Findings may include fatigue, tachypnea, wheezing, cough or tachycardia. Also, in contrast to adults, rather than peripheral edema, children will more commonly present with organomegaly.[2,11]

Returning to Our Case

Once we established the patient had generalized edema, apparently improving after steroids, our leading diagnosis was nephrotic syndrome. We performed a point of care urine dipstick which showed 4+ protein. A bedside ultrasound revealed small bilateral pleural effusions and free fluid in the abdomen. Laboratory studies were remarkable for a normal CBC including normal absolute eosinophil count. Serum chemistry demonstrated hypoproteinemia and hypoalbuminemia (3.5/1.3 g/L), respectively), hypertriglyceridemia, marginally elevated serum creatinine of 0.69 mg/dL, otherwise unremarkable electrolytes (Sodium 140 mg/dL). It was clear at this point her gross hypervolemia was secondary to a nephrotic syndrome rather than an allergic or immunologic process as had been suspected. She was admitted to the pediatric nephrology service and started on prednisolone and a low sodium/fluid restricted diet. She had precipitous improvement of her edema and an uncomplicated hospital course.

For the emergency physician, the recognition and diagnosis of nephrotic syndrome is probably as important as its acute management. Once recognized, the first goal of treatment should be to manage volume status and electrolyte abnormalities. Despite the appearance of gross hypervolemia, patients with nephrotic syndrome may have considerable intravascular volume depletion. For mild to moderate dehydration, small oral aliquots of sodium-deficient solutions are appropriate. Hypervolemia may not respond to loop diuretics in the setting of severe hypoalbuminemia and may require albumin infusion prior to diuresis to prevent further intravascular depletion. Paracentesis or thoracentesis may be indicated for symptomatic ascites or pleural effusion. Naturally, any complications should be managed accordingly – i.e. antibiotics for infection, anticoagulants for thrombotic events, diuretics for severe edema.[7] The definitive treatment of nephrotic syndrome is corticosteroids which are often continued for up to 12 weeks. For patients with known steroid-responsive disease, it may be appropriate to initiate steroids in the emergency department in consultation with a pediatric nephrologist. In those with disease resistant to steroids, pediatric nephrology consultation is necessary as immunomodulatory medications may be required.[1] Children who are well-appearing without complications may be appropriate for outpatient follow-up with a pediatric nephrologist with instructions for sodium restriction and return precautions for signs of disease progression or complication.[1,2,7,8]

The presentation of this case also raises an important consideration about premature

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closure, anchoring and diagnostic inertia, some of the cognitive biases we as practitioners of emergency medicine ought to be aware and consciously avoid. One of the cornerstones of emergency medicine is the ability to rapidly and effectively triage and evaluate undifferentiated patients. It is often the case, however, that our patients are not truly undifferentiated. Many present with a recurrence of a previously experienced symptom or an exacerbation of an established diagnosis. In these cases, it is easy to anchor on the established diagnosis, sometimes relying upon or carrying momentum from the evaluation and diagnosis of a previous clinician. In the case we present here, our patient had undergone very extensive allergic and immunologic testing and had even been found to have a plausible explanation for her symptoms. Furthermore, she was seen by a specialist the very same day and presented with a very specific concern. Perhaps the easiest thing to do would have been to accept the previously postulated diagnosis of an allergic or immunologic process and continue her workup accordingly. However, we felt that our most vital role in her evaluation was to approach the case as if it were undifferentiated, keeping a broad, multisystem differential and evaluating accordingly. While this was certainly not an extraordinary display of diagnostic acumen or skill, it does highlight the idea we should be cautious not to prematurely close or anchor on a diagnosis made by ourselves or our colleagues, particularly when it does not adequately account for the complete clinical picture.

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Table 1: Some Causes of Generalized and Localized Facial Swelling in Pediatric Patients

Diagnosis	Pathophysiology	Clinical Features	Diagnostic Studies
Generalized Swelling/Edema			
Heart Failure	Increased hydrostatic pressure due to salt and water retention	Peripheral edema, tachypnea, fatigue, wheezing, poor weight gain, organomegaly	EKG, BNP, CXR, echocardiography
Acute Glomerulonephritis		Elevated BP, edema, red-brown urine, secondary signs depending on type.	Serum creatinine, Urinalysis
Medications (such as vasodilators)		Varies depending on drug, typically peripheral edema	
Cirrhosis	Increased hydrostatic pressure due to obstruction	Malaise, +/- encephalopathy, +/- ascites	AST/ALT, bilirubin, coagulation studies, APAP level, evaluation for specific etiologies.
Venous Obstruction		Swelling, pain, neurologic manifestations	Venography, evaluation for underlying cause
Protein Malnutrition/Kwashiorkor	Decreased capillary oncotic pressure due to protein loss	Dependent edema, rash over scalp and extremities, hypopigmentation	Electrolyte abnormalities, serum albumin, must differentiate from sepsis/infection
Protein Losing Enteropathy		Generalized edema, symptoms associated with primary cause (abdominal pain, diarrhea, hematochezia, etc).	CBC, serum chemistries and LFTs, celiac serologies, stool studies including alpha-1 antitrivpsin.
Nephrotic Syndrome		Generalized edema, elevated blood pressure, nonspecific physical complaints.	Proteinuria, serum albumin, serum creatinine and electrolytes
Generalized Facial Swelling			
Angioedema	Increased capillary permeability due to local inflammatory factors.	Asymmetric swelling, rapid onset, not dependent areas, most commonly lips, larynx, gut.	Clinical
Allergic Reaction		Urticaria, swelling predominantly lips, tongue, uvula, anaphylaxis.	Clinical
SVC Syndrome	Mechanical obstruction	Facial swelling/fullness, dyspnea, stridor, cough, dysphagia, cerebral edema	CXR, Venous duplex ultrasound, CT/MR venogram
Localized Facial Swelling			
Lymphangitis	Inflammatory/Infectious Causes – local inflammatory mediators cause increased capillary permeability.	Swelling, erythema, warmth, induration overlying affected area.	Typically clinical. Evaluate for signs of sepsis or systemic infection.
Preseptal/Periorbital/Orbital Infections			
Sinusitis (frontal, maxillary, ethmoid)			
Masticator space			
Congenital Anomalies (e.g. cephaloceles, glioma, dermoid, epidermoid cysts)	Varies depending on type	Varies depending on type	Imaged based on type
Other masses (e.g. neurofibroma, hemangioma, rhabdomyosarcoma, Ewing sarcoma, Langerhans cell histiocytosis)			

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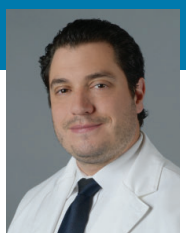

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EMS Fellowship: Beyond Lights and Sirens

"So what are you doing after graduation?" I asked the senior resident.

"I'm doing an EMS fellowship," she replied as we walked down the halls of the Emergency Department (ED) to see our next patient.

I remember thinking to myself, "Why, after medical school and residency, would she want to spend a year on an ambulance?"

I was a medical student at the time and, having never been an EMT or a paramedic, I had minimal knowledge of the field of emergency medical services (EMS). It is an almost laughable memory now, four and a half years later, as I'm nearing the end of my own EMS fellowship. As the academic year marches towards the finish line, in an economically strained time for the specialty of emergency medicine (EM), many of you may be considering subspecialty training as well. You may even find yourself asking: "what is an EMS fellowship and training all about anyway?"

If you are as naive to the field as I was, the term EMS likely brings to mind ambulances and firefighters. I think it is helpful, however, to reframe EMS as prehospital medicine and transport. In doing so, it becomes a little easier to see just how wide the scope of EMS can be, with a variety of field settings including urban cities, wilderness and austere environments, mass casualty incidents (MCIs) and disaster events, tactical medicine, as well as mass gatherings. Of course, the prehospital setting includes our traditional preconception of ground ambulance transport, which is often (but not always) fire-department based, but it also includes medical care achieved through alternative means of transport including air, via fixed or rotary wing aircraft, as well as water, such as marine rescue or cruise ship medicine.

The ultimate goal of any EMS fellowship is to train future medical directors, physicians who provide medical oversight and guidance for prehospital providers. Given such an expansive breadth, it is not surprising fellowship programs vary in their structure and training opportunities. For example, due to their geography, some programs have more of a wilderness environment component while others are more urban in nature. Locations requiring longer transport times might have a bigger emphasis on air transport. Furthermore, training to be a medical director involves learning both the administrative as well as the field work components of prehospital care. Each program varies in regard to the opportunities and emphasis on either of these aspects.

While many conventionally seek an EMS fellowship to become an EMS medical director with a municipality, there are other reasons and career opportunities that make the extra training worthwhile.

One of the core competencies of any EMS fellowship is providing medical oversight for direct patient care on scene. A firsthand understanding of the challenges of practicing EM in the field is paramount. Managing a cardiac arrest and intubating a patient in the bathtub of their apartment, surrounded by an emotional family, with only a two-member crew, and transporting from the fourteenth floor of a high rise with no elevator, is a far cry from running a code in an ED equipped with video laryngoscopy, multiple backup airways, nursing and technical staff and the space (however limited) of an ED room. Experiencing this from within a system and gaining this perspective and respect for the members who operate in these environments, is imperative to becoming a leader amongst them.

But in addition to on scene care, direct medical oversight can also be delivered via radio, phone or telemedicine. Guiding patient care through remote means, though uncomfortable, is a learned skill that can benefit any EM physician. While the 911-system in New York City has a centralized online medical control facility through which to direct these field needs, most other locations in the United States have a radio or phone that is answered by EM physicians who are on shift in an ED. In the future, you may be given the task of answering these calls from prehospital providers, deciding whether a patient has the decisional capacity to refuse care or determining termination of resuscitation efforts. Furthermore, in the pandemic era, many patients are seeking more medical care from home in the form of Telehealth. Thus, experience in remote medical evaluation is increasingly beneficial and marketable as an EM physician.

EMS training also involves indirect medical oversight of field care. This involves evidence-based protocol development, requiring research and analysis of up-to-date scientific literature to synthesize guidance manuals for pre-hospital providers in the management of common emergency medical conditions. Then, once enacted, the safety and competency of the providers is monitored through quality assurance and improvement (QA/QI) to ensure the standard of care is upheld. Though

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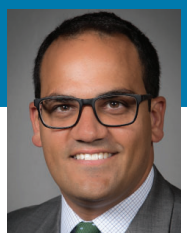
PRACTICE MANAGEMENT



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"Fix-It" - Revamping the Work-Order Identification and Completion Process

Introduction

Having an Emergency Department (ED) that is efficient with unimpeded clinical operations is ideal. As with all departments, there is a focus on big-ticket items such as front-end processes, metrics relating to turnaround times or patient satisfaction. One essential factor that heavily disrupts workflow is broken or malfunctioning equipment. Malfunctioning equipment becomes not only an impediment to provider workflow but can become a hindrance to safe and effective patient care. Identifying and promptly fixing broken equipment is often challenging, especially when this burden falls to providers working clinically and caring for patients simultaneously. These processes can be further affected when equipment work-order requests have siloed ticketing processes. Due to the varied processes involved in generating a work-order ticket, it became evident our front-line staff could not identify and address these issues in real-time, leading to downstream delays in care and lack of identification of malfunctioning equipment. To minimize workflow interruptions to clinical staff and improve real-time identification of equipment problems in the ED, our administrative team at Staten Island University Hospital piloted the ED Fix-It Initiative.

ED Fix-It Front End Process

Before the ED Fix-It Initiative, there was a significant knowledge gap in initiating a work order for broken equipment. Three separate ticketing processes were in place depending on whether the issue was related to clinical engineering, information systems (IS) or plant operations. Rather than expecting clinical staff to become educated and familiar with this process, we created a simplified method for providers to identify issues in the ED as they arise. We created multi-modal identification channels using a shared email (Microsoft Outlook) and a unified communication platform (Microsoft Teams) for our front-end staff. Any provider who identified malfunctioning equipment would simply obtain an image and description of the issue. The provider would then forward that image to Microsoft Teams or the shared email address. Identified issues were then tracked and logged into a shared repository by our ED administrative staff on the back end. This allowed our support team to have two-way communication and near real-time work-order generation.

ED Fix-It Back End Process

Addressing the identification process was just the tip of the iceberg as managers and support staff generated most work orders. The back-end process to create a work order typically consisted of tickets being placed for the departments mentioned earlier, such as plant operations, clinical engineering and IS. There were also issues regarding telecommunications and specific hardware that had no formal processes at all. These processes were maintained by separate departments and databases that had no cohesive interaction with one another. Pending orders that involved more than one department could easily slip through the cracks or fail to be adequately delegated, leading to delays in work order completion. Therefore, we created a Fix-It work order tracker that unified the process to become a repository for all pending issues in the ED. After the identification and classification of an issue, our ED administrators generated a formal work-order ticket. Cataloging and updating the tracker prevented duplicate tickets from being created.

Furthermore, representatives from ED administration, nurse management, IS, clinical engineering and plant operations were given access to the tracker. This process was supplemented by weekly rounding with all department representatives to identify and prioritize all pending work orders and determine which department would be responsible for ensuring the completion of jobs that involved inter-departmental collaboration. Once the respective departments completed the work order, an auto-generated email was sent to the unified inbox and manually updated on the tracker. This additional step allowed us to track and monitor the overall turnaround times for completion and provide accountability and transparency regarding the fulfillment of work orders.

Fix-It Implementation and Impact

The ED Fix-It Initiative was fully launched in May 2020. Initially, all ED physicians, mid-levels, and nurses were educated and encouraged to send any issues they identified to a Fix-iT email address. We streamlined the process even further by implementing a

Microsoft Teams communication board that was monitored by ED administrators and email generating QR codes placed in strategic clinical areas. Since June 2020, a total of 135 work orders have been completed through the ED Fix-It process. This was representative of approximately 13% of all work orders placed in the ED.

Moreover, Fix-It was responsible for completing over 75% of all IT-related work orders in the past six months. Additionally, we were able to track turnaround times for work order completion with a median turnaround time of nine days for plant operations work orders, one day for IS issues and the same day for clinical engineering issues. By unifying the fragmented processes to generate a work order we enabled our clinical staff to identify problems in real-time and increased accountability and consistent communication between different departments in the ED to ensure timely completion of all ED work orders.

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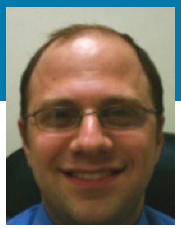
QA/QI programs take different forms depending on the EMS system, it usually involves identifying areas for systemic improvement as well as addressing errors made by providers that require further attention or education. In practice, identifying areas of improvement for a prehospital system entails designing and executing research projects to analyze data within your system, or on a broader scale, to make recommendations for optimal patient care. The analytical and communication skills, as well as diplomacy required to perform the aforementioned tasks, makes a physician well suited to serve in equivalent hospital administrative roles such as quality officer, EMS liaison or hospital EMS director.

Another key component of EMS is teaching the core and continuing education of EMTs and paramedics. Depending on the needs of the program, this may entail creating or revising a curriculum. For a more established system, this will frequently require case reviews and delivering educational modules geared towards adult learners based on their level of training and knowledge. This experience not only prepares a physician for a career in academic medicine but also provides him or her with a specialized niche that adds to the strength of a residency program.

Finally, perhaps one of the more adrenaline-infused facets of EMS is special operations, which include MCIs and disaster management, mass gathering events and technical rescue. Fellowship gives a trainee the opportunity to organize or participate in tabletop exercises, field drills and practice MCI triage. Depending on the program, you may be able to participate in once in a lifetime events, such as providing medical care to a major concert, sporting event or even the New Years Eve celebration in Times Square. In my year, I also had the unique privilege of attending the FDNY Rescue Medic basic training course, where I was able to complete field training in specialized scenarios including high rise, high angle, collapsed structure and confined space. Extensive field exposure and advanced training such as this provides insight and technical skills that can be utilized in service to a hospital disaster committee, incident command system or even to a task force, disaster medical assistance team (DMAT), or search and rescue (SAR) team.

So, why spend a year on an ambulance? Well, hopefully by now it is clear there are a myriad number of experiences and professional development aspects to an EMS fellowship. And each program will have its own unique package, which may include other opportunities that are not mentioned here. But perhaps the most humanistic reason is to simply gain the perspective and respect for our EM brethren who practice our craft in a different and less controlled environment. Because the more we understand each other and learn to speak the same language, the more we can advance as one entity in the pursuit of safer and better quality patient care inside - or outside - hospital walls.

ASK THE EXPERTS



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Interviewee
Craig Spencer, MD MPH
Director of Global Health in Emergency Medicine and Associate Professor of Emergency Medicine and Population and Family Health at the Columbia University Irving Medical Center/ NewYork-Presbyterian Hospital

Interviewer
Lauren Curato, DO FACEP
Assistant Professor, Department of Emergency Medicine, Columbia University Irving Medical Center/ NewYork-Presbyterian Hospital

Global Health in Emergency Medicine

I had the pleasure of speaking with Dr. Craig Spencer about global and public health in emergency medicine (EM). Dr. Spencer is the Director of Global Health in the Department of Emergency Medicine at Columbia University Medical Center and divides his time between working as an emergency physician in New York City and working on public health initiatives internationally. He has worked as a field epidemiologist in Africa and South East Asia on projects that examine access to medical care and human rights, he coordinated Doctors Without Borders' epidemiological response to Ebola in Guinea, survived Ebola himself, has provided medical care in the Caribbean, Central America, East and West Africa and on a medical search and rescue boat in the Mediterranean. He currently serves on the Board of Directors for Doctors Without Borders USA and has recently been spending time advocating for EM physicians and public health initiatives through news interviews and publications. Thank you, Dr. Spencer, for taking the time to speak with us.

Curato: **Would you share with us what inspired you to pursue a career in Global and Public Health, and the path you took to get there?**

Spencer: I actually went to medical school to become a cardiothoracic surgeon. But things completely changed while in school when I went to the Dominican Republic and saw incredible health inequities. My medical school was in Detroit where the social determinants of health and inequities were already very apparent to me, but when I went to the Dominican Republic I was just blown away. To see patients taking care of other patients [because the attendings were on strike], to see diseases I never could have imagined, even if I had read about them and seeing these clear inequities that existed in a place not far from the US - it got me really interested and I pretty quickly realized I was going to commit my professional life to global health issues. After that I went to China for a year to do public health research. I knew I had to come back to the US to do residency so I went to the most international place I could find in the US, Flushing, Queens. I wanted to work with Doctors Without Borders after residency, but they needed two-year post residency experience. That led to my fellowship in International Emergency Medicine and a public health degree. The formal training and MPH really helped me to reframe these issues from the individual level to the population level.

Curato: What are your roles in EM & Global and Public Health?

Spencer: I previously spent six months of the year working internationally on various projects and six months working in the emergency department (ED) at Columbia, but two years ago I made the natural life transition to less travel abroad. My international work was a wide range of clinical practice, training medical teams to be able to provide trauma care and working as an epidemiologist conducting measurements in public health with the goal of highlighting issues around inequities or need for stronger investment in global health systems and preparedness. I currently have an ongoing research project on measurement of health implications of migration policies, human rights violations and health consequences of closing migration routes in places like sub–Saharan Africa. After my experience in 2014 working in West Africa with Ebola I also work on pandemic preparedness projects. I spend a lot of time teaching in the medical school and school of public health and also serve on the Board of MSF [*Médecins Sans Frontières*/Doctors Without Borders] as well as working clinically in the ED.

Curato: **Why do you think the field of Emergency Medicine aligns so well with Public and Global Health?**

Spencer: A lot of the competencies we are expected to have as EM physicians prepares you for work in global health. One example is preparation for a mass casualty incident. While we don't use it frequently here, we train for it and I used that training daily while working at the trauma center in Bujumbura, Burundi when we'd have 80 people arriving at once and I'd have to assign triage tags. Another example is that we ED doctors work without an algorithm and without a diagnosis all the time and are fairly comfortable with that. While in Guinea working with Ebola patients, we had no algorithm for how to treat pregnant women who survived Ebola. We adapted and as EM physicians we're capable of that. Additionally, it's our job in the ED to find the sickest person in the department. That translates to when you're on a boat with migrants and you know there are probably five septic people aboard who you need to find and treat.

All of the experiences I've had overseas have also made me a better EM doctor here. It's taught me to be crafty and confident, from edu-

cational, practice, and preparedness perspectives. I had to re-think and change my approach when teaching residents abroad - I couldn't teach the e-FAST exam to them in the same way I was taught because it was almost always a positive or abnormal exam. I had to deliver babies and treat maternal hemorrhage on a ship in the middle of the Mediterranean without backup. And having worked with Ebola, I already knew how to put on and take off PPE, the importance of PPE buddies and unidirectional flow models which during this COVID-19 pandemic helped me implement for myself and share with others.

Curato: What advice would you give to EM residents interested in pursuing a Global EM Fellowship?

Spencer: The first question to ask is whether you want to do this as a hobby or a job? Is your commitment such that you want to make this a big part of your future and career or is this something you want to do more casually. Know that a career in global health will take time, you will miss life events of family and friends and is typically a pay cut from the compensation of a full time EM physician.

If you've decided to commit your professional existence to global health and are committed to doing a fellowship, I have three recommendations 1. Do one that that gets you an advanced degree (such as a MPH). 2. Find one that provides mentorship and 3. A connection to an organization or individuals doing the type of work that you like. If the program you're looking at does not have those three ideal components, make sure it's aligned with what you ultimately want to be doing.

Curato: Throughout the COVID-19 pandemic, you've been working to advocate for EPs, our patients and the public through news interviews, writings and your social media feed. With a constant stream of research and guidelines coming out, how do you stay current and what sources do you prefer to use?

Spencer: Hours and hours a day reading preprints and news articles. A lot of it is the same as everyone else: mainstream news, STAT, Brief19, Global Health NOW and news aggregators are wonderful. I'm able to get internal information through MSF. The process of doing news interviews and writing forces me to keep current so I also review the CDC briefings, the CDC MMWR and the FDA vaccine briefing packets so I can feed information back in the news piece or in writing.

Curato: Any advice for other EM physicians on how to prepare for the media spotlight should they find themselves in front of the camera someday?

Spencer: Have a thick skin and be prepared. Doing this is ostensibly a great public service, trying to reflect out public health information, but it can end up being quite political with a lot of people trying to discredit or disarm you. Taking a position on what may seem like an unequivocal public health initiative becomes political. Learning communication techniques such as blocking-and-bridging and when to engage and when not to is also helpful.

Curato: As this pandemic continues to shine a spotlight on domestic and global public health systems, what do you see as the future of Global Health as a subspecialty of EM?

Spencer: I want to believe we are now more concerned about what's happening in other countries, that there is this interest in emerging infectious diseases and that there is this long-term tenable commitment to understanding these issues. But I worry because recent years' events have forced a lot of our nation to think inward. As a result, trying to get the global impact of COVID alone to resonate is difficult. I worry that pendulum has swung to where we'll be interested in global health only from a self-interest perspective in terms of how we protect ourselves but won't be thinking in terms of the global health issues - how we can lift, assist and accompany others to doing the things that will protect themselves, which will ultimately keep ourselves protected. A lot of this will depend on how we approach, fund, talk about and support the populations that were doing this work to help. My hope and goal will be to advocate for people in places that don't have as loud of a voice and elevate their voices, so people are aware of these injustices and inequities in health.

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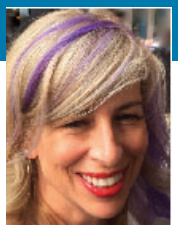

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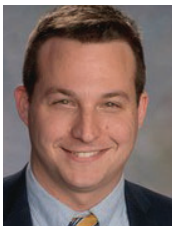

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Thinking About Testing; It's All About The Bayes

You are working a typically busy emergency department shift when you are notified—"Patient W. Smith, Potassium 7.2, grossly hemolyzed." Drat. You check the renal function—normal. Maybe you look at the EKG anyway, just to be thorough—normal. Patient Smith is not on a potassium-sparing diuretic. You then mentally dismiss the information as spurious. As an astute clinician you realize that in this situation, despite the 99% accuracy of the chemistry analyzer, your patient is very unlikely to have hyperkalemia. But this is an accurate test! That really is the potassium level in the sample provided to the lab. You understand, however, that the "disease" is in the sample, not the patient. You understand this intuitively, because you know the probability of hyperkalemia in that patient was very small in that patient prior to the test; and the probability after the test did not increase to any real degree. You know while this is an extremely accurate test, it does not predict disease in your patient well at all, and you have a simple explanation for the error—hemolysis. Of course you would be more disturbed if you had a patient with a much higher pretest probability. Then you might actually need to repeat the potassium level.

You know this. We all know this. While we are all mentally clear about it in some clinical scenarios, most of us get muddy in others. In medical school, we were taught to think of tests in terms of sensitivity and specificity. SpIN and SnOUT; a sensitive test can rule out a diagnosis and a specific test can rule in a diagnosis. But we know that is not the whole story. It's all about the Bayes—meaning you need to understand your patient's pretest probability to understand how the evidence provided by the test updates the post-test probability in your specific patient.

Sensitivity, so important to ED testing, is just one piece of the puzzle. We often think sensitivity alone makes a test useful for us. We accept a test that reliably rules out a pathology, even if it cannot reliably tell us yes, the pathology is present. Sensitivity asks what are the chances the diagnostic test correctly alerts us to the presence of a disease, ***given that the disease is present.*** Sensitivity is calculated based on true positives—people with the disease, and strictly is a function of the test apparatus itself. For example, if a patient does have appendicitis and gets a CT scan (assuming sensitivity of 95%), theoretically, the CT scan would miss five in 100 cases of appendicitis. The characteristics of a particular diagnostic test are independent of its interpretation. Or to put it another way, if we scanned that same patient 100 times, it will miss that patient's appendicitis five times. Or does it depend on the patient?

We order diagnostic tests because ***we do not know whether or not the disease is present***, therefore, we cannot use sensitivity alone to interpret this test, as sensitivity alone answers the wrong question. The calculated sensitivity ***assumes*** the patient does have the disease. Consider these two probabilities, are they the same?

1. What is the probability the patient has the disease given a positive test?

2. What is the probability of a positive test, given the patient has the disease?

On first read, you might think these statements are equivalent. Let us rephrase the problem.

1. What is the probability of an animal having four legs, given that it is a dog (>95%

2. What is the probability of an animal being a dog, given that it has four legs (low, <1%)

This example illustrates the purpose of asking and answering the right question using statistics, as similar questions can have wildly different answers and interpretations of those answers. Sensitivity and specificity exist to help you pick the right test for the clinical scenario and predictive values help to interpret test results. It is incorrect and actually illogical to use sensitivities to interpret test results—we need the predictive value of the test. Predictive value asks the inverse question to sensitivity/specificity; knowing the results of the test (positive or negative), how likely is it the person has the disease. In reality, true predictive values are difficult to calculate, as they are multifactorial and theoretically individualized.

1.What is the probability of appendicitis given a negative CT scan in a vomiting, febrile, ill appearing patient with McBurney's point tenderness, leukocytosis and PO intolerance

2. What is the probability of appendicitis given a negative CT scan in a healthy patient with history of abdominal pain with benign labs and examination?

Obviously, there is a difference between these two probabilities and we would be more likely to assume #1 to be a false negative. Predictive values involve pre-test probability, clinical features and results of diagnostic testing. A familiar example is when physicians use the triple-stratifying Wells pathway for PE, and you are guided straight to CT scan with a "high risk" Wells score. This is because the negative

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predictive value of low d-dimer value in a high-risk patient is not good enough to reassure us the patient does not have a PE. Despite its excellent (>95%) sensitivity, a negative d-dimer is not sufficiently *predictive* to rule out DVT/PE for a high-risk patient.

To calculate an exact predictive value of a test is impossible, but knowing the exact number is less important than understanding the statistical concepts. Bayes' Theorem, from the 1800s, helps us understand how to answer these questions.

Bayes Theorem is a rule of conditional probability and it has far reaching and powerful implications. In statistics text books it is written as P(A|B)= (P(B|A)P(B))/P(A). The vertical line means "given", so P(A|B)= Probability of event A, given that event B happened.

If you were not too happy in your math classes, this formula may look dense, but it is actually quite simple. Let us break it down and then think about it in terms of diagnostic testing. The probability of one event, given the other, is a function of both the independent probabilities of each event happening and the correlation between the two events. When it comes to diagnostic testing, we can define A as "has disease", and B as "has positive test", so in this context Bayes' formula means the following:

The probability that this positive test represents a true positive is a function of three separate factors:

1. The independent odds of the test coming back positive knowing nothing about the patient
2. The independent odds of the patient having the disease knowing nothing about the test results
3. The *conditional* odds of the test coming back positive, given the patient has the disease

We also know when calculating predictive values from sensitivity and specificity, we need to consider the prevalence of the disease. This lets us see in more common diseases, a positive finding is more likely to be a true positive and in rare diseases, a positive finding is more likely to be a false positive and in a different way incorporates one aspect of post-test probability. This is may seem like common sense, yet, as physicians, we get it wrong all the time, depending on how results are presented to us. A famous American College of Obstetrics and Gynecology (ACOG) study by Anderson et al asked OBGYN residents to interpret the meaning of screening mammogram results to an individual patient. They were presented a fictional population with 0.1% chance of breast cancer and a fictional patient from that population with a positive mammogram. They were told the mammogram was 90% sensitive and specific. They were then asked what the odds of that patient with the positive having breast cancer were, given only the positive mammogram. The large majority believed that the individual patient with a positive test had an 80 or 90% chance of actually having breast cancer. In reality, the answer was <10%. The residents were not understanding the predictive value of the test;

Positive Predictive Value:

$$PPV = \frac{prevalence\ x\ sensitivity}{prevalence\ x\ sensitivity + [(1 - specficity)(1 - prevalence)]}$$

Negative Predictive Value:

$$PPV = \frac{(1 - prevalence)\ x\ specificity}{(1 - prevalence\ x\ specificity) + (1 - sensitivity)prevalence}$$

This kind of cognitive error—thinking a sensitive test is highly predictive in a very low prevalence cohort, in combination with our own aversion to risk, helps explain why we as physicians often overestimate and miscommunicate risk to patients.

Prevalence, the proportion of the population with "yet to be diagnosed" disease, is only one determinant of predictive value. As we discussed earlier, pre-test probability, test technique and apparatus, patient population and clinical presentation are all factors that affect the predictive value of a test. Representing the sensitivity and specificity on a space that represents prevalence can help you visualize how much space the true positive test takes up in the world.

Of course, as you remember, any patient that undergoes a diagnostic test, has four possible outcomes:

1. True Positive (T+D+)
2. True Negative (T-D-)
3. False Positive (T+D-)
4. False Negative (T-D+)

When ordering a diagnostic test, it is critical to understand the probability space, specifically the ratio of patients who get vertical stripes to those who get horizontal stripes, inclusive of crossover. It is important to understand whether at the time, far more patients will test positive than actually have the disease, for example.

In the *absence* of any reliable pre-test probability calculator or prevalence information, the easiest way to estimate these ratios is to actually use sensitivity and specificity information.

Sensitivity refers to false negative rates (using true positives), and specificity refers to false positive rates (using true negatives). By combining the two quantities, we can now address all four subspaces which are represented in the graph above, TP, TN, FP, FN. Furthermore, using Bayes' formula, we can now predict whether a positive or negative result is more likely to be a true negative or a false negative, a predictive value, that we can use to counsel our patients in a statistically sound way.

Of course, we have to bring in COVID testing. There was so much provider and patient anxiety about the availability of diagnostic testing early in the pandemic. There were meetings, conversations, conferences and chat threads where many voiced concerns about the lack of testing available impacting their decisions about using COVID-19 treatment algorithms (a topic for a whole other discussion) versus bacterial pneumonia/sepsis algorithms.

I decided to make a calculator that could help attendings and residents understand how much of a difference a positive or negative test would make on the predictive value. This calculator incorporated Bayes Rule using Desmos, a free online graphing calculator software.

I calculated the derivation for a negative test as the superior specificity >99% and high relative prevalence (about 20-25% in our population at times!) made false positives dramatically unlikely. Additionally, the guidance for a positive, which would have been symptom monitoring and quarantine, were unlikely to cause much harm in context of a pandemic. We did have RT-PCR testing available, with approximately 70% sensitivity. Therefore, using the formula for likelihood ratios:

$$LR\_ = \frac{1 - sens}{spec}$$

$$Post\ Test\ Odds = Pre - Test\ Odds\ x\ LR$$

$$Post\ Test\ Odds = Pre - Test\ Odds\ x\ \frac{1 - sens}{spec}$$

And given Odds=1-probability/probability

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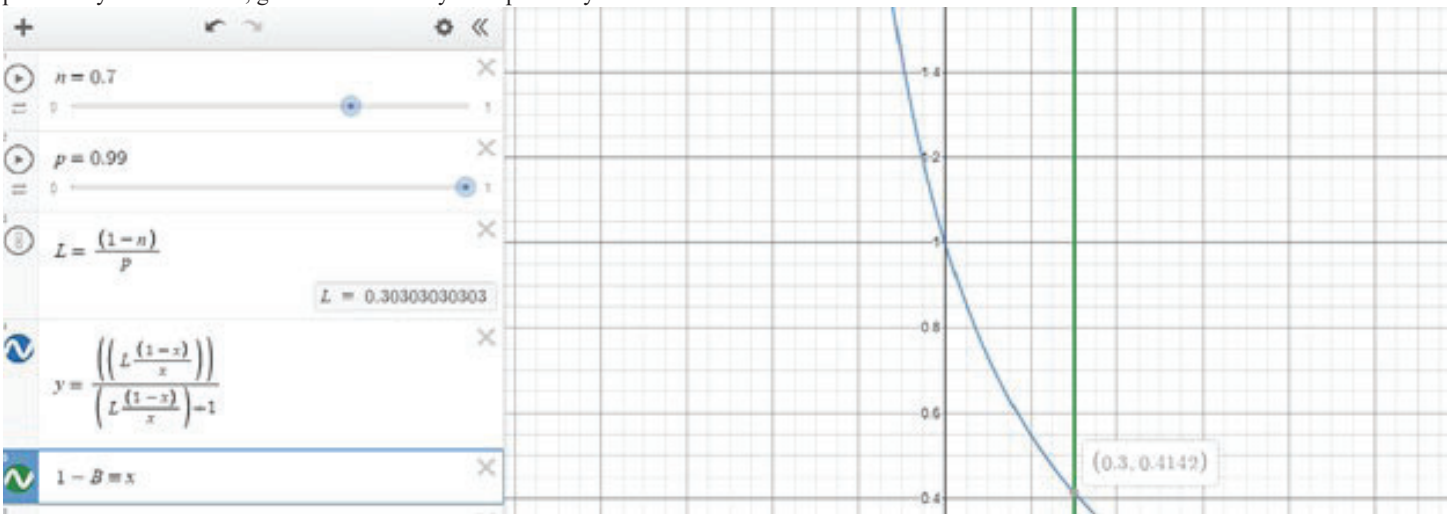
$$Post-test\ Odds = \frac{1-Pretest\ Prob}{Pretest\ Prob}\ x\ LR$$

$$Post-test\ Prob = \frac{\frac{1-Pretest\ Prob}{Pretest\ Prob}\ x\ LR}{1+\left[\frac{1-pretest\ prob}{pretest\ prob}\ x\ LR\right]}$$ LR= .3/.99= .303

Which you can see visually represented here as "covid calc": https://www.desmos.com/calculator/qeg1captix

To use this calculator, you drag the sliders *n* for sensitivity and *p* for specificity and B, the pre-test probability of having the disease. The intersection of the vertical green line and blue curve, the y value, represents the post-test probability of the patient having the disease. For example, for a pre-test probability of 70% we can infer a 41% posterior probability of the disease, given the sensitivity and specificity alone.



This is an extreme example but important—think of the patient with fever, cough, diarrhea and anosmia. That patient has a very high pretest probability of having COVID, you cannot reasonably rule out COVID infection with a single test in a patient who after a negative test has a post-test 40% chance of having the disease. Even if the patient had a 10% chance, the negative predictive value is still only 4%! Not likely, but not outside the realm of possibility. Even now, with testing readily available it is important to remain conscious of this and repeatedly test patients who seem highly likely to have COVID. The rate of false positive in real world use of PCR is approximately 0.2-0.9%. That can translate to a lot of false positives in a population with a low rate and lots of testing. This is going to happen more and more as people test to travel or go to large events or even the "surprise" covid positives in the asymptomatic ankle sprains. It may make sense to repeat those as well.

For many of us, a calculator like the one I used, might not have enough pre-defined to make us comfortable. So another option is something like the Diagnostic Test Calculator found at this link: http://araw.mede.uic.edu/cgi-bin/testcalc.pl This calculator gives you a page that looks like this: (see image 1 next page)

All the fields can be filled in with whatever data you have. If you do not know some of the data, like your local prevalence, estimate. Change the numbers to see how it affects results. Especially the information about your own risk tolerance; then try imagining those numbers from the patient's perspective. How much risk is your patient comfortable with? That is where the real-world impact on your decisions lies.

Here is an example of what you get when you add data. We added prevalence, sensitivity and specificity data for a made up test with made up risk tolerances and got the following: (see image 2 next page)

Take a nerdy afternoon and plug in the numbers for tests you do all the time like troponins, white counts for "infection" and flu tests. For us as practicing physicians seeing real patients, it is critical to understand the reasoning behind the data we make use of, to guide which tests we choose and how we interpret the results of those tests.

References and Further Exploration

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Bayesian Thinking

https://www.youtube.com/watch?v=lG4VkPoG3ko

https://www.youtube.com/watch?v=HZGCoVF3YvM

Calculators

http://araw.mede.uic.edu/cgi-bin/testcalc.pl Diagnostic test calculator (version 2010042101). Copyright (c) 2002-2006 by Alan Schwartz <alansz@uic.edu>. This calculator is Free Software, available under the Clarified Artistic License

https://www.desmos.com/calculator/qeg1captix

Image 1

Diagnostic Test Calculator

This calculator can determine diagnostic test characteristics (sensitivity, specificity, likelihood ratios) and/or determine the post-test probability of disease given given the pre-test probability and test characteristics. Given sample sizes, confidence intervals are also computed.

Fill out one of the sections below on the left, and then click on the 'Compute' button. Sections you don't fill out will be computed for you, and the nomogram on the right will display the probability that a patient has the disease after a positive or negative test.

Numbers of patients with and without the disease who test positive and negative:

	Disease present	Disease absent	Total
Test positive			
Test negative			
Total			

Compute

or
disease prevalence, test sensitivity, and test specificity (and, optionally, sample size):

Prevalence (e.g. 0.10):	
Sensitivity (e.g. 0.80):	
Specificity (e.g. 0.80):	
Total sample size:	

Compute

or
disease prevalence, positive likelihood ratio, and negative likelihood ratio (and, optionally, sample size):

Prevalence (e.g. 0.10):	
+LR (e.g. 4):	
-LR (e.g. 0.01):	
Total sample size:	

Compute

Optional information:

Your local prevalence (e.g. 0.10):	
Probability of disease at or above which you would be **comfortable** treating with no further testing (e.g. 0.8)	
Probability of disease at or below which you would be **comfortable** managing with no futher treatment or testing (e.g. 0.25)	
Probability of disease at or above which you would treat (comfortable or not) and below which you would not treat, if there were no further options (e.g. 0.4)	

Recompute

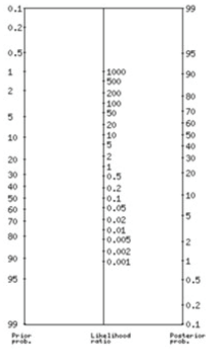


Image 2

Numbers of patients with and without the disease who test positive and negative:

	Disease present	Disease absent	Total
Test positive	106	150	257
Test negative	19	225	243
Total	125	375	500

Compute

or
disease prevalence, test sensitivity, and test specificity (and, optionally, sample size):

Prevalence (e.g. 0.10):	0.250000
Sensitivity (e.g. 0.80):	0.850
Specificity (e.g. 0.80):	0.599
Total sample size:	500

Compute

or
disease prevalence, positive likelihood ratio, and negative likelihood ratio (and, optionally, sample size):

Prevalence (e.g. 0.10):	0.250000
+LR (e.g. 4):	2.12
-LR (e.g. 0.01):	0.25
Total sample size:	500

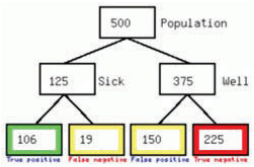
Compute

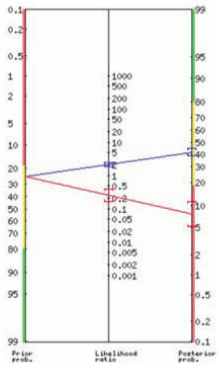
Optional information:

Your local prevalence (e.g. 0.10):	0.250000
Probability of disease at or above which you would be **comfortable** treating with no further testing (e.g. 0.8)	0.8
Probability of disease at or below which you would be **comfortable** managing with no futher treatment or testing (e.g. 0.25)	0.18
Probability of disease at or above which you would treat (comfortable or not) and below which you would not treat, if there were no further options (e.g. 0.4)	.8

Recompute

Clear Entries





Prior probability (odds): 25% (0.3)

POSITIVE TEST:

Positive Likelihood ratio: 2.12
95% confidence interval: [1.84,2.45]
Posterior probability (odds): 41% (0.7)
95% confidence interval: [38%,45%]
(~ 1 in 2.4 with positive test are sick)

NEGATIVE TEST:

Negative Likelihood ratio: 0.25
95% confidence interval: [0.16,0.38]
Posterior probability (odds): 8% (0.1)
95% confidence interval: [5%,11%]
(~ 1 in 1.1 with negative test are well)

Odds = Probability / (1-Probability)
+LR = Sensitivity / (1 - Specificity)
-LR = (1 - Sensitivity) / Specificity
Posterior Odds = Prior Odds x LR

Warning: A positive test result does not provide enough certainty to be comfortable treating or not treating

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COVID-19 and Emergency Department Mental Health Visits, It's Not Your Imagination

It has now been over a year since we saw the first wave of COVID cases in the US with New York being the epicenter of cases one year ago. With the pandemic over the past year, there have been dramatic swings in emergency department (ED) volumes for both COVID related visits as well as non-COVID related visits. While many of our departments saw overwhelming spikes in volume at the outset of the pandemic, what followed were dramatic reductions in volume by as much as 25-30% in many locations. Many of us were left wondering what happened to all the patients with STEMIs, CVAs, even appendicitis, leading many to speculate that these patients were waiting at home until they had no choice but to come in or delay care until they felt safe seeking care. For all of us working in the ED, one type of visit that at least anecdotally felt like it had increased, was mental health. It seemed visits for anxiety, depression, substance abuse and suicidal ideations had increased or at least remained constant, but did they? Recently, data has been published regarding mental health visits to US EDs that helps elucidate issues regarding providing mental health care during the pandemic. Additionally, as we have data available for a sample of approximately 15 EDs in New York State we work with, we looked at trends in New York State visits for mental health to see how they compare with national trends.

In the early days of the pandemic there were many factors that were thought could potentially drive an increase in mental health visits based on other disaster situations, however, a pandemic of this magnitude had not been seen in 100 years. It was speculated by many mental health experts imposition of unfamiliar public health measures would infringe on personal freedoms, loss of jobs and income and conflicting messages regarding the pandemic would be major stressors for people that could lead to additional mental health needs of the population. Additionally, those with pre-existing conditions placing them in the high-risk category, residents in congregate care settings such as assisted living or group homes and those with prior psychiatric illness would be at particularly high risk for need of emergency mental health care.

The effects of prolonged isolation as well, due to stay-at-home orders, lack of physical connection with loved ones and concerns over receiving on-going medical or mental health services will vary from person to person and could be unpredictable. Finally, patient acceptance of mental health care and psychosocial services being delivered via telemedicine was unknown at the time.

According to a report published in the MMWR, during the period from March 29 – April 25, 2020 when widespread shelter-in-place orders were in effect, ED visits for persons of all ages declined 42% compared to the same period in 2019; during this time, ED visits for injury and non-COVID-19-related diagnoses decreased, while ED visits for psychosocial factors increased. To assess changes in mental health related visits, data from the CDC's National Syndromic Surveillance Program (NSSP) was used for January to October 2020 and compared to the same timeframe in 2019. With regard to children, they observed a sharp decrease in mental health related visits from mid March through early April. A steady increase was noticed then through October of 2020, with a 24% increase in children ages 5 to 11 and a 31% increase in adolescents aged 12-17.

We looked at data from approximately 15 EDs in New York we have data for related to ED visits. These departments are geographically scattered in the New York City area as well as the Hudson Valley and Capital Regions so they represent areas of the state that had COVID peaks at different times and they vary in size from small critical access hospitals to large academic centers. While this is a convenience sample of New York EDs and may not represent the trends across all EDs in the state, our data does closely mirror what was found in the national data using the CDC's NSSP. We observed an overall decline for all ED visits in 2020 of 19% when compared to 2019, however, we saw a 41% decrease in pediatric visits (<18 years old) and a 5.2% decrease in psychiatric visits. When we separate out the decline, we see a 4% decrease in adult psychiatric visits versus an overall 19% for all comers and in the pediatric group those numbers were 17% vs 41% (Figure 2). While psychiatric visits did decline, they did so at a much lower rate than other ED visits and were a proportionally higher percent of visits in 2020. This likely contributed to the impression many emergency physicians had that the "psychiatric patients never stopped coming. " Although these visits did also decline, the fact that they did so at a much lower rate and proportionally increased gave the impression there were more psychiatric patients in the department to many clinicians and administrators.

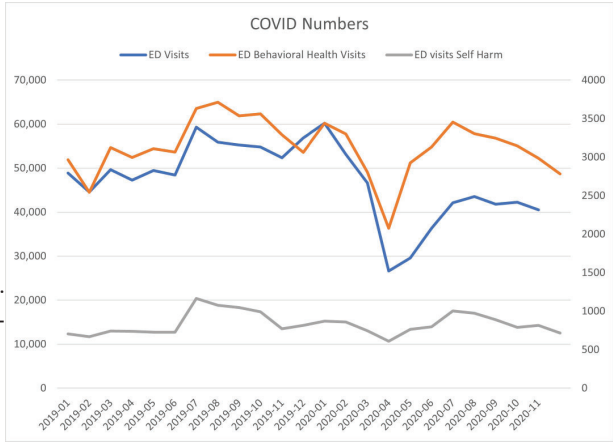

Figure 1

We also saw the sharp drop-off of both mental health patients as well as all ED patients that was seen nationally from mid-March to mid-April coinciding with the implementation of shelter-in-place and other public health measures followed by the proportional increase as shown in Figure 1. Next, we looked at the admit rate as a percentage of visits for general behavioral health reasons as well as self-harm, again broken down by adults and pediatrics. While we noted a very similar admission rate for both general behavioral health and self-harm in adults, we saw a significant increase in pediatric admission for both categories as shown in figure 3.

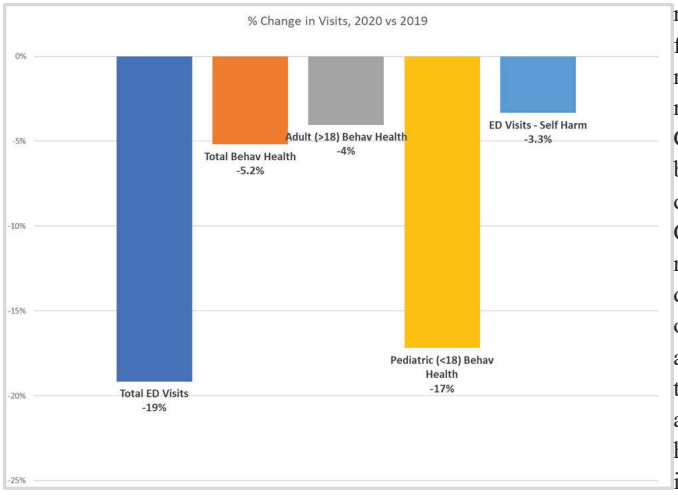

Figure 2

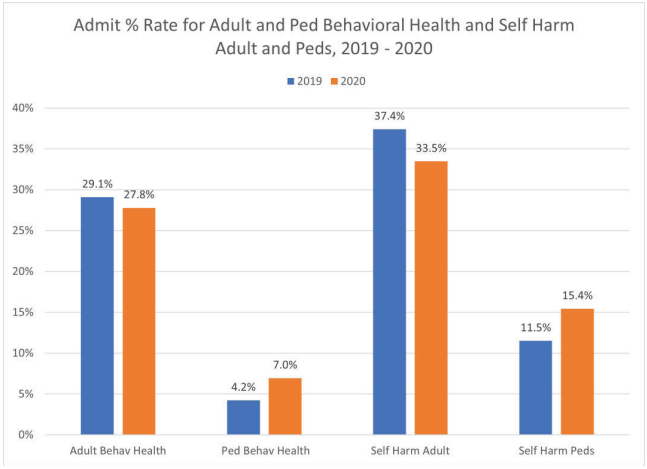

Figure 3

As we all know, the availability of mental health beds prior to COVID in 2019 was already decreasing and not sufficient to meet demand which resulted in long dwell times and prolonged ED boarding, sometimes for days. This was even more pronounced in the pediatric mental health population and the pediatric or adolescent behavioral health bed is one of the scarcest resources we have which often means ED boarding times of up to a week in some situations prior to the pandemic. While we were not able to consistently measure boarding times across our departments to compare 2020 to 2019 due to varying definitions of boarding, inconsistent transfer timestamps and arrival of transportation resources and other EMR issues, we did receive numerous anecdotal reports of significantly longer than usual times to bed placement for these patients. Some of the reasons beyond an increased number of admissions include the concern of non-medical psychiatric facilities to manage even minor coexisting chronic medical issues, potential COVID exposure while being evaluated in an ED, demands for a negative COVID test, etc. Our assessment was some of these delays did improve later on in the pandemic once availability of rapid COVID testing reached many EDs and patients were able to have a negative test result in a reasonable timeframe. Alternatively, for pediatric patients requiring admission who were asymptomatic but tested COVID positive, their placement became close to impossible and many stayed in an ED.

It is unclear to us why the need for pediatric in-patient mental health care increased in 2020 vs 2019 while the adult rate remained constant. Some possible reasons that have been offered include the potential for greater impact of pandemic related stressors on children and adolescents such as loss of routine, remote learning, decreased social interaction, etc. Additionally, children may suffer greater anxiety or fear over losing a parent or other family member to COVID as well as ability to cope with the unknown. While this pandemic overwhelmed the capacity of our hospitals to accommodate the increase in medical admissions requiring unprecedented surge efforts, the pre-pandemic mental health capacity was already severely strained with little to no ability to surge thus any increase in need for mental health inpatient care resulted in significant delay and longer ED boarding in already crowded departments. Finally, there was almost no ability to provide for admitted mental health patients whose admission COVID test was positive, even if asymptomatic for both adult and pediatric patients, although as the pandemic progressed to the second wave, some facilities did try to create "COVID wards". Cohorting of mental health and substance abuse inpatients who may have COVID was further complicated by the fact that so much of therapy involves group activities which makes quarantine and isolation almost impossible.

Future disaster planning and pandemic preparedness should focus on increased need for mental health and substance disorder care during times of crisis which may be prolonged in the case of a worldwide pandemic with a special focus on inpatient beds. Additionally, strategies for providing this care safely when there is a concern for concomitant spread of infectious disease will be needed so we can decrease ED dwell time and free up beds for incoming ED patients.

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EDUCATION

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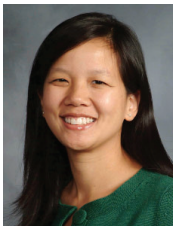

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The Evolution of Medical Education: Before and After COVID-19

Note to Readers: This is the second installment of a series we are putting together about teaching theories, techniques and innovations in the Emergency Department. Please feel free to contact us with questions or suggestions for future topics.

In 1910, the Carnegie Foundation for the Advancement of Teaching commissioned Abraham Flexner, an educator, to assess the state of medical education in North America.[1] The resulting Flexner Report led to a significant transformation and standardization of medical education in the United States. The model of medical education born from the Flexner Report has remained relatively fixed for a century despite major advancements in medicine, health care delivery, technology and adult learning theory during this time. In 2010, the Carnegie Foundation again examined the state of medical education in the United States and found it to be "inflexible, overly long and not learner-centered."[2] The ensuing call for reform in medical education is in part responsible for a shift away from traditional curricula, teaching and assessment methods to curriculum innovation and competency-based assessment. Technological advancement, as well as evolved understanding of adult learning, has also led to the increased use of flipped classroom models, simulation, asynchronous platforms and free open access medical education (FOAM) resources.

> In March 2020, the COVID-19 pandemic significantly disrupted medical education. Schools and training programs were mandated to rapidly transition away from traditional teaching methods, including bedside teaching, because of restrictions resulting from the pandemic. Educators were forced to rethink teaching methods and become more thoughtful in incorporating educational theory in revamping curricula.

At the core of clinical medicine, at both the undergraduate and graduate levels, is bedside teaching. It allows trainees to directly observe and emulate history and physical exam skills, diagnostic reasoning and integration of multiple data points in patient care, as well as professionalism and communication with patients.[3] However, current day health care is very different from health care in the early part of the 20th century. In the intervening years, major advances in diagnostic testing and imaging have resulted in a significant growth of information that must be acquired and synthesized to care for patients. This, combined with reductions in inpatient lengths of stay and physician contact time with outpatients and focus on clinical productivity, has made finding adequate time for bedside teaching difficult.

As mentioned in our previous installment "A New Era of Bedside Teaching for the Resident Learner,"[4] there has been an evolution in the importance of education theory, particularly adult learning theory, in medical education. Historically, undergoing medical education oneself and having clinical expertise were deemed sufficient qualifications to educate medical students, residents and fellows. This is the basis of the adage "see one, do one, teach one." With the emergence of educational theory as an academic discipline, its utility in medical education has become apparent as understanding of educational theory enables medical educators to utilize strategies that have been proven to be effective.[5] Adult learning theory in particular, as described by Malcolm Knowles in the mid-20th century, is distinct from pedagogy, which describes how children learn and are taught.[6] In contrast to children, adults are intrinsically motivated to learn, are self-directed, bring already acquired experience and prioritize learning skills and knowledge that can be applied immediately to solving known problems. One application of andragogy in medical education is the flipped classroom model in which time with an educator or attending physician is reserved for the application of knowledge and skills already acquired through other means. There is much literature describing the use of this approach in both undergraduate and graduate medical education. Although systematic reviews

EDUCATION

have called for more rigorous studies examining higher-level learning outcomes, current literature shows a strong learner preference for the flipped classroom model[7,8] and supports its role in improving knowledge acquisition.[9-11]

Simulation use in medical training began in the 1960s with low-fidelity trainers that allowed practice of basic resuscitation skills.[12] In the past 20-30 years, the growth of simulation has accelerated. Its breadth of use is now wide and it allows both trainees and faculty to hone skills essential in practicing medicine on either standardized patients, procedural trainers or mannequins. It is especially useful in providing experience with low-frequency, high-acuity events and procedures such as perimortem c-sections[13] and trauma thoracotomies. Simulation is also used in creating a standardized environment for testing competencies and helping practicing physicians maintain proficiency. With increased focus on patient safety and interdisciplinary collaboration in medicine, simulation is an ideal teaching tool enabling health care providers to improve team dynamics and develop teamwork, interpersonal and communication skills in a safe setting. In simulation, adverse events and mistakes are low-stakes learning opportunities, allowing clinicians to rectify deficiencies before they affect patients. With advancements in technology, the fidelity of mannequins and task trainers are continuing to improve.

The advent of widely available internet access in the early 21st century gave rise to a newer teaching tool in medical education, free open access medical education (FOAM). This term was created by a group of international emergency physicians in 2012 in response to the disdain the medical community had for medical education available through social media and online platforms.[14] FOAM describes medical education resources available through non-print media and includes blogs, podcasts and infographics. It also describes a movement in which medical trainees become "curators" of information and research.[15] This has led to a shift in the role of medical educators. They no longer serve as collectors, stewards and disseminators of credible data; instead, they are now responsible for teaching trainees how to negotiate and synthesize the vast amount of data available. Virtual communities of practice, in which experts in a particular field collaborate in vetting, applying and communicating educational resources and mentor learners in digital scholarship, have arisen from the FOAM movement.[16] Additionally, online platforms have facilitated asynchronous discussions between experts and junior learners, as well as clinicians from different disciplines and perspectives, resulting in more robust, well-rounded and balanced conversations. FOAM has also facilitated the flipped classroom model of adult learning theory and when FOAM resources are adequately vetted, developing best practices becomes easier and more efficient.

In March 2020, the COVID-19 pandemic significantly disrupted medical education. Schools and training programs were mandated to rapidly transition away from traditional teaching methods, including bedside teaching, because of restrictions resulting from the pandemic. Educators were forced to rethink teaching methods and become more thoughtful in incorporating educational theory in revamping curricula. Simulation and FOAM appeared at the forefront of many educational innovations. Other innovations incorporated non-traditional teaching tools including telemedicine,[17-19] gamification,[20] virtual reality[21] and artificial intelligence.[22] Medical education literature is now replete with reports of medical education adaptations due to COVID-19,[23] and multiple medical education societies and organizations have curated resources for teaching during the pandemic (Table 1). As the pandemic highlighted the need for alternatives to traditional teaching strategies, many innovations utilized proxies for bedside teaching. Implementation and evaluation of these innovations revealed the advantages some of these adaptations have over traditional bedside teaching. As a result, many of these adaptions will remain even after the pandemic ends, permanently changing medical education for the better. The need to overhaul medical education has been long-standing with some progress made in improving how trainees are taught and assessed during the several decades preceding 2020. However, much more significant transformation has occurred in the past year as the COVID-19 pandemic "catalyzed" medical education reform (refer to Table 1 for resources),[24] accelerating changes necessary in evolving and advancing medical education.

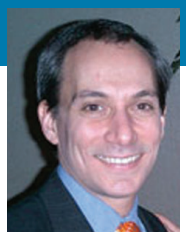
Table 1: COVID-19 Education Adaptations and Resources for Educators

- Medical Education Adaptations: Really Good Stuff for Educational Transition During a Pandemic
  https://onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)1365-2923.med.adaptations.vi
- Academic Emergency Medicine Education and Training Collection of COVID-19 Related Articles
  https://onlinelibrary.wiley.com/journal/24725390/covid19
- Academic Medicine Collection of COVID-19 Related Articles
  https://journals.lww.com/academicmedicine/pages/collectiondetails.aspx?TopicalCollectionId=68
- AAMC COVID-19 Resources for Medical Schools
  https://www.aamc.org/coronavirus/medical-education
- Harvard Macy Institute Crowdsourced List of Online Teaching Resources
  https://docs.google.com/spreadsheets/d/1axEjhwL_VF8EutJcAL1Ds8DP4uyUyYSD/edit#gid=122126530
- Medical Teacher COVID-19 Special Issue (volume 42, issue 7
  https://www.tandfonline.com/toc/imte20/42/7
- Academic Life in Emergency Medicine Teaching in the Age of COVID-19 Blog Series
  https://www.aliem.com/teaching-age-covid-19-wrap-up/
- FacDevCanada Resources for Pivoting Medical Education Online (PivotMedEd)
  https://sites.google.com/view/pivotmeded/home

Upcoming Topic for Next Installment:
The past year has generated new conversations about clinical safety for both providers and patients. The challenge to balance safety and education can be daunting. However, simulated bedside experiences have proven efficacy and can be utilized to meet educational needs or provide opportunities for assessment.

continued on page 26

NEW YORK STATE OF MIND



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Care Cascade of Patients With Hepatitis C and HIV Identified by Emergency Department Screening.

Cowan E, Hardardt J, Brandspiegel S, Eiting E, Calderon Y; Icahn School of Medicine at Mount Sinai, New York; J Viral Hepat; 2021 May 1.

We compared the care cascades of Hepatitis C (HCV) mono-infected and HCV/HIV co-infected patients screened in a universal Emergency Department (ED) HCV screening program. This was a retrospective review of program data collected between June 6, 2018 and December 31, 2019. HIV and HCV status, linkage to care and treatment outcomes were abstracted from the program-screening database.

Descriptive statistics were used to characterize the population. Group comparisons (HCV mono-infected vs. HIV/HCV co-infected) were compared using Chi-square. There were 116,596 adult (age 18 y and above) patient visits, representing 62,001 unique individuals. Of these, 17,676 (28.5%) received an HCV antibody test. We identified 418 evaluable patients (2.4%) with active HCV (HCV RNA positive). Of these, 337 (81%) were HCV mono-infected, 58 (14%) were HCV/HIV co-infected and 23 (5%) had unknown HIV status. Among the 418 evaluable patients 174 (41%) were linked to care and 94 (22.5%) achieved sustained virologic response (SVR). There were no significant differences between HCV mono-infected and HCV/HIV co-infected groups at any step of the care cascade (diagnosed and aware, linked to care, medications prescribed or SVR). Universal HCV screening in the ED identified a large number of patients with active HCV infection, of which 14% were co-infected with HIV. While there were no differences in the care cascades between mono and co-infected patients, linkage and treatment outcomes were low in both groups. Barriers to linkage to care and treatment after ED diagnosis should be further investigated and addressed to improve public health outcomes.

Testing for and Identification of Multisystem Inflammatory Syndrome in Children in the Pediatric Emergency Department.

Patel R, Patel KJ, Rocker J; Cohen Children's Medical Center, New Hyde Park; Curr Opin Pediatr; 2021 Jun 1;33(3):275-280.

PURPOSE OF REVIEW: The current article summarizes updates on multisystem inflammatory syndrome in children (MIS-C) research and focuses on strategies to diagnose and manage these patients in the emergency department.

RECENT FINDINGS: MIS-C is an inflammatory syndrome that occurs approximately 4-5 weeks after severe acute respiratory syndrome coronavirus 2 infection. It is associated with symptoms such as fever, shock, abdominal pain, rash, and conjunctivitis along with laboratory abnormalities such as elevated inflammatory markers, coagulation factors, and cytokines. Patients fall into the following three subcategories: first, classic or incomplete Kawasaki; second, cardiogenic or distributive shock; or third, an inflammatory response that does not initially meet criteria of the other subcategories. Immediate treatment largely focuses on supportive care through fluid resuscitation and pressor support; however, inpatient management may also include intravenous immunoglobulin, steroids, anticoagulation and at times anti-inflammatory biologics.

SUMMARY: Overall fatality rate remains low and short-term research has demonstrated self-limited sequelae. Pediatricians should focus on the timely diagnosis and identification of this inflammatory disease via clinical findings and laboratory evidence to best treat these patients.

An Assessment of Management Strategies for Adult Patients With Foreign-Body Sensation in the Neck.

Garg N, Lee RN, Pekmezaris R, Gupta S; Southside Hospital, Bay Shore; J Emerg Trauma Shock; 2021 Jan-Mar;14(1):28-32.

OBJECTIVES: Patients come to the emergency department (ED) for the evaluation of foreign-body sensation in the neck. Given the dearth of clinical studies for this complaint, these patients are treated subjectively by different providers. We aim to propose a treatment approach that results in the timely diagnosis and removal of foreign bodies by comparing the common radiologic studies used in the ED for this complaint, determining the utility of consults, and providing an approach that minimizes length of stay.

METHODS: We conducted a retrospective cohort study of adults between January 2014 and December 2015 presenting to LIJ and NSUH EDs with a chief complaint of foreign-body sensation in the pharynx, larynx, or esophagus. Fifty unique cases were studied. Consultations with ear, nose, and throat (ENT) and/or gastrointestinal, any imaging studies used, and time until discharge from the hospital were the primary exposures studied. The time for each diagnostic path for successful removal of a foreign body was compared for each case.

RESULTS: Three common diagnostic approaches were identified. The most common pathway (six cases) had an ENT consult for removal of the foreign body, with an average time to discharge of 188 min. Another common pathway (four cases) began with a neck X-ray followed by an ENT consult, with an average time of 327 min. The third common approach (6 cases) involved no imaging studies or consults, with an average time of 166 min. Neck X-ray (20 cases) was found to have a sensitivity of 43% and a specificity of 83%. The sensitivity of neck computed tomography (CT) (15 cases) had a sensitivity of 91% and a specificity of 50%. Chest X-ray (15 cases) was found to have a sensitivity of just 17%. Chest CT (3 cases) had a sensitivity of 67%.

CONCLUSION: Based on our data, we recommend that an attempt to localize the foreign body be completed by the emergency physician. If an initial attempt does not resolve the sensation, an ENT consult to remove the possible object should be initiated. Only after failure by ENT should radiological imaging be considered.

MyEDCare: Evaluation of a Smartphone-Based Emergency Department Discharge Process.

Steel PAD, Bodnar D, Bonito M, Torres-Lavoro J, Eid DB, Jacobowitz A, Shemesh A, Tanouye R, Rumble P, DiCello D, Sharma R, Farmer B, Pomerantz S, Zhang; NewYork-Presbyterian Hospital, New York; Appl Clin Inform; 2021 Mar;12(2):362-371.

BACKGROUND: Poor comprehension and

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low compliance with post-ED (emergency department) care plans increase the risk of unscheduled ED return visits and adverse outcomes. Despite the growth of personal health records to support transitions of care, technological innovation's focus on the ED discharge process has been limited. Recent literature suggests that digital communication incorporated into post-ED care can improve patient satisfaction and care quality.

OBJECTIVES: We evaluated the feasibility of utilizing MyEDCare, a text message and smartphone-based electronic ED discharge process at two urban EDs.

METHODS: MyEDCare sends text messages to patients' smartphones at the time of discharge, containing a hyperlink to a Health Insurance Portability and Accountability Act (HIPAA)-compliant website, to deliver patient-specific ED discharge instructions. Content includes information on therapeutics, new medications, outpatient care scheduling, return precautions, as well as results of laboratory and radiological diagnostic testing performed in the ED. Three text messages are sent to patients: at the time of ED discharge with the nurse assistance for initial access of content, as well as two and 29 days after ED discharge. MyEDCare was piloted in a nine-month pilot period in 2019 at two urban EDs in an academic medical center. We evaluated ED return visits, ED staff satisfaction, and patient satisfaction using ED Consumer Assessment of Healthcare Providers and Systems (ED-CAHPS) patient satisfaction scores.

RESULTS: MyEDCare enrolled 27,713 patients discharged from the two EDs, accounting for 43% of treat-and-release ED patients. Of the treat-and-release patients, 27% completed MyEDCare discharge process, accessing the online content at the time of ED discharge. Patients discharged via MyEDCare had fewer 72-hour, 9-day, and 30-day unscheduled return ED visits and reported higher satisfaction related to nursing care.

CONCLUSION: EDs and urgent care facilities may consider developing a HIPAA-compliant, text message, and smartphone-based discharge process, including the transmission of test results, to improve patient-centered outcomes.

Modified PRIEST Score for Identification of Very Low-Risk COVID Patients.

Suh EH, Lang KJ, Zerihun LM; Columbia University, New York; Am J Emerg Med; 2021 Apr 23;47:213-216.

BACKGROUND: COVID-19 transmission remains high around the world, and severe local outbreaks continue to occur. Prognostic tools may be useful in crisis conditions as risk stratification can help determine resource allocation. One published tool, the Pandemic Respiratory Infection Emergency System Triage Severity Score, seems particularly promising because of its predictive ability and ease of application at the bedside. We sought to understand the performance of a modified version of this score (mPRIEST) in our institution for identifying patients with a greater than minimal risk for adverse outcome (death or organ support) at 30 days after index visit.

METHODS: Consecutive visits at two northern Manhattan EDs with a new diagnosis of symptomatic COVID-19 were identified between November and December of 2020. Demographic variables and clinical characteristics were obtained from chart review. Outcomes were obtained from chart review and follow-up phone call.

RESULTS: Outcomes were available on 306 patients. The incidence of death or mechanical ventilation at 30 days for patients in patients with mPRIEST above the threshold value was 43/181 (23.8%), and for patients below 1/125 (0.8%). The sensitivity of the score for adverse outcome was 97.7% (95% CI: 93.3% to 100%).

CONCLUSIONS: This data suggests the mPRIEST score, which can be calculated from clinical variables alone, has potential for use in EDs to identify patients at very low risk for adverse outcomes within 30 days of COVID diagnosis. This should be confirmed in larger formal validation studies in diverse settings.

Social Media Bridges the Training Gap Between Match Day and Internship With ACGME Milestone-Based Clinical Case Curriculum.

McLean ME, Huls TA, Cotarelo AA, Husain A, Park JC, Chan JC, So ES, Anana MC, Chen AS, Chien GK, Chung AS, Cygan LD, Gupta SJ, Kanter MP, Lee E, Mishra D, Ng KM, Restivo AJ, Russell JT, Shah K, Surles RT, Kulkarni ML; St. John's Riverside Hospital, Yonkers; AEM Educ Train; 2020 Aug 6;5(2):e10503.

OBJECTIVES: The objective was to bridge the relative educational gap for newly matched emergency medicine preinterns between Match Day and the start of internship by implementing an Accreditation Council for Graduate Medical Education Milestone (ACGME)-based virtual case curriculum over the social media platform Slack.

METHODS: We designed a Milestone-based curriculum of 10 emergency department clinical cases and used Slack to implement it. An instructor was appointed for each participating institution to lead the discussion and encourage collaboration among preinterns. Pre- and postcurriculum surveys utilized 20 statements adapted from the eight applicable Milestones to measure the evolution of preintern self-reported perceived preparedness (PP) as well as actual clinical knowledge (CK) performance on a case-based examination.

RESULTS: A total of 11 institutions collaborated and 151 preinterns were contacted, 127 of whom participated. After participating in the Slack intern curriculum (SIC), preinterns reported significant improvements in PP regarding multiple Milestone topics. They also showed improved CK regarding the airway management Milestone based on examination performance.

CONCLUSIONS: Implementation of our SIC may ease the difficult transition between medical school and internship for emergency medicine preinterns. Residency leadership and medical school faculty will benefit from knowledge of preintern PP, specifically of their perceived strengths and weaknesses, because this information can guide curricular focus at the end of medical school and beginning of internship. Limitations of this study include variable participation and a high attrition rate. Further studies will address the utility of such a virtual curriculum for preinterns and for rotating medical students who have been displaced from clinical rotations during the novel coronavirus pandemic.

Point-of-Care Ultrasound Findings in Multisystem Inflammatory Syndrome in Children: A Cross-Sectional Study.

Kennedy TM, Dessie A, Kessler DO, Malia L, Rabiner JE, Firnberg MT, Ng L; NewYork-Presbyterian Morgan Stanley Children's Hospital, New York; Pediatr Emerg Care; 2021 Mar 23.

OBJECTIVES: Multisystem inflammatory syndrome in children (MIS-C) associated with coronavirus disease 2019 is a novel

pediatric condition with significant morbidity and mortality. The primary objective of this investigation was to describe the point-of-care ultrasound (POCUS) findings in patients evaluated in the emergency department (ED) who were diagnosed with MIS-C.

METHODS: A retrospective cross-sectional study was conducted including patients <21-years-old who had POCUS performed for clinical care in a pediatric ED and were diagnosed with MIS-C. Point-of-care ultrasound studies were performed by pediatric emergency medicine attending physicians or fellows. Data abstracted by chart review included patient demographics, clinical history, physical examination findings, diagnostic test results, the time POCUS studies and echocardiograms were performed, therapies administered, and clinical course after admission.

RESULTS: For the 24 patients included, 17 focused cardiac ultrasound, nine lung POCUS, seven pediatric modified rapid ultrasound for shock and hypotension, one focused assessment with sonography for trauma, one POCUS for suspected appendicitis, and one ocular POCUS were performed by 13 physicians. Point-of-care ultrasound identified impaired cardiac contractility in five patients, large intraperitoneal free fluid with inflamed bowel in one patient, and increased optic nerve sheath diameters with elevation of the optic discs in one patient. Trace or small pericardial effusions, pleural effusions, and intraperitoneal free fluid were seen in three patients, six patients, and four patients, respectively.

CONCLUSIONS: This study demonstrates the spectrum of POCUS findings in MIS-C. Prospective studies are needed to help delineate the utility of incorporating POCUS into an ED management pathway for patients with suspected MIS-C.

Emergency Medicine Intern Education for Best Practices in Opioid Prescribing.

Lowy R, Bodkin RP, Schult R, McCann M, Jones CMC, Acquisto NM; University of Rochester Medical Center, Rochester; West J Emerg Med; 2020 Dec 16;22(2):297-300.

INTRODUCTION: Opioid exposure has been identified as a contributing factor to the opioid epidemic. Reducing patient exposure, by altering heavy opioid prescribing patterns but appropriately addressing patient pain, may represent one approach to combat this public health issue. Our goal was to create and implement an opioid education program for emergency medicine (EM) interns as a means of establishing foundational best practices for safer and more thoughtful prescribing.

METHODS: This was a retrospective study at an academic, urban emergency department (ED) comparing ED and discharge opioid prescribing practices over a 12-week time period for two 14-intern EM classes (2016 and 2018) to evaluate an early opioid reduction education program. The education program included opioid prescribing guidelines for common ED disease states associated with moderate pain, clinician talking points, and electronic education modules, and was completed by EM interns in July/August 2018. Opioid prescription rates per shift were calculated and opioid prescribing best practices described. We used chi-squared analysis for comparisons between the 2016 and 2018 classes.

RESULTS: Overall, ED and discharge opioid orders prescribed by EM interns were fewer in the 2018 class that received education compared with the 2016 class. ED opioid orders were reduced by 64% (800 vs 291 orders, rate per shift 1.8 vs 0.7 orders) and opioid discharge prescriptions by 75% (279 vs 70 prescriptions, rate per shift 0.7 vs 0.2 prescriptions). The rate of prescribing combination opioid products compared to opioids alone was decreased for ED orders (32% vs 16%, $P < 0.01$) and discharge prescriptions (91% vs 74%, $P < 0.01$) between the groups. Also, the median tablets per discharge prescription (14.5 vs 10) and total tablets prescribed (4,305 vs 749) were reduced, $P < 0.01$. There were no differences in selection of opioid product or total morphine milligram equivalents prescribed when an opioid was used.

CONCLUSION: An opioid reduction education program targeting EM interns was associated with a reduction in opioid prescribing in the ED and at discharge. This may be an effective way to influence early prescribing patterns and best practices of EM interns.

Language Barriers and Timely Analgesia for Long Bone Fractures in a Pediatric Emergency Department.

Gaba M, Vazquez H, Homel P, Likourezos A, See F, Thompson J, Rizkalla C; Maimonides Medical Center, Brooklyn; West J Emerg Med; 2021 Jan 11;22(2):225-231.

INTRODUCTION: Long bone fractures are common painful conditions often managed in the pediatric emergency department (PED). Delay to providing effective pediatric pain management is multifactorial. There is limited information regarding how the issue of language spoken impacts the provision of adequate and timely institution of analgesia. We sought to determine whether there is a difference between English-speaking and non-English speaking patients with respect to time to pain management for long bone fractures in a multi-ethnic urban PED.

METHODS: We conducted a retrospective cohort study of consecutive cases over 29 months of children <18 years old who presented to the PED with a first-time long bone fracture. A correlation of multiple clinical variables with timeliness to providing analgesia as a primary outcome was determined. We performed regression analysis to eliminate confounding and to determine the magnitude of each variable's effect on the outcome.

RESULTS: We analyzed a total of 753 patient cases (power 0.95). Regression analysis showed the variable of English vs non-English language spoken was the most significant predictor of timeliness to pain management ($p < 0.001$). There was a significant difference in median time to triage measurement of pain score (1 minute vs 4 minutes for English vs non-English speakers [$p < 0.001$]); median time to initial analgesia (4 minutes vs 13 minutes for English vs non-English speakers ($p < 0.001$]); and median time to opioid analgesia (32 minutes vs 115 minutes for English vs non-English speakers ($p < 0.001$]), respectively. All measurements of time were from the creation of a patient's electronic health record. Just 30% of all patients received an opioid analgesic for treatment of long bone fractures, including only 37% with moderate triage pain scores.

CONCLUSION: Delay to receiving analgesic medications in pediatric patients with long bone fractures can be augmented by language barriers. Time to providing analgesia for long bone fractures is significantly delayed in non-English speaking families, contributing to disproportionate care in the PED. Furthermore, use of opioid analgesia for fractures in children remains poor.

Interviewed By:
Angelo Mascia, DO
Chief Resident (PGY-4), St. Barnabas Hospital
Chair, New York ACEP Emergency Medicine Resident Committee

Interview With
Lyubov Nisenbaum, DO
Emergency Medicine Resident (PGY-3)
St. Barnabas Hospital

Interview With
Stanton Jasicki, DO
Emergency Medicine Resident (PGY-4)
St. Barnabas Hospital

Disparities in Healthcare

This past year has put a spotlight on not only the importance of healthcare worldwide, but also the exceedingly large disparities in healthcare between regions and nations. More than ever, we have come to an understanding that we are an interconnected network and our support of healthcare as a basic necessity is of utmost importance. Everyone should be able to access high quality healthcare and some have worked diligently in this area doing remarkable work in expanding these opportunities. It is my pleasure to speak with Dr. Lyubov Nisenbaum and Dr. Stanton Jasicki with respect to their incredible efforts to improve healthcare globally.

Dr. Nisenbaum is a PGY-3 in Emergency Medicine at St. Barnabas Hospital. She started her career with Doctors Without Borders/ Medecins Sans Frontieres (MSF) in 2008 in the Field Human Resources and Program departments at the U.S. headquarters in New York City. She then left for the field and worked with MSF in the Central African Republic, Democratic Republic of Congo, Mongolia, Burkina Faso, South Sudan, Haiti, Nepal and most recently Nigeria. After having held coordination and operational research positions, she was inspired by her medical colleagues in the field to change careers and become a physician.

Dr. Stanton Jasicki is a PGY-4 in Emergency Medicine at St. Barnabas Hospital. He first became involved in global health during his undergraduate studies conducting Chagas disease research in Ecuador. During medical school he began working with a non-profit called MGY that builds healthcare capacity through training and equipping community health workers in the Peruvian Amazon and rural Uganda. He is currently acting as Director of Emergency Medical Services of the organization.

Why do you feel global health is an important area to be involved?

Dr. Jasicki

I think it's important to look at health as a basic human right. No one should have to be sick or die just because they cannot afford healthcare or do not have access to it. As medical professionals we have the knowledge and skills to help elevate the global health status and make a difference.

Dr. Nisenbaum

Experience and knowledge of global health are important in better understanding the health care inequities and challenges patients face in the United States and in other countries. As physicians, we are in a unique position to be advocates for patients around the world who do not have access to healthcare.

What is your most memorable experience working in this field?

Dr. Nisenbaum

One of my most memorable experiences was coordinating a vaccination campaign and supporting teams treating cases of measles during an epidemic, in the Democratic Republic of Congo with Doctors Without Borders (MSF). At the height of the epidemic, we were seeing multiple children die each day from measles. After the vaccination campaign, walking into the measles ward and seeing it empty was incredible.

Dr. Jasicki

I have been working in rural Uganda teaching community health workers (CHWs) basic medical skills since I was a medical student. I think the best memory I have from my time there was when our inaugural class of CHWs transitioned into the role of educators, instructing a new class of CHWs entirely on their own. Everything had come full circle at that point. I was very proud of them!

What do you feel are the biggest challenges in addressing global health and what can be done to help?

Dr. Nisenbaum

The COVID pandemic is changing global health. Since the finite number of resources are going towards fighting the pandemic, disparities in basic healthcare around the world are getting worse. Policymakers and international organizations need to remember in order to fight the pandemic, lower income countries need to be included in vaccinations. In addition, resources need to continue to be allocated towards primary and preventive health care services.

Dr. Jasicki

Climate change is one of the biggest threats to global health. Extreme weather potentiates famine and the spread of infectious diseases like malaria. Contaminated water can lead to a host of diarrheal diseases and malnutrition. Poor air quality can lead to heart and lung disease and exacerbate chronic conditions. A cleaner world will ultimately be a healthier one. Health needs to take a front seat in the debate on climate change

Residents

and governments should be enacting policies to make a difference.

What advice or information do you have for someone looking to get more involved in global health initiatives?

Dr. Jasicki

Find a mentor that works in the area you want to work in or does the kind of work you want to be doing. A good mentor can help guide you through some of the challenges you will face and help you make connections. Surround yourself with like-minded individuals. Some of my best friends were made working in global health and they continue to be a source of inspiration and motivation. When it comes time to start looking at residencies ask the leadership about global health opportunities and how they would support your endeavors.

Dr. Nisenbaum

You do not have to travel far to get involved in global health initiatives. There are ways to get involved by working with refugee populations or in underserved areas in the United States. Learning a new language can also be helpful for international work. Think about how you want to integrate global health into your career. There are large international organizations working abroad but there are also opportunities for teaching and training of emergency physicians in countries where it is a very new specialty.

Calendar

July 2021

6-8 Scientific Assembly
6 Board of Directors Meeting, 11 am - 12 pm
7 Annual Meeting
8 Board of Directors Meeting, 7 am - 8 am

August 2021

25 Emergency Medicine Resident Career Day

September 2021

8 Education Committee Conference Call, 2:45 pm
8 Professional Development Conference Call, 3:30 pm
9 Practice Management Conference Call, 1:00 pm
15 Government Affairs Conference Call, 11:00 am
15 Emergency Medicine Resident Committee Conference Call, 2:00 pm
15 Research Committee Conference Call, 3:00 pm
16 EMS Committee Conference Call, 2:30 pm
29 San Diego Zoo Virtual Tour, 6 pm

October 2021

5 Professional Development Lecture Series, 7:30 - 8:30 pm
8 Board of Directors Meeting, 11:00am - 3:00 pm
13 Education Committee Conference Call, 2:45 pm
13 Professional Development Conference Call, 3:30 pm
14 Practice Management Conference Call, 1:00 pm
20 Government Affairs Conference Call, 11:00 am
20 Emergency Medicine Resident Committee Conference Call, 2:00 pm
20 Research Committee Conference Call, 3:00 pm
21 EMS Committee Conference Call, 2:30 pm
23-24 ACEP Council Meeting, Boston Massachusetts
25-28 ACEP21, Boston Massachusetts

November 2021

3 Annual Research Conference
10 Education Committee Conference Call, 2:45 pm
10 Professional Development Conference Call, 3:30 pm
11 Practice Management Conference Call, 1:00 pm
17 Government Affairs Conference Call, 11:00 am
17 Emergency Medicine Resident Committee Conference Call, 2:00 pm
17 Research Committee Conference Call, 3:00 pm
18 EMS Committee Conference Call, 2:30 pm

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