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Physicians' vehicles parked curbside for quick exit were buried in a record snowfall

See more blizzard photos, page 69

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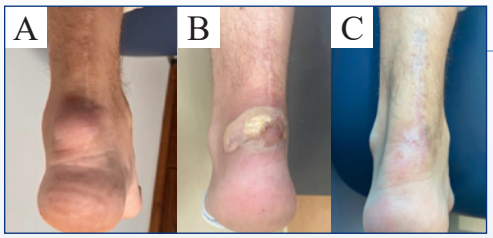

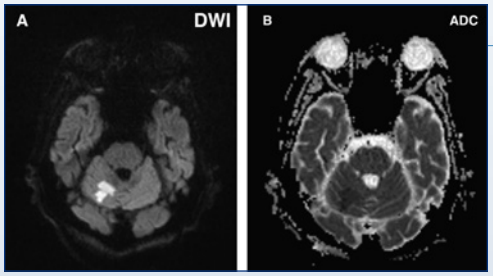

CASE REPORTS

IMAGES IN MEDICINE

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RESEARCH STUDIES

PUBLIC HEALTH

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On the cover: Vehicles belonging to health care providers, parked at the curb to make a quick exit, were instead buried by a record-breaking snowfall of 36 inches in Providence.

Brown Health Medical Group Primary Care in Middletown.

Ob/Gyn resident Kalin Gregory-Davis, MD, skied to work when roads were impassable.

Twins Liliana and Amelia DiPrete were born at W&I during the height of the storm.

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Sigmoid Volvulus in a Healthy Adolescent Male

JOSEPH A. INGER, BS; CAITLIN AZZO, MD; KRISTIN H. DWYER, MD, MPH; ARTUR CHERNOGUZ, MD; LACHLAN DRIVER, MD

ABSTRACT

We report the case of a 15-year-old previously healthy male who presented with several days of progressive abdominal pain, vomiting, and anorexia. On arrival to the emergency department, he was hemodynamically stable. Patient's abdominal exam revealed a soft, benign abdomen with right-sided greater than left-sided tenderness. Cross-sectional imaging demonstrated sigmoid volvulus without evidence of pneumatosis, perforation, or free air. He underwent multidisciplinary evaluation by pediatric surgery and gastroenterology, and urgent endoscopic detorsion was performed. Pediatric sigmoid volvulus is rare, accounting for a small minority of large bowel obstructions in this age group. Symptoms may be nonspecific, and exam findings can appear reassuring despite the presence of a high-risk surgical emergency. This case highlights the importance of maintaining a broad differential diagnosis in adolescents presenting with abdominal pain and underscores the role of imaging and multidisciplinary collaboration in timely recognition and management.

KEYWORDS: adolescent abdominal pain; computed tomography; cross-sectional imaging; endoscopic detorsion; gastrointestinal volvulus; large bowel obstruction; pediatric sigmoid volvulus; pediatric surgery

INTRODUCTION

Sigmoid volvulus results from torsion of the sigmoid colon around its mesenteric axis, leading to colonic obstruction and potential ischemia. While relatively frequently encountered in adult patients—particularly in elderly, institutionalized or constipated patients—it is exceedingly rare in patients under 18 years old, with fewer than 300 cases reported.[1] Pediatric presentations can be subtle, with abdominal pain, distention, or emesis that mimic functional gastrointestinal disorders. Delayed diagnosis risks bowel ischemia, necrosis, or perforation, leading to increased morbidity.[2]

We present the case of a previously healthy 15-year-old male who developed sigmoid volvulus, which was managed with urgent endoscopic intervention. This case demonstrates the diagnostic challenge of sigmoid volvulus in the pediatric population and emphasizes the importance of early imaging and multidisciplinary management.

CASE PRESENTATION

A 15-year-old previously healthy male presented with four days of progressive abdominal pain. The pain began as intermittent, diffuse discomfort but escalated in severity, radiating around the waist and to the lower back, more prominent on the right side. By the time of presentation, the patient's pain intensity had reached 8/10 and he had limited prolonged ambulation. He also reported two episodes of non-bloody, non-bilious emesis, mild watery diarrhea, and reduced appetite. He denied fever, chills, hematochezia, or dysuria.

He had no significant past medical or surgical history. He was not taking medications, had no known allergies, and there was no family history of gastrointestinal disease. He denied tobacco, alcohol, or drug use. He lived with his parents and attended school regularly.

On arrival to the emergency department, vital signs were notable for blood pressure 117/78 mmHg, heart rate 72 bpm, temperature 97.8°F, and oxygen saturation 97%.

Physical exam revealed an alert, non-toxic adolescent in no acute distress. Abdominal exam revealed a soft abdomen with mild right-sided greater than left-sided tenderness. There was no costovertebral angle tenderness. Cardiopulmonary and neurologic examinations were unremarkable.

Laboratory evaluation showed no leukocytosis (WBC 8.5 $\times 10^3/\mu L$), hemoglobin 16.3 g/dL, creatinine 0.9 mg/dL, and lactate within normal limits. Urinalysis demonstrated

Figure 1. Coronal contrast-enhanced CT image of the abdomen demonstrating "Whirl Sign" indicated by white arrows.

concentrated urine with mild proteinuria and microscopic hematuria but no pyuria. Liver function and lipase levels were unremarkable.

Computed tomography (CT) of the abdomen and pelvis with intravenous contrast revealed findings compatible with sigmoid volvulus with no evidence of pneumatosis, portal venous gas, or free air [**Figure 1**].

Pediatric surgery and gastroenterology were urgently consulted. Given the absence of peritonitis or ischemic signs, the decision was made to pursue endoscopic detorsion. Flexible sigmoidoscopy was performed with successful detorsion, resulting in decompression. The patient was admitted for observation and further surgical evaluation regarding definitive management to prevent recurrence. On hospital day three he underwent open resection of redundant sigmoid colon (55 cm) with primary rectosigmoid anastomosis. A rectal biopsy was performed with concern for Hirschsprung disease, showing no pathology. The patient experienced postoperative ileus with subsequent nasogastric decompression, tolerated regular diet on postoperative day 10, and was discharged on postoperative day 11.

DISCUSSION

Colonic volvulus accounts for 10–15% of all large bowel obstructions in the United States and Western Europe. Sigmoid volvulus is the most common type of colonic volvulus in both children and adults.[3] Incidence of colonic volvulus varies widely in different regions of the world, with endemic areas in regions of Africa, South America, Eastern Europe, and the Middle East, with volvulus accounting for 13% to 42% of all intestinal obstructions.

Sigmoid volvulus is most common in elderly adults with predisposing factors such as chronic constipation, diabetes, and neuropsychiatric illness, potentially leading to reduced autonomy, prolonged bed rest, or institutional placement.[3] In contrast, pediatric and adolescent sigmoid volvulus is rare, and recognition can be delayed due to its nonspecific presentation.[4]

Epidemiology and risk factors

From case reports, predisposing risk factors have included late onset Hirschsprung disease, history of chronic constipation, neuromuscular disorders (cerebral palsy, myopathy, and Prader-Willi syndrome), anatomic variants such as dolichosigmoid and infections such as *Ascaris lumbricoides* (roundworm) infestation or Chagas disease in tropical areas.[3,5-7]

Many cases, however, as in our patient, occur in otherwise healthy children without clear predisposing conditions.[1,4,8] From a systematic review of pediatric sigmoid volvulus case reports, two incidence peaks were identified: the first within the first six months of life and the second during the school-age years. Multiple reviews also reported a higher prevalence in male patients, with male-to-female ratios ranging from 2.3:1 to 3.5:1.[1,4]

Clinical features

Symptoms of sigmoid volvulus include abdominal pain, distention, nausea, vomiting, and constipation or diarrhea. Physical examination may be deceptively benign, with minimal tenderness despite advanced disease.[4,9] In this case, the patient's abdomen remained soft and only mildly tender despite radiologic evidence of volvulus. Notably, the patient continued to have episodes of diarrhea, highlighting that clinical signs of complete obstruction were absent despite significant pathology.

Diagnosis

Imaging plays a crucial role in diagnosis. Abdominal radiographs may show the "coffee-bean" sign, formed through the progressive distention of the closed loop of the sigmoid colon with gas, leading to apposition of the medial walls of the dilated bowel,[10] while CT can demonstrate the whirl sign of twisted mesentery.[2,10] In pediatric patients, CT is typically reserved for cases with uncertain diagnosis, with efforts made to limit radiation exposure. When performed, CT can help identify complications such as free intra-abdominal fluid or gas, thereby guiding appropriate management decisions.[1]

Management

In stable pediatric patients without signs of ischemia or perforation, first-line therapy is endoscopic detorsion via flexible sigmoidoscopy or colonoscopy.[11] Recurrence is common, however, and elective sigmoid resection is often recommended to prevent recurrence and future complications.[8] Surgery is mandatory in cases of failed detorsion, peritonitis, or gangrenous bowel.[11,12]

Initial clinical presentation and availability of endoscopic expertise dictates the urgency of surgical intervention. Hemodynamically stable patients with radiographic signs of sigmoid volvulus should undergo an urgent colonoscopic decompression. Placement of a rectal tube at the conclusion of the procedure can help prevent an early recurrence of the volvulus, but does not commit to definitive partial colectomy. While endoscopic decompression is typically successful in resolving the volvulus, it can do little to prevent recurrence (up to 57%).[1] Unfortunately, no specific predictors of recurrence have been identified and the presence of a redundant sigmoid colon is a risk for recurrent volvulus. Therefore, elective resection of the redundant sigmoid colon is generally recommended and well-tolerated. Nevertheless, definitive sigmoid resection can be occasionally avoided.[2,13]

Patients presenting with clinical and/or radiographic signs of bowel ischemia are not candidates for endoscopic decompression. Instead, urgent operative intervention should be undertaken and aimed at excision of the affected and redundant sigmoid colon. Primary restoration of bowel continuity should be the goal, provided that the patient is hemodynamically stable. However, a temporary fecal diversion

procedure is appropriate when bowel viability is in question or the patient cannot tolerate a lengthier procedure. In either case, the patient can be positioned in lithotomy, in order to facilitate access to the rectum and to enable the option of a transrectal end-to-end anastomosis after the resection of the redundant sigmoid portion. A rectal biopsy for Hirschsprung's disease (reported to be present in up to 17% of cases) is frequently, albeit not routinely, performed.[1,4]

CONCLUSION

Although rare, sigmoid volvulus should be considered in adolescents presenting with abdominal pain and vomiting, even when physical examination is reassuring. Prompt recognition, imaging, and collaborative management are key to preventing life-threatening complications. This case illustrates the importance of broad diagnostic consideration in the pediatric emergency setting.

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First Presentation of Tophaceous Gout in the Achilles Tendon After Primary Repair: A Report of Two Cases

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KEYWORDS: Gout; Achilles tendon repair; Achilles tendon gout; postoperative complications

INTRODUCTION

While it is unusual for the Achilles tendon to be the initial site of a gout flare in patients with no history of gout or hyperuricemia, up to 25% of patients with chronic gout have Achilles tendon involvement.[1] Gout flares may present initially as pain, swelling, and weakness around the Achilles tendon without trauma and can mimic infection at presentation.[2-6]

There are rare individual case reports of the development of gouty tophi as the initial presentation of gout years after the repair of a ruptured Achilles tendon.[7-9] We present two such cases, in a 42-year-old male and a 35-year-old male with no prior history of gout who each developed gouty deposition on and around retained suture material 6 and 8 years after initial Achilles repair. We hope to direct attention to the presentation of gout in this setting and start to delineate the progression of this presentation.

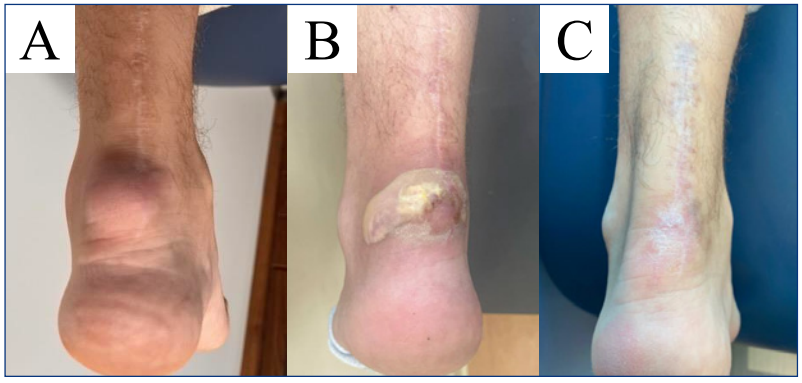
CASE REPORT

Case 1

A 42-year-old male, 6 years status post Achilles repair presented with 1 week of posterior Achilles pain and progressive ankle swelling. He was afebrile with normal vital signs and denied any trauma. His initial x-rays were normal. He was found to have a palpable golf ball-sized mass at the distal extent of the original incision [**Figure 1A**]. With concern for abscess and eruption of a previous occult infection, he was started on cephalexin and an MRI without contrast was obtained, demonstrating extensive tendinopathy with degenerative cystic change extruding through the dorsal distal Achilles into the subcutaneous tissue along with soft tissue swelling [**Figure 2A**]. The area of fluctuance was aspirated, yielding a white opaque fluid concerning for infection versus gout. Lab work revealed elevated C-reactive protein (CRP) (20.04 mg/L) and normal erythrocyte sedimentation rate (ESR) (11 mm/h). The patient subsequently developed drainage and additional skin changes at the aspiration site, and a surgical procedure for irrigation and debridement was scheduled [**Figure 1B**].

In the operating room, gray viscous fluid and white material exuded upon skin incision. The nonabsorbable suture and Achilles tendon were found to be embedded with white chalky material consistent with tophaceous gout. Irrigation and debridement was performed and all suture and friable tissue were removed. The patient was discharged the next day with empiric trimethoprim-sulfamethoxazole due to ongoing concern for superimposed infection. Preoperative aspiration cultures demonstrated no growth, and intraoperative cultures grew mixed cutaneous flora consistent with contamination. Pathology confirmed gouty tophi with fibrin as well as abundant acute inflammation. Upon further questioning at his 1-week follow-up, the patient confirmed a history of pain in his great toe and noted that his father had a history of gout. The patient's uric acid level was 7.9 mg/dL (normal 3.5–7.0 mg/dL) and he was started on allopurinol. Two weeks post-operatively, there were no signs of drainage or swelling. At 1 month, the patient could walk without limping. Six months post-operatively, the wound remained fully healed with baseline thickening of the Achilles tendon and no pain, swelling, or drainage [**Figure 1C**]. Physical exam demonstrated full range of motion with good plantar flexion strength, although single leg heel rise was weaker compared to the contralateral side, unchanged from prior to

Figure 1. [**A**] Palpable golf ball-sized mass at the distal extent of the original incision of Case 1. **[B]** Site of tophaceous gout and drainage 1 day before surgery. **[C]** Fully healed wound 6 months after surgery.



the gout flare. At 1 year follow-up, the patient had continued taking allopurinol with no additional symptoms reported. The Foot and Ankle Outcome Score (FAOS) at one year was 85%, broken down into the following subtotals: Symptoms + Stiffness: 71%; Pain: 92%; Function, daily living: 96%; Function, sports and recreational activities: 90%; Quality of life: 44%.

Case 2

A 35-year-old male, 8 years post-Achilles repair presented with 4 days of new left ankle pain and progressive swelling after light exercise. Exam revealed swelling and tenderness along the Achilles tendon posteriorly, as well as decreased dorsiflexion range of motion and decreased sensation in the sural nerve distribution. X-rays demonstrated posterior calcaneal bone spurring and mild lateral and posterior soft tissue swelling. Deep vein thrombosis was excluded through ultrasound. The patient's ankle was made weightbearing in a tall boot and he was given a 6-day methylprednisolone taper with transient relief. Lab work revealed normal CRP (<3 mg/L), elevated ESR (15 mm/h), and normal uric acid (6.7 mg/dL). Given continued pain with attempted weightbearing, an MRI with and without contrast was ordered, revealing edema in the flexor hallucis longus muscle and fluid along the medial Achilles tendon [**Figure 2B**]. Due to concern for deep infection, he was started on trimethoprim-sulfamethoxazole. However, swelling and tenderness increased over the following week, along with the development of erythema about the posterior ankle. A second methylprednisolone taper was initiated, and the patient had transient improvement; however, symptoms returned after discontinuation. He was taken to the operating room 3 weeks after initial presentation, where an incision along the Achilles tendon exuded a chalky white fluid. Both suture and Achilles tendon were found to be embedded with white chalky material consistent with tophaceous gout. The suture and all friable tissue were removed, and the tendon was thoroughly irrigated. Intraoperative cultures were negative. Pathology confirmed gouty tophi with fibrin. Two weeks postoperatively, there were no signs of drainage or swelling. At 1 month, the patient could walk without pain in a tall boot. Three months postoperatively, he had significant improvement in symptoms and was able to walk without a boot. At 6 months, he had returned to his baseline function and pain level, and physical exam demonstrated good plantar flexion strength and full range of motion. The Foot and Ankle Outcome Score (FAOS) at 6 months was 84%, broken down into the following subtotals: Symptoms + Stiffness: 93%; Pain: 83%, Function, daily living: 87%; Function, sports and recreational activities: 80%; Quality of life: 63%.

Figure 2. T2-weighted MR images: [**A**] In Case 1, sagittal and corresponding axial views. [**B**] In Case 2, sagittal and corresponding axial views.

DISCUSSION

Four other reports of surgical site gout surrounding retained suture material after Achilles tendon repair that share similarities with our cases were found in the literature: in a 58-year-old female 12.5 years after repair,[9] in a 49-year-old male many years after repair,[6] in a 32-year-old male 7 years after repair,[8] and in a 53-year-old male during revision surgery 2.5 years after initial repair.[7] All six patients had no prior diagnosis of gout or hyperuricemia and at presentation were afebrile with progressive pain and swelling around the original incision. Three patients presented with an abscess that drained a significant amount of chalky white material, although similar material was found embedded in the nonabsorbable suture in all patients, and suture removal appeared to resolve all redness, swelling, and pain.

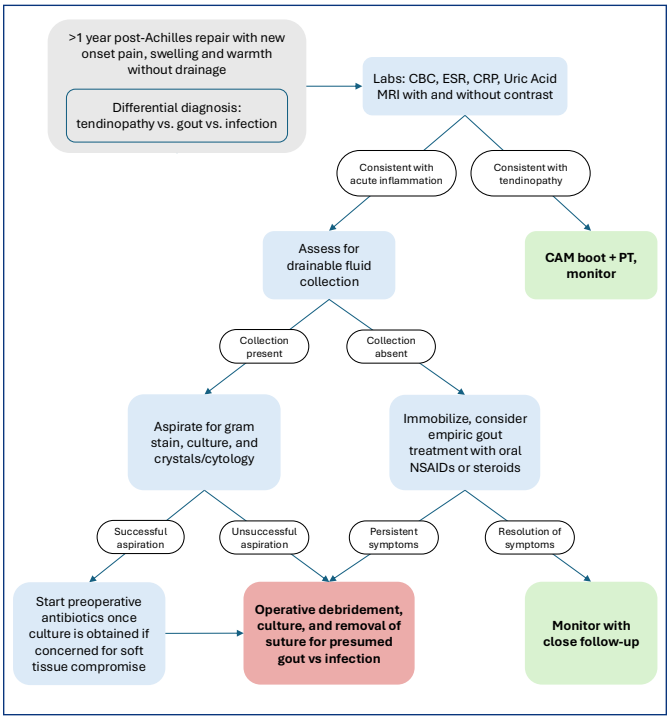
There may be a relationship between gout and Achilles rupture even without suture repair. Studies have shown that asymptomatic hyperuricemia may be a risk factor for Achilles tendon rupture as elevated serum uric acid levels may disrupt the functional integrity of tendon tissue.[10–12] In tendon stem/progenitor cells (TSPCs), high uric acid levels have been shown to suppress the AKT-mTOR signaling pathway, which plays a critical role in sensing cellular stress and metabolic abnormalities, thus impeding the function of TSPCs in regulating tendon homeostasis and increasing risk of rupture.[12] Again, neither patient in this study had prior uric acid levels available to reference as a potential risk factor for their initial ruptures.

Even without prior rupture or repair, tophaceous gout may have a specific predilection for the Achilles tendon. Lower temperatures and limited blood supply make the tendon more prone to monosodium urate (MSU) crystal buildup due to decreased clearance, and repeated mechanical stress with microtrauma can create local inflammation or microtears that serve as a nidus for MSU crystal accumulation.[13]

Another factor involved may be the suture material. Nonabsorbable sutures are frequently used in tendon repairs because they have greater tensile strength and may reduce the risk of re-rupture compared to absorbable sutures.[14,15] While no association between retained suture material and gout flares has been established, it is possible that the sutures can act as foreign bodies that increase inflammation, contributing to the development of gout. In particular, both of our patients' initial repairs were done with FiberWire (Arthrex, Naples, FL), a braided nonabsorbable silicone-coated suture, which has been associated with inflammatory and foreign body reactions.[16] Mechanical friction from shoes and chronic irritation by the suture against the overlying skin may lead to further inflammation, precipitating the formation of MSU crystals.[9] The combination of nonabsorbable sutures and MSU crystals has been hypothesized to result in a more robust inflammatory response than induced by either process alone.[7] Two similar cases have been reported in the upper-extremity literature, with tophi formation surrounding nonabsorbable suture 7 and 33 years after initial tendon repair in the forearm and hand in patients with no history of gout or hyperuricemia.[17,18]

These cases underscore the need for heightened clinical awareness and consideration of gout in the differential diagnosis for late post-surgical Achilles repair complications. Earlier diagnosis can lead to expedited operative intervention prior to potential skin breakdown or superimposed infection. The presentation for infection and tophaceous gout is similar and delineating the two pathologies is critical for appropriate treatment. If a fluid collection is present, aspiration for gram stain, culture, and cytology/crystals prior to initiating oral antibiotics would be ideal. Empiric antibiotics following aspiration should be considered if there is concern for infection causing destruction of the tenuous soft tissue over the Achilles tendon. We recommend early surgical intervention if there is a large fluid collection or failure to respond to oral NSAIDs or steroids as surgical debridement is indicated if either infection or gout is present. The treatment algorithm outlined in **Figure 3** provides a useful framework, but individual patient care should ultimately be guided by clinical judgement.

Figure 3. Algorithm for workup and management of new inflammatory symptoms at repair site >1 year after initial Achilles repair.



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Dizziness Found to Be *Candida Parapsilosis* Prosthetic Valve Endocarditis

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ABSTRACT

Candida parapsilosis is an opportunistic pathogen with a propensity for biofilm formation and adhesion to medical devices. Although rare, fungal prosthetic valve endocarditis (PVE) is a feared complication of disseminated candidemia or direct intraoperative contamination from fungal adherence to prosthetic valves. *C. parapsilosis* is one of the most common species underlying fungal endocarditis. We present a 78-year-old male patient 2 months after transcatheter aortic valve replacement with persistent dizziness and a cerebellar stroke found to be secondary to treatment-resistant disseminated candidemia and fungal PVE. This case highlights the diagnostic challenges of source identification in fungal endocarditis and reinforces the importance of considering prosthetic valve involvement early in the evaluation of persistent fungemia. Optimal management of *C. parapsilosis* endocarditis requires prolonged antifungal therapy as well as definitive source control.

KEYWORDS: Candidemia; candida parapsilosis; TAVR; infective endocarditis; infectious diseases

BACKGROUND

Candida parapsilosis is an opportunistic pathogen with a propensity for adhesion to medical devices via biofilm formation.[1,2] The organism has a particular predilection for colonizing prosthetic devices such as implanted cardiac valves, although most *C. parapsilosis* infections arise from underlying intestinal colonization with subsequent fungal translocation to the blood and possible dissemination to solid organs.[3,4] Along with *C. albicans*, *C. parapsilosis* is the most common species underlying fungal endocarditis,[5] a life-threatening condition with reported mortality rates approaching 60%.[6-11] It should be noted, however, that fungal endocarditis is rare, accounting for only 1–2% of all infective endocarditis cases.[11,12] More specifically, *Candida parapsilosis* accounts for approximately 0.61% (5/822) of infective endocarditis cases.[11] A subset of fungal infective endocarditis is fungal prosthetic valve endocarditis (PVE), a condition in which an implanted cardiac valve serves as a nidus for fungal colonization. *Candida parapsilosis* as the source of PVE is similarly rare, accounting for approximately 0.84% (2/237) of all PVE cases.[11] Fungal PVE may either arise as a complication of disseminated candidemia or serve as the primary source of bloodstream infection, the latter most often due to direct intraoperative contamination with fungal adherence to prosthetic valves. Bacterial and fungal organisms, including *Candida* spp., can be introduced during valve surgery in both children[13] and adults[11] and often manifest as clinical infection within 60 days to over a year post-operatively.

We present the case of a patient with persistent candidemia 2 months after a transcatheter aortic valve replacement. We outline the diagnostic complexities associated with a nonspecific initial presentation with minimal symptom progression despite fungemia and discuss the optimal management of prosthetic valve endocarditis.

CASE REPORT

A 78-year-old male presented to the emergency department with urinary frequency and acute dizziness, ongoing for the past day. His past medical history included type 2 diabetes mellitus, atrial fibrillation, heart failure with reduced ejection fraction ([EF] 25–30%), and stage D2 aortic stenosis (symptomatic severe low-flow, low-gradient aortic stenosis with reduced left ventricular ejection fraction). The patient presented 2 months after a transcatheter aortic valve replacement (TAVR) and three-vessel coronary artery bypass grafting (CABG) with post-operative EF of 40%. Notably, the patient was hospitalized 3 weeks prior for *Serratia marascens* urinary tract infection (UTI) that evolved into *Serratia marascens* bacteremia and eventually septic shock requiring vasopressor support. Blood and urine cultures at that time did not detect fungal species. The patient also had an unrelated unilateral ureteral stent placed for an obstructive renal calculus in the mid-ureter.

On presentation, the patient was afebrile, normotensive, and breathing comfortably on room air. Physical exam revealed a non-toxic appearance, a grade II/VI systolic ejection murmur best heard at the right upper sternal border, and mild suprapubic tenderness. The neurologic exam was notable only for an unsteady gait. Labs were notable for hemoglobin 8.9 g/dL (baseline 8–9 g/dL); leukocytosis was not present. Urinalysis was significant for pyuria (>180

WBC/HPF), hematuria (>180 RBC/HPF), and 4+ bacteriuria. Computed tomography (CT) of the abdomen and pelvis was largely unremarkable with no evidence of pyelonephritis or intrabdominal abscesses. Treatment for UTI was initiated with trimethoprim/sulfamethoxazole following urine culture growing *Serratia marascens* >100,000 col/mL. Blood cultures speciated as *Candida parapsilosis*, prompting initiation of caspofungin therapy. Transesophageal echocardiography demonstrated two mobile densities on the bioprosthetic aortic valve with trace intravalvular leak suggestive of fungal endocarditis. Magnetic resonance imaging (MRI) of the brain on hospital day (HD) 7 revealed acute ischemia of the superior right cerebellum consistent with septic emboli [**Figure 1**]. Per the patient's goals of care and concern for high surgical risk, the patient declined urgent valve replacement surgery. Therapy was changed to liposomal amphotericin B (AmphoB) for treatment of disseminated candidemia with endocarditis. The patient was switched to fluconazole and micafungin in the setting of acute kidney injury (AKI) secondary to AmphoB toxicity. Blood cultures were negative for yeast on HD 19. Fluconazole was transitioned to isavuconazole due to QTc prolongation. The patient was discharged on HD 32 with an additional 4 weeks of micafungin treatment and long-term suppressive therapy with isavuconazole. Unfortunately, the patient succumbed to disseminated infection with multiorgan involvement 48 days after hospital admission [**Figure 2**].

Figure 1. [**A**] MRI imaging acquired on hospital day 7 depicting a 17 x 13 mm wedge-shaped lesion in the superior right cerebellum, visualized as hyperintense with restricted diffusion on DWI, [**B**] with a corresponding hypointensity on ADC, consistent with acute ischemic infarct.

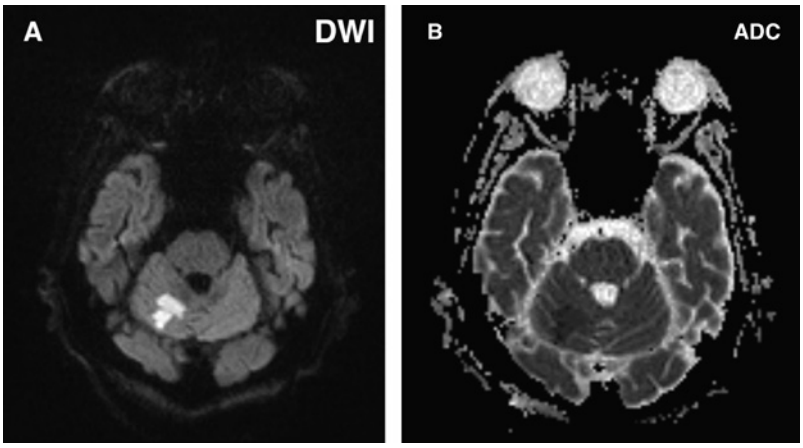
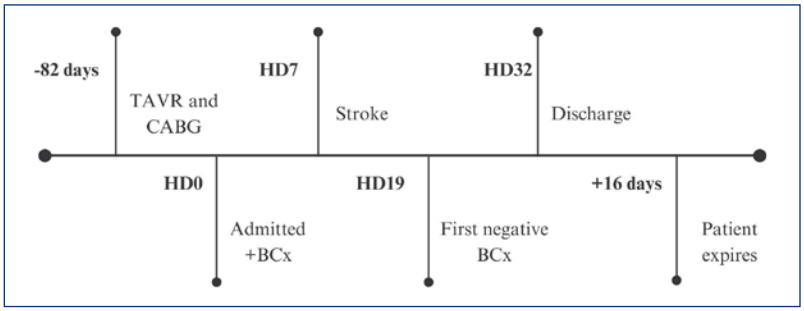


Figure 2. Timeline of events.



DISCUSSION

This case is an example of post-TAVR *Candida parapsilosis* endocarditis complicated by septic embolic stroke, overall illustrating the importance of a thorough history and physical examination in determining the source of fungal endocarditis. Although fungal PVE can be a sequela of candidemia from another source, the infected prosthetic valve itself can also be the primary source of infection. In our patient, the absence of a clear extracardiac infectious focus ultimately pointed to the prosthetic valve itself as the likely nidus of infection. Biofilm formation on the prosthetic surface likely enabled continuous microbial shedding into the bloodstream, contributing to persistent fungemia despite appropriate antifungal therapy.

It is important to recognize that embolic and/or hemorrhagic complications, most commonly as cerebral thromboembolic events, have been found to occur in greater than 40% of patients with *Candida parapsilosis* endocarditis.[14] Our patient's mild but persistent dizziness was ultimately found to be the manifestation of cerebellar infarct, likely caused by septic emboli originating from the infected valve. This complication highlights the importance of thoroughly investigating unexplained symptoms, even when they are mild or nonspecific, especially in the context of systemic infection. Although stroke was not initially suspected, the combination of fungal endocarditis and ongoing dizziness warranted advanced neuroimaging, which proved essential in identifying the full extent of disease.

Previous reports of *C. parapsilosis* endocarditis within a year after TAVR have established that source control is elusive with medical treatment alone given the propensity for biofilm formation,[9,15,16] a hallmark of *C. parapsilosis* pathogenicity that underlies fluconazole resistance.[4] The latest guidelines from the Infectious Diseases Society of America (IDSA) and the American Heart Association recommend treatment of *C. parapsilosis* endocarditis with antifungal therapy (ie, echinocandins, triazoles, polyenes) combined with adjuvant surgical intervention.[17,18] The combination of medical and surgical therapy confers increased survival in patients with fungal endocarditis compared to medical therapy alone. A 2005 meta-analysis of *Candida* endocarditis cases reported a prevalence odds ratio of 0.56

for mortality in patients undergoing adjunctive surgery in addition to medical therapy when compared to medical therapy alone.[5,19] Regardless of surgical intervention, the IDSA recommends chronic suppressive antifungal therapy with a triazole agent to prevent disease recurrence.[17] Although our patient was discharged with chronic antifungal suppression, he succumbed to the infection in the context of goals of care precluding valve replacement surgery.

CONCLUSION

In summary, we describe a unique presentation of *Candida parapsilosis* endocarditis complicated by embolic cerebellar infarction. This case highlights the diagnostic challenges of source identification in fungal endocarditis and reinforces the importance of considering prosthetic valve involvement early in the evaluation of persistent fungemia. Prior reports and our experience emphasize that optimal management of *C. parapsilosis* endocarditis requires not only prolonged antifungal therapy but also timely surgical valve replacement to achieve definitive source control.

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Central Hypothyroidism Associated with Oxcarbazepine in Pediatric Patients: Case Series and Literature Review

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ABSTRACT

Central hypothyroidism, a hypothyroid state resulting from insufficient stimulation by thyrotropin (TSH) of an otherwise normal thyroid gland, is a rare under-recognized side effect of oxcarbazepine. We describe four young patients diagnosed with central hypothyroidism likely due to oxcarbazepine and conducted a literature review for previously published cases. Four patients ranging in age from 11-20 years were treated with oxcarbazepine and were subsequently found to have low free thyroxine (FT4) levels and inappropriately normal thyroid stimulating hormone (TSH) concentrations. All had normal thyroid examinations and normal morning cortisol. The two patients who were still growing had normal growth hormone markers. Magnetic resonance imaging (MRI) of the brain was normal in all. Three of the patients experienced symptoms consistent with hypothyroidism; treatment with levothyroxine led to resolution of symptoms. Three of the patients discontinued oxcarbazepine; subsequently all had normalization of thyroid function. Oxcarbazepine can lead to low FT4 concentrations with normal TSH values. Assessment of TSH and FT4 could be included in the periodic screening of patients taking oxcarbazepine. A limited number of reported cases have suggested that monitoring of thyroid function studies may be indicated in patients taking oxcarbazepine, to monitor for development of CH.

KEYWORDS: Central hypothyroidism; oxcarbazepine; child; youth

INTRODUCTION

Central hypothyroidism (CH) is a hypothyroid state resulting from insufficient stimulation by thyrotropin (TSH) of an otherwise normal thyroid gland.[1] Medications including glucocorticoids, dopamine, and bromocriptine can lead to central hypothyroidism (CH) by suppressing thyroid stimulating hormone (TSH) through their action at the hypothalamus or pituitary.[2] Oxcarbazepine has also been reported to cause CH.[1,3,4] Oxcarbazepine, a structural analogue of carbamazepine, was developed for the treatment of focal seizures among children and adolescents and has been used in the United States since 2000.[1] Here we describe the evaluation and management of four youth with CH secondary to oxcarbazepine in our institution and compare them with the clinical course of six previously described adolescents who developed CH following oxcarbazepine use.[1,4]

CASE PRESENTATIONS

Patient 1

A 16-year 10-month-old girl with Townes Brocks syndrome (TBS) was found to have abnormal thyroid function tests (TFTs) during evaluation of menorrhagia. TBS is a rare autosomal dominant malformation characterized by a triad of imperforate anus, malformed ears (commonly associated with sensorineural or conductive hearing loss), and thumb anomalies and is not typically associated with CH.[5] She reported constipation and tiredness. She had been treated with oxcarbazepine for focal seizures for the past 8 years. She had normal vital signs and a history of normal growth and development. Her thyroid examination was normal. Laboratory evaluation showed CH [**Table 1**] and she was started on levothyroxine 100 mcg daily (1.14 mcg/kg/day). The oral dose for levothyroxine for adolescents with growth and puberty complete is around 1.6 mcg/kg/dose once daily.[6] The patient was lost to follow up, discontinued the levothyroxine on her own, and continued to take oxcarbazepine. Repeat laboratory tests 16 months later showed persistent CH: inappropriately normal TSH 2.567 uIU/mL in the setting of a low free T4 (FT4) 0.69 ng/dL concentration. She reported fatigue, constipation, and weight gain. She restarted levothyroxine and was biochemically euthyroid on follow-up. Subsequently she discontinued the oxcarbazepine, after which the levothyroxine was stopped as well. Repeat thyroid function studies subsequently normalized.

Patient 2

An 11-year 9-month-old girl with Phelan McDermid syndrome was found to have a low FT4 and normal TSH as part of the evaluation for developmental delay. Phelan–McDermid syndrome is a disorder of neurological development resulting from deletion of the distal long arm of chromosome 22 (22q13.3) which is not typically associated with CH.[7] She had been treated with oxcarbazepine for focal seizures over the past 7 months. She had baseline constipation

Table 1. Clinical and laboratory parameters of our patients

Patient characteristics	Patient 1	Patient 2	Patient 3	Patient 4
At presentation				
Age and gender	16y 10mo, F	11y 9mo, F	20y 8mo, M	11y 10mo, M
BMI, Kg/m2 (percentile)	37.8 (99)	20.76 (81)	21.56	17.27 (38)
Height in cm (percentile)	152.1 (5)	135 (3)	169	155.7 (76)
GV (cm/year)	—	6	—	6.9
PMH	TBS, seizures, depression, tethered cord, IIH	PMD, focal seizures, ADHD, developmental delay	ALL, BMT, GVHD on steroids, depression, asthma, seizures	Benign Rolandic epilepsy
TFT prior to OXZ use	Normal at 11mo	Normal at 8y 5mo	—	—
Age at starting OXZ	8y	11y 2mo	17y 6mo	10y 4mo
OXZ dose at presentation	600 mg twice daily	750 mg twice daily	900 mg twice daily	300 mg am, 450 mg pm
Age at abnormal TFT	16y 10mo	11y 9mo	20y 8mo	11y 4mo
Medications other than OXZ	OCP, sertraline, acetazolamide	FP inhaler	HC, sertraline, olanzapine, MT, FP inhaler	Vitamin D
Laboratory studies at diagnosis				
TSH (0.35 -5.5 uIU/mL)	1.822	0.617	3.239	1.246
FT4 (0.80-1.80 ng/dL)	0.65	0.77	0.63	0.72
Morning cortisol (5.5-20 ug/dL)	14.4	9.9	16.1	17.6
IGF1 (ng/mL)	—	454 (90–581)	—	430 (76–549)
IGF BP3 (ng/mL)	—	5380 (2838–6846)	—	
MRI brain	Normal	Normal	Normal	Normal
Levothyroxine (LT4)	0.67–1.1 mcg/kg/day	Not started	0.4–0.8 mcg/kg/day	0.6 mcg/kg/day
Follow-up details				
Age at D/c of OXZ	17y 8mo	12y 8mo	20y 8mo	Not discontinued
Age at D/c of LT4	18y 3mo	Not started	continuing	continuing
Thyroid function studies post initiation of LT4				
TSH (0.35 -5.5 uIU/mL)	0.008	—	0.90	1.41
FT4 (0.80-1.80 ng/dL)	1.48	—	1.15	0.81
Follow-up thyroid function studies				
TSH (0.35-5.5 uIU/mL)	[1]2.52, [2]2.28	[3]2.085, [4]2.386	—	—
Free T4 (0.8-1.8 ng/dL)	[1]1.00, [2]1.00	[3]0.75, [4]0.89		—

[1] One month post discontinuation of levothyroxine; [2] 3.5 months post discontinuation of levothyroxine; [3] One month post discontinuation of oxcarbazepine; [4] Three months post discontinuation of oxcarbazepine. D/c- discontinuation, BMI- body mass index, FT4-Free T4, FP- Fluticasone propionate, GV – growth velocity, HC- hydrocortisone, IGF1- insulin like growth factor 1, IGF BP3- IGF binding protein 3, mo- months, MT- montelukast, MRI – magnetic resonance imaging, OXZ- oxcarbazepine, TSH- thyroid stimulating hormone, y-year

attributed to Phelan-McDermid syndrome and did not have other symptoms of hypothyroidism. Her growth pattern was consistent with her genetic potential, and she had Tanner 2 breast development. She had a normal thyroid gland on examination. Further evaluation did not reveal any other pituitary dysfunction. Repeat TFTs were consistent with CH. After discussion with her neurologist, she was weaned from oxcarbazepine and transitioned to valproic acid. Her TFTs normalized 3 months after stopping oxcarbazepine.

Patient 3

A 20-year-old male with a complex medical history and focal seizures treated with oxcarbazepine for 3 years was diagnosed with syndrome of inappropriate antidiuretic hormone secretion (SIADH) in the setting of severe fatigue, dizziness and nausea. Further work up revealed isolated CH. Examination showed a normal thyroid gland. Both SIADH and CH were attributed to oxcarbazepine use. The oxcarbazepine was discontinued, and he was started on topiramate. He was treated with levothyroxine 50 mcg daily, with plans to discontinue within a few months of stopping the oxcarbazepine. Three months after discontinuation of oxcarbazepine,

he had normal TFTs, and levothyroxine dose was decreased to 25 mcg daily. Plans were made to discontinue levothyroxine, but he transitioned to an adult endocrinologist for ongoing care and further information was not available.

Patient 4

An 11-year 10-month-old girl with seizure disorder treated with oxcarbazepine for benign Rolandic epilepsy was referred to endocrine clinic for CH based upon low FT4 and normal TSH, detected on screening laboratory studies ordered by her neurologist. Rolandic epilepsy, also known as benign childhood epilepsy with central-temporal spikes is the most common pediatric epilepsy.[8] She reported recent fatigue, cold intolerance, and poor concentration. The patient had a normal thyroid gland and unremarkable systemic examination. She was growing along her genetic potential. She was started on levothyroxine 25 mcg daily (0.6 mcg/kg/day) and continued to take oxcarbazepine. Oxcarbazepine dose was increased, and free T4 was at low end of reference range. The levothyroxine dose was increased to 37.5 mcg daily. Two years later she began an oxcarbazepine wean, with plans for a trial off of levothyroxine once she was off of the oxcarbazepine.

DISCUSSION

We describe four young patients who developed CH in the setting of oxcarbazepine therapy. Oxcarbazepine was replaced with other antiseizure medications in 3 of the patients, with normalization of TFTs off of levothyroxine therapy in two of them while the third patient was on a tapering dose of levothyroxine. One patient continued on oxcarbazepine and levothyroxine at the time of publication.

CH refers to thyroid hormone deficiency owing to a functional or anatomical disorder of the pituitary, hypothalamus or hypothalamic-pituitary-portal circulation causing decreased TSH, thyrotropin releasing hormone or both.[9] The diagnosis of CH should be considered in any patient with low FT4 and a low or inappropriately normal TSH level, as was seen in the four patients described in this report. The FT4 by equilibrium dialysis, the most accurate method for the determination of FT4 levels was low in all three patients who had thyroid hormone analyzed by this assay, ruling out possible interference in measurement.[9]

Isolated CH is rare, as CH usually presents along with other pituitary hormone deficiencies.[9] All the patients had normal morning cortisol and the younger patients (patients 2 and 4) had normal growth hormone markers. An MRI brain scan was normal in all, ruling out anatomical problems of the hypothalamic pituitary axis.

Older antiepileptics, such as phenytoin, carbamazepine, phenobarbital and valproic acid, may cause subclinical hypothyroidism due to hepatic microsomal P450 enzyme induction and hence increased thyroid hormone metabolism.[1] Oxcarbazepine, the 10-keto analogue of carbamazepine, has minimal effect on P450 enzyme system and is associated with fewer side effects than carbamazepine.[3] The mechanism of oxcarbazepine induced CH is unclear and might be due to disruption of the hypothalamic pituitary axis.[10] Oxcarbazepine may change pituitary or hypothalamic responsiveness to feedback by thyroid hormones.[1] While the United States Food and Drug Administration (FDA) recommends monitoring serum sodium levels in patients on oxcarbazepine with symptoms suggestive of hyponatremia such as nausea, malaise, headache, lethargy, confusion, or increase in seizure frequency or severity because oxcarbazepine can cause SIADH,[11] routine screening for CH is not part of standard guidelines.

A small number of international studies have reported on the effects of oxcarbazepine on thyroid function among youth with normal thyroid function.[3,10,12-17] Some studies reported decreased thyroxine (T4) and FT4 levels without change in TSH.[3,10,12] One study reported a decrease in FT4 levels and increase in TSH levels compared to baseline TFTs,[16] while another described a decrease in FT4 levels without change in T4, triiodothyronine (T3), or TSH levels.[13] Two other studies observed no changes in TFTs after 1 year of oxcarbazepine treatment.[14,17]

Table 2 summarizes the four patients identified in our study and the six previously reported pediatric cases of CH associated with oxcarbazepine.[1,4] The mean age (± standard deviation) of the four patients in our cohort was 183.2 ± 51.7 months, similar to 145.5 ± 26 months in the six previously reported cases. The majority of patients were female: 75% in our cohort compared to 83.3% in the prior cases. The mean dose of the oxcarbazepine at presentation with abnormal TFTs was 1312.5 ± 447.9 mg daily in our cohort compared to 1155 ± 473.9 mg daily in the previously reported cohort. The duration of oxcarbazepine treatment prior to abnormal TFT detection was available for six patients (of 10) and ranged widely from 7 to 106 months (median 32.5 months). Nine (of 10) patients treated with oxcarbazepine had at least one symptom suggestive of hypothyroidism: lethargy, fatigue, decreased energy level or increased sleepiness were present in eight patients, weight gain was reported in five patients, and cold intolerance was noted in four patients. Menstrual irregularities, constipation, dry skin/hair and poor linear growth were each reported by three patients.

CONCLUSIONS

The majority of patients with CH associated with oxcarbazepine, both in our cohort and those previously described, reported symptoms of hypothyroidism which developed at a wide range of treatment duration and dosing range. The majority (80%) of patients with CH associated with oxcarbazepine were female; given the small numbers of patients described, further work is needed to identify if there is any

Table 2. Characteristics of cases of central hypothyroidism associated with oxcarbazepine use

Case Number (ref)	Age	Sex	OXZ		Symptoms of hypothyroidism	Levothyroxine (LT4)	Outcome
			Daily dose (mg)	Duration (mo)			
1[1]	15y	Female	750	—	Menstrual irregularities, cold intolerance, constipation, PTM	50 ug/d	Euthyroid
2[1]	14y	Female	900	—	Menstrual irregularities, cold intolerance, constipation, PTM	50 ug/d	Euthyroid
3[3]	10.9y	Male	600	27	Poor GV, short stature, decreased exercise tolerance and energy level	—	Replaced OXZ with valproic acid Improved GV.
4[4]	10y	Female	1380	—	Rapid weight gain, constipation, poor GV	25 ug/d	Euthyroid, Tapered off OXZ and started on lacosamide
5[4]	13y	Female	1500	72	Weight gain, fatigue and dry skin, poor GV	37.5–100 ug/d over 2½y	Euthyroid
6[4]	10y	Female	1800	—	Fatigue, joint pain and butterfly rash on the face	25 ug/d	Resolution of joint pain & facial rash, fatigue persisted. Replaced OXZ with lamotrigine, weaned off LT4. Euthyroid.
7 (PC-1)	16y 10mo	Female	1200	106	Menstrual irregularities, fatigue, cold intolerance, weight gain	100 ug/d, subsequent reduction to 75 ug 5d a week	Replaced OXZ with levetiracetam and weaned off LT4. Clinically and biochemically euthyroid.
8 (PC-2)	11y 9mo	Female	1500	7	None	—	Replaced OXZ with valproic acid with normalization of TFT
9 (PC-3)	20y 8mo	Male	1800	38	Severe fatigue, SIADH	50 ug/d x 3 mo, then 25 ug/d x 1 mo	Replaced OXZ with topiramate with a plan to stop LT4 after 1 mo
10 (PC-4)	11y 10mo	Female	750	12	Cold intolerance, increased sleepiness, poor concentration	25 ug/d	Remains on OXZ

d-day, GV- growth velocity, mo- months, OXZ-oxcarbazepine, PC- present case, PTM- pretibial myxedema, SIADH-syndrome of inappropriate antidiuretic hormone secretion, y-year

association between sex and risk of CH. Given the importance of thyroid function in normal growth, pubertal progression, and metabolism, monitoring for thyroid dysfunction with clinical and laboratory assessments could be considered prior to and during oxcarbazepine treatment. Thyroid function studies should include both FT4 and TSH to assess for CH. Prospective studies are needed to determine optimal timing and frequency of thyroid function screening in youth treated with oxcarbazepine.

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Vasculitic Rash Caused by Levamisole-Adulterated Cocaine

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CASE PRESENTATION

A 71-year-old white male presented to the emergency department with several days of a gradually spreading rash [**Figure 1A–F**]. He reported a similar eruption 2 years prior that resolved with supportive care and abstinence from cocaine. He endorsed recent resumption of cocaine use. The current rash was a painful, non-blanching, palpable purpuric rash. Initially, the rash developed on his ventral forearms and medial thighs but spread to involve his hands and torso over several days. His mucous membranes were spared.

During the present episode, laboratory studies were largely unrevealing apart from an elevated ESR and CRP. Neutropenia was not present. Urinalysis showed microscopic hematuria and proteinuria, concerning for renal involvement.

Although no definitive confirmatory testing was performed, such as lab analysis for levamisole, the suspected etiology was levamisole-adulterated cocaine causing this characteristic leukocytoclastic vasculitis. This most likely diagnosis was supported by the patient's resumed cocaine use and a prior episode also in the setting of cocaine.

The patient was admitted to the hospital for supportive care. He improved clinically over several days and was discharged home. He was counseled regarding the importance of avoiding re-exposure to levamisole-laced cocaine.

Figure 1. Painful, non-blanching, purpuric rash on the [**A**] abdomen, [**B,C**] left and right thighs, [**D,E**] bilateral lower legs and feet, and [**F**] left forearm.

DISCUSSION

Levamisole is an anthelminthic drug used in veterinary medicine. Its prior use in humans as an immunomodulatory agent was discontinued in the United States in 1999 due to its adverse effects, which most notably include neutropenia, agranulocytosis, and vasculitis.[1] Since the 2000s, it has been established to be a common adulterant added to cocaine.[2] Levamisole is believed to potentiate the euphoric effects of cocaine by inhibiting catecholamine breakdown. It also shares similar physical and chemical properties with cocaine, allowing it to pass drug purity tests without detection.[1] Due to the logistical difficulty in confirmatory lab testing for levamisole, a high index of suspicion is necessary to make this diagnosis. It must always be considered in a patient who has a leukocytoclastic cutaneous rash, with or without neutropenia, and a temporal association with cocaine use. Levamisole-adulterated cocaine has also been linked to production of autoantibodies that can damage the lungs and kidneys. The mechanism by which levamisole causes vasculitis and agranulocytosis has yet to be fully elucidated. No specific treatment is required beyond supportive care and future avoidance of levamisole from contaminated cocaine. Though in severe cases, treatment can be more extensive when the rash exhibits central areas of necrosis that may require surgical debridement and can be complicated by wound infection and delayed healing.

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Increasing Emergency Medicine Resident Utilization of the Fascia Iliaca Nerve Block Through an Early Education Intervention

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ABSTRACT

BACKGROUND: Ultrasound-guided nerve blocks are a core skill for emergency medicine (EM) physicians in the treatment of pain. Despite this, there is a dearth of education on the topic during EM residency training.

METHODS: We implemented a 2-hour hands-on teaching session for the fascia iliaca nerve block (FINB) during orientation for 14 new EM interns. We assessed if this increased their confidence in performing the FINB, if they retained their knowledge based on a structured assessment of performing a simulated FINB at 0, 2, and 8 months, and if the number of FINBs performed increased compared to the previous year's intern class who did not receive the same structured educational teaching session.

RESULTS: Confidence levels of EM interns in performing the FINB increased after the hands-on session on a 1–5 scale from 1.69 to 2.93 ($P<.001$). Their performance and knowledge of the FINB based on a structured hands-on assessment showed a slight drop at 2 months and then remained constant at 8 months. There was an increase in the number of FINBs performed by the EM interns from two to 11 during their first year of training compared to the previous year's interns.

CONCLUSION: Implementing a hands-on FINB training session during intern orientation for EM residents increased their confidence in performing the procedure, showed retention of the taught knowledge at 8 months, and increased the number of FINB procedures performed during their first year of training.

KEYWORDS: Regional anesthesia; resident education; emergency medicine; ultrasound; fascia iliaca nerve block

INTRODUCTION

Ultrasound-guided nerve blocks (UGNBs) are an established part of pain management in the emergency department (ED).[1-2] These procedures offer non-opioid analgesia and have been shown to improve outcomes in patients with hip fractures.[3-6] They have also been shown to be extremely safe, with low complication rates when performed in the ED.[7] Despite this, most emergency medicine (EM) residencies offer little to no formal education on this topic.[2,8] The need to improve this has been recognized, such that Accreditation Council for Graduate Medical Education (ACGME) has proposed to make it mandatory for EM trainees to perform 10 UGNBs before graduation, with up to five of these allowed to be simulated.[9] To assess the state of resident education and confidence level in performing UGNBs at our institution, a needs assessment survey was performed on graduating fourth-year EM residents. Of the six residents who responded to the survey, all six respondents indicated that they would not have met this proposed ACGME requirement. One of the respondents indicated they had never performed a UGNB, while another respondent indicated they had only performed one. In response to this demonstrated educational need, we created and implemented a fascia iliaca nerve block (FINB) teaching session as part of our intern orientation during the first month of residency. Unlike previously published nerve block educational curricula, we focused only on one nerve block.[10] We chose to do this for a few reasons. The FINB has the largest body of evidence and guidelines supporting its use, such that it is the standard of care in patients with hip fractures in the emergency department and is strongly supported by the American Academy of Orthopedic Surgeons.[11-14] It is also the most performed nerve block in our ED, with 91 out of 146, or 62.3% of the ultrasound-guided nerve blocks performed between 01/2022 and 08/2024, being FINBs. As it is the most performed block, it has the highest number of opportunities for being performed by the trainees. We hypothesized that by increasing the confidence in this procedure early in EM residents' training, residents will be able to perform it more often when the opportunity arises.

METHODS

Study design

This was a prospective cohort study aimed at assessing if a 2-hour hands-on session at the start of training during EM residents' intern orientation increased the number of nerve blocks performed during their intern year compared to the prior intern class and improved self-reported provider procedural comfort, and if that knowledge was retained on a 2- and 8-month reassessment. The primary outcome was to assess if there was an increased number of FINBs performed in the year that the educational intervention was introduced.

Institutional Review Board approval was obtained before the initiation of this study. Informed consent was obtained from the participants.

Setting

During the EM intern orientation in July of 2024, a 2-hour teaching session on the FINB was implemented. All 14 EM interns participated in this session. Previously, there was no formal nerve block education included in the intern's educational curriculum. Before starting the session, all participants received a pre-course survey, shown in **Table 2**, which asked them to self-report their previous experience with nerve blocks and their comfort in performing the FINB. Institutional Review Board approval was obtained before initiation of this study.

Table 1. Assessment, including the knowledge assessment and OSCE. Each question/observed clinical evaluation is worth one point. Possible score ranges from 0–17.

Assessment
1. Obtains patient consent through an adequate explanation of benefits and risks (3 points): a. Counsels the patient with realistic expectations, that pain will not be completely relieved but decrease the need of other analgesics b. Risk of nerve injury, rare and almost always self-resolve c. Adequate discussion of LAST
2. What is the most common indication in the emergency department for this procedure? Femur fracture
3. Does it cause motor blockade? Yes
4. What monitoring should the patient be on? Telemetry, SpO2 monitoring
5. What are the symptoms of LAST toxicity (name 2)? Numbness of tongue, lightheadedness, auditory disturbances, seizure, coma, respiratory arrest, cardiac arrest
6. What is the treatment of LAST? Intralipid and supportive care
7. What is the volume of anesthetic used in this procedure for an adult patient? Will vary based on weight of patient and max dose of anesthetic. Total volume (anesthetic plus an sterile saline) typically 30–40cc
Observed Structured Clinical Exam
8. Maintains sterile technique
9. Pre-flushes needle and tubing to displace air bubbles
10. Places the linear probe in the correct location and orientation
11. Identifies target fascia iliaca plane, femoral artery and vein
12. Inserts needle along correct path
13. Only advances needle if able to visualize needle tip through the procedure
14. Injects only once needle is in correct position
15. Does not puncture any vessels

Curriculum

During this session, a 20-minute lecture was given introducing the mechanism of anesthetics, risks of regional anesthesia, and how to perform the FINB. Participants then practiced performing the FINB using meat models guided by an educator. Three meat models were created by the instructors to simulate the typical anatomy of the appropriate muscle and fascial plane layers of the FINB. These models are inexpensive and replicate the anatomy and sonographic landmarks of the FINB.[15] It is also possible to inject saline into these models under the simulated fascia iliaca plane, replicating the entire process of performing the FINB. These models took 1 hour to create before the session. They were created using 2–3 lbs of boneless pork tenderloin, straws, ultrasound gel, meat glue, yarn, and chewing gum. Detailed instructions on how to create the meat models are described by Naraghi et al.[15]

During the hands-on session, learners were guided by educators to focus on practicing anatomy identification, ultrasound-guided needle visualization and control, and hydrodissection. After demonstrating being able to guide the needle to the correct target under ultrasound, followed by successful hydrodissection of fluid under the simulated fascia iliaca layer in the meat model, the next participant would be rotated in. The participant who completed the session would then immediately complete an assessment, which can be found in **Table 1**. This assessment involved both a knowledge assessment through questions and an objective structured clinical examination (OSCE) with a score ranging from 0–17. The assessment evaluated if the learners know what concepts are needed to properly consent participants before performing a FINB, what the indication for performing a FINB is, what level of monitoring the patient should

Table 2. Pre-survey

What is your comfort level in performing a fascia iliaca compartment block?
1 – not at all comfortable even with supervision
2 – uncomfortable but would be willing to try with supervision
3 – neither comfortable nor uncomfortable
4 – comfortable to do on own without supervision
5 – comfortable enough to teach another learner

Table 3. Post-survey

After performing this hands on session, what is your comfort level in performing a fascia iliaca compartment block?
1 – not at all comfortable even with supervision
2 – uncomfortable but would be willing to try with supervision
3 – neither comfortable nor uncomfortable
4 – comfortable to do on own without supervision
5 – comfortable enough to teach another learner

be on, and information on the presentation and treatment of Local Anesthetic Systemic Toxicity (LAST). The OSCE portion assessed whether the learners were able to perform a FINB without instructor guidance. The same meat models used during the teaching session were also used for the OSCE to ensure consistency between models. Following the session, all the participants completed a post survey assessment of their confidence in performing a FINB, as seen in **Table 3**.

Educators included three faculty members and two emergency medicine residents. Two out of the three faculty members were ultrasound fellowship trained. The two emergency medicine residents included a Post Graduate Year (PGY-3) and PGY-4, both of whom had previous experience in performing at least one FINB. The initial lecture and assessment were administered by the three faculty members, while both the resident educators and faculty members participated in teaching the hands-on portion.

Follow-up

Participants repeated the same assessment seen in **Table 1** at 2 and 8 months after the initial training session. No additional formal FINB instruction was given in the interim. After 1 year, the electronic medical record was retrospectively queried for all FINBs performed by trainees in their first year of training during the academic periods of 2023–2024 and 2024–2025 to assess if there was a change in the number of these procedures performed.

An unpaired *t*-test was used to assess if there was a change in the assessment score between the three sessions. The pre- and post-survey results were analyzed using a paired *t*-test.

RESULTS

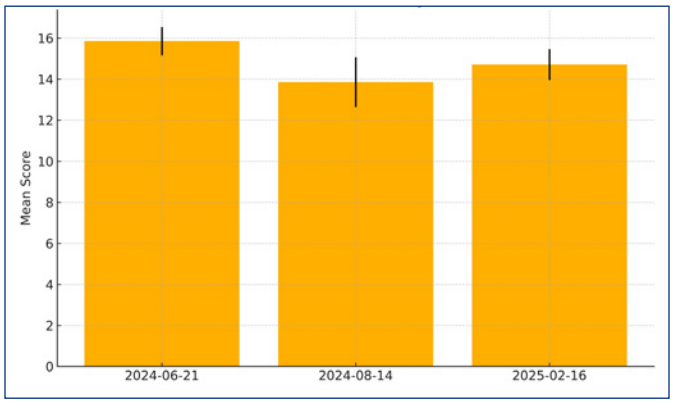
Participant demographics

All 14 of the EM interns at our program completed the hands-on instructional session in the first month of their training in July and the pre- and post-test surveys. Eight of the participants were female (57%), and six of them were male (43%). Two of the interns (14%) reported having performed a UGNB prior to the session, with one of them (7%) having performed a FINB.

Number of nerve blocks performed

There was an increase in the number of FINBs performed by the intern class from two in the 2023–2024 year to 11 in 2024–2025 after implementing this hands-on teaching session. Seven different interns in the class of 2024–2025 performed these 11 blocks. This represents a 450% increase. The total number of FINBs performed in our ED did not significantly change between the two periods, with 37 having been performed in 2023–2024 and 39 in 2024–2025.

Figure 1. Assessment score results on 06/21/2024, 08/14/2024, and 02/16/2025.



Assessment scores

On the assessment performed immediately after the instructional session, participants scored an average of 16, or 94% of the questions correctly (95% CI = 15.18 to 16.82) as seen in **Figure 1**. Seven participants completed the 2-month reassessment and scored an average of 13.71 (95% CI = 11.67 to 15.76). Four participants completed the 8-month reassessment and scored an average of 13.75 (95% CI = 9.57 to 17.93). There is a statistically significant difference between the initial assessment and the 2- and 8-month reassessments using an unpaired *t*-test, with $P<.05$ in both cases. There is no statistically significant difference between the 2- and 8-month reassessments ($P=.98$).

Impact on FINB procedural confidence as assessed by surveys

When asked on the pre-survey, as seen in **Table 2**, what their comfort level is in performing a FINB, the participants indicated a mean score of 1.69. When asked a follow-up question on the post-survey seen in **Table 3**, administered immediately after the teaching session, the participants indicated a mean score of 2.93. Using a paired *t*-test, this represents a statistically significant increase in comfort level between the pre- and post-surveys from 1.69 to 2.93 ($P<.001$).

DISCUSSION

We have shown that by focusing on the FINB and introducing this block early in training, it greatly increased the frequency with which first-year EM residents performed this procedure. It also improved their confidence in performing this procedure. Before the teaching session, our learners indicated that they were not at all comfortable performing the FINB, even with supervision. After the session, they indicated that they were willing to try with supervision and were more comfortable with the procedure. This likely led to the increased frequency with which they performed the

FINB compared to the previous year's cohort of residents. Additionally, after a slight drop at 2 months after the teaching session, the knowledge learned remained constant when reassessed after 8 months.

Despite agreement on their clinical benefit and importance, there is currently no widely accepted educational curriculum for UGNBs in emergency medicine. There are many microskills required to achieve mastery of these procedures. This includes using in-plane needle guidance to advance a needle through multiple facial planes, hydrodissection, depositing local anesthetic into a target anatomic area, and recognizing the correct appearance of the tissue after successful anesthetic spread. Like other UGNBs, the FINB requires knowledge of all of these microskills. Mastering the FINB early on in training likely allows for easier mastery of other less commonly performed blocks later in training and increases the number of UGNBs performed. The findings of this study support implementing a hands-on teaching session focusing on the FINB early in emergency medicine residency training.

While we showed that an early educational intervention results in increased EM interns' knowledge, confidence, and utilization of the FINB, longitudinal reinforcement is key to ensuring skill retention. Methods to achieve this for the FINB include annual refreshers during residency conference and including regional anesthesia education on scan shifts and ultrasound tape review.

Future studies could assess whether introducing this educational session early in training improves the clinical outcomes of the blocks performed. They could also investigate if the trainees ultimately perform a greater variety of blocks during their emergency medicine residency.

LIMITATIONS

One limitation is that not all the participants completed the 2- and 8-month reassessments. It is possible that only the interns who got the experience of performing a FINB or those who continued to feel more confident in their skillset completed the repeat assessments. There may also have been a selection bias where the interns more interested in ultrasound or regional anesthesia completed the follow-up. However, all the interns who showed up to their regularly scheduled conference, which was held the same day as our study activities, also completed the repeat assessments. The interns who did not complete the repeat assessments were the ones who did not show up to conference, which usually occurs when they have vacation or worked the night before. It would be unusual for an intern to not show up to conference because they were not interested in the educational material offered that day. Ten interns completed the reassessment across the two sessions, with only one intern completing both. This means the majority, or 10/14 of the participants, completed a reassessment.

It is also possible that the participants received FINB education separate from our intervention. It is also possible that the culture around the performance of ultrasound guided nerve blocks changed between the 2023–2024 and 2024–2025 academic years. To our knowledge, however, there was no other formal or informal education on the topic, other than that encountered during clinical work. There were also no differences in the ultrasound fellowship-trained faculty members, who perform the majority of the FINBs in our department, between the 2 years that were compared.

CONCLUSION

We have shown that by focusing on the FINB and introducing this block early in training, it greatly increased the frequency of and confidence with which first-year EM residents performed this procedure. This supports implementing a hands on teaching session focusing on the FINB, which was relatively inexpensive and easy to implement, early on in emergency medicine residency training.

Future studies could assess whether introducing this educational session early in training improves the clinical outcomes of the blocks performed. They could also investigate if the trainees ultimately perform a greater variety of blocks during their emergency medicine residency.

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Factors Associated with Delayed On-Time Starts and Cancellations of Scheduled Non-Obstetric Surgeries

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ABSTRACT

OBJECTIVE: There is currently lacking research regarding patient and surgical factors contributing to in-hospital delays of gynecologic surgery, and the impact of the COVID-19 pandemic on such cases. The objective of this study was to determine if primary language was associated with delays or cancellations for patients presenting for scheduled non-obstetric surgery. The secondary objectives were to determine if this association changed after the COVID-19 pandemic, and identify other risk factors for delays or cancellations.

METHODS: This was a retrospective cross-sectional study at a single academic women's hospital. Eligible cases were those undergoing first-case non-obstetric surgeries between January 2019–January 2020 (pre-pandemic), and May 2020–May 2021 (post-pandemic). The primary outcome was delayed start time or same-day cancellation, defined as start time of greater than 10 minutes from scheduled time, or cancellation after arrival. Sample size calculation assumed a 9:1 ratio of English to non-English primary language study population for comparison of first case on-time starts averaging 55% to 75% based on recent hospital data. A sample size of 414 English-speaking and 46 non-English-speaking patients were needed to detect a 20% difference in proportion of on-time start with an alpha of 5% and power of 80%, for a total of 460 charts analyzed from each time point, and 920 charts total. Bivariate analysis and multivariate regression analysis was performed.

RESULTS: In our study population, 90% spoke primarily English. Approximately 74% were non-Hispanic White, 12% Hispanic or Latino, and 6% non-Hispanic Black. Twenty percent of cases were delayed/canceled overall. There was no difference in delays or cancellations by primary language overall, before, or after the COVID-19 pandemic. Factors associated with preoperative delays or cancellations included: non-Hispanic Black race (aOR 2.92, [95% CI 1.56–5.45]), having public or no insurance (aOR 1.45, [95% CI 1.01–2.07]), having diabetes (aOR 2.11 [95% CI 1.23–3.63]), requiring preoperative medications (aOR 1.68 [95% CI 1.08–2.64]), or urogynecologic procedure (aOR 1.89 [95% CI 1.10–2.62]).

CONCLUSIONS: Primary language was not associated with first-case delays or cancellations in our study populations. We identified populations at risk for first-case surgical delays. Future qualitative research is needed to identify modifiable causes of delays in perioperative units to guide cost-effective, equitable patient care.

KEYWORDS: Surgical delays; perioperative care; quality improvement

INTRODUCTION

At the outset of the COVID-19 pandemic in March 2020, the Centers for Disease Control and Prevention, United States Surgeon General, and the American College of Surgeons recommended that all elective surgeries be suspended.[1] Despite a universal mandate, there were observed differences in the outcome of this pause: non-English speaking patients, those uninsured, or living in lower incomes experienced delays in surgical scheduling due to backlog of elective procedures.[2] These disparities raise concern for inherent biases within perioperative care not attributable to surgeon or hospital factors alone.

We know that delays in surgery lead to worsened health inequities,[2] increased patient morbidity and mortality,[3] and increased institutional costs.[4,5] Patients with limited English proficiency also have worse access to perioperative care.[6] While prior research in gynecologic surgery has shown delays in time from diagnosis to surgical management,[7,8] less is known about patient and surgical factors contributing to in-hospital delays for gynecologic cases, and the impact of the COVID-19 pandemic on such cases. It is therefore important to identify factors associated with delayed on-time starts or cancellations to effectively design and change preoperative processes for equitable care.

The hypothesis for this study was that non-English primary language would be associated with increased odds of in-hospital first-case delays or cancellations. The primary aim of this study was therefore to identify if primary language was associated with delays in first-case on-time starts at a single large academic women's hospital. Our secondary aims were to determine if the association between primary language and delays were different between two time points:

before the COVID pandemic, and after scheduled non-obstetric surgeries were resumed, and if there were other patient or surgical characteristics associated with delays or cancellations.

MATERIAL AND METHODS

Data source and study population

This cross-sectional study analyzed first-case scheduled non-obstetric surgeries between January 2019 and January 2020, as well as May 2020 and May 2021 at a single academic women's hospital with surgical subspecialties including benign and oncologic gynecology, plastics, breast, and gastroenterology for female sex patients. First-cases were selected to avoid confounding delays in operating room turnover and readiness. These two time points represent before and after elective surgeries were "paused" during the COVID-19 pandemic (designated "pre-pandemic" and "post-pandemic"). These two time periods were of interest to reflect the recent history and understand if and how a national pandemic impacted certain patient populations. All eligible cases in the two time periods were identified. There were 1,748 unique eligible cases in the pre-pandemic population, and 1,704 in the post-pandemic population. Eligible cases were numerically randomized with unique study ID numbers, and then data was extracted from charts sequentially until the sample size of complete charts was met. Cases were excluded if charts were incomplete for study variables below.

Study variables

The outcome was a composite outcome of first-case delay or cancellation. A delay was defined as an in-room time of greater than 10 minutes from scheduled surgery time. Ten minutes is the threshold at which cases are flagged as delayed at our institution, which falls within the mean for first-case delays of approximately 8 to 15 minutes.[5,9,10] First-case scheduled start times and in-room times were extracted from the electronic medical record. Cases were designated as canceled if the patient arrived to the hospital, but their case was canceled before transfer to the operating room. Patient and surgery demographics were extracted, including patient's primary language, race and ethnicity—which are self-reported characteristics through the hospital registration process—age, type of insurance, and past medical history. The need for preoperative labs or non-Enhanced Recovery After Surgery (ERAS) medications upon admission was also extracted. Preoperative labs are routinely performed on an outpatient basis, but included in our study were inpatient COVID-19 testing (in post-pandemic cohort), complete blood count (CBC), type and screen, or potassium level for appropriate patients. We also included same-day preoperative labs such as blood glucose level and urine pregnancy tests, both of which are routinely done at our hospital on admission for appropriate patients. The gender of the primary surgeon was extracted through the National Plan and Provider Enumeration System National Provider Identification (NPPES NPI) Registry, as well as surgeon specialty through hospital designation. Cases were classified based on primary surgical team: resident service versus private practice.

Statistical analysis

Sample size calculation assumed a 9:1 ratio of English to non-English primary language study population for comparison of first case on-time starts averaging 55% to 75% based on recent study hospital data. A sample size of 414 English-speaking and 46 non-English-speaking patients were needed to detect a 20% difference in proportion of on-time start with an alpha of 5% and power of 80%, for a total of 460 charts analyzed from each time point, and 920 charts total. Bivariate analysis and multivariate regression analysis was performed.

We compared bivariate associations for patient demographics and surgical characteristics. We also compared bivariate associations between surgeries that were not delayed and delayed/canceled overall and by time period. Fisher exact tests (when participant counts were <20) and Chi square tests were used for categorical variables. Multivariable logistic regression was used to determine the odds of preoperative delays or cancellation after adjusting for potential confounders. Confounders were considered for inclusion in the multivariable model if any bivariable Chi square *P* values were <.05, or if there was biologic plausibility: patient age, history of hypertension or cardiac event. We also compared the average time delay for each variable overall and by time period in a **Supplemental Table** (please email the corresponding author for this table). Analyses were conducted using SAS statistical software version 9.4 (SAS Institute, Cary, NC).

RESULTS

Study population characteristics

Approximately 20% of cases were delayed/canceled overall: 21% of cases in the pre-pandemic group, and 18% in the post-pandemic group [**Table 1**]. There were significant differences in the proportion of non-English-speaking patients in the cohort when stratified by time period: approximately 7% of patients in the pre-pandemic cohort were non-English-speaking, vs. 13% in the post-pandemic cohort (*P*<.01); the most common non-English language was Spanish. Approximately 74% of study population being non-Hispanic White, 12% Hispanic or Latino, and 6% non-Hispanic Black. Approximately 75% of patients required preoperative labs on admission. Approximately 5% of patients required COVID testing upon admission. 18% of patients required preoperative medications on admission, and the most common was heparin followed by phenazopyridine.

Table 1. Patient and surgery demographics

	Overall N=920 N, %	Pre-Pandemic N=460 N, %	Post-Pandemic N=460 N, %	P
Delayed/Canceled	181 (19.67)	98 (21.30)	83 (18.04)	.21
Patient Demographics				
Primary language				<.01
English	824 (89.8)	425 (92.6)	399 (86.9)	
Non-English	94 (10.2)	34 (7.4)	60 (13.1)	
Age, Years, Median (IQR)	47.0 (38.0–59.0)	48.0 (38.0–60.0)	46.5 (37.5–58.0)	.24
Race/Ethnicity				.28
Non-Hispanic White	688 (74.8)	355 (77.2)	333 (72.4)	
Hispanic or Latino	112 (12.2)	51 (11.1)	61 (13.3)	
Non-Hispanic Other	64 (7.0)	26 (5.7)	38 (8.3)	
Non-Hispanic Black	56 (6.1)	28 (6.1)	28 (6.1)	
Type of Insurance				.48
Private	501 (54.5)	258 (56.1)	243 (52.8)	
Public	406 (44.1)	197 (42.8)	209 (45.4)	
Uninsured/Charity Care	13 (1.4)	5 (1.1)	8 (1.7)	
Past Medical History				
Hypertension	266 (28.9)	134 (29.1)	132 (28.7)	.88
Diabetes	98 (10.7)	43 (9.4)	55 (12.0)	.20
Cardiac event	31 (3.4)	14 (3.0)	17 (3.7)	.72
Asthma	183 (19.9)	87 (18.9)	96 (20.9)	.46
Smoking	209 (22.7)	113 (24.6)	96 (20.9)	.18
Surgery Demographics				
Pre-op Labs				.01
Yes	690 (75.0)	329 (71.5)	361 (78.5)	
No	230 (25.0)	131 (28.5)	99 (21.5)	
Pre-op Meds				.35
Yes	169 (18.4)	90 (19.6)	79 (17.2)	
No	751 (81.6)	370 (80.4)	381 (82.8)	
Surgeon specialty				.03
Benign GYN	483 (52.6)	234 (51.0)	249 (54.3)	
Oncology	211 (23.0)	123 (26.8)	88 (19.2)	
Urogynecology	134 (14.6)	65 (14.2)	69 (15.0)	
Non-GYN	90 (9.8)	37 (8.1)	53 (11.6)	
Gender of Primary Surgeon				.59
Female	568 (61.7)	288 (62.6)	280 (60.9)	
Male	352 (38.3)	172 (37.4)	180 (39.1)	
Resident Service Case				.84
No	894 (97.2)	446 (97.0)	448 (97.4)	
Yes	26 (2.8)	14 (3.0)	12 (2.6)	
Delay				.21
Yes	181 (19.7)	98 (21.3)	83 (18.0)	
No	739 (80.3)	362 (78.7)	377 (82.0)	

Difference in primary language across time periods

In bivariate analysis, there was no difference in delays/cancellations by language overall or when comparing pre- or post-pandemic. Overall, non-English-speaking patients rep-resented 10% of the cohort and proportionally 10% of delayed/canceled cases. Pre-pandemic, they represented 7% of the cohort and 6% of delayed/canceled cases. Post-pandemic, they repre-sented 13% of the cohort but 16% of delayed/canceled cases [**Table 2**].

Other differences in patient and surgical characteristics

There were significant differences in the proportion of delayed/canceled cases across race and ethnicity groups overall and pre-pandemic [**Table 2**]. Proportions were not different in the post-pandemic group. Overall, there were also significant differences in the proportion of delayed/canceled cases among insurance type (P<.01), patients with diabetes (P<.01), patients requiring preoperative medications (P<.01), and surgeon specialty (P<.01). These differences remained significant when analyzed in the pre- and post-pandemic cohorts.

Patients with a history of hypertension (29% of overall cases) or asthma (20% of overall cases) were overrepresented in overall delayed/canceled cases (35%, P=.05, and 25%, P=.04, respectively), but no differences were seen when aggregated into pre- and post-pandemic cohorts. There were no differences in the proportion of delayed/canceled cases among patients requiring preoperative labs, with history of cardiac event, smoking status, or surgeon gender.

Multivariate analysis

In multivariate analysis, non-English-speaking patients did not have higher odds of delays/cancellations overall, pre-pandemic, or post-pandemic [**Table 3**]. When compared to non-Hispanic White patients, non-Hispanic Black patients had higher odds of delays/cancellations overall (aOR 2.92, 95% CI 1.56–5.45), pre-pandemic (aOR 5.15, 95% CI 2.13–12.46), but not in the post-pandemic cohort. Non-Hispanic other patients had higher odds of delays/cancellations in the pre-pandemic cohort (aOR 3.01, 95% CI 1.17–7.78).

When compared with private insurance, patients with public or no insurance had higher odds of delays/cancellations overall (aOR 1.45, 95% CI 1.01–2.07), but not when stratified by time period.

Patients with diabetes had higher odds of delays/cancellations overall (aOR 2.11, 95% CI 1.23–3.63) and post-pandemic (aOR 2.33, 95% CI 1.09–4.99), but not pre-pandemic.

Requiring preoperative medication administration was also associated with higher odds of delays/cancellations overall (aOR 1.68, 95% CI 1.08–2.64)

Table 2. Bivariate analysis of proportion of delayed/canceled cases by patient and surgical factors overall, pre-pandemic and post-pandemic.

	Overall			Pre-Pandemic			Post-Pandemic		
	Total	Delay/ Canceled (N, %)	P	Total	Delay/ Canceled (N, %)	P	Total	Delay/ Canceled (N, %)	P
N (%)	920	181 (19.7)		460	98 (21.30)		460	83 (18.04)	
Patient Demographics									
Primary language			.89			.67			.47
English	824 (89.8)	162 (89.5)		425 (92.6)	92 (93.9)		399 (86.9)	70 (84.3)	
Non-English	94 (10.2)	19 (10.5)		34 (7.4)	6 (6.1)		60 (13.1)	13 (15.7)	
Age, Years, Mean (SD)	48.3 (14.9)	50.3 (16.7)	**.04**	49.0 (15.4)	51.2 (18.1)	.12	47.6 (14.4)	49.3 (15.0)	.22
Race/Ethnicity			**.01**			**<.01**			.47
Non-Hispanic White	688 (74.8)	127 (70.2)		355 (77.2)	65 (66.3)		333 (72.4)	62 (74.7)	
Hispanic or Latino	112 (12.2)	20 (11.1)		51 (11.1)	10 (10.2)		61 (13.3)	10 (12.1)	
Non-Hispanic Other	64 (7.0)	13 (7.2)		26 (5.7)	9 (9.2)		38 (8.3)	4 (4.8)	
Non-Hispanic Black	56 (6.1)	21 (11.6)		28 (6.1)	14 (14.3)		28 (6.1)	7 (8.4)	
Type of Insurance			**<.01**			**.05**			**<.01**
Private	501 (54.5)	77 (42.5)		258 (56.1)	45 (45.9)		243 (52.8)	32 (38.6)	
Public	406 (44.1)	102 (56.4)		197 (42.8)	52 (53.1)		209 (45.4)	50 (60.2)	
Uninsured/Charity Care	13 (1.4)	2 (1.1)		5 (1.1)	1 (1.0)		8 (1.7)	1 (1.2)	
Past Medical History									
Hypertension	266 (28.9)	63 (34.8)	.05	134 (29.1)	36 (36.7)	.06	132 (28.7)	27 (32.5)	.39
Diabetes	98 (10.7)	34 (18.8)	**<.01**	43 (9.4)	16 (16.3)	**.01**	55 (12.0)	18 (21.7)	**<.01**
Cardiac event	31 (3.4)	10 (5.5)	.10	14 (3.0)	5 (5.1)	.19	17 (3.7)	5 (6.0)	.21
Asthma	183 (19.9)	46 (25.4)	.04	87 (18.9)	25 (25.5)	.06	96 (20.9)	21 (25.3)	.27
Smoking	209 (22.7)	38 (21.0)	.54	113 (24.6)	19 (19.4)	.19	96 (20.9)	19 (22.9)	.65
Surgery Demographics									
Pre-op Labs			.81			.78			.46
Yes	690 (75.0)	137 (75.7)		329 (71.5)	69 (70.4)		361 (78.5)	68 (81.9)	
No	230 (25.0)	44 (24.3)		131 (28.5)	29 (29.6)		99 (21.5)	15 (18.1)	
Pre-op Meds			**<.01**			**<.01**			**<.01**
Yes	169 (18.4)	53 (29.3)		90 (19.6)	30 (30.6)		79 (17.2)	23 (27.7)	
No	751 (81.6)	128 (70.7)		370 (80.4)	68 (69.4)		381 (82.8)	60 (72.3)	
Surgeon Specialty			**<.01**			**.03**			**.02**
Benign GYN	483 (52.6)	73 (40.3)		234 (51.0)	38 (39.2)		249 (54.3)	35 (42.2)	
Oncology	211 (23.0)	52 (28.7)		123 (26.8)	28 (28.9)		88 (19.2)	24 (28.9)	
Urogynecology	134 (14.6)	37 (20.4)		65 (14.2)	20 (20.6)		69 (15.0)	17 (20.5)	
Non-GYN	90 (9.8)	18 (9.9)		37 (8.1)	11 (11.3)		53 (11.5)	7 (8.4)	
Gender of Primary Surgeon			.70			.70			.91
Female	568 (61.7)	114 (63.0)		288 (62.6)	63 (64.3)		280 (60.9)	51 (61.5)	
Male	352 (38.3)	67 (37.0)		172 (37.4)	35 (35.7)		180 (39.1)	32 (38.5)	
Resident Service Case			**.02**			.51			**.01**
No	894 (97.2)	171 (94.5)		446 (97.0)	94 (95.9)		448 (97.4)	77 (92.8)	
Yes	26 (2.8)	10 (5.5)		14 (3.0)	4 (4.1)		12 (2.6)	6 (7.2)	

Table 3. Multiple logistic regression analysis—Odds of preoperative delay or cancellation based on patient and surgical demographics

	Overall (Unadjusted) (N=916)	Overall (Adjusted) (N=916)	Pre-Pandemic (N=458)	Post-Pandemic (N=458)
Non-English Primary Language	1.04 (0.61–1.76)	0.91 (0.48–1.75)	0.66 (0.2321.95)	1.71 (0.69–4.25)
Race/Ethnicity				
Non-Hispanic White	Reference	Reference	Reference	Reference
Hispanic or Latino	0.96 (0.57–1.62)	1.07 (0.58–1.98)	1.71 (0.70–4.14)	0.62 (0.25–1.52)
Non-Hispanic Other	1.13 (0.60–2.13)	1.06 (0.52–2.15)	3.01 (1.17–7.78)	0.32 (0.09–1.09)
Non-Hispanic Black	2.65 (1.49– 4.71)	2.92 (1.56–5.45)	5.15 (2.13–12.46)	1.32 (0.48–3.63)
Age	1.01 (1.00–1.02)	0.99 (0.98–1.01)	1.00 (0.33–1.02)	0.99 (0.97–1.02)
Hypertension	1.41 (0.998–1.99)	0.96 (0.21–1.49)	1.13 (0.62–2.05)	0.81 (0.41–1.61)
Cardiac Event	1.99 (0.93–4.32)	1.43 (0.63–3.26)	1.13 (0.33–3.86)	1.40 (0.44–4.45)
Diabetes	2.44 (1.55–3.84)	2.11 (1.23–3.63)	2.13 (0.94–4.780)	2.33 (1.09–4.99)
Asthma	1.50 (1.02–2.20)	1.53 (1.02–2.29)	1.72 (0.96–3.07)	1.40 (0.76–2.57)
Pre-op Labs	1.05 (0.72–1.53)	0.99 (0.63–1.54)	0.85 (0.46–1.58)	1.35 (0.67–2.73)
Pre-op Meds	2.22 (1.53–3.24)	1.68 (1.08–2.64)	2.11 (1.12–3.99)	1.54 (0.78–3.04)
Public/Uninsured	1.82 (1.31–2.53)	1.45 (1.01–2.07)	1.28 (0.77–2.14)	1.69 (0.99–2.90)
Surgeon Specialty				
Benign GYN	Reference	Reference	Reference	Reference
Oncology	1.84 (1.23–2.74)	1.62 (1.00–2.62)	1.18 (0.59–2.34)	2.07 (1.03–4.15)
Urogynecology	2.14 (1.36–3.37)	1.89 (1.10–2.62)	2.07 (0.95–4.54)	1.64 (0.75–3.55)
Non-GYN	1.40 (0.79–2.49)	1.53 (0.85–2.76)	2.45 (1.05–5.71)	0.96 (0.39–2.37)

and pre-pandemic (OR 2.11, 95% CI 1.12–3.99) but not post-pandemic.

Urogynecologic procedures had increased odds of delays/cancellations overall (aOR 1.89, 95% CI 1.10–2.62), although not when stratified by time period. Non-gynecologic cases had higher odds of delays only pre-pandemic, and oncologic cases had higher odds of delays only post-pandemic.

Characteristics among delayed cases

The average time delay was 33 minutes overall, which was similar to the averages pre- and post-pandemic [**Supplemental Table**]. In analysis of delayed cases, there was no difference in the average time delay across primary language, race and ethnicity, type of insurance, requiring preoperative labs or medications, specialty or gender of primary surgeon, or resident service case.

DISCUSSION

This cross-sectional study investigating factors associated with delays in first-case on-time starts and cancellations of non-obstetric scheduled surgeries demonstrated disparities across patient and surgical characteristics. Our study did not detect a difference in the proportion of delayed cases based on patient's primary language. Our study is the first to demonstrate disparities for in-hospital delays by race and ethnicity, with non-Hispanic Black patients disproportionately represented in delayed or canceled first cases. Other factors associated with overall delays or cancellations included having public or no insurance, having diabetes, requiring preoperative medications, and urogynecologic procedures.

This study adds to prior research identifying reasons for in-hospital delays, including patient age,[4] comorbidities,[11] and need for preoperative testing or imaging.[12,13] Our data further contributes specific, targetable areas for improvement. For example, diabetes was a significant factor in delayed cases. This may be due to added time needed to check blood sugars upon arrival, review home medications and administrations, or intervene on hyper- or hypoglycemia. Diabetes may also be a marker for other health comorbidities not captured in this study. Possible interventions to minimize delays may include presurgical screening interviews to review medications and administrations, earlier arrival time for high-risk patients, designated staff to simultaneously perform testing separate for perioperative nursing workflow, and set protocols to expedite intervention. Requiring preoperative medications was also a significant factor in delayed cases, and heparin was the most common medication given. While addressing such comorbidities is important for safe preoperative care, our study suggests areas for improvement in perioperative workflow to minimize delays, such as adjusting patient arrival times to account for anticipated delays. However, further quantitative and qualitative data is needed to address specific reasons for delays in these population.

Other at-risk populations included urogynecologic and oncologic patients. One potential reason for this is an older patient population with more medical comorbidities requiring a longer preoperative process or preoperative medication administration. This highlights the need for further investigation into more efficient preoperative workflow for patients at high risk of delay. Current research on improving first case on-time start times focuses on (1) improving the patient arrival process, (2) improving multidisciplinary operative team communication, and (3) debriefing that reviewed and improved performance on a daily basis.[14] Our study provides specific patient populations of focus for out-of-hospital

preoperative outreach and targeted in-hospital preoperative processes to optimize throughput.

Our results also add to the literature regarding surgical disparities among Black patients and publicly insured or uninsured patients. Black patients made up 6% of the overall population, but 12% of delayed/canceled cases. Patients with public insurance represented 44% of the study population, and 56% of delayed/canceled cases overall. While prior studies demonstrate disparities in the time to surgery or surgical management of both benign and oncologic conditions (fibroids,[15,16] breast cancer,[17] or endometrial cancer[18,19]), our study is the first to examine in-hospital delays based on patient and surgical characteristics. A prior study by Hicks et al. highlights that nearly 50% of preoperative delays are attributed to surgeon or patient reasons—human factors and interactions where implicit or explicit bias may play a role.[5] When controlling for other patient or surgical characteristics that may impact on-time starts in our study, such as medical comorbidities or surgical specialties, racial and ethnic disparities are still apparent.

Our findings suggest an unmeasured role of systemic racism in contributing to surgical health inequities. In considering implications of this work, it is important to emphasize that race is a social construct, and genetics do not account for differences seen between groups. Differences in race, such as those demonstrated in our study, represent structural racism in healthcare systems; to address these disparities, equality will not guarantee equity. Therefore, clinical efforts should focus on addressing biases in care processes to specifically improve the experience of historically marginalized, high-risk groups.

This study has numerous strengths. Race and ethnicity were self-reported variables extracted from the electronic medical record at the time of patient registration, minimizing bias in data analysis. Our study only included first cases; therefore, operating room availability and turnover time were not confounding factors. A limitation of this study is that the reason for preoperative delay was not a required documentation in the medical record. Prior studies have demonstrated specifics such as preoperative assessment and patient-related factors to be significant and modifiable through Lean interventions.[20] Such data is necessary to hone efforts for quality improvement endeavors. Furthermore, qualitative research is essential to understanding patient experience within the healthcare system, and future research should focus on describing these experiences. Another limitation in this study is that most cases were gynecologic and findings may not be generalizable to other areas of surgery. Our study results also do not capture patients who are unable to arrive to the hospital, or whose cases are canceled before arrival. Such individuals are at the highest risk for poor health outcomes, worsened by delays and disruptions to care during the COVID-19 pandemic.[21]

In conclusion, this cross-sectional study found that patient language was not associated with delayed starts and cancellations of scheduled non-obstetric surgeries. Differences were seen based on race, insurance, having diabetes, requiring preoperative medications, or undergoing urogynecologic procedure. Future research is needed to elucidate the impact of delays in preoperative units to focus quality improvement efforts and outcome measures.

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Impacts of Declining Hepatitis B Vaccine Birth Dose on Future Immunization Uptake

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ABSTRACT

BACKGROUND: Childhood vaccination remains one of the most effective public health interventions, yet recent national declines in coverage and rising vaccine hesitancy threaten these achievements. Hepatitis B (HepB) birth dose administration is an early predictor of parental adherence to future immunization schedules. We examined recent trends in Rhode Island (RI) HepB birth dose coverage and their relationship to subsequent vaccine completion and school-entry compliance.

METHODS: We identified the immunization records of RI resident infants born in RI hospitals from 2019 through mid-2025 in the Rhode Island Child and Adult Immunization Registry (RICAIR), and categorized them by timing of initial HepB vaccination: birth dose prior to discharge; early well visit dose; or no dose by 3 months of age in order to compare combined 7-series completion by 24 months and kindergarten immunization. Recent trends were then used to model projected future coverage.

RESULTS: HepB birth dose coverage declined abruptly to 84.2% by Q2 2025. Infants who received a HepB birth dose were more likely to meet kindergarten immunization requirements (91.1%) compared with those vaccinated later (81.8%) or not by 3 months (10.1%). Projections suggest statewide kindergarten compliance could decline from 88.8% to 85.3% if current trends persist.

CONCLUSIONS: The accelerating decline in HepB birth dose administration in RI is an early warning sign of eroding vaccine confidence and adherence. Coordinated, cross-sector interventions linking public health, prenatal, and pediatric care are urgently needed to reverse this trend and sustain high early childhood immunization coverage.

KEYWORDS: Hepatitis B vaccine; birth dose; immunization coverage; vaccine hesitancy; childhood vaccination

INTRODUCTION

Childhood vaccination remains one of the most effective public health interventions, preventing millions of cases of infectious diseases each year.[1] However, in recent years, U.S. childhood vaccination rates have plateaued in some parts of the U.S. and even declined in others, due in part to the growing influence of vaccine hesitancy.[2,3] Delays or refusals in vaccination have been linked to outbreaks of vaccine-preventable diseases across the country.[4,5] Rhode Island (RI) has been less affected by these developments than some other parts of the country, but below we provide evidence of emerging warning signs.

Hepatitis B (HepB) birth doses can serve as a bellwether for surveillance of changing parental decisions regarding pediatric immunization. Even after nirsevimab was recommended to reduce risk of Respiratory Syncytial Virus (RSV) in October 2023, administration is seasonal, therefore HepB remains the only vaccine universally recommended prior to discharge from the hospital. The Advisory Committee on Immunization Practices (ACIP) first recommended a universal HepB birth dose in 1991,[6] but neonatal HepB vaccination rates in the United States have remained suboptimal, with only 81.5% of infants born between 2019 and 2020 receiving the birth dose,[7] below the Health People 2020 goal of 85%.[8]

Suboptimal birth dose rates are of concern not only because of increased risk of perinatal HepB but also because they serve as a predictor of future vaccination adherence.[9,10] Analyses using state immunization registries[11-13] and national survey data[14] have shown that infants whose parents postpone the HepB birth dose are less likely to receive routinely recommended vaccines between 19 and 35 months of age.

The current study, therefore, aims to a) describe recent trends in RI HepB birth dose rates; b) identify rates of Combined 7 series completion by 24 months and Kindergarten immunization compliance children currently age-eligible who did and did not receive a HepB birth dose; and c) on the basis of those rates, model likely future overall compliance in light of recent birth dose trends.

METHODS

KIDSNET is RI's integrated child health data system, through which healthcare providers and other authorized users can access health data to assure the provision of appropriate preventive health services. KIDSNET also enables RIDOH to exercise public health surveillance to identify trends, areas of shortfalls in preventive care, and differential receipt of preventive care among subpopulations. A major component

of KIDSNET is the Rhode Island Child and Adult Immunization Registry (RICAIR), RI's immunization information system. RI providers submit data on administered vaccines; since 2022, RICAIR also includes vaccines administered in a growing number of other jurisdictions including MA, CT, NYC, and FL.

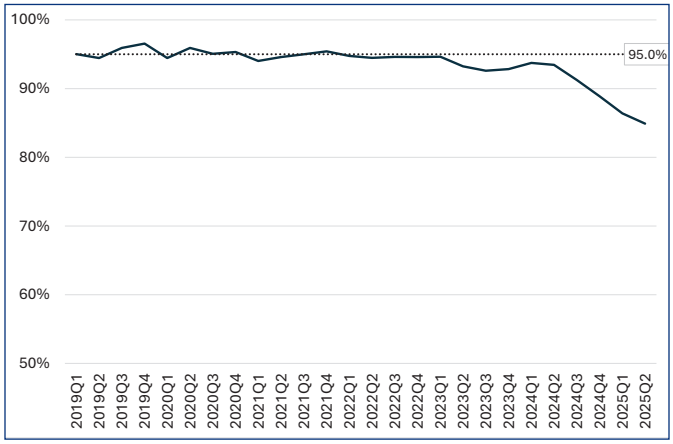
We used birth certificate data in KIDSNET to identify deliveries of RI residents in RI hospitals from 2019 through June of 2025, where the infant was discharged from the hospital. We then merged all Hepatitis B vaccine administration data during that period and used the infant's hospital discharge date to determine whether a birth dose was administered prior to discharge. (As of 2018, clinical guidelines call for administration within 24 hours; in order to assess birth dose receipt more generally, we included all doses administered prior to the date of discharge.) Guidelines indicate that infants with birth weight <2000 grams to a mother with confirmed negative Hepatitis B can be vaccinated either up to 1 month of age or prior to discharge; those infants were excluded from calculations of birth dose rates although included in the calculations of well visit vaccination, as were a small number of infants born in a hospital other than a newborn nursery.

For infants who did not have a birth dose prior to discharge, we then investigated whether the infant received a HepB dose at a well visit before 3 months of age, resulting in three final categories: infants who received a birth dose, infants who received a first dose at an infant well visit, and infants with no HepB vaccine on record by 3 months. We then subset children who were at least 24 months of age at the time of analysis and calculated the proportion in each category who had the combined 7-vaccine series[15] complete by age 24 months. In order to compare kindergarten requirement compliance rates across the three categories, we also created a "historical" cohort of children 5.0–6.5 years old. Finally, we applied those rates to estimate the probable impact on future overall toddler and kindergarten vaccine compliance of the most recent birth dose rates. The analysis was deemed exempt from the RIDOH Institutional Review Board as an extension of normal public health surveillance activities.

RESULTS

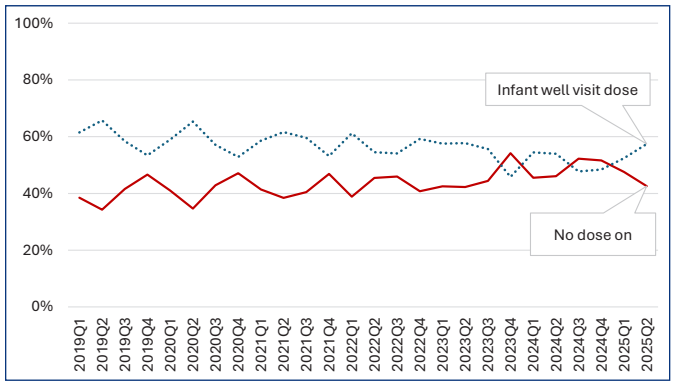
From 2019 through Q1 2023, there was only one calendar quarter when HepB birth dose coverage in Rhode Island fell below 94.5% [**Figure 1**]. Starting in Q2 2023, coverage was consistently below 94%, with sharp decreases starting Q3 2024 down to 84.2% in Q2 2025. Among the increasing proportion of infants who did not receive a birth dose, quarter-to-quarter trends fluctuated somewhat more but the percent of infants receiving a well visit dose trended downward [**Figure 2**]. As a result, the proportion of all infants with no HepB dose at 3 months increased from 2.9% of infants born Q1 2024 to 6.4% of infants born in Q1 2025 [**Figure 3**].

Figure 1. Percent of eligible* Rhode Island newborns receiving Hepatitis B birth dose prior to discharge, 2019–Q2 2025



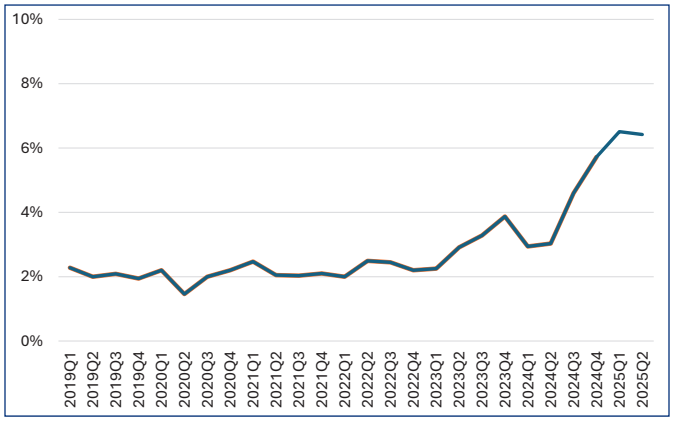
*Born in and discharged from a Rhode Island newborn nursery, birth weight >=2000 grams and mother not confirmed negative Hepatitis B

Figure 2. Hepatitis B vaccination status at age 3 months, among Rhode Island infants*who did not receive a birth dose prior to discharge from hospital, 2019–Q2 2025



*All infants born in and discharged from a Rhode Island newborn nursery

Figure 3. Percent of all Rhode Island infants*with no dose of Hepatitis B on record by 3 months, 2019–Q2 2025



*Discharged from a Rhode Island hospital

Table 1. Modeled future vaccination status of RI infants born Q1–Q2 2024 versus Q1–Q2 2025

	Combined 7 series complete by 24 months	Kindergarten requirements met
Compliance rates for previous birth cohort		
Birth dose in hospital	81.8%	91.1%
Well visit dose <3 mo.	65.4%	81.8%
No dose by 3 mo.	2.8%	10.1%
Overall completion rate	79.6%	89.1%
Projected overall completion rates for infants born Q1–Q2 2024	79.3%	88.8%
Projected overall completion rates for infants born Q1–Q2 2025	75.6%	85.3%

*For Combined 7 series: born July 2020–July 2023.
For Kindergarten requirements: born July 2017–January 2020

Among infants who received a HepB birth dose prior to discharge from the hospital, 81.8% completed the Combined 7 series by 24 months of age, compared to 65.4% of those who received an initial HepB dose at an early well visit [**Table 1**]. Among those who had no HepB dose on record, only 2.8% completed the Combined 7 series. Among those in an earlier birth cohort who received a HepB birth dose prior to hospital discharge, 91.1% completed all Kindergarten school immunization requirements compared to 81.8% of infants who received a HepB dose at a well visit and 10.1% of infants with no HepB dose on record by 3 months. Applying these rates to infants born in Q1–Q2 2024 and Q1–Q2 2025, all else remaining equal, overall Kindergarten immunization compliance can be anticipated to drop to 85.3% for infants born in the first half of 2025, from 88.8% for infants born in the first half of 2024.

DISCUSSION

The proportion of RI newborns receiving a Hepatitis B birth dose prior to discharge began falling in 2023, with the decline accelerating since late 2024. While about half of the infants without a birth dose do receive a first HepB dose at one of their first well visits, this still results in an increased proportion of infants with no HepB vaccine in their first 3 months. This vaccination status is further associated with completion of the Combined 7 series on target and with Kindergarten requirements compliance. These findings align with previous work showing that delayed receipt of an initial HepB is associated with reduced adherence to subsequent vaccinations, suggesting that the birth dose not only provides immediate protection against HBV but also establishes positive patterns of vaccine uptake.[10-13] This study adds to the current literature by showing an abrupted acceleration of decline starting in 2024 and by projecting the potential future impact on childhood immunization rates if current patterns hold in 2 and 5 years, respectively.

Despite RI's historically strong performance, the sharp recent decline of birth dose receipt is cause for concern. The timing aligns with previous findings that unlike pediatric/adolescent vaccination, the decline is driven not by the COVID-19 pandemic but by more recent developments.[16] However, it is less clear whether the decline is due more to health systems issues (eg, overextended hospital staff), sociocultural developments, or some synergy between the two—and understanding underlying causes is critical to formulating ways that health systems and public health can together address a trend that threatens to undo one of RI's key public health triumphs.

Historically, good health care access was considered a key predictor of vaccine receipt, but traditional measures of healthcare access are unlikely to explain our findings. RI has a robust universal childhood immunization purchase program that includes the birthing hospitals. Moreover, previous publications have found that traditionally advantaged subpopulations (eg, parents with private vs. public insurance) are more likely to refuse a birth dose, though also more likely to agree to a subsequent well visit dose.[17,18] In addition, providers may focus on traditionally less-advantaged populations stereotyped to be higher-risk, although 1/3 of HepB positive patients have no clear risk factors[18] and about half don't know their HepB status.[19] Studies have shown that health system interventions such as electronic health record prompts, and healthcare staff and community-based education campaigns do indeed result in improved birth dose rates.[20-22] Starting in 2025, RIDOH's Office of Immunization is applying the CDC's Immunization Quality Improvement for Providers (IQIP) program to newborn nurseries for the first time. This will provide technical assistance to help enhance workflows, reduce missed immunization opportunities, and increase vaccination rates.

The more difficult work for us all may lie in understanding and engaging with the cultural, social, and informational factors that also shape parental decision-making. The decline in HepB birth dose coverage signals a broader challenge for sustaining vaccine confidence and adherence. Coordinated action across public health, prenatal, and pediatric care is essential to reverse this trend and strengthen early immunization practices.

Limitations

The data source for this study is a sophisticated and comprehensive integrated data system, but like any data system it is subject to limitations. It is possible that some doses were administered but not reported into RICAIR, although we did also include doses submitted by subsequent providers as reported history. Despite routine address checks, KIDSNET also may not know if a child appears to be unvaccinated

simply because s/he has moved out of RI. We also acknowledge the tenuousness of projected compliance rates based on the limited data available. However, we have provided those projections solely as an approximation of potential public health ramifications of recent trends.

CONCLUSIONS

The HepB birth dose plays a dual role: preventing perinatal HepB infection and establishing early adherence to the recommended vaccination schedule. While some providers may feel their patients are sufficiently low-risk to skip the birth dose, achieving universal coverage is not only essential for protecting infants from HepB but also represents a critical step toward broader vaccine confidence and progress toward HepB elimination goals.

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The authors report nothing to disclose.

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Cancer Screening and Barriers to Screening Among Unhoused Individuals in Rhode Island

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ABSTRACT

INTRODUCTION: Unhoused individuals have higher mortality from cancer than the overall population. We aimed to determine cancer screening uptake and the barriers to screening faced by unhoused individuals in Rhode Island.

METHODS: Surveys focused on cancer screenings. Logistic regressions were used to identify interactions between having undergone screening and demographic characteristics. Responses to open-ended questions were analyzed to inform the findings.

RESULTS: Amongst 502 participants, the screening rates for breast, cervical and colorectal cancer were 27%, 58%, and 39%, all below the national averages. Cancer risk factors such as smoking and alcohol were highly prevalent. Not having a primary care provider (PCP), lack of transportation, fear and logistical issues were among the most self-identified barriers to cancer screening. There was a statistically significant interaction between sex and access to PCP (P=.03) with regards to having up to date colorectal cancer screening. Specifically, unhoused men with a PCP were significantly more likely to be screened for colorectal cancer than those without PCP (52% vs 18%, P<.0001).

CONCLUSIONS: Improving cancer screening among unhoused communities is critical. Access to PCP and health insurance can be leveraged to improve uptake of screening recommendations.

KEYWORDS: Cancer; screening; unhoused

INTRODUCTION

Homelessness is a rising public health crisis in the United States, affecting more than 3.5 million individuals.[1,2] In Rhode Island, the unhoused population increased by 35% between 2023 and 2024, with more than 2,400 individuals accounted for in early 2024.[3] Unhoused individuals are twice as likely to die from cancer relative to the general population.[4-6] While the reasons underlying these disparities are undoubtedly complex, low rates of cancer screening are recognized factors.[7] Unhoused individuals are nearly half as likely as the general population to undergo screening for colorectal, breast, and cervical cancers, among others as recommended by the U.S. Preventive Service Task Force (USPSTF).[6-12] More recent studies show that screening gaps may have been exacerbated by the COVID-19 pandemic.[13] Even when unhoused individuals are willing to undergo cancer screening, the inadequate healthcare infrastructure, lack of social support, and complex care logistics deter them from completing screening and having appropriate follow-up.[8-10] Additionally, unhoused individuals may face stigma and discrimination from healthcare institutions and providers, leading to a reluctance to seek care exacerbating this disparity.[14] This underscores the important role that primary care providers (PCPs) and community clinics have in ensuring trustworthy longstanding relationships with this population.[15] This study attempts to identify the screening rates and barriers to cancer screening among unhoused individuals in Providence, Rhode Island by conducting structured surveys focused on screening and system level barriers to screening.

METHODS

Study design and data collection

This cross-sectional study gathered quantitative data via a structured survey which included several open-ended, semi-structured questions. Surveys were conducted with adult unhoused individuals 18 years of age or older, from the metropolitan area of Providence, Rhode Island and nearby areas. The survey consisted of 46 items and was conducted from September 2023 to April 2024. The survey queried 1) basic demographics; 2) housing history; 3) basic medical information; 4) cancer risk factors; 5) cancer screenings; and 6) barriers to cancer screening. The open-ended items included questions about barriers to completing cancer screening. These items were verbally administered by the interviewers who took notes capturing the participants' open-ended responses. The surveys were administered by social scientists (PJ, MS), and were conducted at soup kitchens, shelters, on the street, and at other community events supporting unhoused individuals. Participants were identified via snowball sampling. Surveys were conducted using the participants' preferred language (English or Spanish) with the use of a certified Spanish interpreter when needed. Complete survey items are available in **Figure 1**.

Figure 1. Survey questions

What is your age?
What is your sex/gender?
What is your race or ethnicity?
Where do you sleep at night?
How long have you been sleeping there?
How long have you been unhoused?
What were the factors that led you to homelessness?
What is your highest level of education?
What language do you speak most of the time?
Have you ever had cancer? If so, what type?
Do you have any family history of cancer? If yes, who and what type?
Do you smoke cigarettes?
Have you ever smoked cigarettes?
If yes, how many cigarettes do you smoke?
If yes, how long have you smoked?
Do you drink alcohol?
Have you ever drank alcohol?
If yes, how often and how much alcohol do you drink?
Do you use sun block?
Do you use any intravenous drugs?
Have you been screened for HIV?
Have you been screened for hepatitis C?
Have you ever had a mammogram?
If yes, when was the last mammogram?
If not, why have you not had one yet?
Have you ever had a pap smear?
If yes, when was the last pap smear?
If not, why have you not had one yet?
Have you ever been screened for colorectal cancer?
If yes, when was the last colonoscopy or FIT test?
If not, why not?
Have you ever had a CT scan screening on your lungs for lung cancer?
If yes, when was the last screening?
If not and they smoke and are over 50, why not?
Have you ever had a prostate cancer screening?
If yes, when was the last screening?
If not and they are over 50, why not?
Have you ever had a skin cancer screening?
If yes, when was the last screening?
If not, why have you not had one yet?
Is there anything that is stopping/preventing you from getting cancer screening?
Do you have health insurance?
If yes, what type of health insurance do you have?
Do you have a primary care doctor or practice?

Having up-to-date cancer screening was defined by USPSTF recommendations for the average risk adult.[12] For breast cancer, that is having completed a mammogram between the last year for participants with breasts between ages 40 and 74; for cervical cancer, having completed a pap smear within the last 3 years for participants with cervix between ages 21 and 65, and for colorectal cancer, having completed a colonoscopy within the last 10 years for participants of any sex between ages 45 and 75.

Statistical analysis

Descriptive statistics for the quantitative data were generated using SAS version 9.4 (The SAS Institute, Cary, NC). Logistic regressions including terms for a) whether they were sheltered, b) had a primary care provider, c) race, and d) sex, as well as all 2-, 3-, and the 4-way interaction in order to highlight any sparsity in the sample, and avoid averaging across potentially important higher-order effects. Firth's penalized maximum likelihood estimation was used to reduce bias in the parameter estimates associated with separability arising from 100% of participants having the same response. Rather than having equal coefficients across classifications, coefficients were structured to be proportional to the size of the observed margins. In this way, estimates were more reflective of raw percentages.

Analysis of open-ended items

Participants' answers to open-ended survey questions were summarized by the interviewer and entered into the data tracking system. If relevant, participants were asked what got in the way of getting any cancer screening. All answers were reviewed by the study team and coded to identify common barriers to screening. As these were open-ended items, participants could offer as many barriers as were personally relevant. In addition to organizing coded responses into the types of barriers experienced, we also sorted those barriers by sex and by whether participants had a primary care provider (PCP), to explore how those contexts shape the barriers participants identified.

Ethics

The study was approved by the Brown University Health Institutional Review Board. Local community leader (KS) provided feedback on the study design and logistics. A research member (PJ, MS) approached potential participants and invited them to voluntarily participate in the study. All individuals who participated in the study provided verbal informed consent. Participants were given a $5 food gift card and a list of local healthcare resources following participation. This study was supported by a Health Equity Grant from Genentech Inc. The sponsor had no role in study design, data collection, analysis, or manuscript writing.

RESULTS

Participants demographics

A total of 502 unhoused individuals participated in the survey. Demographic characteristics of the survey participants are presented in **Table 1**.

Table 2 describes the up-to-date screening rates among eligible participants for breast, cervical, and colorectal cancers. Out of 125 eligible participants for breast cancer screening, only 34 (27%) reported having up-to-date screening. Regarding cervical cancer screening, from 133 eligible participants, only 77 (58%) had up-to-date screening. With regards to colorectal cancer screening, from 359 eligible participants, only 140 (39%) had up-to-date screening. When these results were disaggregated by access to a PCP, participants with a PCP were more likely to have up-to-date colorectal cancer screening, and had a trend toward higher rates of screening for breast and cervical cancer. In terms of lung cancer screening, 226 (70%) participants were eligible for screening at the time of the study, however only 18 participants reported having received screening with a computed tomography; the remaining eligible participants were unsure if they had ever been screened for lung cancer. Similarly, 223 male participants were eligible for prostate cancer screening at the time of the survey; however, most of them were unsure if they had received a PSA test. Regarding hepatitis C screening, the majority of the participants were unsure of having been screened. Given the reported low rates of lung, prostate and hepatitis C screening, these were not disaggregated by access to PCP or included in further analysis.

In the exploratory analysis using logistic regressions, to understand the relationship between different demographics and up-to-date cancer screenings, there was a statistically significantly larger effect of having a PCP on colorectal cancer screening and sex. [adj. P=.0246; **Figure 2**]. This was largely driven by the fact that men with a PCP were more likely to have been screened for colorectal cancer than those without a PCP (adj. P<.0001); while this effect was attenuated in females (adj. P=.8952). In contrast, unhoused female participants with PCP access did not differ from those without for colorectal cancer screening (35% vs 32%, P=.8213). Further, the rates of colorectal cancer screening in females were higher than males without PCP prior to but not after adjustment for multiplicity (33% vs 18% P=.0291, adj. P=.0582), and lower than males with a PCP (33% vs 52% P=.0093, adj. P=.0280). Regarding breast and cervical cancer screening, the rates in women did not differ by access to PCP in the multivariate analysis.

Barriers to cancer screening

Among all study participants, when asked "Is there anything that is stopping/preventing you from getting cancer screening" 212 answered "yes" and 254 participants answered "no". From their open-ended responses to the question, these participants identified 273 total barriers.

Table 1. Participant Demographics

Demographics	n (%) N=502
Sex	
Male	357 (71.1)
Female	143 (28.5)
Age - median (IQR)	53 (44 – 61)
Race/Ethnicity	
Non-Hispanic White	271(54.2)
Non-Hispanic Black	94 (18.8)
Hispanic/Latino	72 (14.4)
Other	63 (12.6)
Access to a PCP (y/n)	334 (66.5)
History of cancer (y/n)	48 (9.6)
Smoking (current)	355 (70.7)
Alcohol (current)	226 (45.0)
Active health insurance (y/n)	460 (92.0)
Shelter arrangements (y/n)	359 (71.5)

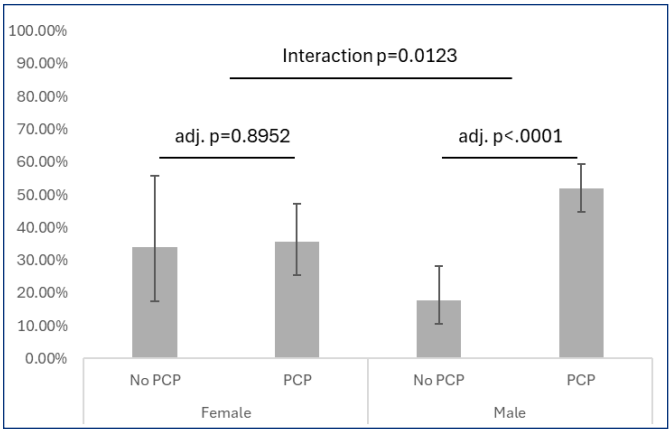
PCP: primary care provider.

Table 2. Rates of Up-to-Date Screening for Breast, Cervical, and Colorectal Cancer among Screening-Eligible Participants

Screening (eligible)	Overall Screened (% of eligible)	Participants with Access to PCP	Participants without PCP Access	Diff (95% CI)
Breast (n=125)	34 (27.2%)	27/90 (30.0%)	7/35 (20.0%)	10.0 (-6.3–26.3)
Cervical (n=133)	77 (57.9%)	58/92 (63.0%)	19/41 (46.3%)	16.7 (-1.5–34.9)
Colorectal (n=359)*	140 (39.0%)	119/253 (47.0%)	21/106 (19.9%)	27.2 (17.5–36.9)†

PCP: primary care provider. Data presented as n (%).
*Many participants were unsure of having had a prostate, lung, and/or hepatitis C screening, therefore were not included in the table.
†P value <.001.

Figure 2. Percent of Unhoused Screened for Colorectal Cancer



Any participant could identify multiple barriers. The most common barriers being lack of transportation, lack of PCP, fear, lack of information on screening, and lack of health insurance [**Table 3**].

Among female participants citing barriers, transportation was most discussed (n= 26; 46%) with lack of PCP and fear tied for second most noted barrier (n= 10; 18% each). Among male participants who discussed barriers to cancer screening, transportation was again the most noted (n=59; 38%) and lack of PCP was the second most noted barrier (n=32; 21%). Among the participants who discussed barriers to cancer screening, 123 indicated they had a PCP. Transportation was also the most cited barrier among these participants (n=49; 40%). Similarly, of the 89 participants who both discussed barriers and indicated they did not have a PCP, transportation was again the most common barrier (n=36; 40%). Of note, lack of health insurance was more commonly cited by male participants (n=18; 12%) than by female participants (n=3; 5%) who identified barriers to cancer screening. Being undocumented was not commonly cited; females did not note this as a barrier and only five men (3%) noted it. Ability to prepare for tests was cited by only one female and one male participant (n= 2% and 1% respectively).

Table 3. Self-identified Barriers to Cancer Screening

Barrier	Count (%)
Transportation	85 (40%)
Lack of primary care provider	42 (20%)
Fear	28 (13%)
No knowledge of services/lack of information	24 (11%)
Lack of insurance/underinsured	21 (10%)
Situation of homelessness	17 (8%)
Mental health, anxiety, and/or stress;	16 (8%)
Distrust of doctors/medical treatment	8 (4%)
Other	33 (14%)

n=212, participants who identified a barrier.

Table 4. Reasons for delayed colorectal cancer screening

Reason	Count (%)
Fear, uncomfortable with test	36 (24%)
Unaware of need or doctor hadn't ordered	35 (23%)
Knows they need one but hasn't been able to go	27 (18%)
No primary care provider (PCP)	26 (17%)
Does not feel they need one	10 (7%)
Medical issues prevent them from going or having test	4 (3%)
Difficulty preparing for test	4 (3%)
Other	8 (5%)

(N=150, participants age 45 to 75 who provided a reason as to why they have not had a colonoscopy)

If participants were eligible to have received colorectal cancer screening based on their age (between 45 and 75) and reported not having been screened, they were asked why they had not been screened. A total of 150 participants provided 150 open-ended responses. The most common responses are included in **Table 4**, fear of the test and not being aware of the need for screening were the most cited.

DISCUSSION

This cross-sectional study highlights significant gaps in early cancer detection for unhoused individuals, specifically for breast, cervical, and colorectal cancer, and negligible awareness in regards to screening for lung, prostate, and liver cancer. Additionally, it provides information on the self-perceived barriers of the unhoused to cancer screening, which can inform the design and implementation of initiatives and programs to address these gaps.

For breast cancer, the percentage of eligible unhoused female participants reporting being up-to-date with mammograms was around 27.2%, compared to 79.8% nationally in 2023.[16] This very low rate is consistent with findings from similar studies with unhoused populations in the U.S.[8,10] These findings call for the adoption of programs informed by unhoused individuals to reduce these disparities, including addressing transportation challenges, utilization of mobile mammography clinics, reducing fear of tests by incentivizing screening, counseling, and educational initiatives; as well as addressing logistical barriers assisting individuals with scheduling appointments and timely and appropriate follow ups.

For cervical cancer, only 57.9% of eligible participants in our study were up-to-date with cervical cancer screening compared to the national average of 75.8% in 2023.[16] In addition to addressing transportation challenges, interventions to increase awareness about cervical cancer and HPV screening, and assessing the feasibility of self testing should be assessed.

For colorectal cancer, only 39.0% of the participants in our study were up-to-date with screening recommendations, and to our knowledge, none of the participants had completed a stool based screening essay. By comparison, the U.S. national average for colorectal cancer screening in 2023 was 72.6%.[16] Our findings highlight the underutilization of colonoscopy for cancer screening in this population and the challenges that unhoused individuals face for colorectal cancer screening. The most commonly identified barriers by the participants included fear of the colonoscopy and/or the results, followed by lack of information or being unaware of the need, barriers to attending a colonoscopy appointment, and not having a PCP. The design of multifaceted and culturally appropriate interventions aimed at increasing knowledge and reducing fear; partnerships with PCPs and community practices to strengthen referral networks; and exploring the

feasibility of using fecal based screenings are deeply needed. Additionally, collaboration with shelters and other community organizations to provide respite and private bathrooms to allow comfortable colonoscopy preparation for unhoused individuals would be important. Furthermore, logistics for transportation, patient accompaniment, and adequate follow up can be addressed through patient care navigation. Using patient care navigators with prior experience of unhousing could be pivotal for decreasing fear and gaining trust among unhoused individuals. To our knowledge, this is the first study to report the positive effect of access to PCP on up-to-date colorectal cancer screening among unhoused men. This finding comes at a crucial time for primary care provision in the U.S. where workforce shortages are widespread,[17] and where local and federal policies to address provider shortages are urgently needed. Future research should focus on understanding facilitators for PCP access in this population, best practices to connect unhoused individuals to PCPs, and the important role of PCP engagement in screening initiatives for this population. Similarly, a better understanding of the roadblocks and facilitators that PCPs face when obtaining colorectal cancer screening for unhoused individuals is necessary. A recent study conducted in the province of Ontario, Canada, found that working in interprofessional practices, using trauma-informed care models, and adaptive care approaches can facilitate screening uptake.[15]

Increasing lung cancer screening is important in this community, because 71% of survey participants were current smokers, compared to 12% for the U.S. general population.[18] In our study, the majority of participants were unsure if they had undergone lung cancer screening. These low rates of lung cancer screening are similar to those found in other underserved communities in the U.S.[19,20] Our results also highlight the need for increased adoption of lung cancer screening recommendations for the overall population, given the national average of only 16% of eligible individuals being screened annually.[16] Partnerships with PCPs, tobacco cessation programs, and the use of patient care navigators could be strategies to overcoming barriers to lung cancer screening in this population[19,21]; similar efforts are currently being utilized in Rhode Island.[22]

Regarding prostate cancer, the majority of eligible participants were unsure if they had undergone screening. Our results are similar to those of a recent study of medical records of a metropolitan healthcare system in Ohio, in which the rates of prostate cancer screening with PSA among unhoused individuals was low.[23] The prostate cancer screening rate they found and the rate we found in our participants are both way below the 38% national average.[16] Together, these results underscore the need for increasing awareness among the unhoused population and providers and for the design of targeted interventions.

With respect to barriers to screening, lack of transportation has been identified both in our study and by others as one of the most prevalent barriers to complete cancer screening.[24,25] A recently published study similarly identified lack of transportation and lack of access to or awareness of screening among the most cited barriers in an unhoused population in Michigan.[26] The study also identified "low prioritization of health compared to other insecurities faced while being homeless" as an important barrier. The study, with 143 participants, sorted data by willingness to be screened and whether the participant was due for screening. The data from our current study amplifies these findings with data from our much larger sample and adds to the experienced barriers the important role of PCP engagement. Identifying facilitators to PCP engagement and supportive environments are important.[15] It has been recognized that PCPs experience moral distress when screening patients who may not be able to undergo appropriate treatment due to social factors.[27] The establishment of patient referral networks and partnerships between primary clinics and oncology centers are important to ensure appropriate follow-up and treatment. Lack of transportation is also a barrier addressable by public policy and dedicated local government funding, therefore partnerships with stakeholders could be fundamental.

In our study, 92% of the unhoused participants had health insurance which was almost always Medicaid, which suggests that undergoing screening may be feasible for this population. However, we fear that with recent funding cuts to Medicare and Medicaid programs,[28] many unhoused individuals may lose or will not be able to renew their healthcare coverage and therefore impact their ability to complete cancer screenings. Continuing funding for state Medicaid and Medicare programs is crucial for efforts to improve cancer screening in this and other disadvantaged populations.

Our study has several notable strengths. First, through collaboration with local community organizations, we were able to survey a significant number of unhoused individuals in the Providence, RI area. Second, our study contributes to the literature on cancer screening and barriers that this population faces. To our knowledge this is the first study to report the positive impacts of access to PCP on colorectal cancer screening in the U.S. unhoused population. Furthermore, the participants in our study were willing to discuss cancer screening, including answering open-ended questions about their reasons for not engaging in screening and identifying how barriers to cancer screening intersect with their housing experiences. This willingness suggests that future research might consider a qualitative study to learn more about how unhoused individuals think these existing barriers to cancer screening could be addressed, and to develop interventions that target their particular needs and housing context, including best practices to connect them with PCPs, ways to ensure they are able to attend their health visits and cancer screening appointments, address concerns and transportation needs. Furthermore, it is important to recognize that some participants identified the stresses of

being unhoused and regarded a higher priority to accessing food and shelter than to undergoing cancer screening.

There are several limitations of this study. First, this was a cross-sectional study, it is possible that access to PCPs or access to adequate housing may evolve or change over time. We did not account for the length of time being unhoused and the willingness to undergo screening in our study. The validity of self-reported responses is additionally an issue for our study. We noted a trend to higher up-to-date screening for cervical and breast cancer among unhoused female individuals with a PCP, but due to the small sample size of women in our study we were not able to reach a conclusion. Efforts are underway to better characterize the perceptions and barriers to cancer screening among unhoused female individuals. Although our study identified high risk cancer behaviors in this population, the self-reported data on lung cancer, hepatitis C, and prostate cancer screening was not enough to conduct rigorous analysis. Future research should aim to address these questions. Answers to our open-ended questions were entered as notes by survey administrators, therefore it was not possible to infer the meaning of some responses. Our study contributes to the lack of cancer screening data in marginalized populations; however, our results may not be generalizable to unhoused populations beyond Providence, RI. Finally, while we have outlined several suggestions to improve the experience and outcomes of unhoused patients regarding cancer screening, efforts to improve housing and healthcare access in this community are needed, it is of utmost importance to continue to address the fundamental causes of unhousing, and to support programs to improve access to shelter, food, and other basic needs for this community.

CONCLUSIONS

Unhoused individuals have high rates of cancer risk factors, however, important gaps in cancer screening remain. Unhoused individuals face significant barriers to cancer screening, yet access to PCP is associated with higher uptake of colorectal cancer screening. The most common self-identified barriers to cancer screening were lack of transportation, fear of the testing or results, and lack of information. We have outlined suggestions to improve cancer screening in the unhoused population, but more research is needed for the development of interventions to address these disparities.

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An Investigation Into an Increase in Invasive Group A *Streptococcal* Disease Cases in Rhode Island

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INTRODUCTION

Group A *Streptococcus* (GAS), or *Streptococcus pyogenes,* is a bacteria that can cause a wide range of illnesses, including those that are mild (eg, strep throat) and those that are more severe (eg, bacteremia, necrotizing wound infections, and Streptococcus Toxic Shock Syndrome [STSS]). Invasive GAS disease (iGAS) occurs when GAS invades a normally sterile part of the body, such as the blood, deep muscle tissue, and lungs. These infections can be severe, difficult to treat and are associated with prolonged hospital stays and increased mortality.[1] Elevated risk for iGAS occurs among adults 65 years of age and older, persons with chronic or immunocompromising conditions, people who inject drugs, individuals experiencing homelessness, and residents of congregate care settings.[1]

Active Bacterial Core surveillance (ABCs) is a component of the U.S. Centers for Disease Control and Prevention's Emerging Infections Program and operates among geographically distributed sites in the United States. The ABCs provides national estimates of invasive disease for select pathogens, including iGAS. From 1995 to 2013, iGAS incidence at ABCs sites remained stable. After a temporary decline during the COVID-19 pandemic, incidence rose overall from 2014 to 2023.[2-5]

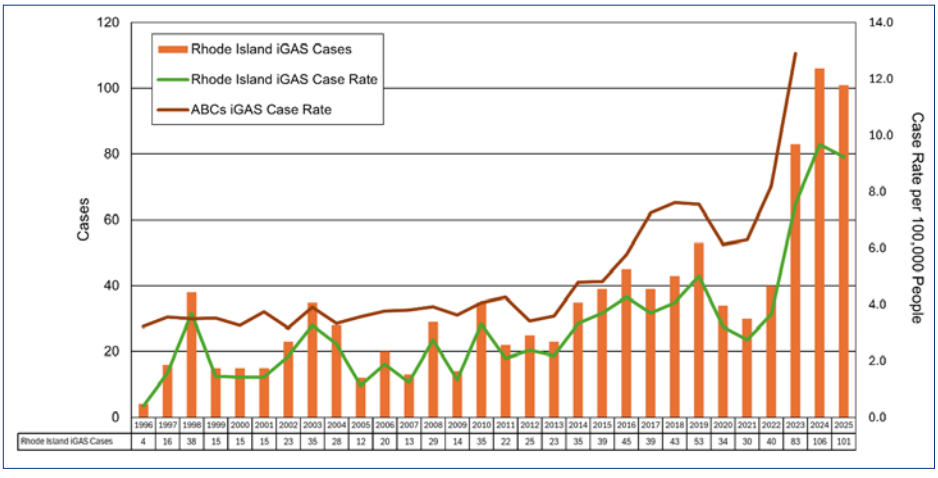
Over the past 20 years, Rhode Island has mirrored what has been observed by ABCs. From 1996 until 2014, iGAS incidence rates remained stable in Rhode Island, averaging 2.0 cases per 100,000. Between 2015 and 2019 cases began to increase, averaging 4.1 cases per 100,000 before decreasing to an average of 3.2 cases per 100,000 from 2020 to 2022 during the COVID-19 pandemic. From 2023 through 2025, the incidence rate of iGAS in Rhode Island drastically increased with an average incidence rate of 8.8 cases per 100,000. This was a 340% increase compared to the average incidence rate of the 19 years between 1996 and 2014 [**Figure 1**]. To investigate this increase, the Center for Acute Infectious Disease Epidemiology (CAIDE) performed enhanced surveillance for confirmed iGAS cases over an 8-month period and the Rhode Island State Health Laboratories (RISHL) performed whole genome sequencing of available *Streptococcus pyogenes* isolates from 2018 to 2025.

METHODS

Through regulation 216-RICR-30-05-01, cases of iGAS and STSS are reportable to the Rhode Island Department of Health and clinical laboratories must submit *Streptococcus pyogenes* isolates grown from sterile sites to the RISHL. A case was considered confirmed if *Streptococcus pyogenes* was isolated from a normally sterile site, such as blood, or if invasive disease was suspected. STSS cases were classified using the 2010 CDC STSS case definition. Confirmed iGAS cases with a specimen collected from November 1, 2023, to June 30, 2024, were included in the enhanced surveillance group for an in-depth medical record review. The 2023 ABCs Case Report Form was used to capture case demographics, hospitalization information, outcome of illness, pregnancy/postpartum status, congregate care associations, underlying health conditions and substance use. Microsoft Excel 365 was used for data storage and analysis.

The RISHL performed whole genome sequencing (WGS) on all available banked *Streptococcus pyogenes* isolates

Figure 1. Twenty-year comparison of Rhode Island and active bacterial core iGAS case surveillance, 1996–2025*



collected from January 1, 2018, to December 31, 2025. Single-colony subcultures were plated on nonselective media and submitted for sequencing. Bacterial DNA was extracted using either New England Biolabs Monarch gDNA Purification Kit or Qiagen EZ1 DSP Virus Kit. Extracts were evaluated for purity and concentration; Zymo DNA Clean & Concentrator-5 Kit was used for additional DNA clean up as needed. Sequencing libraries were prepared using the Illumina DNA Prep Kit, standard protocol, modified for half-volume reactions. Libraries were indexed with compatible Illumina unique dual indexes and pooled. Libraries were sequenced on Illumina MiSeq, MiniSeq, or NextSeq 1000 using paired-end, 300-cycle chemistries. Fastq files were analyzed using *RISHL_Mixed_With_Emmtyping* on GalaxyTrakr, hosted by the U.S. Food and Drug Administration. This pipeline uses Trimmomatic (https://github.com/usadellab/Trimmomatic) for quality and adapter trimming, followed by MicroRunQC (https://github.com/estrain/MicroRunQC), which reports quality metrics and generates a de-novo assembly with SKESA (https://github.com/ncbi/SKESA). A Multi-Locus Species Type (MLST) is generated, utilizing the PubMLST reference set (https://github.com/tseemann/mlst). Identity is confirmed with KRAKEN2 (https://github.com/DerrickWood/kraken2) and *emm* type is determined with emmtyper (https://github.com/MDU-PHL/emmtyper). Suspected antimicrobial resistance genes are identified using AMRFinderPlus (https://github.com/ncbi/amr). Outputs of these analyses are then summarized for interpretation by laboratory personnel. Supplemental analyses for plasmid detection and phylogenetic comparison are carried out offline using PlasmidFinder (https://github.com/genomicepidemiology/plasmidfinder) and IQ-Tree (https://iqtree.github.io/), respectively.

RESULTS

From November 1, 2023, to June 30, 2024, 90 iGAS cases met the inclusion criteria for enhanced surveillance. **Table 1** summarizes the findings. Bacteremia was the most common disease (78.9%). This was followed by pneumonia (present in 13.3% of cases with either bacteremia or another site of disease), STSS (13.3%), and soft tissue necrosis, including necrotizing fasciitis (7.8%). The average length of hospital admission for cases was 7 days with a range of stay from 1 to 123 days. Of cases with a known outcome, 13 (15.3%) died. Cases identified with either STSS and/or soft tissue necrosis were more likely to die (50.0%) than cases without (9.7%).

Overall, 98.8 % of cases had an identified risk factor for invasive disease. The most common risk factors included being greater than or equal to 65 years of age (37.8%), having diabetes mellitus (32.2%) and either having a recent positive test for a respiratory virus (17.8%) or having a recent respiratory-like illness (11.1%). The Rhode Island Child and Adult Immunization Registry (RICAIR) was utilized to determine the influenza vaccination status of each case for the 2023–2024 flu season. Of the 90 cases, 37.7% received an influenza vaccination in the year prior to their iGAS illness onset date. This was slightly higher than Rhode Island's statewide influenza vaccination coverage (35.3%) for the 2023–2024 influenza season. Residents of long-term care facilities (LTCF) and assisted living residences (ALR) were also found to be

Table 1. Characteristics of iGAS Cases, Rhode Island, November 1, 2023 to June 30, 2024

Characteristic	Number of Cases (N= 90)	Percent of Cases
Age (Years)		
0–19	9	10.0
20–39	12	13.3
40–64	35	38.9
>=65	34	37.8
Sex		
Female	43	47.8
Male	47	52.2
Site of Disease*		
Bacteremia	71	78.9
Bacteremia with Pneumonia	8	8.9
Other Site of Focus	7	7.8
Other Site of Focus with Pneumonia	4	4.4
Streptococcal Toxic Shock Syndrome	12	13.3
Soft Tissue Necrosis, Including Necrotizing Fasciitis	7	7.8
Tenosynovitis	5	5.6
Cellulitis	30	33.3
Risk Factors*		
Diabetes Mellitus	29	32.2
Heart Disease, Chronic	7	7.8
Homelessness or Unsteady Housing	1	1.1
Recent Respiratory Illness	26	28.9
Immunosuppressed	5	5.6
Lung Disease, Chronic	9	10.0
Malignancy, Hematologic	4	4.4
Malignancy, Solid Organ	12	13.3
Obesity	6	6.7
Recent Surgery/Skin Trauma	17	18.9
Renal Failure, Chronic	7	7.8
Resident of Congregate Care Facility	10	11.1
Injecting Drug Use	5	5.6
Survived		
Yes	72	80.0
No	13	14.4
Unknown	5	5.6

*Cases may have had more than one site of disease and risk factor identified.

Table 2. Common predicted *emm* types identified, Rhode Island, 2018–2025

Predicted *EMM* Type	2018	2019	2020	2021	2022	2023	2024	2025	Total
*emm*1.0	9	11	1	1	6	25	39	5	97
*emm*3.1	0	0	0	0	0	6	19	2	27
*emm*11.0	1	0	1	0	1	4	4	10	21
*emm*12.0	3	2	1	0	3	13	1	0	23
*emm*49.0	0	1	1	0	0	0	1	13	16
emm77.0	3	1	5	3	0	2	1	1	16
*emm*81.0	0	0	0	1	8	1	0	0	10
*emm*82.0	0	0	1	1	0	2	1	16	21
*emm*89.0	5	4	2	1	1	8	7	5	33
*emm*92.0	0	0	0	1	4	9	7	2	23

at an increased risk for iGAS. Over the 8-month enhanced surveillance period, of the 10 cases residing in congregate settings prior to their illness onset, eight were determined to be residents of these facility types, leading to the identification of two outbreaks.

Of the 451 isolates submitted for sequencing, 429 were confirmed as GAS and successfully sequenced. Sequenced isolates passing acceptable quality metrics (429/451) were uploaded to NCBI BioProject PRJNA854046 and to Sequence Read Archive (SRA). WGS showed drastic changes to *emm* types and diversity from 2018–2025. **Table 2** summarizes these changes and highlights the predominant *emm* types circulating in Rhode Island.

DISCUSSION

The dramatic increase in iGAS cases since 2023 has had an impact on the health of Rhode Islanders. Although no single or combination of risk factors were identified as the cause of the increase, it was clear that having at least one risk factor put an individual at risk for acquiring a severe Group A *Streptococcus* infection. Residents of LTCFs or ALRs face higher risk due to increased age, underlying health conditions and congregate living. During the study period, eight iGAS cases were identified among residents of these facilities. Additional resident cases have been identified since June 30, 2024. Overall, in 2024–2025, 38 iGAS cases were associated with these facility types, leading to the identification of seven outbreaks.

WGS of GAS isolates, has established a robust phylogenetic framework, enabling the integration of genetic, phenotypic and epidemiologic data to support early outbreak detection and response. In addition, there is now a better understanding of the history of circulating strains in Rhode Island. Some *emm* types, such as 1 and 89, can be considered endemic and have been present in Rhode Island every year since at least 2018. Some *emm* types (eg, *emm*11), were rare pre-pandemic and now constitute a large subset of new cases. Other *emm* types (eg, *emm*12) were well represented pre/early pandemic but are virtually non-existent post-pandemic [**Table 2**]. The change in circulating *emm* types over the past 7 years has likely played a role in the increase in iGAS cases due to more severe strains being present in larger quantities.

During the 8-month enhanced surveillance period, 12 STSS cases were identified through medical record review. In total, 16 STSS cases were reported in 2024, representing a substantial increase compared with the prior decade (2014–2023), when fewer than two cases were reported annually. Several factors may explain this increase. Although STSS is a reportable condition at both the national level and in Rhode Island, requiring healthcare providers to report cases, the national case definition is based on specific clinical criteria. As a result, reporting to RIDOH depends on provider recognition and diagnosis of syndrome, which may have led to underreporting in prior years. Additionally, although many *emm* types can cause STSS, *emm* types 1 and 3 are often associated with STSS.[6] Of the 21 STSS cases identified from 2024–2025 with a known *emm* type, 61.9% were either *emm*1.0 or *emm*3.1.

The enhanced surveillance system implemented during the 8-month iGAS investigation was critical for identifying previously unreported STSS cases, and iGAS cases among residents of LTCFs and ALRs. The findings enabled timely infection prevention and control interventions to further transmission. Enhanced case investigation and WGS remain central to surveillance efforts and facilitated identification of an iGAS outbreak among individuals experiencing unstable housing in Rhode Island in December 2025. Although the increase in GAS activity represents an ongoing public health concern, strengthened surveillance capacity has improved early detection, guided targeted interventions and increased awareness among healthcare providers and the public.

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Rhode Island Monthly Vital Statistics Report
Provisional Occurrence Data from the Division of Vital Records

VITAL EVENTS	REPORTING PERIOD		
	JULY 2025	12 MONTHS ENDING WITH JULY 2025	
	Number	Number	Rates
Live Births	989	10,962	10.3*
Deaths	796	10,713	10.1*
Infant Deaths	9	50	4.6#
Neonatal Deaths	5	33	3.0#
Marriages	561	7,008	6.6*
Divorces	265	2,542	2.4*

* Rates per 1,000 estimated population
# Rates per 1,000 live births

Underlying Cause of Death Category	REPORTING PERIOD			
	JANUARY 2025	12 MONTHS ENDING WITH JANUARY 2025		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	224	2,362	215.2	2,885.0
Malignant Neoplasms	209	2,192	199.7	3,992.5
Cerebrovascular Disease	49	450	41.0	549.5
Injuries (Accident/Suicide/Homicide)	59	863	78.6	9,911.5
COPD	51	475	43.3	454.5

(a) Cause of death statistics were derived from the underlying cause of death reported by physicians on death certificates.
(b) Rates per 100,000 estimated population of 1,097,379 for 2020 (www.census.gov)
(c) Years of Potential Life Lost (YPLL).

NOTE: Totals represent vital events, which occurred in Rhode Island for the reporting periods listed above.
Monthly provisional totals should be analyzed with caution because the numbers may be small and subject to seasonal variation.

Why join RIMS?

The Rhode Island Medical Society is your voice at the State House and in the community. In 2025, we secured wins on prior authorization, clinician wellness, and primary care funding—but this work depends on physician support. Without membership, RIMS cannot continue to advocate, educate, and protect the profession. Join or renew today—and consider getting involved in one of our committees. Together, we are stronger. The Rhode Island Medical Society is the only organization dedicated solely to advocating for physicians and their patients in our state.

In 2025, RIMS members helped

- Eliminate prior auth for PCP-ordered services (3-year Medicaid pilot)
- Secure fair Medicaid rates—up to 100% of Medicare starting Oct. 2025
- Protect physician wellness with the Clinician Wellness & Support Act

We're not stopping here

RIMS is fighting for the future of telemedicine, tackling workforce shortages, and reducing administrative burdens.

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https://rhodeislandmedicalsociety.wildapricot.org/Join-us/

Wins for providers

RIMS worked to secure and support key budget investments.

Medicaid primary care rate increase

Up to 100% of medicare rates
Starting October 2025

Medicaid prior authorization pilot

Eliminates prior authorization for Medicaid for three years
Starting October 2025

Physician loan repayment funding

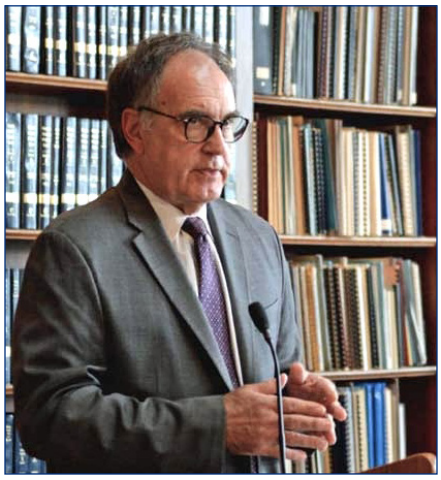
Includes $200,000 in funding to recruit and retain clinicians

Health center funding

Sustained investments in FQHCs and community health

Health services funding assessment

$30Mannually for primary care and other critical programs



Our priorities

RIMS focused on strengthening Rhode Island's healthcare system, protecting physicians' well-being, reducing administrative burdens, and improving access to care. Together with members, specialty societies, and partner organizations, we made significant progress on our top priorities.

The Rhode Island Prior Authorization Reform Act (SB 168/HB 5120)

Eliminates prior authorization for admissions, services, and procedures ordered by in-network primary care physicians in a three-year pilot.
Effective: October 1, 2025.
Status: Passed and signed
Sponsored by: Rep. Brandon Potter; Sen. Melissa Murray

The Rhode Island Clinician Wellness and Support Act (SB 695/HB 6036)

Recognizes RIMS' Physician Health Program in statute, strengthens confidentiality protections, and updates licensing language to encourage clinicians to seek care without fear.
Status: Passed and signed
Sponsored by: Rep. John "Jay" Edwards; Sen. Bridget Valverde

"I'm Sorry" Bill (H6210/S66)

Although not yet enacted, RIMS made significant progress this session on legislation to allow physicians to express sympathy or apologize after an adverse outcome without it being used as evidence of liability. We met twice with the Rhode Island Association for Justice (trial lawyers) and reviewed their suggested language—which we ultimately could not support—laying important groundwork for next session.
Sponsored by: Rep. Teresa Tanzi; Sen. Pamela Lauria

IT ALL STARTS HERE!
JOIN OR RENEW IN 2026
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The Rhode Island Medical Society is the statewide home for physician advocacy, education, wellness, and leadership. This past year, RIMS vdelivered meaningful wins for Rhode Island physicians, including:

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- **STRONGER CLINICIAN WELLNESS PROTECTIONS**
- **MEDICAID RATES TO 100% OF MEDICARE**
- **12 SPECIALTY SOCIETIES SUPPORTED AND 35+ EDUCATION PROGRAMS**
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Trust as a Weapon to Combat Misinformation

WILLIAM BINDER, MD

With the invention of the transistor in 1947, the world entered the information age. While the early 21st century has matured into the digital era, a subset of the information age, a parallel, dissolute historical epoch has emerged—the misinformation and disinformation age. A quick Google search using the phrase "misinformation in healthcare" resulted in thousands of "hits" in the past year, with organizations such as the Health and Human Services department, the National Institutes of Health, the World Health Organization, and the American Psychological Association all warning about the dangers of misinformation and disinformation in healthcare. *The Journal of the American Medical Association* has initiated a series on health misinformation and communicating medicine headed by Dr. Anne Coppola out of the University of Pennsylvania.[1] Scores of individuals have entered the fray, with multiple YouTube, TikTok, and Instagram videos offering tips for navigating misinformation in healthcare. In my own department, our residency program director is co-chairing a conference at the Society for Academic Emergency Medicine on "Rebuilding Trust and Mitigating Unreliable Information."

This new, darker period has significant implications for healthcare. Over the past decade, disinformation, misinformation, and missteps by the medical profession (the opioid epidemic and destructive prescription patterns), have led to plummeting trust in physicians and the medical profession. In an annual Gallup survey that queries the public about trust in professions, trust in physicians has decreased markedly since 2019.[2] While physicians rank higher than clergy, television reporters, and politicians, poll numbers are down. There are stark cultural and political fault lines—Republicans trust their physicians less than Democrats. In one study regarding the reliability of vaccine information, Republicans trusted Donald Trump (35%), Robert F. Kennedy, Jr. (27%), and their personal physician (32%) equally. Only 1% of Democrats trusted Trump, 2% trusted Kennedy, while 56% relied on information from their personal physician.[2]

The COVID-19 pandemic also corroded the trust in our professional institutions. For a brief moment, those of us in the medical profession and on the frontlines were considered heroes. However, a more sinister narrative emerged during the wobbly first year of the SARS CoV-2 pandemic, and medicine and science became hostages to a partisan account. Similar to the Great Influenza epidemic (Spanish flu) from 1918–1919, multiple battlefronts emerged between public health proponents and business interests.[3] However, unlike 100 years ago when the preeminence of science was on the rise, scientific organizations suffered a loss in trust and prestige. From its origins (lab leak, the China virus) to the public health response (isolation, school and business closings) to the scientific face of the pandemic (Dr. Anthony Fauci and the National Institutes of Health), the amplified chaos and noise from social media resulted in damage to our relationships and our profession.

Are we beyond repair? How do we combat misinformation? Can we recreate Rousseau's social contract, a collective bond for the general good, or have we devolved into a Hobbesian interpretation of human interaction? In both extremes, trust is the essential component of a two-part equation. In medicine, we have individual relationships with patients, and personal and professional relationships with colleagues. Our relationships create the covalent bonds which secure good will. Trust, like politics, is local, and it needs to be earned. It is an extremely rare event in which a physician knowingly harms a patient. Not every interaction is perfect. I remember one instance in which a patient arrived in the Emergency Department with obvious mental health needs, and who responded to my cold, robotic approach to his chief complaint by asking, "Hey, aren't you supposed to help me?" I immediately broke, and redirected our conversation toward a more therapeutic approach that led to a mutual understanding. In some cases, we cannot reach our patients, despite our best intentions. Early in the pandemic, a woman in her 50s presented with fever and a cough. After testing positive for COVID-19, she demanded ivermectin. Hoping to earn her trust by quoting the literature, I explained that while ivermectin worked on viral replication *in vitro*, there was no evidence for its use, and in fact, it failed to reduce viral replication in human studies.[4] She would have none of it. Sometimes science and evidence do not win. While I could not earn my patient's trust, I consoled myself by not amplifying misinformation. I am sure my Press-Gainey patient satisfaction score suffered upon her discharge.

Concurrent with the erosion of trust in physicians, there has been the slow decline of our own professional societies. In

the 1950s, 75% of all physicians belonged to the American Medical Association. Currently, the number hovers around 20%.[5] It is important to not let a similar fate befall our local medical society. As we seek to repair the physician-patient relationship, we also need to coalesce as a collective in support of ourselves. The Rhode Island Medical Society, in existence since 1812, has taken important steps to support current and next generation providers, and to earn our confidence. It supports physician wellness through the Physician Health Program, effectively advocates for common sense policy change (elimination of some prior authorizations for primary care physicians), and offers educational opportunities through continuing medical education and the *Rhode Island Medical Journal* (RIMJ). RIMJ, a publication of RIMS, is the only monthly medical society publication with a local and regional focus still operating in New England. As the federal government's reliability recedes, the *Journal* takes on renewed importance. The *Journal* offers a forum for commentary and an exchange of ideas, while providing our colleagues curated educational opportunities which (hopefully) accurately inform, and counter the scourge of misinformation. In addition, the *Journal* monitors the pulse of our community by regularly publishing data from the RI Department of Health. In an educational landscape complicated by misinformation, disinformation, and artificial intelligence, the RIMJ is (to borrow a phrase) locally and regionally sourced, and written and produced by colleagues. The *Journal* supports Rhode Island's healthcare community, and in turn, the patients we serve. We hope to continue earning our readers' trust as a veracious source of reliable information. ❖

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Music, Art and Dance Therapy in Parkinson's Disease: Gauging Awareness and Providing Education

MIRA RAJANI; JANINE MOLINO, PhD; PRARTHANA PRAKASH, MD

Dr. Joseph H. Friedman discusses the significance of tremor in the December edition of *Rhode Island Medical Journal*, and similarly, many other writers have outlined the impact of neurologic conditions on functional status and quality of life.[1] Despite demonstrated benefits of music, art, and dance (MAD) therapies in alleviating symptom burden for people with Parkinson's disease (PwPD) and related neurologic conditions, there is little knowledge about patient awareness of these resources.[2-5] By surveying PwPD, we identified areas in which healthcare providers can supplement patient knowledge and demonstrated the efficacy of a 15-minute educational intervention in increasing interest in MAD therapy participation.

Following neurology appointments, informed consent was verbally obtained and 10 PwPD completed a survey assessing interest and involvement in MAD, along with preconceptions about its role in PD therapy [**Table 1**]. They then had the opportunity to select one or more of the three complementary therapies to learn about and were given flyers describing the selected therapy's role in managing PD and local/online resources for engagement. Participants reviewed these flyers with the researcher and were subsequently surveyed on the intervention's efficacy and their willingness to engage in MAD therapies. Descriptive statistics were obtained on each response.

Table 1. Participant responses to a survey assessing interest in MAD therapies (N = 10). Participants were allowed to select more than one answer for each question.

	Music	Art	Dance
Number of participants who initially expressed interest in MAD	9	3	2
Number of participants who were involved in previous MAD classes	3	0	2
Number of participants who are still involved in MAD	0	0	1
Number of participants who had previously discussed the role of MAD in PD	1	0	0
Number of participants who believed that MAD can help PD symptoms	9	4	4
Number of participants who were interested in hearing more about MAD	8	6	2
Number of participants who considered engaging in MAD post-intervention	7	5	3

PD = Parkinson's disease.

Within this population [**Supplementary Tables 1 and 2**; please email the author for these tables], the majority of participants expressed interest in music (90%), while three (30%) and two (20%) expressed interest in art and dance, respectively. Although 50% had previously taken music, art, or dance classes, only one (10%) was still involved. Only one patient (10%) had been informed about MAD in the context of PD, and none knew of community resources for MAD therapy. 90% of participants believed music could help with PD symptoms, and 40% believed visual arts and dance each could help. All participants believed MAD could help with mood, with varying responses for other symptoms [**Supplemental Table 3**; please email the author for this table]. Eight (80%) participants were interested in learning more about music therapy, six (60%) about visual art therapy, and two (20%) about dance therapy. All participants reported finding the intervention helpful, and nine (90%) said that they would consider MAD (70% music, 50% visual arts, 30% dance).

While we acknowledge limitations in sample size, participant self-selection, and geographic representativeness, PwPD were highly interested in participating, and recruitment required fewer than 10 hours. Our findings provide insight into the value of conversations about these therapies between PwPD and healthcare providers. Despite little current involvement in MAD, most participants were interested in initiating involvement post-intervention, suggesting that a brief discussion during a provider visit could increase participation. Furthermore, despite more extensive research supporting dance as an adjunctive treatment for PD, music and visual arts were substantially more popular as therapies, suggesting that they should be more prominently discussed alongside dance. Finally, participants with a family member present for the intervention expressed more interest in MAD than participants there alone, and family members often encouraged engagement. This suggests that it is beneficial for healthcare professionals to involve loved ones during patient education to achieve the best outcomes. ❖

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Disclosures

None.

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Ethics Approval: This study was reviewed by the Institutional Review Board (IRB) of Lifespan (Lifespan Institutional Review Board, Providence, RI), and we were informed that no approval from IRB was deemed necessary.

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Governor McKee signs legislation to support sale of Roger Williams Medical Center and Our Lady of Fatima Hospital

PROVIDENCE — Governor **DAN McKEE** recently signed legislation to support the sale of Roger Williams Medical Center and Our Lady of Fatima Hospital by creating an $18-million fund to assist potential buyer Centurion in closing the transaction, contingent upon Centurion securing outside financing.

"Keeping Fatima and Roger Williams open is my top priority—for both the communities these hospitals serve and the dedicated professionals who care for their patients," said Governor Dan McKee. "My team has worked closely with the Attorney General's Office and the General Assembly, and we will continue to work together to assure the long-term viability of these critical hospitals."

"A potential closure of Fatima and Roger Williams hospitals is a catastrophic scenario for the people of Rhode Island and our fragile healthcare system. Not only would it affect the patients of the two hospitals, but the ripple effect would be devastating for Rhode Island's other hospitals and the patients they serve. Thankfully, with urgent recognition of this serious problem, our state government came together swiftly to ensure the sale of Fatima and Roger Williams hospitals proceeds," said Representative **SCOTT A. SLATER** (D-Dist. 10, Providence), Vice Chairman of the House Finance Committee.

"Tens of thousands of Rhode Islanders rely on Fatima and Roger Williams for medical care. For those patients, for the stability of our entire health system, and for our state's well-being now and in the years to come, we absolutely must find a secure and sustainable path forward for these safety-net hospitals. The legislation being signed today—which is fiscally responsible and limited in scope, while creating a critical backstop that will protect Rhode Islanders—represents a critical piece of that puzzle. On behalf of the Senate, I am grateful for the outstanding efforts of all the parties involved and the overwhelming support from the General Assembly," said Senator **LOUIS P. DiPALMA** (D-Dist. 12, Middletown, Little Compton, Newport, Tiverton), Chairman, Senate Committee on Finance.

This legislation dedicates $18 million from the state's supplemental rainy-day fund to support Centurion's acquisition of the hospitals, and includes several safeguards to support the acquisition while protecting taxpayers. No state funds will be used unless the Rhode Island Health and Educational Building Corporation issues the bonds needed to purchase the hospitals. The $18-million appropriation will not be given directly to Centurion even if the sale moves forward. Instead, the funds will be placed in a backup reserve account and can be used only if Centurion is unable to make its bond payments and only after its primary reserve has been fully exhausted. The bond issuance is expected to total about $80 million; the state's financial exposure is capped at $18 million.

"I am thankful to the General Assembly and Governor McKee for the passage and signing of this legislation, which is fundamentally about securing stability for patients, staff and the communities that rely on these hospitals every day," said Rhode Island Executive Office of Health and Human Services Secretary **RICHARD CHAREST**. "This legislation gives Centurion the opportunity to finalize the sale of these hospitals, to preserve care, and to protect our state's broader health care system."

"Roger Williams Medical Center and Our Lady of Fatima Hospital are critical safety-net hospitals. These facilities need to stay open for the patients they serve, and for the healthcare system in Rhode Island overall," said Director of Health **JERRY LARKIN, MD**. "The passage and signing of this legislation represents an important step in that direction. We are very grateful to the Governor and the General Assembly for their leadership and action on this critical issue." ❖

Sen. Whitehouse reintroduces the Prior Authorization Relief Act to more quickly deliver care to patients

Washington, DC — U.S. Senator **SHELDON WHITEHOUSE** (D-RI) reintroduced the Prior Authorization Relief Act on Feb. 3, 2026, This legislation to cut the administrative burdens associated with prior authorizations, a tool requiring healthcare providers to secure approval from health insurance plans before delivering medicines and services for a patient, resulting in faster care for patients. The bill eliminates prior authorizations from providers in value-based payment models.

"Americans are rightfully fed up with healthcare bureaucracy, and one of the many reasons is payment warfare by prior authorization," said Whitehouse, a senior member of the Senate Finance Committee. "Providers in value-based programs have every incentive to avoid unnecessary medical care, so these prior authorization requirements simply delay treatment and drive up overhead costs. My legislation aims to cut red tape and make it faster, easier, and cheaper to deliver high-quality care to patients."

Over 53 million prior authorization requests were submitted to Medicare Advantage health insurance plans in 2024. This can lead to increased administrative red-tape for healthcare providers and potential harm for patients.

Senator Whitehouse's Prior Authorization Relief Act would require the Centers for Medicare and Medicaid Services (CMS) to perform an audit across prior approvals required in Medicare Advantage insurance plans for medicines and services and ensure CMS standardizes prior authorization requirements across those medicines and services identified through the Agency's audit.

"Prior authorization continues to be a significant barrier to care faced by Medicare Advantage enrollees, and additional oversight and accountability are desperately needed," said **DAVID LIPSCHUTZ**, Co-Director of the Center for Medicare Advocacy. "Standardizing prior authorization requirements would be an important step forward towards achieving such accountability." ❖

New finding for glioblastoma treatment from Brown University Health

PROVIDENCE — In a groundbreaking study, researchers from Brown University Health have identified a factor that may help improve treatment for glioblastoma, a very aggressive and very common form of adult brain cancer. The findings were published in *Cell Reports*, and they reveal how differences among cells within a single tumor influence the cancer's response to chemotherapy. This promising new therapy might increase the odds of a favorable outcome for patients.

Glioblastoma is extremely difficult to treat because no two cells within the tumor behave exactly alike. Even within the same tumor, some cells respond to treatment while others do not, allowing the cancer to continue to grow. Scientists have long known that tumors are composed of diverse cells, but the biology behind these differences, and their impact on treatment, have remained unknown.

"Traditionally, researchers have focused on the overall behavior of a tumor by studying the average response across all the individual cells, using differences between the cells to interpret the average," said senior author **CLARK CHEN, MD, PhD**, Professor and Director of the Brain Tumor Program, Department of Neurosurgery at Brown University Health. "Our study fundamentally flipped that approach. Rather than focusing on the average response, we focused on the differences between individual cells within the same tumor, and what we found could change how we treat glioblastoma."

Chen's team discovered that a small molecule called miR-181d acts like a master switch that helps control how much of a DNA-repair protein called MGMT (short for methyl-guanine methyl transferase) each glioblastoma cell produces. When glioblastoma tumors are treated with chemotherapy, levels of miR-181d drop. This drop amplifies the differences among individual cells within the tumor, thereby allowing more cells to make more MGMT and survive treatment. The research team found that administering miR-181d into the tumor can reduce this effect, making the cancer cells behave more uniformly, and importantly, more likely to respond to chemotherapy.

"This is an exciting step forward," commented **GATIKRUSHNA SINGH**, Assistant Professor of Neurosurgery, University of Minnesota and one of the study's key collaborators. "Scientifically, it helps explain why tumors maintain so much internal variability. Clinically, it opens the door to gene-therapy strategies that could be truly game-changing for many glioblastoma patients."

The discovery has already led to the development of a new potential therapy aimed at improving patients' responses to chemotherapy by stabilizing miR-181d levels within the tumor.

This study was a collaborative effort involving scientists from Brown University Health, the University of Minnesota, VisiCELL Medical Inc., Stanford University, and Johns Hopkins University. ❖

Promising new prostate cancer trials treat first patients at The Miriam Hospital

PROVIDENCE — The Miriam Hospital has treated the first patients worldwide in two new clinical trials testing groundbreaking therapies for prostate cancer, affording local patients cutting-edge treatments years before they may be available elsewhere.

The two studies are part of Brown University Health's Early Phase Clinical Trial (Phase I) Program, led by **BENEDITO CARNEIRO, MD**, Director of Clinical Research and Cancer Drug Development and Associate Director of the Division of Hematology/Oncology and Co-Leader of the Cancer Therapeutics Program at the Legorreta Cancer Center at Brown University.

"The Early Phase Clinical Trial Program at Brown University Health and Legorreta Cancer Center is essential to making this kind of progress possible," said Dr. Carneiro "Our program allows us to safely bring the most innovative cancer therapies to patients early and close to their home, while advancing research that can change how prostate cancer is treated worldwide."

Both studies are centered on treatments designed to precisely target prostate cancer cells while minimizing damage to healthy tissue. One trial is testing a new type of immunotherapy that helps the body's immune system recognize and attack prostate cancer. It works by guiding immune cells directly to cancer cells that carry a protein commonly found in prostate cancer. The second trial is evaluating a targeted drug delivery approach that sends a cancer-killing medicine directly to prostate cancer cells. This strategy is designed to limit side effects by concentrating treatment where it is needed and sparing healthy cells. These studies are sponsored by AstraZeneca.

The Miriam Hospital's prostate cancer team, including medical oncologists, urologists, and radiation oncologists are also participating in several other clinical trials for patients with newly diagnosed and advanced prostate cancer. "These trials reflect the very best of what The Miriam Hospital stands for, innovation, collaboration, and a deep commitment to our patients," said **MARIA DUCHARME, DNP, RN**, President, The Miriam Hospital and Chief Quality Executive, Brown University Health. "By bringing first-in-the-world clinical research to our community, we are giving patients access to highly advanced care close to home and helping shape the future of prostate cancer treatment." ❖

RIDOH travel-related measles advisory

Measles transmission in the U.S. continues to increase. A large measles outbreak is currently impacting a region of South Carolina and smaller outbreaks are occurring in Arizona, Utah, and Florida, among others. Travel to areas with active measles transmission increases during school and higher education breaks in February, March, and April; the Rhode Island Department of Health (RIDOH) reminds clinicians to be vigilant for potential measles cases.

RIDOH is sharing the following guidance for identifying, reporting, and testing suspected measles cases. RIDOH also urges clinicians to review MMR vaccination records and strongly encourage MMR vaccination for patients who may not be up to date on MMR vaccination.

RIDOH request the following actions:

- Report all suspected cases of measles to RIDOH immediately at the time of initial clinical suspicion by calling 401-222-2577 (Monday–Friday, 8:30 am–4:30 pm) or 401-276-8046 after hours.
- Collect specimens for measles testing in patients presenting with febrile rash illness, clinically compatible measles symptoms, and epidemiological risk factors, such as travel or exposure to travelers.
- Ensure all patients are up to date on MMR vaccine. Refer to this resource for tips on having vaccine conversations and addressing concerns about the MMR vaccine.
- Review strategies for preventing measles transmission.

Measles cases have been increasing rapidly in the U.S. since early 2025 with large, extended outbreaks. Delayed recognition of measles can increase the risk of transmission. The clinical presentation of measles in adults and children is an acute, viral illness characterized by fever followed by a generalized, maculopapular rash. Additional symptoms may include cough, conjunctivitis and coryza. Koplik spots, blue-white spots on the buccal mucosa, are occasionally seen.

The rash usually starts on the face, proceeds down the body, and may include the palms and soles. The rash, which lasts for several days, fades in order of appearance. Patients are considered infectious 4 days before and 4 days after rash onset. Measles can be severe. Complications include diarrhea, otitis media, pneumonia, hepatitis, and encephalitis.

Requested Actions:

1. Report all suspected cases of measles immediately (24 hours a day) to RIDOH at 401-222-2577 Monday–Friday 8:30 am–4:30 pm or 401-276-8046 after hours, at the time of initial clinical suspicion. Don't wait for laboratory confirmation to report.

- Review the clinical features of measles.
- Maintain a high index of suspicion for measles in people with compatible febrile rash illness.

2. Collect specimens in patients presenting with febrile rash illness, clinically compatible symptoms, and clinically compatible measles symptoms, and epidemiological risk factors, such as travel or exposure to traveler.

- Contact RIDOH for assistance with submitting specimens to the Rhode Island State Health Laboratories (RISHL) for testing. Follow CDC's testing recommendations and collect a nasopharyngeal swab for reverse transcription polymerase chain reaction (RT-PCR), as well as a serum specimen for serology from all patients with clinical features compatible with measles.
- RISHL cannot accept throat swabs at this time. Please only collect a nasopharyngeal swab and a blood specimen for RISHL submissions.

Please follow these specimen transport instructions:

- **Refrigerated**: Transport and deliver to the laboratory within 72 hours of collection at 2–8°C in a cooler able to maintain specimen temperature. A plug-in electric cooler is recommended, however a cooler packed with excess frozen gel packs is acceptable as long as the transport temperature is maintained at 2–8°C.
- **Frozen**: If specimen previously frozen, it must be transported on frozen gel packs in insulated shipper.
- RISHL specimen collection guidance for Measles PCR can be found here.

3. Ensure all patients are up to date on MMR vaccine. As of February 5, 2026, CDC reported 95% of current measles cases in the U.S. were unvaccinated or had an unknown vaccination status.

Measles is almost entirely preventable through vaccination. The MMR (measles, mumps, and rubella) vaccine remains the best protection against measles. MMR vaccines are safe and highly effective, with 2 doses being 97% effective against measles (1 dose is 93% effective). When more than 95% of people in a community are vaccinated (coverage >95%) most people are protected through community immunity (herd immunity).

Vaccination coverage among U.S. kinder-gartners has decreased over time, but Rhode Island has a very good MMR vaccination rate. Approximately 97% of Rhode Island kindergartners have completed the MMR series, above the national average of 92.5%.

Rhode Island's measles immunization recommendations and requirements are as follows:

Pediatric Patients

Children should receive a first dose of MMR between 12 and 15 months of age, and a second dose between 4 and 6 years of age. Two doses of MMR are required for entry into kindergarten and all subsequent grades. For adolescents and older students, two doses of MMR are also required for entry into colleges and universities in Rhode Island. Learn more.

- For additional support**:** Healthcare professionals can run a KIDSNET Missing Immunization Report to assess patients who may be missing doses of MMR. The report will also highlight MMR doses that may need to be repeated due to timing between doses. Consider nurse-only visits to get patients in faster. If you need technical assistance or access to the Rhode Island Child and Adult Immunization Registry (RICAIR), please reach out to DOH.KIDSNET@health.ri.gov.

Adults

Adults who have not been vaccinated against measles, those who have only received one dose of MMR, or those who are not sure of their immune status can still be vaccinated.

Adults may contact their healthcare professionals to find out whether they were vaccinated against measles. Adults who were not vaccinated against measles and who do not have evidence of immunity against the disease may be advised to get at least one dose of MMR. There is no harm in giving MMR to a person who may already be immune to one or more of the vaccine viruses. Pregnant women should not receive any live virus vaccine during pregnancy, including MMR.

Travelers

- International travel: Anyone traveling internationally should be fully vaccinated before traveling. It is very important that infants 6 to 11 months old get one dose of MMR before international travel. Then they should get one more doses after their first birthday in accordance with the standard schedule. Children 12 months and older need two doses separated by at least 28 days, and teenagers and adults who do not have evidence of immunity against measles need two doses separated by at least 28 days.
- Domestic travel: Given current U.S. measles cases, people traveling to U.S. locations with active measles outbreaks should ensure they are fully vaccinated, following the immunization guidance stated above.

Vaccination and immunity for healthcare workers

MMR is required for all healthcare workers in certain facilities. A list of these facilities can be found at: https://health.ri.gov/immunization/information/healthcare-workers. These facilities should ensure:

- All newly hired healthcare workers in these facilities must have received two doses of MMR, show laboratory evidence of immunity, or show laboratory confirmation of disease.
- For current healthcare workers in these facilities born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease, two doses of MMR vaccine are recommended. These individuals will be required to be vaccinated during outbreaks.

4. Prepare for measles cases:

- Review infection control plans for assessing patients who may have measles or who may have been exposed.
- Screen for fever with rash at the point of entry into a healthcare facility and place symptomatic individuals in airborne isolation immediately. Don't allow patients with suspect measles to remain in waiting rooms. If a negative pressure room isn't available, place the patient in an exam room with a closed door, and don't use that room for at least 2 hours after the patient has left.
- Healthcare workers should adhere to standard and airborne precautions when evaluating suspect cases, regardless of their vaccination status.
- All healthcare workers should have documented evidence of immunity to measles. ❖

New regulation for medical practice groups

NEWPORT — Effective January 28, 2026, per a new regulation, medical practice groups in Rhode Island are required to submit a Notice of Material Change to the Office of the Attorney General before completing certain transactions, including, among other things, mergers or affiliations that result in a group of eight or more clinicians, transactions involving hospitals or health systems, arrangements involving management services organizations, and transactions involving private equity or other significant investors.

This will give the Attorney General advance notice of transactions that could impact access to care, market competition, or the delivery of healthcare services in Rhode Island. The notice must generally be submitted at least 60 days in advance of the effective date of a covered transaction.

The Attorney General encourages practices to carefully review these materials and to consult legal counsel if any transaction that might fall within the scope of this requirement is under consideration. RIMS will continue to monitor implementation of the regulation and share updates or clarifications as they become available.

For more about this regulation, please see:

The Notice of Material Change Form, which outlines what information must be submitted; and

The Attorney General's press release, which summarizes the intent and scope of the new regulation. ❖

PACT Act event held by VA Providence in Woonsocket

WOONSOCKET—The VA Providence Healthcare System, partnering with the Veterans Benefits Administration, Veterans Inc, and the Elks Lodge Veterans Committee, hosted a successful PACT Act outreach event on January 25th.

The event took place at the Woonsocket Elks Lodge and provided Veterans with crucial information and support regarding enrollment, benefits, and resources.

Event attendees were able to connect directly with VA Providence's enrollment team and representatives from key organizations dedicated to serving Veterans.

"The turnout today was incredible, and it's a testament to the commitment of our community to ensuring Veterans receive the care and benefits they've earned," said **LAWRENCE CONNELL**, Director of the VA Providence Healthcare System. "By bringing these services directly to Veterans, we're making it easier for them to access the support they need."

The PACT Act, expands healthcare eligibility and benefits for Veterans exposed to burn pits and other toxic substances, remains a vital topic for Veterans seeking to understand their options.

To learn more about the PACT Act or future events, please visit https://www.va.gov/providence-health-care/events. ❖

New blood markers identified that may detect early pancreatic cancer

PHILADELPHIA — National Institutes of Health (NIH)-supported investigators developed a blood test to find pancreatic ductal adenocarcinoma. The new test could improve survival rates from pancreatic cancer, one of the deadliest forms of cancer which tends to be diagnosed at late stages when therapy is less likely to be effective. The findings were published in *Clinical Cancer Research*.

Approximately one in 10 pancreatic cancer patients survive more than 5 years from diagnosis. When the cancer is found and treated at an earlier stage, experts expect that survival would improve.

Researchers at the University of Pennsylvania Perelman School of Medicine, PA, and Mayo Clinic, Rochester, MN, used a phased approach to testing biomarkers in the blood collected from patients with pancreatic cancer and similar patients without the malignancy. They included two blood biomarkers previously explored for use in this way, carbohydrate antigen 19-9 (CA19-9), which is used to monitor treatment response in patients with pancreatic cancer, and thrombospondin 2 (THBS2), another previously used marker but neither worked well as a screening tool.

In analyzing banked blood samples, the team found two novel biomarker proteins that were elevated in the blood of early-stage pancreatic cancer patients compared with healthy volunteers, aminopeptidase N (ANPEP) and polymeric immunoglobin receptor (PIGR).

When they combined ANPEP and PIGR with CA19-9 and THBS2 the four-marker panel successfully identified pancreatic cancer cases from non-cases 91.9% of the time for all stages combined at a false positive rate of 5% in non-cases. Similarly, for early-stage (stage I/II) cancer, the four-marker test identified 87.5% of cases.

"By adding ANPEP and PIGR to the existing markers, we've significantly improved our ability to detect this cancer when it's most treatable," said the study's lead investigator, **KENNETH ZARET, PhD**, University of Pennsylvania's Perelman School of Medicine. "Our retrospective study findings warrant further testing in larger populations, particularly in people before they show symptoms," Zaret said. "Such 'prediagnostic' studies would help determine if the test could be used as a screening tool for people at high risk of developing the disease based on family history, genetic screening results or personal history of pancreatic cysts or pancreatitis."

The study was supported by NIH grants U01CA210138, P50CA102701, S10 OD023586-01, P30 DK020579, UL1 TR002345, P30CA091842, and U01CA210138. ❖

New Middletown location for Brown Health Medical Group Primary Care

MIDDLETOWN — Brown University Health Medical Group Primary Care has opened a new site in Middletown, at 99 East Main Road, Suite 19A. A ribbon-cutting ceremony was held at the ~15,000-square-foot facility on Feb. 11, with Brown University Health leaders, Middletown clinicians, and staff in attendance. The space features on-site lab services, specialty space, updated amenities, and room for expansion.

"The opening of our Middletown location represents more than a new address—it marks a major investment and commitment to the future of primary care for this community," said **EDWARD McGOOKIN, MD**, Chief of Primary Care, Brown Health Medical Group Primary Care. "In a region where access to primary care has long been limited, this new site meets community need by expanding access to high-quality coordinated care in the region."

The Middletown care team looks forward to expanding access with the addition of new clinicians to the practice later this year. They also aim to reconnect with two key patient groups: individuals on Brown Health Primary Care's current waitlist and patients who were displaced during earlier provider transitions. ❖

Appointment

Mukesh K. Jain, MD,appointed Brown's Senior Associate Provost for Life Sciences

PROVIDENCE [BROWN UNIVERSITY] — Effective immediately, **MUKESH K. JAIN, MD**, Brown's Senior Vice President for Health Affairs and Dean of Medicine and Biological Sciences at Brown University, will assume an additional role as the University's Senior Associate Provost for Life Sciences.

In a message to the Brown community dated Feb. 10, Brown President **CHRISTINA H. PAXSON** and Provost **FRANCIS J. DOYLE III** noted Dr. Jain's commitment to advancing research and education in medicine and the life sciences at Brown and across Rhode Island.

"Since joining Brown in 2022, Mukesh has worked to develop and implement a vision for an integrated biomedical ecosystem that allows innovations to move from discovery to real-life impact, seeking both to improve human health and to enhance economic vibrancy in Providence and Rhode Island," Paxson and Doyle wrote. "With the additional role of Senior Associate Provost for Life Sciences, he will extend this work, stewarding the continued expansion of life sciences research across the University. Mukesh is ideally suited to help Brown advance its goals in the life sciences."

In his new role, Dr. Jain will employ institutional resources to strengthen signature life sciences initiatives by partnering with campus-based departments, as well as with schools, hospitals and external partners. Chairing a new advisory group on the life sciences, he will work with leaders across the University to advance research from discovery through clinical and translational impact.

As the University prepares for the 2027 opening of the William A. and Ami Kuan Danoff Life Sciences Laboratories, Dr. Jain will chair a group of stakeholders planning for the facility centered on determining scientific areas of focus and the optimal use of the new space to maximize collaboration and impact.

"It's a privilege to take on this role at a time of extraordinary momentum for the life sciences at Brown," Dr. Jain said. "I'm excited to work closely with colleagues across the University and with affiliated partners to strengthen collaborative, cross-disciplinary research and education. Together, we have an opportunity to build something distinctive with lasting impact for our community and beyond."

Dr. Jain played a pivotal role in the expanded affiliation with the health system known now as Brown University Health, helping to expand the integration of academic medicine with clinical delivery. His support was key in the creation of the Rhode Island Life Sciences Hub, aligning academic goals with statewide economic development, innovation and workforce initiatives. ❖

Brown University Health names Bassel George Diebo, MD, Co-Director of The Spine Center at The Miriam Hospital

PROVIDENCE — Brown University Health has named **BASSEL GEORGE DIEBO, MD**, as co-director of the Spine Center at The Miriam Hospital. Dr. Diebo will help guide the center's clinical, academic, and strategic direction while continuing to provide expert patient care.

The Spine Center's mission is to deliver high-quality, evidence-based care to patients from across New England, and as co-director, Dr. Diebo, a fellowship-trained spine and scoliosis surgeon, will lead efforts to advance multidisciplinary spine care, strengthen collaboration across services, and drive quality and safety initiatives. .

"I'm honored to join **ADETOKUNBO OYELESE, MD, PhD, FAANS**, in leading this exceptional spine-specialized team, from our dedicated anesthesiologists and operating room staff to our inpatient teams, nurse navigator, and program leadership," said Dr. Diebo. "Patients already travel from across New England for care here, and my goal is to build on that foundation with evidence-based protocols, precision surgical planning, and world-class innovation that positions The Miriam Hospital to compete at the highest level nationwide."

"Dr. Diebo is a nationally recognized expert in spine and scoliosis care whose clinical excellence and academic leadership have been instrumental to the success of The Miriam Hospital's Spine Center," said **MARIA DUCHARME, DNP, RN**, President, The Miriam Hospital and Chief Quality Executive, Brown University Health. "His contributions were key in earning an Advanced Certification in Spine Surgery from The Joint Commission; we are thrilled to have him serve as co-director of the program as we continue to set the standard for spine care excellence in the region." ❖

Recognition

Samir A. Shah, MD, MACG, 2025 Master of the American College of Gastroenterology recipient

PROVIDENCE — Designation as Master of the American College of Gastroenterology recognizes stature and achievement in clinical gastroenterology and/or teaching, and contributions to the College in service, leadership, and education. **SAMIR A. SHAH, MD, MACG**, has been recommended by the Awards Committee and approved by the Board of Trustees for designation as Master.

Dr. Shah is a Clinical Professor of Medicine at the Alpert Medical School of Brown University, Chief of Gastroenterology at the Miriam Hospital, and a partner with Gastroenterology Associates Inc. in Providence, RI. A magna cum laude graduate of Brown University, he received his MD from Harvard Medical School. He joined the American College of Gastroenterology (ACG) as a GI fellow in 1995, and as ACG Governor for RI, he was elected Vice-Chair and Chair of the Board of Governors. The coauthor of more than 200 abstracts, book chapters, and articles, he has delivered over 100 invited presentations throughout his career. He joins past and current ACG Masters, including his father, Dr. Ashok N. Shah (1939–2023) who was honored as a MACG in 2007. ❖

Rhode Island Hospital earns Beacon Award for Excellence from American Association of Critical-Care Nurses

PROVIDENCE — Rhode Island Hospital has again earned a silver-level Beacon Award for Excellence from The American Association of Critical-Care Nurses (AACN) for its Coronary Care Unit (CCU). The national designation recognizes performance in the areas of optimal patient outcomes, a healthy nursing work environment and exceptional nursing care. This marks the second submission for Rhode Island Hospital's CCU and its second consecutive Beacon Award for Excellence.

"This is an incredible achievement for our dedicated CCU team here at Rhode Island Hospital. I'm proud to say that it is a reflection of the outstanding collaborative care that is provided to our patients and families every day," said **SARAH FROST**, Chief of Hospital Operations and President of Rhode Island Hospital and Hasbro Children's.

The Beacon Award for Excellence recognizes unit caregivers who successfully improve unit outcomes and align practices with AACN's six Healthy Work Environment Standards. Units that earn this annual award with a gold, silver or bronze designation meet specific criteria established by AACN that represent the characteristics and components of the unit environment that nurses can influence to achieve nursing excellence. ❖

Westerly Hospital honored with Press Ganey's 2025 Guardian of Excellence® Award

WESTERLY — Westerly Hospital has been honored with Press Ganey's 2025 Guardian of Excellence® Award for Patient Experience, recognizing the hospital as one of the top-performing healthcare organizations in the nation.

The Guardian of Excellence Award is presented annually to hospitals and health systems that rank in the 95th percentile or higher for patient experience performance. Press Ganey partners with more than 41,000 healthcare facilities nationwide, supporting healthcare organizations in their mission to strengthen caregiver resilience and elevate the overall safety, quality and human experience of care.

"Receiving this award once again shows how deeply our staff values every patient who walks through our doors," said **RICHARD C. LISITANO**, president, Westerly Hospital. "Their dedication to delivering safe, high-quality care is unwavering, and this recognition reflects the pride they take in serving our community every day."

Westerly Hospital also earned Guardian of Excellence awards for Patient Experience in 2023 and 2024.

This year, 211 health systems and 46 health plans across the United States were recognized with Press Ganey's Human Experience awards. The Patient Experience award recognizes organizations that demonstrate unwavering commitment to improving the experience of those they serve, determined by key measures in the Press Ganey patient experience or Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey. The survey, developed by the Agency for Healthcare Research and Quality (AHRQ), are standardized tools designed to measure patient experiences across various healthcare settings, such as hospitals, nursing homes and health plans. They focus on essential aspects like provider communication, care coordination and access to services. ❖

Felipe Vivas, MD, Internist

Blizzard Babies

Even in a blizzard, the dedicated Care New England teams provided care to those who need it! Twins, Liliana and Amelia DiPrete, were born at Women & Infants during the height of the historic storm on Feb. 23. They were delivered at 8:44 am and 9:06 am, weighing 5 lbs. 6 oz. and 6 lbs. 5 oz. They are from Warwick.

[CARE NEW ENGLAND, WITH PERMISSION OF PARENTS]

Care New England physicians

Talk about determination! Not even nearly three feet of snow kept Care New England staff from getting to the hospitals to care for our patients. While the powerful blizzard blanketed the region and roads became impassable, our team turned to unconventional ways to get to work—hiking and skiing! Patient care is our top priority, so they strapped on their skis and boots and made their way to Kent and Women & Infants to ensure the hospital remained staffed and patient care was uninterrupted.

[CARE NEW ENGLAND]

Kalin Gregory-Davis, MD, Ob/Gyn resident

Adam Lewkowitz, MD, Division of Maternal-Fetal Medicine

Obituary

PAUL YU LIU, MD, passed away on January 26, 2026.

He was a world-renowned plastic surgeon who pioneered research in wound healing, and a revered educator.

Dr. Liu held prestigious leadership positions, including Chief of Plastic Surgery at Brown University Health, Chief of Surgery at Roger Williams Medical Center, and Professor of Surgery at The Warren Alpert Medical School of Brown University. He was internationally recognized for his clinical expertise and innovations in the treatment of complex wounds and diabetic limb salvage, integrating insights from mathematics, immunology, genetics, and surgery.

Dr. Liu earned his MD from Harvard Medical School, then completed his internship, residency, and research fellowship at Harvard's Brigham and Women's Hospital, where he served as senior and chief resident in plastic surgery. His academic and professional accomplishments were myriad, including an MA *ad eundum* from Brown University, the Louis T. Benezet Award from Colorado College, the Outstanding Mentor in Plastic Surgery Award, the Gordon Fellowship at Lahey Clinic, and the Compassionate Doctor Award. He is remembered by colleagues and students for his humility, generosity, and stalwart commitment to nurturing the next generation of surgeons and researchers.

Dr. Liu served as president of the Wound Healing Society, program co-chair for its annual meetings, and director of the Functional Diabetic Limb Salvage and Wound Healing Foundation Conference. He also organized the Thomas K. Hunt Lecture Series, fostering collaboration and innovation across the field.

In the laboratory, Dr. Liu focused on wound healing, exploring ways to optimize surgical repair by developing biologicals that could improve on the body's natural healing. He established a biotech company, PAX Therapeutics, with his partner Dr. Xiaotian Wang.

He leaves behind his wife of 37 years, Sally Anne Lund, MD, and his children, Christian Liu, JD, of Boston, MA, and Meredith Liu, MFA, of Falls Church, VA; sisters Ingrid Lin, MD, (Henry Lin, MD), and Margaret Liu, MD, (Robert Johnson, MD, PhD), of Palos Verdes Estates and Lafayette, CA, respectively.

Those seeking to make contributions in Dr. Liu's memory can donate in his name to the Wound Healing Foundation or to the Warwick Symphony Orchestra. ❖