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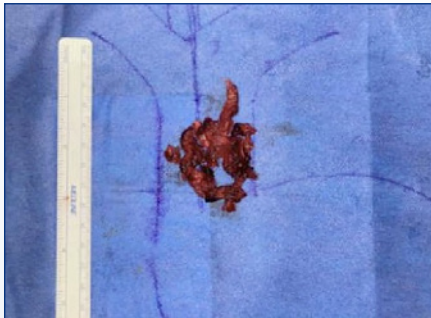
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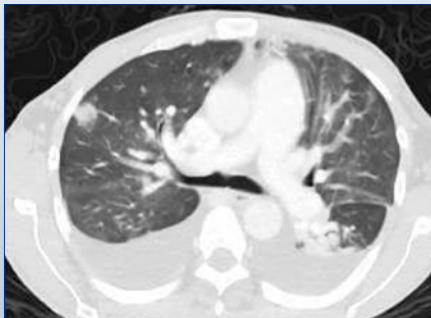
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When the Tumor Presses Back: Recognizing Malignant Superior Vena Cava Syndrome

GREGORY DAMPOLIAS, MD

KEYWORDS: superior vena cava syndrome; SVC obstruction; oncologic emergency; lung cancer; Pemberton sign; small cell lung cancer

INTRODUCTION

Superior vena cava (SVC) syndrome results from obstruction of blood flow through the SVC, producing a recognizable clinical syndrome.¹ It is most often caused by malignancy, particularly lung cancer and lymphoma.² We report a case of malignant SVC syndrome due to small cell lung cancer presenting to the emergency department.

CASE PRESENTATION

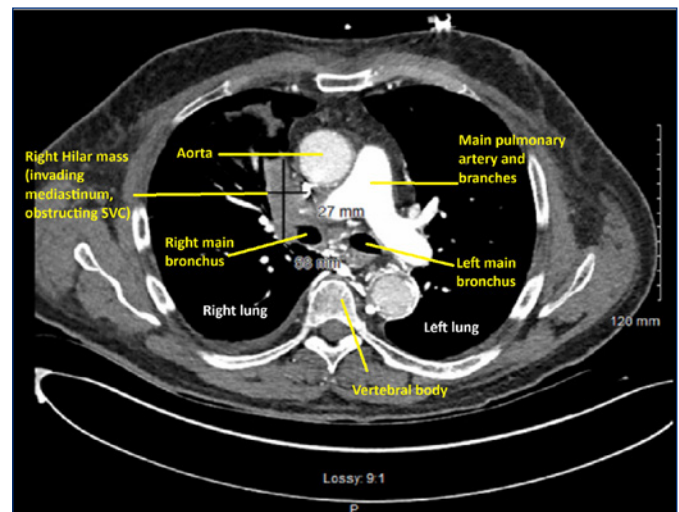
A 78-year-old man with hypertension, hyperlipidemia, and a 64-pack-year smoking history presented with several weeks of progressive facial and bilateral upper extremity swelling. His symptoms were initially attributed to pneumonia and treated empirically with antibiotics by his primary care physician but continued to worsen, and the day before presentation he noted new dilated veins across his chest wall. He reported mild exertional dyspnea and difficulty clearing sputum but denied hemoptysis, chest pain, fevers, or other constitutional symptoms; a recent colonoscopy was normal, and he had no family history of malignancy.

On arrival, vital signs were stable, and he was afebrile with normal oxygen saturation. An electrocardiogram showed new-onset atrial fibrillation with a heart rate of 98 beats per minute. Examination revealed facial plethora, marked venous distension of the neck and chest wall, bilateral upper extremity edema, hoarseness, and a positive Pemberton sign, with facial plethora and cyanosis developing within one minute of arm elevation. Laboratory studies showed mild hypercalcemia (10.4 mg/dL) and leukocytosis ($14.9 \times 10^9/L$), with normal coagulation studies. Computed tomography angiography of the chest revealed a $5.6 \times 2.7 \times 2.8$ cm right hilar mass invading the mediastinum and obstructing the SVC, with extensive chest wall venous collaterals consistent with chronic obstruction [Figures 1,2]. He underwent endobronchial ultrasound-guided fine needle aspiration of the hilar mass and mediastinal lymph nodes, along with endovascular SVC stenting and radiation therapy.

Figure 1. A portable AP Chest Radiograph on admission showing elevation of right hemidiaphragm, and mild right paratracheal soft tissue fullness.



Figure 2. High Resolution Chest CT showing a right hilar mass suspicious for malignancy that invades the mediastinum and obstructs the superior vena cava.



DISCUSSION

This case illustrates how malignant SVC syndrome can mimic more common, benign conditions, often delaying diagnosis; facial and upper extremity edema are frequently attributed to allergic reactions, venous thrombosis, or infection before malignancy is considered.⁹ SVC syndrome most often results from external compression by an enlarging tumor in the right hilum or anterior mediastinum, though direct invasion or thrombus formation in a hypercoagulable malignant state can also contribute.^{3,4} Classic findings—facial plethora, neck and upper extremity edema, dilated chest wall veins, and a positive Pemberton sign—should prompt urgent evaluation, particularly when accompanied by red flags such as stridor, hemodynamic instability, or altered mental status, which signal impending airway or cerebral compromise.^{5,6} A five-grade classification system can help stratify severity and guide management [Table 1].⁷

Histologic diagnosis should be obtained before starting therapy whenever feasible, since treatment is directed by tumor type.⁸ In this case, tissue sampling confirmed small cell lung cancer, one of the most common causes of malignant SVC syndrome given its central, mediastinal growth pattern.¹¹ Management is guided by symptom severity. Patients with mild to moderate symptoms, as in this case, can often be stabilized with supportive measures—head-of-bed elevation, supplemental oxygen, and avoidance of upper-extremity procedures—while diagnostic workup proceeds. Glucocorticoids are sometimes used empirically, though supporting evidence is limited.⁴ For patients with severe or refractory symptoms, endovascular stenting offers the most rapid and durable relief and was effective in achieving symptom control in this patient.^{10,12}

Table 1. Grading System for Superior Vena Cava Syndrome

Grade	Findings	Estimated incidence (%)
0	Asymptomatic – Radiographic superior vena cava obstruction in the absence of symptoms	10
1	Mild – Edema in head or neck (vascular distention), cyanosis, plethora	25
2	Moderate – Edema in head or neck with functional impairment (mild dysphagia, cough, mild or moderate impairment of head, jaw, or eyelid movements, visual disturbances caused by ocular edema)	50
3	Severe – Mild or moderate cerebral edema (headache, dizziness), mild/moderate laryngeal edema, or diminished cardiac reserve (syncope after bending)	10
4	Life-threatening – Significant cerebral edema (confusion, obtundation), significant laryngeal edema (stridor), or significant hemodynamic compromise (syncope without precipitating factors, hypotension, renal insufficiency)	5
5	Fatal – Death	<1

Superior vena cava syndrome is classified using a five-grade severity scale developed by Yu and colleagues (2008), which guides clinical decision-making and treatment urgency

CONCLUSION

Malignant superior vena cava syndrome is a serious oncologic emergency that requires prompt recognition, particularly in the emergency department where patients may first present. As demonstrated in this case, delays in diagnosis can occur when symptoms are attributed to more common etiologies. Increased awareness of SVC syndrome's clinical presentation can result in earlier diagnosis for this high-risk population.

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Disclosures

None

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Superior Vena Cava Syndrome Due to Catheter-Associated Thrombus

PETRANEA SMITH, MPH; KATHERINE ALLDER, MD; WILLIAM BINDER, MD

CASE PRESENTATION

A 56-year-old woman with past medical history of recurrent diffuse gastric adenocarcinoma, hypertension, gastroesophageal reflux disease (GERD), and anxiety presented to the emergency department with a chief complaint of dizziness and nausea for 12 hours. Upon arrival, she reported additional dyspnea, blurry vision, and a sore throat. On examination, the patient's skin was discolored with a blanching purplish appearance that extended from the face to the nipple line [Figure 1]. The patient had not noticed this prior to her visit, but upon showing her a photo of her face, she was surprised by the marked discoloration and swelling of her face and neck. In addition to her facial and neck plethora, periorbital edema and supraclavicular fullness were noted.

At the time of presentation, the patient was undergoing a FOLFOX (leucovorin, fluorouracil, and oxaliplatin) and nivolumab chemotherapy regimen for recurrent diffuse gastric adenocarcinoma via a right chest port catheter.

Computed axial tomography (CT) revealed a peri-catheter thrombus in the superior vena cava (SVC) as well as pre-occlusive stenosis at the cavoatrial junction. CT and venogram of the brain were clear with no anastomoses or intracranial abnormalities.

The patient was diagnosed with SVC syndrome, caused by a catheter-associated thrombus in the SVC. Heparin was started for anticoagulation, and intravenous dexamethasone was administered to reduce inflammation. The patient's head was elevated to 45 degrees to facilitate draining of fluid from her face and neck. The patient was admitted to the internal medicine service and the following day, the interventional radiology team performed mechanical thrombectomy with tissue plasminogen activator (tPA) pulse dose infusions [Figure 2].

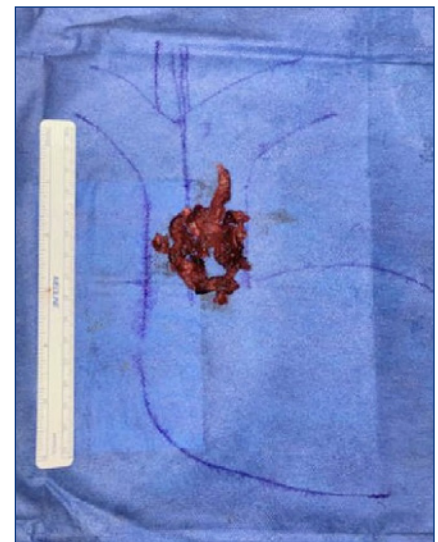
Figure 1. Upper Extremity and Facial Plethora

Facial, neck, and upper extremity plethora and purplish discoloration noted upon presentation to the ED. Note the color difference between the patient's face and abdomen.



Figure 2. Venous Clot

SVC venous clot removed by Vascular and Interventional Radiology (VIR) via venography and mechanical thrombectomy with tPA pulse dose infusion.



After the thrombectomy, the patient reported marked improvements in her dizziness, headache, and blurred vision, and her face, neck, and upper chest returned to her typical coloration. She was discharged home on apixaban. Her right chest port was determined ready for immediate use and she continued her FOLFOX chemotherapy infusion cycles.

SUPERIOR VENA CAVA SYNDROME

SVC Syndrome occurs when blockage of the vein occurs due to compromised vessel anatomy, diminished vessel wall integrity, or impaired venous flow, often due to a thrombus. In the US alone, about 15,000 estimated cases of SVC syndrome occur each year.¹

Approximately 70% of cases of SVC syndrome are associated with malignancy.² Device-related SVC syndrome comprise almost 30% of cases and occurs when fibrin deposits build up on the surface of the intravascular device,

embedding the device into the vessel wall and leading to inflammation, fibrosis, stenosis of the vessel, and eventual thrombus formation.² Device-associated thrombosis is the most common noninfectious complication of implantable venous access devices.³

SVC syndrome most commonly presents with swelling of the face, neck, and upper extremities, facial plethora, dyspnea, dizziness, cough, and distension of collateral neck and chest veins. CT imaging with venous phase contrast is the most practical and accessible method for diagnosis, with venography as the gold standard.² Once a diagnosis has been made, treatment options include anticoagulation via heparin infusion followed by oral medications, surgical bypass grafting, endovascular interventions (angioplasty, stenting, thrombus removal), and chemotherapy, depending on the etiology of the SVC obstruction.⁴ Initial management also commonly includes elevation of the patient's head to facilitate venous draining, as well as glucocorticoids or diuretic agents to help reduce inflammation.² For device-associated thrombosis, device removal is recommended (unless the device is required and well-functioning), followed by anticoagulation and catheter-directed thrombolysis or thrombectomy.³

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Rapid-Onset Subacute Combined Degeneration After Short-Term, High-Dose Nitrous Oxide Use

JACOB MICHALIK, DO; NEAL MADHANI, MD

ABSTRACT

Recreational nitrous oxide (N_2O) use has risen in recent years and is increasingly accessible in high-volume cartridges and canisters. N_2O oxidizes cobalamin and functionally inhibits methionine synthase disrupting methylation pathways essential for myelin maintenance and DNA metabolism. Serum vitamin B12 levels may be normal despite functional deficiency, making markers such as homocysteine and methylmalonic acid helpful to confirm the diagnosis. Clinical manifestations range from peripheral neuropathy and megaloblastic anemia to subacute combined degeneration (SCD), a demyelinating myelopathy classically involving the dorsal columns (and sometimes corticospinal tracts). Although SCD is often associated with chronic exposure, brief but high-dose use may precipitate rapid neurologic decline. Early recognition and prompt parenteral vitamin B12 replacement may reduce the risk of irreversible deficits.

KEYWORDS: Subacute Combined Degeneration; Nitrous Oxide; Functional b12 deficiency

CASE PRESENTATION

A 40-year-old man with polysubstance use (cocaine, nitrous oxide), suicidal ideation, and substance-induced psychosis presented with three days of progressive distal numbness and tingling in the hands and feet, generalized weakness, and gait instability after inhaling one full N_2O canister daily for three consecutive days. Symptoms began after the initial exposure and persisted, accompanied by nausea and bilious emesis. He denied chest pain, dyspnea, bowel or bladder dysfunction, and fever. He was afebrile and hemodynamically stable; cardiopulmonary and abdominal examinations were unremarkable. Neurologic examination demonstrated decreased distal sensation to bilateral hands and feet, diffuse weakness, and an ataxic gait without a focal motor deficit. Serum vitamin B12 was decreased at 156 pg/mL (normal range: ≥ 200 pg/mL) with elevated homocysteine at 204 $\mu\text{mol/L}$ (normal range ≤ 13 $\mu\text{mol/L}$) consistent with functional cobalamin depletion. The urine toxicology screen resulted with a presumptive positive for cocaine. Brain magnetic resonance imaging (MRI) was normal. Cervical spine

MRI demonstrated non-enhancing T2-weighted and short tau inversion recovery (STIR) hyperintensity within the dorsal columns from C1 to C5, consistent with SCD. Poison control recommended serial electrocardiograms and corrected QT interval (QTc) monitoring, as well as initiation of high-dose parenteral vitamin B12 therapy. He received intramuscular cyanocobalamin 1,000 mcg daily for 10 days, was counseled to stop N_2O , was evaluated by neurology, and by psychiatry. Psychiatry found no evidence of imminent risk of harm to himself or others and no concerning symptoms warranting psychiatric hospitalization. Neurology recommended maintaining a B12 level above 500 pg/mL and physical therapy (PT)/occupational therapy (OT) consultation. On evaluation by PT/OT, the patient displayed persistent gait instability warranting discharge to an inpatient rehabilitation facility. Improvement in persistent deficits appreciated at rehabilitation facility and patient was subsequently discharged home with outpatient neurology follow-up arranged in two to three weeks.

DISCUSSION

Nitrous oxide (N_2O) can rapidly inactivate cobalamin through oxidation of the cobalt ion resulting in irreversible inhibition of methionine synthase and disruption of methylation-dependent myelin maintenance [Figure 1].¹ This biochemical interference impairs DNA synthesis and leads to accumulation of homocysteine and methylmalonic acid, producing a functional vitamin B12 deficiency even when serum B12 concentrations appear normal.² The downstream consequence is defective myelin formation and progressive

Figure 1. Methionine–homocysteine cycle showing B12-dependent conversion inhibited by nitrous oxide and its role in methylation.

N_2O = Nitrous Oxide

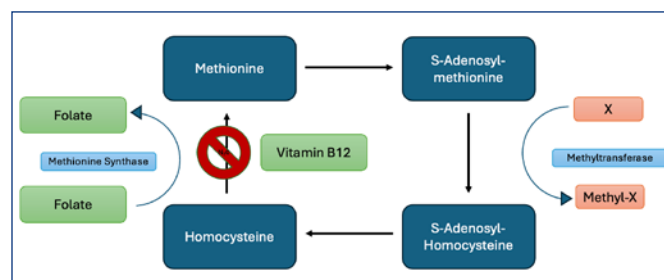
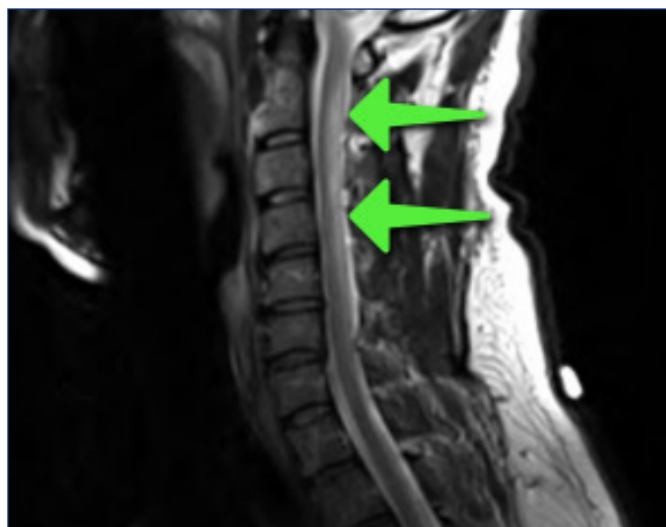


Figure 2. Non-enhancing hyperintense signal in the dorsal column of cervical spine from C1–2 & C5 consistent with subacute combined degeneration (SCD).



demyelination of the dorsal and lateral columns of the spinal cord.³ Radiographically, this manifests as the characteristic symmetric T2 hyperintensity within the posterior columns on MRI often described as an “inverted V” pattern.⁴ In this case, MRI of the cervical spine [Figure 2] demonstrated non-enhancing T2-weighted and short tau inversion recovery (STIR) hyperintensity within the dorsal columns from C1 to C5 consistent with subacute combined degeneration. This mechanism has increasingly been implicated in SCD associated with recreational N₂O use, particularly among younger individuals without traditional nutritional or malabsorptive risk factors.⁵

The differential diagnosis for acute or subacute distal paresthesias and gait ataxia is broad, and includes acute inflammatory demyelinating polyneuropathy, transverse myelitis, multiple sclerosis, copper deficiency myelopathy, and compressive or structural spinal cord lesions. Distinguishing N₂O-induced SCD from these entities requires careful integration of clinical history, imaging, and laboratory findings.⁶ A history of recent or chronic N₂O exposure is a critical diagnostic clue and may not be volunteered unless specifically elicited. Nitrous oxide-associated SCD is typically associated with prolonged or chronic exposure over weeks to months. While this patient described use over a three-day period, the extent of prior nitrous oxide use remains unclear. Acute nitrous oxide use may have precipitated symptoms in the setting of underlying chronic exposure. From a diagnostic standpoint, the combination of dorsal column predominant signal abnormalities on MRI and biochemical evidence of cobalamin dysfunction (particularly elevated homocysteine and methylmalonic acid levels) strongly supports the diagnosis. Notably, reliance on serum B12 alone may be misleading, as levels can be normal or only mildly reduced despite

significant functional deficiency. In this case, the presence of classic dorsal column imaging findings [Figure 2] together with laboratory evidence of impaired cobalamin metabolism supported SCD related to N₂O exposure rather than an inflammatory, autoimmune, or compressive etiology.

Clinically, dorsal column involvement manifests as distal paresthesias, impaired vibration, impaired proprioception, and sensory ataxia frequently resulting in gait instability and increased fall risk.⁷ As disease progression extends to the lateral corticospinal tracts, patients may develop weakness, spasticity, hyperreflexia, bladder incontinence, and fecal incontinence, reflecting upper motor neuron involvement. In some cases, peripheral neuropathy coexists, further contributing to sensory deficits and functional impairment.⁸ Neuropsychiatric symptoms, including mood changes and cognitive impairment, have also been reported, reflecting the broader systemic impact of cobalamin dysfunction. Importantly, the severity of neurologic impairment does not always correlate with the duration of exposure. Even relatively short intervals of high-intensity N₂O use can precipitate clinically significant neurologic injury.⁹ This underscores the potential for acute toxicity, in addition to the more traditionally recognized chronic exposure paradigm.

The rising prevalence of recreational N₂O use often through easily accessible “whippits” or commercial cartridges has led to an increasing number of reported neurologic complications. This trend highlights the importance of maintaining a high index of suspicion in patients presenting with otherwise unexplained neurologic symptoms. Clinicians should specifically inquire about inhalant use when evaluating patients with paresthesias, ataxia, or macrocytosis, as early identification of exposure can expedite diagnosis and management. Additionally, clinicians should maintain suspicion for nitrous oxide misuse in patients presenting with hypoxia, altered mental status, or respiratory failure, as inhalation can cause asphyxiation from oxygen displacement. Recommended laboratory evaluation includes serum vitamin B12, homocysteine, and methylmalonic acid levels which together provide a more accurate assessment of functional cobalamin status. Neuroimaging (particularly MRI of the cervical and thoracic spine) is valuable for confirming dorsal column involvement and excluding alternative diagnoses.

Prompt recognition and treatment are critical, as early intervention may halt disease progression and improve neurologic outcomes. Management consists of immediate cessation of N₂O exposure and initiation of parenteral vitamin B12 supplementation (typically with high-dose intramuscular cyanocobalamin). While some patients experience partial or even substantial recovery, neurologic deficits may persist, particularly in cases of delayed treatment or severe initial presentation. Rehabilitation services, including physical and occupational therapy, may be necessary to address residual functional impairments.

This case highlights the importance of recognizing N₂O-induced functional vitamin B12 deficiency as a reversible but potentially debilitating cause of subacute combined degeneration. It reinforces the need for targeted history-taking, appropriate biochemical evaluation, and early treatment to mitigate long-term neurologic sequelae. As recreational N₂O use continues to increase, awareness of its neurologic risks will be essential for timely diagnosis and optimal patient outcomes.¹⁰

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Doxycycline-Induced Subungual Phototoxicity in an Adolescent Treated for Lyme Arthritis

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Doxycycline is first-line therapy for Lyme disease and is increasingly prescribed in pediatric patients.¹ Photosensitivity is a recognized adverse effect, though subungual phototoxicity is rarely reported.² We describe a case of painful subungual erythema occurring after ultraviolet exposure during doxycycline therapy for Lyme arthritis.

A 13-year-old male receiving doxycycline for Lyme arthritis presented with severe pain and bright erythema beneath all fingernails after prolonged sun exposure during a sailing event. He had been taking doxycycline for approximately two weeks prior to symptom onset. Examination demonstrated striking subungual erythema with sharply

demarcated tanning of the distal fingertips [Figures 1,2]. The patient reported wearing extensive sun-protective clothing but used fingerless gloves, leaving the fingertips and nail beds exposed to ultraviolet radiation.

Doxycycline-associated photosensitivity is well recognized; however, subungual phototoxicity is an uncommon manifestation and may precede photo-onycholysis. Nail bed involvement is thought to rarely occur because ultraviolet light penetrates the nail plate poorly and is further dissipated by surrounding melanin protection.³ Although our patient did not develop photo-onycholysis, he experienced significant pain requiring supportive care, which consisted of oral analgesics, cool compresses, topical emollients and strict sun avoidance. No further intervention for the phototoxic reaction is typically needed, as the cutaneous and subungual inflammation is entirely self-limiting once the ultraviolet exposure ceases and the drug is cleared from the patient's system.³

As doxycycline use increases in regions endemic for Lyme disease, clinicians should counsel patients regarding comprehensive ultraviolet protection, including commonly overlooked areas such as the fingertips and nail beds.^{1,4}

Figure 1. Subungual erythema and distal fingertip tanning in a patient with doxycycline-induced phototoxicity following ultraviolet exposure.

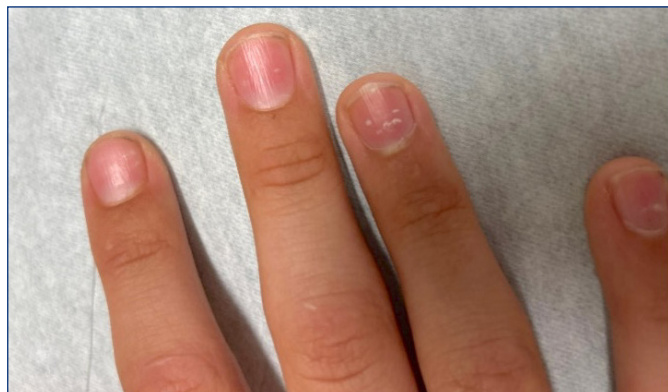


Figure 2. Bilateral hand involvement in doxycycline-induced phototoxicity. Right hand in forefront of image, and left hand displaying subungual erythema and distal fingertip tanning following UV light exposure.



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Recurrent Nodular Lymphocyte Predominant Hodgkin Lymphoma with Diagnostic Evolution Over Two Decades

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ABSTRACT

Nodular lymphocyte predominant Hodgkin lymphoma (NLPHL) is a rare subtype of Hodgkin lymphoma with distinct pathologic and clinical characteristics. We present the case of a 51-year-old man with a nearly 20-year history of NLPHL characterized by multiple relapses, diagnostic reclassification, and treatment de-escalation. This case illustrates the diagnostic challenges in distinguishing NLPHL from lymphocyte-rich classical Hodgkin lymphoma (LRCHL), the indolent natural history of NLPHL with prolonged remissions, and the role of active surveillance in managing asymptomatic relapsed disease.

KEYWORDS: Nodular Lymphocyte Predominant Hodgkin Lymphoma; Lymphocyte-Rich Classical Hodgkin Lymphoma; Relapsed Hodgkin Lymphoma

INTRODUCTION

Nodular lymphocyte predominant Hodgkin lymphoma (NLPHL) accounts for approximately 5% of all Hodgkin lymphoma cases and is distinguished from classical Hodgkin lymphoma (CHL) by the absence of classic Hodgkin/Reed-Sternberg cells and the presence of characteristic lymphocyte-predominant (LP) cells. Unlike CHL, the LP cells in NLPHL consistently express CD20 and lack CD30 expression. The clinical course of NLPHL is typically indolent, with most patients presenting with early-stage disease and experiencing excellent long-term survival.¹⁻³ However, late relapses are common, and transformation to diffuse large B-cell lymphoma (DLBCL) occurs in 8–14% of patients.⁴

The distinction between NLPHL and lymphocyte-rich classical Hodgkin lymphoma (LRCHL) can be challenging, as LRCHL shares morphologic features with NLPHL but has an immunophenotype consistent with CHL.^{5,6} This diagnostic overlap has significant therapeutic implications, as NLPHL may be managed with observation alone or rituximab, while CHL typically requires chemotherapy.

We present a case that highlights these diagnostic and therapeutic challenges over a nearly 20-year disease course.

CASE PRESENTATION

Initial Presentation (2006)

A 31-year-old man presented with an eight-month history of progressive left axillary swelling. He had a history of multiple angioliipomas and initially attributed the mass to another lipoma. Physical examination revealed a golf ball-sized left axillary mass. He denied fevers, night sweats, weight loss, or other B symptoms. His medical history was notable only for a right inguinal hernia repair upon initial presentation.

Excisional biopsy of the left axillary lymph node (May 25, 2006) revealed a 6.0 × 4.0 × 3.0 cm node with histopathology consistent with nodular lymphocyte predominant Hodgkin lymphoma (NLPHL). Immunohistochemistry demonstrated LP cells that were CD20+, CD30+, CD79+ (weak), CD45RB+, EMA+, CD15–, CD3–, and EBV–. Flow cytometry showed a polytypic B-cell population (17%) with a kappa:lambda ratio of 1.2:1 and a T-cell population (79%) with a CD4:CD8 ratio of 4.4:1.

Staging workup included CT of the neck, chest, abdomen, and pelvis, which showed moderate left axillary adenopathy without other pathologic lymphadenopathy. Laboratory studies were unremarkable (WBC 6,300/μL, hemoglobin 16.5 g/dL, platelets 252,000/μL, LDH normal). Bone marrow biopsy (June 21, 2006) was negative for Hodgkin lymphoma, with 45% cellularity and small nondiagnostic lymphoid nodules occupying 3% of the intertrabecular space.

The patient was diagnosed with stage IA NLPHL and treated with involved-site radiation therapy (ISRT) to the left axilla and neck with a left axillary boost. He tolerated treatment well with only mild fatigue and transient erythema, achieving complete remission.

First Relapse (2007)

Fourteen months after completing radiation therapy, surveillance PET/CT (July 2007) demonstrated new areas of increased FDG uptake in the right axillary lymph node, subcutaneous nodules in the right axilla and shoulder, bilateral inguinal lymph nodes, and a left subpectoral lymph node. The prior left axillary uptake had resolved. Physical examination was unremarkable, with no palpable lymphadenopathy; the patient's multiple angioliipomas complicated clinical assessment.

Repeat PET/CT (August 2007) confirmed persistent findings. Excisional biopsy of a left upper chest wall lymph node

(October 2, 2007) revealed a $3.1 \times 1.8 \times 1.2$ cm node with histopathology initially interpreted as NLPHL. Immunohistochemistry showed LP cells that were CD20+, CD30+, CD45RB+, CD15-, CD3-, CD57-, and EMA-.

Expert pathology reclassified the lymphoma as lymphocyte-rich classical Hodgkin lymphoma (LRCHL) rather than NLPHL in February 2008. This reclassification was based on immunophenotypic features more consistent with CHL.

Pre-chemotherapy evaluation included MUGA scan (LVEF 62%, RVEF 57%) and pulmonary function tests, both normal. The patient began ABVD chemotherapy in November 2007. However, bleomycin was discontinued after the first cycle due to pulmonary toxicity.

The patient completed six cycles of ABVD and achieved complete remission. He remained in remission for approximately 15 years.

Surveillance Period (2008–2022)

During the prolonged remission, the patient developed hypothyroidism, likely radiation-induced given the cervical radiation field, and was maintained on levothyroxine (175 mcg daily, with 350 mcg on Mondays and Fridays). His multiple angioliopomas remained stable.

In October 2021, surveillance PET/CT demonstrated FDG-avid right axillary lymphadenopathy. Fine-needle aspiration (October 25, 2021) showed very rare atypical lymphocytes. Flow cytometry demonstrated a reactive/polytypic lymphoid population (64% T-cells, 34% polytypic B-cells). Immunohistochemistry showed CD30- and rare CD15+ cells. Core biopsy was recommended.

Excisional biopsy of the right axillary lymph node (November 5, 2021) revealed a benign lymph node with mild paracortical hyperplasia and no evidence of malignancy. Immunohistochemistry and flow cytometry were consistent with a reactive process. The patient continued observation.

Second Relapse (2023)

In July 2023, the patient (now 48 years old) noticed right axillary lymphadenopathy in the setting of a rash from a new deodorant. He remained asymptomatic without B symptoms.

PET/CT (September 2023) demonstrated Deauville 5 disease with increased size and number of right axillary and subpectoral lymph nodes (largest 2.9×1.7 cm). Intense uptake was also noted in the right thyroid lobe, likely consistent with thyroiditis. Laboratory studies were unremarkable (WBC 5.5, hemoglobin 16.9 g/dL, platelets 181,000/ μ L, CMP and LFTs normal).

Excisional biopsy of the right axillary lymph node (October 2, 2023) revealed a node with histopathology consistent with NLPHL. The sections showed largely effaced lymph node parenchyma with enlarged irregular lymphoid aggregates in a nodular pattern. Atypical large LP cells with irregularly shaped lobulated nuclei, conspicuous nucleoli, open

chromatin, and pale cytoplasm were identified. Immunohistochemistry demonstrated LP cells that were CD19+, PAX-5+, OCT2+, BOB1+, with CD30 highlighting scattered cells (a mix of immunoblasts and a subset of lesional cells). The LP cells were surrounded/rosetted by CD3+ T-cells, and CD21 highlighted variably expanded and disrupted follicular dendritic meshworks. Flow cytometry showed 63% T-cells (CD4:CD8 ratio 3.5) with polytypic TRBC1 expression and 34% polytypic B-cells.

Given the diagnostic discrepancy between the 2007 LRCHL diagnosis and the 2023 NLPHL diagnosis, the case was presented at a multidisciplinary tumor board, and slides were sent for repeat expert review. The consensus diagnosis was NLPHL.

His physicians discussed management options:

- If NLPHL: Observation alone or single-agent rituximab, given asymptomatic status and indolent biology;
- If LRCHL: Chemotherapy (pembrolizumab-GVD)

Given the confirmed NLPHL diagnosis and asymptomatic status, active surveillance was chosen.

Follow-Up (2024–2026)

At follow-up in January 2024, the patient remained asymptomatic with no palpable lymphadenopathy. Angioliopomas were stable. Surveillance continued.

PET/CT (November 2024) showed increased size of right axillary, subpectoral, and supraclavicular lymphadenopathy with a new enlarged portacaval lymph node, raising concern for stage III disease if the portacaval node was involved.

PET/CT (May 2025) demonstrated stable disease at the above sites with questionable uptake in the portacaval node.

PET/CT (October 2025) remained stable compared with prior studies, compatible with stable biopsy-proven Hodgkin lymphoma.

At the most recent evaluation (2026), the patient, now a 51-year-old man, remains asymptomatic, aside from a mobile mass on the chest consistent with an angioliopoma, which was not FDG-avid. Current management is observation alone, with options for single-agent rituximab and/or involved-site radiation therapy if progression occurs. [Figure 1]

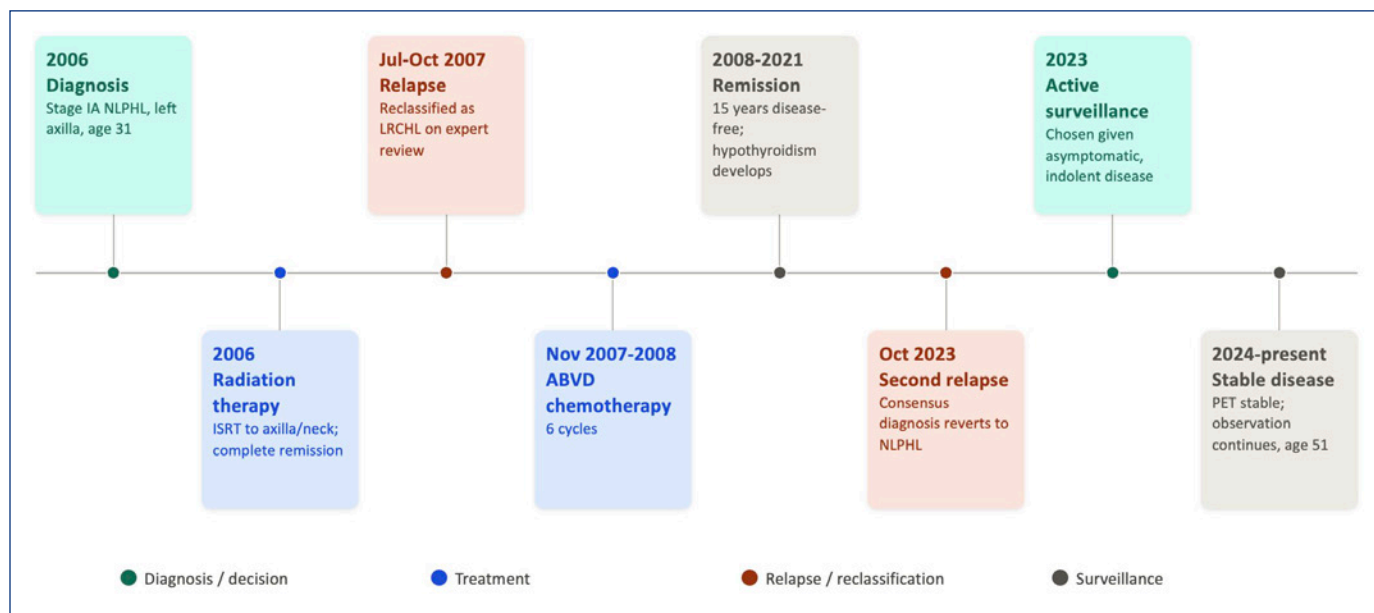
DISCUSSION

This case illustrates several interesting aspects of NLPHL biology, diagnosis, and management.

Diagnostic Challenges: NLPHL vs. LRCHL

The distinction between NLPHL and LRCHL is critical for treatment planning but can be challenging. Both entities share morphologic features, including a lymphocyte-rich background and nodular architecture. However, they differ in immunophenotype: NLPHL LP cells are CD20+, CD45+,

Figure 1. Clinical timeline of a recurrent NLPHL case spanning two decades



CD79a+, BCL6+, PAX-5+, CD15-, and typically CD30-, while LRCHL Hodgkin/Reed-Sternberg cells are CD30+, CD15+, PAX-5+ (weak), CD20- (majority), and CD45-.^{3,4}

In this case, the 2007 relapse specimen was initially diagnosed as NLPHL locally but reclassified as LRCHL upon expert review. The 2023 relapse specimen was diagnosed as NLPHL by both local and expert pathologists. This apparent “reversion” from LRCHL to NLPHL raises several possibilities:

1. Misclassification at one time point: LRCHL occupies an intermediate position between CHL and NLPHL, with overlapping features. The 2007 specimen may have had borderline features that were interpreted differently by different pathologists.⁷

2. Clonal evolution: Although rare, it is theoretically possible for the tumor to evolve between subtypes, though this has not been well-documented in the literature.

3. Two distinct lymphomas: The patient may have had sequential, unrelated lymphomas, though this is unlikely given the clinical continuity.

This case underscores the importance of expert hematopathology review, particularly for cases with atypical features or discordant diagnoses.

Indolent Natural History and Active Surveillance

NLPHL has an excellent prognosis, with five-year overall survival exceeding 90%.^{1,3} However, late relapses are common, occurring in up to 30% of patients.^{1,4} In a Memorial Sloan Kettering study of 163 NLPHL patients, five-year progression-free survival (PFS), second PFS (PFS2), and overall survival (OS) were 85%, 97%, and 99%, respectively.¹ Only one of seven deaths was lymphoma-related.

Active surveillance is a viable initial management strategy for selected NLPHL patients, particularly those with asymptomatic, non-bulky disease. In the MSK study, patients managed with active surveillance had slightly shorter PFS than those receiving active treatment (5-year PFS 77% vs. 87%, $p=0.017$), but this did not translate into differences in PFS2 or OS.¹ Only 27% of patients managed with active surveillance eventually required treatment, after a median of 61 months, and there were no deaths.

This patient's disease course exemplifies the indolent biology of NLPHL: a 15-year disease-free interval after ABVD, followed by stable disease on observation for over two years at the second relapse. The NCCN Guidelines recommend observation as an option for asymptomatic patients with stage III–IV NLPHL and for asymptomatic, non-bulky relapsed NLPHL.

Surveillance Challenges: Angiolipomas

This patient's multiple angiolipomas complicated clinical and imaging surveillance. Angiolipomas can be FDG-avid and may mimic lymphomatous involvement on PET/CT. This highlights the importance of integrating clinical, pathologic, and imaging data in NLPHL surveillance.

CONCLUSION

This case of recurrent NLPHL over nearly 20 years illustrates the diagnostic challenges in distinguishing NLPHL from LRCHL, the indolent natural history of NLPHL with prolonged remissions, and the role of active surveillance in managing asymptomatic relapsed disease. Expert pathology review is essential for accurate diagnosis, and treatment

should be individualized based on disease biology, symptoms, and patient preferences. For asymptomatic patients with indolent relapsed NLPHL, observation alone is a reasonable strategy, with rituximab and/or radiation therapy reserved for symptomatic or progressive disease.

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An Elusive Diagnosis of *Strongyloides* Infection Masquerading as Daptomycin-Induced Eosinophilic Pneumonitis

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VINCENT B. DECHAVEZ, MD

ABSTRACT

Daptomycin-induced eosinophilic pneumonitis, characterized by peripheral eosinophilia, bilateral pulmonary infiltrates and respiratory symptoms, is a recognized adverse drug effect. However, these findings overlap significantly with pulmonary strongyloidiasis, in which transpulmonary larval migration provokes a similar eosinophil-rich inflammatory response. Failure to distinguish between these entities carries serious consequences, as untreated *Strongyloides* infection can progress to hyperinfection syndrome with high mortality. We describe a middle-aged male with alcoholic liver cirrhosis who developed peripheral eosinophilia, bilateral pulmonary nodules, migratory consolidative opacities, and pleural effusions while receiving daptomycin for polymicrobial bacteremia. The findings were initially attributed to daptomycin-induced eosinophilic pneumonitis, and the drug was discontinued. However, given clinical suspicion for a parasitic etiology, *Strongyloides* testing was pursued. Stool ova-and-parasite examination and bronchoalveolar lavage were both negative; however, *Strongyloides* serology returned positive, confirming the diagnosis. The patient improved both clinically and radiographically following treatment with ivermectin and albendazole. The negative stool and bronchoalveolar lavage results further underscore the suboptimal sensitivity of conventional diagnostic methods and the essential role of serologic testing. Clinicians evaluating eosinophilia with pulmonary infiltrates in patients receiving daptomycin should systematically consider parasitic etiologies, including *Strongyloides* serology, before attributing findings solely to a drug-related cause.

KEYWORDS: *Strongyloides*; pneumonitis; daptomycin; eosinophilia

INTRODUCTION

Daptomycin is a cyclic lipopeptide antibiotic used for serious gram-positive infections, including bacteremia and endocarditis caused by methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci.^{1,2} While generally well tolerated, daptomycin has been increasingly recognized

as a cause of eosinophilic pneumonia, characterized by fever, dyspnea, hypoxia, peripheral eosinophilia, and bilateral pulmonary infiltrates, typically occurring within two to four weeks of drug initiation.^{3,4} The diagnosis is generally made clinically after exclusion of alternative etiologies, and management centers on discontinuation of the offending agent, with or without corticosteroid therapy.^{4,5}

However, peripheral eosinophilia with concurrent pulmonary infiltrates has a broad differential diagnosis encompassing drug-induced reactions, allergic conditions, and parasitic infections.⁶ Among infectious etiologies, strongyloidiasis—caused by *Strongyloides stercoralis*—is particularly important, as transpulmonary larval migration provokes an eosinophil-rich inflammatory response producing pulmonary nodules, migratory consolidative opacities, and pleural effusions, frequently referred to as Löffler-like syndrome.⁷⁻⁹ The clinical features of pulmonary strongyloidiasis overlap substantially with daptomycin-induced eosinophilic pneumonia, creating a diagnostic pitfall. Failure to identify *Strongyloides* infection carries serious consequences, as untreated disease can progress to hyperinfection syndrome with mortality rates exceeding 70%.¹⁰

Severe strongyloidiasis has been predominantly described in patients with established immunocompromising conditions, including systemic corticosteroid use, solid organ transplantation, hematologic malignancies, HTLV-1 coinfection, and HIV/AIDS.^{10,11} The extent to which alcoholic liver cirrhosis predisposes to clinically significant infection remains incompletely understood.^{10,12} The diagnostic sensitivity of conventional methods is suboptimal; single stool examinations detect larvae in fewer than 50% of cases, and bronchoalveolar lavage may fail to identify organisms, making serologic testing essential.^{10,13}

We present a middle-aged male with alcoholic liver cirrhosis who developed peripheral eosinophilia and bilateral pulmonary infiltrates during daptomycin treatment. The eosinophilia was initially attributed to daptomycin-induced eosinophilic pneumonitis. However, *Strongyloides* serology later returned positive, reframing the clinical picture as pulmonary strongyloidiasis. This case highlights the overlapping presentations of these conditions and the importance of systematically evaluating for parasitic etiologies before attributing eosinophilic pulmonary disease solely to a drug-related cause.

HOSPITAL COURSE

A middle-aged Mexican male with alcoholic liver cirrhosis, esophageal varices, and diverticulosis presented with a progressive, diffuse, blistering rash of four days' duration. The patient had family in both the United States and Mexico, frequently travelling between the two countries. He had been recently discharged from a hospital in Mexico following treatment for infectious colitis, receiving intravenous antibiotics (patient did not remember which antibiotics he was taking) before transitioning to oral ciprofloxacin and metronidazole. Two days after completing antibiotics, he noted a rash initially involving the face and trunk, progressively spreading to the lower extremities with associated blistering, edema, and significant pain affecting the plantar surfaces. He endorsed oral and ocular discomfort but denied fever, chest pain, or shortness of breath.

The patient was admitted to the burn unit for suspected Stevens-Johnson syndrome. Punch biopsy from the left thigh demonstrated epidermal cell necrosis, a perivascular infiltrate of lymphocytes and eosinophils, and incidental dermatophytosis, consistent with severe drug eruption attributed to ciprofloxacin and metronidazole. Treatment with intravenous immunoglobulin was initiated with symptomatic improvement.

His course was complicated by severe sepsis and persistent fevers secondary to polymicrobial bacteremia. Serial blood cultures yielded *Klebsiella pneumoniae*, ESBL-producing *Escherichia coli*, *Lactobacillus rhamnosus*, and vancomycin-resistant *Enterococcus faecium*. Daptomycin and meropenem were initiated on day 18. Echocardiogram showed no evidence of endocarditis, and diagnostic paracentesis was culture negative. Blood cultures on days 22 and 24 were negative.

On hospital day 24, new peripheral eosinophilia was identified. CT chest on day 26 [Figure 1] demonstrated bilateral scattered ill-defined pulmonary nodules measuring up to 2 cm in the right upper lobe, left upper lobe subpleural consolidative opacities, bilateral pleural effusions with adjacent atelectasis, large-volume ascites, and cirrhotic liver morphology. Given the onset of symptoms coinciding with the initiation of daptomycin and with his recent history of antibiotic reaction, daptomycin-induced eosinophilic pneumonitis was the initial working diagnosis. The patient denied any history of autoimmune disorders, asthma, or malignancies.

Daptomycin was subsequently stopped after discovery of these findings. However, the patient's symptoms did not resolve, and he continued to meet criteria for sepsis (persistent fevers, leukocytosis, and tachycardia), with unresolving eosinophilia. After his clinical regression, suspicion for helminth infections began increasing, especially in the context of his frequent travel to Mexico. In particular, severe *Strongyloides* infection with suspected pulmonary involvement was entertained given eosinophilia, imaging findings

Figure 1. Axial view of initial CT chest on day 26, highlighting the 2cm right upper lobe pulmonary nodule.

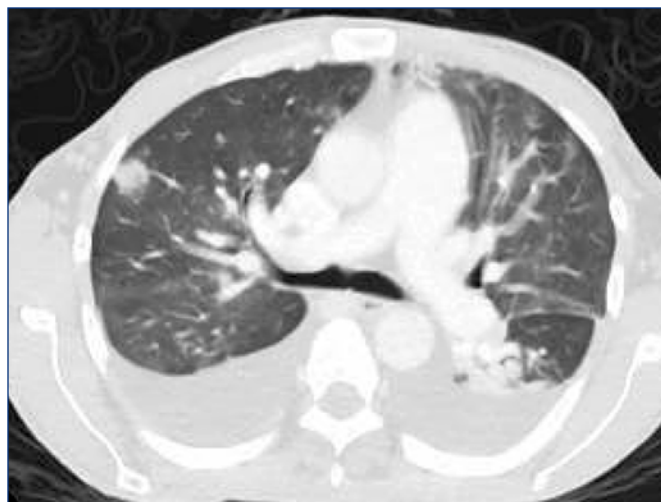


Figure 2. Axial view of follow-up CT chest one week after initiation of anti-parasitic therapy, showing complete resolution of the 2cm right upper lobe pulmonary nodule.



potentially consistent with larval translocation, and otherwise unexplainable polymicrobial bacteremia. Bronchoscopy with bronchoalveolar lavage was negative. Stool ova and parasite examination was also negative. Nevertheless, given high clinical suspicion, *Strongyloides* serology was collected and returned positive. Empiric treatment was initiated with ivermectin 200 mcg/kg daily for four weeks and albendazole 400 mg twice daily for seven days. Follow-up CT demonstrated interval resolution of the right upper lobe opacity [Figure 2].

The patient improved steadily with resolution of fevers, normalization of white blood cell count, and improvement of the cutaneous eruption. He was transferred to step-down and subsequently to general medicine. Blood cultures on

days 26 and 31 showed no growth. At discharge on hospital day 56, he was afebrile and hemodynamically stable with improved leukocytosis. Outpatient follow-up was arranged with infectious disease, hepatology, dermatology, and podiatry.

DISCUSSION

Strongyloidiasis is a soil-transmitted helminthic infection with highest prevalence in tropical and subtropical regions.⁷ Published literature on clinically significant strongyloidiasis focuses on hyperinfection syndrome in classically immunocompromised hosts, particularly those receiving corticosteroids, organ transplant recipients, patients with hematologic malignancies, those with HTLV-1 or HIV co-infection, and those with hypogammaglobulinemia.¹⁰ Notably, our patient carried none of these established risk factors. While his alcoholic liver cirrhosis may have contributed to immune dysregulation, the extent to which hepatic cirrhosis alone confers susceptibility to *Strongyloides* hyperinfection remains poorly characterized.¹⁴ This case adds to limited evidence suggesting clinically significant pulmonary strongyloidiasis can occur in hosts lacking classically defined immunocompromising conditions.

In patients with *Strongyloides* hyperinfection, providers typically expect serial stool and BAL studies to be positive, given the immense parasitic load. In our patient, however, both modalities were negative throughout hospitalization. Treatment was guided by high clinical suspicion and confirmed by serological testing. Initial negative BAL and stool testing should not preclude treatment initiation when clinical suspicion remains high.

The pulmonary manifestations observed—bilateral pulmonary nodules, pleural effusions, and migratory consolidative opacities—are consistent with transpulmonary larval migration characterizing the *Strongyloides* life cycle, provoking an eosinophil-rich inflammatory response reminiscent of Löffler-like syndrome. The clinical presentations of pulmonary strongyloidiasis are nonspecific, encompassing cough, dyspnea, wheezing, and hemoptysis, mimicking asthma, community-acquired pneumonia, or acute respiratory distress syndrome.^{8,9} The interval evolution of CT findings—initial right upper lobe nodularity resolving with new left upper lobe consolidative opacities—was particularly suggestive of the migratory inflammatory process characteristic of larval transit.

A particularly instructive aspect was the initial attribution of eosinophilia to daptomycin rather than parasitic infection. Given the temporal relationship between daptomycin administration and development of eosinophilia with pulmonary findings, initial suspicion of daptomycin-induced eosinophilic pneumonitis was understandable.^{3,4} However, substantial clinical overlap created a diagnostic pitfall. Only upon further evaluation prompted by persistent eosinophilia

was *Strongyloides* serology obtained and found positive. This sequence underscores the importance of comprehensive diagnostic workup for eosinophilia, including serologic testing, before attributing eosinophilic lung disease solely to pharmacologic causes. Failure to identify the parasitic etiology could have resulted in omission of antiparasitic therapy and progression to hyperinfection.

This case reinforces several principles. First, the absence of classic immunocompromising risk factors should not preclude consideration of strongyloidiasis in patients with compatible findings.^{7,10} Second, the nonspecific nature of pulmonary strongyloidiasis demands high clinical suspicion when peripheral eosinophilia accompanies unexplained infiltrates.^{8,9} Third, clinicians must systematically evaluate both drug-induced and infectious etiologies of eosinophilic pneumonia to avoid diagnostic anchoring.^{3,4}

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A Case of Amyand's Hernia in the Emergency Department

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KEYWORDS: Amyand's hernia; appendicitis; inguinal pain

INTRODUCTION

A hernia refers to the abnormal displacement of any organ or fatty tissue beyond the boundary of its containing cavity.¹ Although hernias may vary significantly in location, herniation is most often used when describing displacement of tissue through different sections of the abdominal wall. Inguinal hernias are the most common of these, accounting for 75% of all abdominal wall hernias, and are defined by the intrusion of the peritoneal sac through the interior abdominal wall within the region of the inguinal canal.^{2,3}

Complications of hernias include the risk of incarceration and strangulation—wherein the trapped organ tissue becomes compromised due to venous or lymphatic obstruction—and may ultimately lead to necrosis, perforation, rupture, peritonitis, and sepsis.¹ Normal contents of the hernia sac of an inguinal hernia include parts of the small intestine and omentum; however, inguinal hernial sacs may rarely contain other anatomical structures, including the ureter, bladder, sigmoid colon, stomach, and appendix.²

CASE REPORT

We report a case of an 87-year old man who presented to the emergency department with acute onset inguinal bulging and pain. The patient denied any previous abdominal or pelvic surgical interventions or any significant history leading to his presenting complaints, including any straining or exertion. On examination, the patient had a palpable, tender, inguinal bulge without any overlying skin changes. There was no crepitus and the remainder of his abdominal exam did not reveal any peritoneal findings. Laboratory studies were unremarkable, including a normal white blood cell count and lactate. A CT scan of the abdomen/pelvis revealed an inguinal hernia containing fat and the distal portion of the appendix concerning for Amyand's Hernia.

DISCUSSION

Amyand's hernia was first described on December 6, 1735 at St George's Hospital in London, when French surgeon Claudius Amyand operated on an 11-year-old boy who presented

with an inguinal hernia and fecal fistula, determining intraoperatively that the appendix was within the hernia sac and had previously been perforated by a pin, incidentally causing the fistula.⁴ Furthermore, Amyand's hernia is defined as an inguinal hernia containing vermiform appendix, whether normal, inflamed, or perforated.⁵

Inguinal hernia is a common pathology with an incidence rate of approximately 1.2%, with the condition being roughly 12 times as common in males than females.⁶ The incidence rate of Amyand's hernia varies within published literature and is estimated to account for between 0.19% and 1.7% of all inguinal hernias.^{1,7} Of individuals diagnosed with Amyand's hernia, the majority are found to have a normal appendix. The incidence rate of appendicitis amongst cases of Amyand's hernia is estimated to be between 0.07% and 0.13%.⁸ Cases of an incarcerated segment of vermiform appendix leading to perforation are even more uncommon, and are estimated to be only 0.1% of all cases of appendicitis.⁹⁻¹¹ Mortality rate of Amyand's hernia is variable, with figures reported from as low as 5.5% to as high as 14–30%.^{8,12} Cause of death in cases of Amyand's hernia is most often linked to peritonitis and sepsis.

As is the case with other organs of the abdominal cavity, an incarcerated appendix is at risk of inflammation, infection, necrosis, or perforation. Additionally, it is possible for the appendix to be incarcerated and otherwise remain healthy.^{8,12-14} Prior to the creation of multi-detector computed tomography (MDCT) and ultrasound (US) imaging, herniation of the appendix was predominantly an intraoperative finding.^{2,15}

Clinical presentation of Amyand's hernia is variable and can be influenced by multiple factors, including inflammation of the appendix or peritoneal contamination.¹⁶ Amyand's hernia often presents similar to a strangulated inguinal hernia and may be mistaken for testicular torsion.^{12,13} Common exam findings include a tender, non-reducible mass within the inguinal canal.¹⁶⁻¹⁸ Cases where the appendix has ruptured, causing a chronic fistula or abscess have been documented.^{4,19} Abdominal findings typical of acute appendicitis—including McBurney's point tenderness, Rosving's sign, and Blumberg's sign—may be absent in cases of Amyand's hernia with concomitant appendicitis due to the unique positioning of the appendix, and are therefore unhelpful pertaining to the differential diagnosis.²⁰⁻²²

Table 1. Classification system on management of Amyand's hernia

Type of hernia	1	2	3	4
Salient features	Normal appendix	Acute appendicitis localized in the sac	Acute appendicitis, peritonitis	Acute appendicitis, other abdominal pathology
Surgical management	Reduction or appendectomy (depending on age), mesh hernioplasty	Appendectomy through hernia, endogenous repair	Appendectomy through laparotomy, endogenous repair	Appendectomy, diagnostic workup and other procedures as appropriate

Although most cases of Amyand's hernia occur within the right inguinal canal, a rare few have been documented wherein the appendix was discovered to be incarcerated with a left-sided inguinal hernia.^{14,22,23} Furthermore, laterality of an inguinal hernia alone cannot be used to disqualify Amyand's hernia from a differential diagnosis.

A system of classification aimed at improving management of Amyand's hernia was proposed in 2008 by Losanoff and Basson, differentiating a total of four basic types of Amyand's hernia [Table 1].²⁴

CONCLUSION

The patient was admitted to the surgical service and underwent laparoscopic hernia repair with mesh. Intraoperatively, the appendix did not reveal any findings suggestive of gangrene, infection, or inflammation, and therefore appendectomy was not performed. The patient had an uncomplicated post-operative course and was discharged home and recovered well.

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Unmasking Weakness: A Case of Pembrolizumab-induced Myasthenia Gravis With Concurrent Myositis

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ABSTRACT

Immune checkpoint inhibitors (ICIs) have revolutionized modern oncology by enhancing endogenous anti-tumor immunity by targeting multiple regulatory pathways. Despite their efficacy in cancer management, ICIs can cause many immune-related adverse events (irAE), including neurologic adverse events (irNAEs) such as myasthenia gravis (MG)-like syndromes or myositis. We describe the case of an 86-year-old patient with renal cell carcinoma newly treated with pembrolizumab who developed generalized weakness, dysphagia, dysphonia, eyelid ptosis, and ophthalmoparesis shortly after receiving his second dose of pembrolizumab. Examination revealed weak palatal elevation, mild symmetric muscle weakness, mild weakness of neck flexion, and a positive ice-pack test. His workup revealed coexistence of ICI-induced MG and myositis. He was started on high dose corticosteroids, intravenous immunoglobulin, and pyridostigmine, resulting in clinical improvement. ICI therapy was permanently discontinued. ICI-induced NAEs carry significant morbidity and mortality, requiring early recognition, multidisciplinary management, and aggressive immunosuppressive therapy to improve clinical outcomes.

KEYWORDS: immune checkpoint inhibitors; myasthenia gravis; myositis; intravenous immunoglobulin

INTRODUCTION

Immune checkpoint inhibitors (ICIs) are novel agents that have transformed the therapeutic landscape of oncology and are now important in the management of multiple malignancies, including urothelial carcinoma, renal cell carcinoma, non-small cell lung cancer, Hodgkin lymphoma, colorectal cancer, and melanoma.¹ Unlike traditional chemotherapy, ICIs enhance antitumor immunity by modulating endogenous immune responses by restoring T-cell-mediated recognition and destruction of malignant cells.²⁻⁴ Despite this, ICIs are associated with multiple different types of immune-related adverse events (irAE), including neurological adverse events (irNAEs), which may occur in approximately 1 to 12% of patients, varying by ICI therapy type.⁵ These neurotoxicities include but are not limited to

myositis, peripheral neuropathies, myasthenic syndromes, encephalitis, and demyelinating diseases.^{6,7} Among these, ICI-induced myasthenia gravis (MG) is notable for its rapid progression and high mortality rate, especially in combination with other overlapping syndromes.⁸

CASE PRESENTATION

An 86-year-old man with clear-cell renal carcinoma was started on pembrolizumab, an ICI. Approximately six weeks after initiation of pembrolizumab, he developed generalized weakness. Two days after receiving his second dose of pembrolizumab, he developed new bilateral, symmetrical upper and lower extremity weakness, dysphagia, dysphonia, eyelid ptosis, and ophthalmoparesis. He also recently started requiring a walker for ambulation.

Bedside evaluation revealed a negative inspiratory force (NIF) of -30 cm H₂O. Neurologic examination demonstrated bilateral eyelid ptosis, right worse than left, with inability to volitionally open his right eye. The ice-pack test was positive, with improvement in eyelid ptosis. He also had significant ophthalmoparesis, with limited abduction of the left eye. He had weak elevation of the palate, mild weakness in all the extremities, and mild weakness of neck flexion. Muscle stretch reflexes were normal. CT angiography of the head and neck and brain MRI with and without contrast showed no significant abnormalities.

Given high suspicion for a severe myasthenic syndrome with impending respiratory failure, he was admitted to the intensive care unit. He was initiated on methylprednisolone (1 mg/kg/day), intravenous immunoglobulin (0.4 g/kg daily for five days), and pyridostigmine (30 mg three times daily). Acetylcholine receptor (AChR) and muscle-specific kinase (MuSK) antibodies were negative. The presentation was most consistent with an ICI-associated myasthenic syndrome secondary to pembrolizumab, representing a severe immune-related adverse event (grade 3/4).

In light of the known association between ICI-associated MG and myositis, creatine kinase was measured and found to be elevated (>4,000 IU/L). However, there was no clinical evidence of myocarditis. The patient remained in the intensive care unit for close respiratory monitoring. Muscle power and respiratory function gradually improved and creatine kinase normalized. The patient was discharged to a rehabilitation facility on a steroid taper. ICI therapy was permanently discontinued.

DISCUSSION

ICIs are antitumor therapies that enhance pre-existing immune responses by targeting essential regulatory pathways involved in immune response. ICIs inhibit numerous immune checkpoint molecules, including programmed death 1 (PD-1), programmed death ligand 1 (PD-L1), cytotoxic T-lymphocyte-associated antigen 4 (CTLA-4), and lymphocyte-activation gene 3 (LAG-3), which regulate physiologic anti-tumor immunity. Engagement of these receptors with their respective ligands results in suppression of T-cell proliferation, differentiation, and effector function. Tumor cells exploit these existing physiologic immune checkpoints, thereby suppressing cytotoxic T cell activity and evading immune surveillance. ICIs disrupt the interactions between receptors and their respective ligands, thereby restoring tumor cell destruction without a direct cytotoxic effect.¹⁻⁴

Despite their therapeutic efficacy, ICIs are associated with irAE as a result of excessive dysregulated T-cell proliferation, cytokine release, and autoantibody production, leading to cytotoxic injury across multiple organ systems.²⁻⁴ The severity of irAEs, including irNAEs, are graded on a five-point scale based on the Common Terminology Criteria for Adverse Events by the National Cancer Institute, ranging from grade 1 (asymptomatic), grade 2 (moderate), grade 3 (severe), grade 4 (life-threatening), and grade 5 (death). Although grade 3–5 neurotoxicities occur in less than 1% of irAEs,⁹ their potential severity warrants immediate recognition and intervention.

The incidence of irNAEs varies by ICI therapy type, ranging from 1–12%. The incidence is approximately 3.8% with anti-CTLA-4 therapy, 6.1% with anti-PD-1 therapy, and 12% with combined anti-CTLA-4 and anti-PD-1 therapy.⁵ However, real-world retrospective data from a single-institution study of 1,834 patients suggests a slightly higher incidence of approximately 1.5%.¹⁰ The severity of irNAEs may be greater with combination immunotherapy than with monotherapy.

Among irNAEs, neuromuscular events predominate, occurring three times more frequently compared to those

involving the central nervous system. One systematic review involving 428 patients with nAEs found that myositis with or without MG overlap was the single most commonly reported nAE. The relative frequencies of other irNAEs are noted in **Table 1**.⁵⁻⁷

ICI-induced MG may occur as part of an overlapping syndrome known as “triple M syndrome,” which is characterized by myositis and myocarditis coexisting with MG. Distinguishing isolated ICI-induced MG from “triple M syndrome” is critical as the latter carries a higher mortality rate, approaching 62.5%, compared with approximately 29.8% for PD-1 inhibitor-associated MG.¹¹ Furthermore, 40–64% of patients with “triple M syndrome” require mechanical ventilation and intensive care unit level of care.^{12,13}

Approximately 37% of patients with ICI-induced MG can present with concurrent myositis.¹³ The presence of myositis significantly increases the risk of clinical decompensation. Respiratory failure occurs in approximately 54% of patients with concurrent myositis compared with 42% in those with isolated MG.¹⁴

Early and aggressive treatment of severe irNAEs has been associated with improved survival and prevention of progression of further neurologic disability.⁶ Case series have shown that patients with “triple M” or overlapping syndromes such as concurrent MG and myositis who received early intervention with intravenous immunoglobulin (IVIG) and high-dose steroids have more favorable outcomes.¹³⁻¹⁵ The recommended treatment for severe presentations, including overlapping syndromes, includes high-dose steroids in combination with IVIG or plasmapheresis, with escalation to immunosuppressive agents such as rituximab or mycophenolate mofetil when clinically indicated.^{14,15} Despite this, in one study of 65 patients with ICI-induced MG, only 19% of patients achieved full resolution of symptoms while 55% had partial improvement.¹⁴

Distinguishing ICI-induced MG from classic autoimmune MG is critical as the prognosis varies substantially. Clinically, ICI-induced MG resembles classic autoimmune MG, with patients presenting with ptosis, diplopia, fluctuating

Table 1. Relative frequency and distinguishing features of different immune-related neurological adverse effects (irNAEs)

Type of irNAEs	Relative frequency among irNAEs (%)	Key features
Myositis (with or without myasthenia gravis overlap)	32	Proximal muscle weakness, myalgias, elevated creatinine kinase. May have ocular and bulbar symptoms even in absence of myasthenia gravis
Guillain-Barré syndrome and other peripheral neuropathies	22	Sensory or motor deficits, hyporeflexia or areflexia, autonomic dysfunction
Myasthenic syndromes	14	Ocular and bulbar symptoms, neck flexion weakness, respiratory failure
Encephalitis	13	Altered mental status, seizures, inflammatory findings on cerebrospinal fluid
Cranial neuropathies	7	Unilateral or bilateral involvement of cranial nerves
Aseptic meningitis	3	Altered mental status, meningismus
Transverse myelitis	2	Contrast enhancement on spine MRI, inflammatory cerebrospinal fluid findings

muscle weakness, bulbar involvement, and in severe cases, respiratory depression.⁸ While classic MG carries a mortality rate of approximately 6%, ICI-induced MG is associated with a higher mortality, emphasizing the need for a heightened clinical suspicion.⁸

The diagnosis of ICI-induced MG remains primarily clinical and should ideally involve early neurologic evaluation to facilitate timely, life-saving interventions.^{15,16} Early neurologic evaluation not only supports accurate identification of irNAEs and consideration of other neurologic diagnoses, but also helps guide appropriate immunosuppressant dosing.¹⁶ Notably, studies indicate that, in the outpatient setting, only three out of ten patients initially suspected of having irNAEs retain their original diagnoses following a comprehensive neurologic evaluation, suggesting that earlier inpatient neurological assessment may reduce diagnostic revisions.¹⁶ Early neurologic evaluation also aids in risk stratification, helping determine the need for escalation of care at a given point in the patient's course given the risk of respiratory decompensation.^{15,16}

Neurologists can perform bedside evaluations such as assessing for muscle fatigability to establish a preliminary diagnosis without the need to await serologic testing or electromyography.¹⁵ Although serologic markers such as acetylcholine receptor (AChR) and muscle-specific kinase (MuSK) antibodies may support the diagnosis,^{16,17} their turnaround time may take weeks, limiting their applicability to acute decision-making.¹⁵ It is important to note that serologic markers may often be absent in patients with ICI-induced MG and are not required for diagnosis, though they represent an area of future investigation and possibly further prognostication.

The management of irNAEs, including MG, is guided by the grade of irAE toxicity.^{9,18} For grade 1 nAEs, ICIs may be continued with close monitoring or held. For grade 2 neurotoxicities, ICIs are held and corticosteroid therapy, whether intravenous or oral, is initiated. Agents such as pyridostigmine, an acetylcholinesterase inhibitor, may be used in the management of grade 2 ICI MG; however, is less effective (62% compared to approximately 94% for classic MG).^{19,20} In grade 3 or 4 irAE, ICIs are permanently discontinued, and high-dose steroids such as intravenous methylprednisolone are initiated along with IVIG or plasmapheresis, with refractory cases requiring other immunosuppressive therapies.¹⁸ While thymectomy is the standard of care for classic MG, it is not a part of the current guidelines in the management of ICI MG.¹⁹ Given its rarity, clinical complexity, and high mortality, a multidisciplinary approach involving oncology, neurology, and cardiology in cases of myocarditis are essential to improve patient outcomes.^{15,16}

CONCLUSION

ICI-induced MG is a well-documented, but life-threatening nAE, especially in the presence of overlapping syndromes such as concurrent myositis or myocarditis. Its high mortality rate necessitates early recognition, prompt neurologic consultation, respiratory monitoring in the critical care setting, and timely initiation of immunosuppressive therapy. A multidisciplinary approach can improve patient outcomes and potentially improve survival.

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Post-COVID-19 Penalty Trends Following an Injury-Prevention Rule Change in Rhode Island High School Boys' Hockey

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ABSTRACT

BACKGROUND: Penalty infraction minute (PIM)-based rule modifications have been implemented in youth and high school ice hockey to reduce injury risk. A prior Rhode Island Interscholastic League (RIIL) study demonstrated a reduction in game-related injuries following implementation of a statewide 2015–2016 50/70 PIM rule. The durability of these behavioral trends post-COVID-19 has not been evaluated.

PURPOSE: This descriptive epidemiologic study evaluates post-pandemic trends in penalty infraction minutes and disqualifying penalties in RIIL boys' varsity ice hockey.

METHODS: Publicly available RIIL varsity boys' ice hockey data were reviewed for four consecutive seasons (2021–2022 through 2024–2025). Extracted variables included total rostered players, counts of players exceeding PIM thresholds (≥ 25 , ≥ 50 , ≥ 70), mean team PIM per game, goals scored, number of participating teams, and total disqualifying penalties per season. Data were summarized descriptively by season.

RESULTS: Across four seasons, rostered players ranged from 479 to 540, with 21 to 25 teams competing annually. Mean team PIM per game remained stable, ranging from 8.13 to 8.83. No players accumulated ≥ 50 or ≥ 70 PIM in any season. Players accumulating ≥ 25 PIM ranged from 17 to 24 per season. Disqualifying penalties occurred each season (range, 5–11 per year) without a consistent directional trend. Goals scored remained proportional to participating teams.

CONCLUSIONS: In post-pandemic seasons, PIM distributions and disqualifying penalties remained stable, with no recurrence of high-PIM accumulations requiring suspension. These findings suggest sustained behavioral patterns following rule modifications, but cannot be interpreted as evidence of injury reduction without injury surveillance data. Continued monitoring incorporating injury outcomes is warranted.

KEYWORDS: Ice hockey; penalty infraction minutes; high school athletes; sports rule modification; player safety

INTRODUCTION

The implementation of rule-based interventions to reduce aggressive play and injury risk in youth ice hockey has been a central focus of sports medicine research and policy. In Rhode Island, the 2015–2016 introduction of the “50/70 rule” imposed progressive suspensions for players accumulating 50 or 70 penalty infraction minutes (PIM) was shown by Kriz et al to significantly reduce game-related injuries, including concussions, among high school varsity hockey players, without a significant change in game disqualification penalties. This study builds directly on the work of Kriz et al, extending the analysis of penalty minute trends and player safety in the years following the rule's implementation. While Kriz et al demonstrated significant injury reductions following implementation of the 50/70 rule, this study aims to assess the durability of the policy and persistence of behavioral changes.¹

The effectiveness of stricter penalty enforcement and rule modifications in reducing injury risk has been evaluated across high school and youth ice hockey populations.^{2,3} In the United States, the National Federation of State High School Associations' (NFHS) rule changes targeting dangerous mechanisms such as boarding and checking from behind have been associated with a 40% reduction in checking-related injuries.^{4,5} Similarly, policy changes in Canadian youth ice hockey, such as those limiting body checking and head contact, have been associated with reductions in head impact rates and concussion incidence.^{6,7} Systematic reviews confirm that rule changes are consistently associated with reductions in penalties for aggressive acts and injuries related to aggression. Penalty minutes serve as a tool to represent aggressive or dangerous on-ice behavior and have been shown to correlate with injury risk in contact sports. Therefore, sustained reductions in high-penalty behavior may reflect improvements in player safety.^{3,8,9}

The COVID-19 pandemic introduced unprecedented uncertainty and operational challenges to high school sports, including ice hockey. This creates concerns regarding increased aggressive behaviors or rule violations due to disrupted seasons and altered practice protocols. On the contrary, well-known social distancing guidelines could have also caused physicality to be greatly reduced. Although the American Medical Society for Sports Medicine and the NFHS provided detailed guidance on cardiopulmonary evaluations,

symptom screening, and safe return-to-play protocols for student athletes, their recommendations focused on health monitoring and risk mitigation rather than behavioral trends or penalty enforcement in sports such as ice hockey.¹⁰⁻¹⁵

These guidelines emphasized the importance of daily symptom tracking, the establishment of COVID-19 response teams, and medical clearance before resuming athletic participation, aiming to safeguard athlete health during the pandemic.¹⁶⁻¹⁸ However, they did not address whether pandemic-related disruptions led to changes in penalty minutes or player conduct. Given the documented physiological and social impacts of the pandemic on high school athletes, including increased anxiety, anger, and changes in team dynamics, there is a rationale to investigate whether these factors may have influenced on-ice behavior and player safety metrics such as penalty minutes.¹⁹⁻²² This underscores the need for updated analyses to determine if the protective effects of rule changes such as the 50/70 rule have been maintained in the post-pandemic era. The objective of this study was to evaluate whether reductions in high-risk penalty behaviors seen with implementation of the 50/70 rule have been sustained in the post-COVID-19 era by examining league-wide penalty trends from 2021–2025 and comparing them with pre- and post-rule historical data.

METHODS

Data for the four Rhode Island Interscholastic League (RIIL) boys' hockey seasons following the COVID-19 pandemic (2021–2025) were obtained from the Rhode Island Hockey Coaches' Association (RIHCA) website, which maintains a publicly accessible archive of official statewide team and player statistics. The source was selected for its comprehensive scope, consistency across seasons, and reliable reporting of league-wide metrics. The RIIL provided total game disqualification penalty data for the 2021–2025 seasons.

A custom Python-based data extraction tool was developed to systematically retrieve relevant variables from the RIHCA database. The tool utilized automated HTTP requests to collect all rostered players and associated season statistics across each of the four study years. Automation ensured uniform data capture across seasons, minimized transcription errors, and allowed consistent application of inclusion criteria. Following extraction, all outputs were manually reviewed to verify completeness and accuracy.

For each season, the following variables were collected from the RIHCA website: total number of rostered players, total league games played, total game disqualification (DQ) penalties, number of players with ≥ 25 , ≥ 50 , and ≥ 70 penalty minutes (PIM), mean PIM per team per game, total goals scored, and total number of participating teams. The resulting dataset encompassed the 2021–2025 seasons and was compared directly to the data reported by Kriz et al (2012–2015 and 2015–2018 seasons) to allow for longitudinal observation.

Season-level data from the 2012–2013 through 2024–2025 Rhode Island Interscholastic League (RIIL) boys' hockey seasons were compiled into a unified analytical dataset that included roster size, total league games, game DQ penalties, counts of players accumulating ≥ 25 , ≥ 50 , and ≥ 70 penalty minutes (PIM), combined team PIM per game, total goals scored, and number of participating teams. Each season was assigned a numeric year, and a binary indicator marking implementation of the 2015–2016 safety rule ("post-rule") was created. Derived league-level measures included DQ penalties per 100 games, the percentage of players with ≥ 25 PIM, and goals scored per team-game.

All analyses were conducted in Python using pandas for data management, statsmodels for regression modeling, and matplotlib for figure generation. To evaluate the impact of the safety rule, we estimated four primary before-after regression models. DQ penalties were analyzed using Poisson regression with the natural log of total games as an offset to adjust for varying season lengths and were fitted with heteroskedasticity-consistent (HC3) standard errors. The number of players with ≥ 25 PIM was modeled using binomial logistic regression, with counts of high-PIM versus non-high-PIM players as the dependent structure. Combined penalty minutes per game and goals per team-game were examined using ordinary least squares regression with HC3 standard errors. To assess temporal dynamics beyond simple pre/post contrasts, an interrupted time series model was constructed using Poisson regression that incorporated an overall time trend, a level change at the rule's implementation, a post-intervention slope change, and an indicator for post-COVID-19 "modern" seasons (2021–2025). A counterfactual projection of expected DQ penalties was generated by fitting a Poisson model to pre-rule seasons only and applying the estimated trend to subsequent years. Finally, player-level penalty data for modern seasons (2021–2025) were aggregated from cleaned season-specific files, with penalty minutes converted to numeric form and missing values set to zero; summary statistics were used to describe within-season PIM distributions. All regression results, summary metrics, and figures were exported as high-resolution PNGs and LaTeX-formatted tables to ensure reproducibility and consistent manuscript preparation.

RESULTS

Table 1 summarizes league-wide penalty and performance data across the 2012–2025 RIIL boys' hockey seasons. In the three seasons preceding the 2015–2016 safety rule change, the league averaged 14–17 game DQ penalties per year and 52–57 players with ≥ 25 penalty minutes (PIM). Immediately after the rule implementation (2015–2018), roster size and total games remained similar, but DQ penalties declined to 6–21 per season, and the number of players with ≥ 25 PIM remained within historical ranges (49–56 players).

Table 1. Penalty and Performance Data: Rhode Island Interscholastic League Hockey (2012–2025)

Season	Before Rule Change			After Rule Change			Recent Seasons			
	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2021–2022	2022–2023	2023–2024	2024–2025
Rostered Players	652	675	703	659	704	698	540	527	514	479
Total League Games	338	288	297	295	275	269	204	192	184	161
Game DQ Penalties	17	14	17	6	21	10	5	11	11	9
Players with PIM ≥ 25	52	45	57	56	53	49	24	18	17	18
Players with PIM ≥ 50	5	2	8	5	3	7	0	0	0	0
Players with PIM ≥ 75	0	0	0	1	0	1	0	0	0	0
Team PIM, mean/game	9	9	10	10	10	11	8	8	9	9
Goals Scored	1913	1775	1791	1672	1547	1626	1209	1249	1340	1084
Total Teams	32	30	29	28	26	27	25	24	23	21

Following league reactivation after the COVID-19 hiatus, more pronounced improvements emerged. From 2021–2025, game DQ penalties decreased further to 5–11 per season, and the number of players with ≥ 25 PIM fell by more than half compared with pre-rule levels (17–24 vs. 52–57 players). No players in any recent season accumulated ≥ 50 or ≥ 70 PIM. Team combined penalty minutes per game also decreased relative to the pre-rule era (8–9 vs. 9–11). These trends are illustrated in **Figure 1** (DQ rate per 100 games), **Figure 2** (high-PIM prevalence), and **Figure 3** (combined PIM per game), all of which show sustained reductions beginning shortly after the safety rule introduction, with further declines after 2021.

Scoring levels remained stable or increased slightly over time, with recent seasons showing the highest goals per team-game in the dataset. As shown in **Figure 4**, the scoring environment did not decline alongside reductions in penalties, suggesting no negative effect on offensive performance.

To quantify the impact of the rule change, regression analyses were conducted. A Poisson regression model found no statistically significant change in DQ penalties associated with the post-rule period (Rate Ratio 0.77; 95% CI 0.45–1.31). In contrast, logistic regression demonstrated that the odds of accumulating ≥ 25 PIM decreased significantly after the rule change (Odds Ratio 0.70; 95% CI 0.57–0.88). Linear regression models found no significant associations between the rule change and combined penalty minutes per game or goals per team-game.

To contextualize observed disqualification penalty trends, season-level DQ rates were plotted over time [**Figure 5**]. Observed DQ rates after 2016 consistently fell below the projected pre-rule trajectory, reinforcing the directionality of improvements despite statistical nonsignificance.

Overall, across descriptive, graphical, and modeled analyses, the data demonstrate a marked reduction in high-penalty players and severe penalties following the 2015–2016 safety rule change, with the most pronounced improvements emerging in the post-pandemic era.

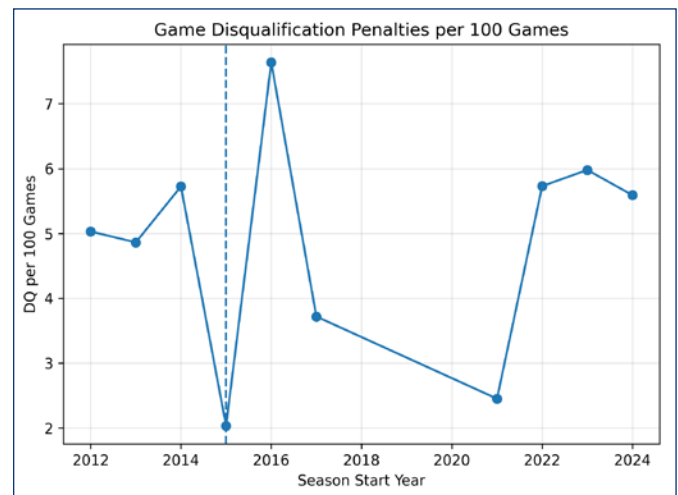
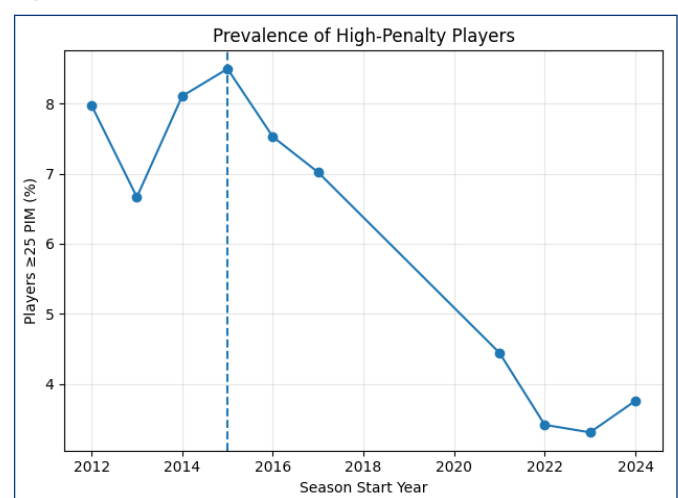
Figure 1.**Figure 2.**

Figure 3.

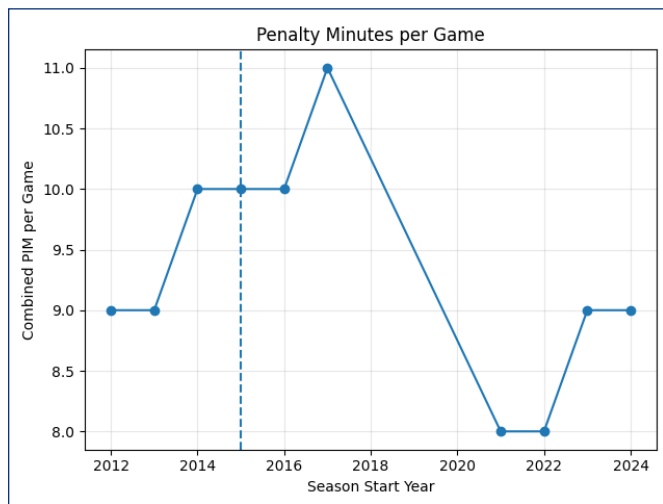


Figure 4.

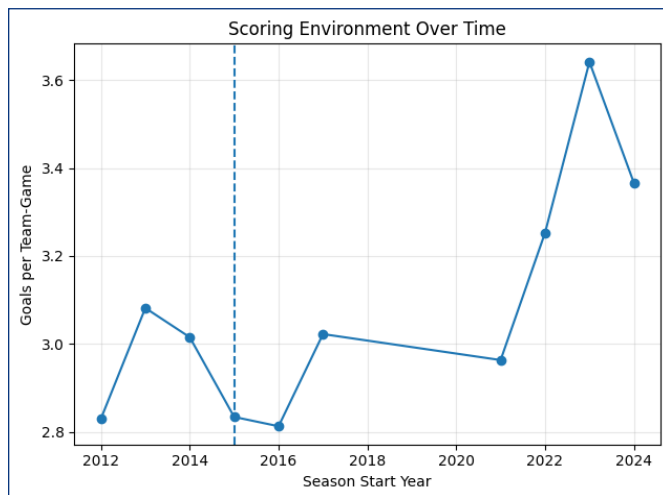
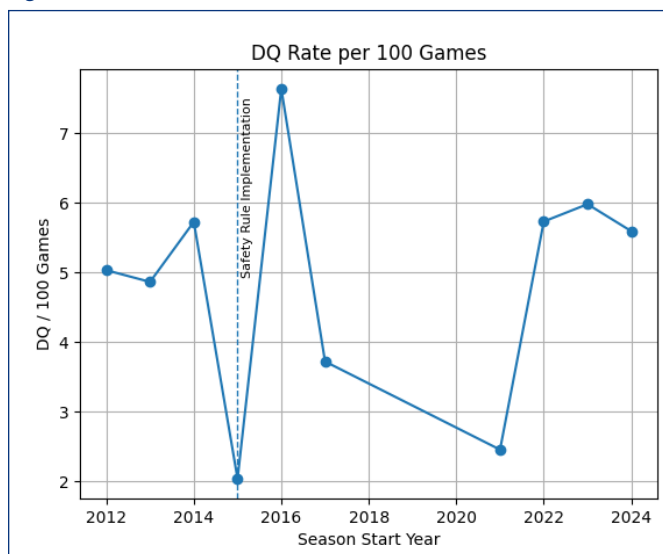


Figure 5.



CONCLUSION/DISCUSSION

The implementation of the 2015–2016 RIIL safety rule was followed by meaningful reductions in high-risk penalty behaviors across boys' high school hockey. While game disqualification penalties showed year-to-year variability and did not change significantly in regression modeling, the prevalence of players accumulating high penalty minutes declined substantially, particularly in the post-pandemic seasons. These reductions occurred without any apparent negative impact on scoring or overall game flow. Together, these findings suggest that targeted safety policies can effectively reduce severe and dangerous penalties while preserving the competitive integrity of play. This analysis also provides clarity that the rule change has produced lasting improvements rather than only transient compliance. Continued monitoring of penalty trends and periodic reassessment of safety rules are essential to ensure that such policies continue to achieve their intended safety outcome as the sport evolves. These results indicate that the uncertainty of the COVID-19 pandemic did not appear to undermine the effectiveness of the 50/70 rule.

From a policy perspective, these findings provide additional support for penalty-based safety rules as a viable injury prevention strategy at the high school level. Unlike equipment mandates or rule changes that substantially alter gameplay, the 50/70 rule preserves competitive structure while incentivizing safer behavior. By limiting the participation of repeatedly penalized players, the 50/70 rule protects opposing players by encouraging safer play. The absence of negative effects on scoring further suggests that such policies are capable of enhancing safety without diminishing the quality or appeal of the sport. Although this analysis is limited to a single statewide high school league, the findings of this work and future findings should be informative for other state associations considering or maintaining similar penalty-based safety policies.

A limitation of this study is that the Rhode Island Interscholastic League (RIIL) changed the manner in which data was stored and made available, resulting in limited access to raw data from the pre-rule change seasons. As a result, complete season-level datasets from earlier years were not available for independent reanalysis. However, the study by Kriz et al provided sufficient aggregate data to allow meaningful comparison and identification of overall trends across the pre- and post-rule change periods. While access to more comprehensive raw data would have potentially allowed for additional observations, this limitation did not compromise the validity or integrity of the observed trends or the study's conclusions.

Future directions will involve evaluating specific injury outcomes during the post-pandemic seasons by examining state-wide emergency department-reported injuries. By correlating injury data with seasonal penalty trends, this additional analysis will aim to assess whether observed

reductions in penalty infraction minutes still correspond to a decrease in both overall and concussion-related injuries. This approach will also enable assessment of additional injury-related outcomes, such as reinjury. Given the significant injury reductions reported following the original rule change, we hypothesize a similar decline in the post-COVID seasons analyzed in this study. We hope additional observation will further reinforce that penalty-based rule modifications offer an effective injury-prevention strategy.

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Performance of AI Chatbots in Adult Reconstruction Education: A Comparative Evaluation Using AAOS ResStudy Questions

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ABSTRACT

BACKGROUND: Artificial intelligence (AI) chatbots are increasingly incorporated into orthopedic education, yet their ability to handle complex, clinically oriented questions remains unclear. This study evaluates the accuracy, response time, and citation reliability of contemporary AI chatbots when answering adult reconstruction questions from the AAOS ResStudy question bank.

METHODS: Fifty-five multiple-choice adult reconstruction questions were extracted and categorized by anatomic region (hip vs. knee), concept (clinical presentation, prognosis, management), and AAOS-defined difficulty. Seven chatbots (ChatGPT-3.5, ChatGPT-4, ChatGPT-4o, Gemini, Gemini Advanced, Claude, and Co-Pilot) were assessed. Accuracy, response time, and citation quality (existence and relevance) were recorded. Statistical analyses included chi-square testing, t-tests, Pearson correlation, one-way ANOVA, and Kruskal-Wallis testing ($p < 0.05$).

RESULTS: Overall chatbot accuracy was 67.5%. GPT-4o performed best (80%), outperforming AAOS members (75%), while Co-Pilot ranked second (70.9%). Accuracy varied by concept, with highest performance in Clinical Presentation (78.6%) and lowest in Prognosis (63.1%). Difficulty strongly influenced performance, with accuracy dropping from 84.7% on very easy questions to 45.4% on difficult ones. Average response time was 3.6 seconds, and no significant correlation existed between speed and accuracy. Among citation-producing chatbots, Co-Pilot achieved 100% citation existence and relevance.

CONCLUSION: Modern AI chatbots demonstrate moderate overall accuracy on adult reconstruction questions, with GPT-4o exhibiting the strongest performance. While chatbots excel at descriptive orthopedic knowledge, they continue to struggle with applied reasoning tasks such as prognosis and management. These findings support their use as supplementary, rather than primary, learning tools. Improving citation reliability and reasoning capabilities may enhance future educational applications.

LEVEL OF EVIDENCE: IV, Cross-Sectional Comparative Analysis

KEYWORDS: chatbots; orthopedic education; adult reconstruction; artificial intelligence; medical learning tools

INTRODUCTION

In recent years, the use of chatbots in education has surged, driven by their versatility and user-friendly design.¹ These AI-powered programs interact with users through dynamic, conversational queries.² Their integration into medical education has further expanded their popularity, highlighting their potential to enhance learning experiences. From automating tasks like summarizing and evaluating medical literature to developing interactive simulations, AI chatbots have diverse applications within medical education.³ Orthopedics, in specific, has shown a staggering tenfold increase in the use of interactive AI chatbots since 2010.⁴ From boasting about 80% accuracy when answering orthopedic trauma questions to having about 63.3% accuracy in answering hand surgery questions, several AI chatbots have shown promise as didactic tools in orthopedic education.^{5,6} On the other end of the spectrum, however, studies have been performed that render the accuracy of these bots' orthopedic knowledge questionable.⁷⁻¹⁰ One study indicated that while these AI bots have approximately the knowledge level of a PGY-2 orthopedic resident, they still fall short of passing the American Board of Orthopedic Surgery (ABOS) written exam, thus highlighting the need to be wary of blindly relying on them for orthopedic questions.⁸

As of late, the efficiency and accuracy of AI chatbots in orthopedics has garnered significant attention, becoming a prominent and rapidly expanding area of research.^{4-6,9,11-18} Some articles have specifically focused on the application of chatbots in hip and knee reconstruction.^{9,11-16,18,19} However, the majority of these articles concentrate on how AI chatbots can enhance patient understanding of hip and knee pathologies.^{9,11,12,14-16,18} Less is known about chatbots ability to answer clinical questions posed to medical professionals. After a comprehensive review of the current literature, we found no studies that evaluate the accuracy of different chatbots when answering adult reconstruction questions designed for orthopedic trainees.

This study therefore seeks to assess the performance of various AI chatbot models (ChatGPT-3.5, ChatGPT-4, ChatGPT-4o, Gemini, Gemini Advanced, Claude (Anthropic), and Co-Pilot) in answering adult reconstruction questions from the American Academy of Orthopaedic Surgeons (AAOS) question bank, ResStudy. The purpose of this investigation is to critically assess the performance of different

modern chatbots tasked with answering adult reconstruction questions and to evaluate their potential as a learning tool for orthopedic trainees.

METHODS

Question Selection and Categorization

Fifty-five multiple-choice questions on adult reconstruction topics were extracted from the AAOS Resident Question Bank. Questions containing images were excluded a priori, as most chatbot platforms lack the capability to reliably interpret visual data. From the remaining pool of eligible text-based questions, a random sample of 55 questions was generated for analysis. Random sampling was employed to minimize selection bias and enhance the representativeness of the dataset across a broad range of topics and difficulty levels within adult reconstruction. This approach also ensured methodological feasibility while maintaining consistency with prior studies evaluating AI chatbot performance in orthopedic education that have utilized similarly sized question sets.

They were then categorized by: 1) hip or knee-related content and 2) concept (clinical presentation, prognosis, and management). Concept categories were defined a priori by one investigator (AL) based on standard medical education frameworks: clinical presentation (questions focused on signs, symptoms, and diagnostic findings), prognosis (questions addressing disease course, outcomes, and risk factors), and management (questions concerning treatment decisions and interventions). Each question was assigned to a concept category by the same investigator, with categorization reviewed for consistency.

Difficulty was determined based on AAOS members' average performance: very easy (>90% correct), easy (80–90%), moderate (50–80%), and difficult (<50%).

Chatbot Testing and Data Collection

The questions were presented to ChatGPT-3.5, ChatGPT-4, ChatGPT-4o, Gemini, Gemini Advanced, Co-Pilot, and Claude. Accuracy and response times were recorded, with response time measured manually from prompt submission to the chatbot's first response.

While ChatGPT models could not provide citations, Gemini, Claude, and Co-Pilot did. Citation analysis was performed for all correct responses that included references. Three investigators (T.P., A.K., J.B.) independently verified citation existence (whether the cited reference could be located in standard medical databases) and citation relevance (defined as whether the referenced source was related to the clinical topic of the question being addressed). Discrepancies in citation assessment were resolved through consensus discussion among the three reviewers.

Statistical Analysis

Descriptive statistics analyzed chatbot performance by anatomic location, concept, difficulty, and response time. Chi-square tests compared accuracy, correlation tests examined accuracy vs. response speed, and t-tests compared knee vs. hip questions. One-way ANOVA assessed differences by difficulty and concept, while Kruskal-Wallis tested citation generation. A significance level of $p < 0.05$ was used, with all analyses conducted in IBM SPSS (2017). Given that all eligible non-image-based questions within the module were included, and the study was designed as an exploratory comparative analysis, a formal a priori power analysis was not performed.

RESULTS

Characteristics of Included Questions

Our study included 55 questions, with 36 focusing on the knee and 19 on the hip. Prognosis emerged as the most frequently assessed concept, encompassing 24 questions (43.6%), followed by management with 21 questions (38.2%), and clinical presentation with 10 questions (18.2%). Among knee-related questions, prognosis was the leading concept ($n=15$, 41.7%), while hip-related questions also predominantly explored prognosis ($n=9$, 47.4%). Regarding difficulty, the majority of the questions were categorized as moderate ($n=16$, 29.1%), while 14 questions (25.4%) were categorized as easy and another 14 (25.4%) as very easy, with 11 (20.0%) were classified as difficult.

Table 1 summarizes the distribution of the included questions by anatomic focus, conceptual emphasis, and difficulty level.

Table 1. Characteristics of Included Questions

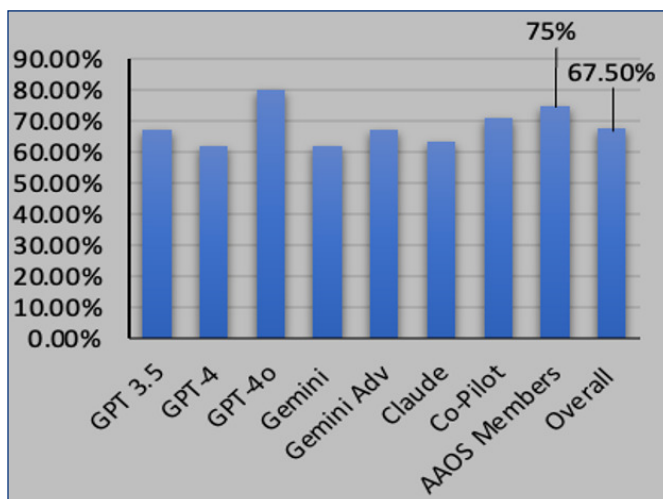
Characteristics of Questions (N=55) based on anatomic location, concept, and difficulty		
Anatomic Location	N	%
Knee	36	65.5
Hip	19	34.5
Concept	N	%
Clinical Presentation	10	18.2
Prognosis	24	43.6
Management	21	38.2
Difficulty	N	%
Very Easy	14	25.5
Easy	14	25.5
Moderate	16	29.1
Difficult	11	20.0

Overall Performance

The overall chatbot accuracy was 67.5%, with 37 out of 55 questions answered correctly. GPT-4o led (80.0%), followed by Co-Pilot (70.9%). ChatGPT 3.5 and Gemini Advanced each scored 67.3%, Claude 63.6%, and GPT-4 and Gemini had the lowest accuracy (61.8%). These accuracy differences were not statistically significant ($p=0.429$). AAOS members outperformed all bots except GPT-4o, averaging 75.0% accuracy.

The average response time was 3.6 seconds. Gemini Advanced was the slowest (5.8s), while GPT-3.5 was the fastest (2.5s). A weak, non-significant positive correlation was found between speed and accuracy ($r=0.218$, $p=0.639$) [Figure 1].

Figure 1. Accuracy Comparison of Chatbots and AAOS members



Performance According to Knee Versus Hip Questions

For knee-related questions, GPT-4o had the highest accuracy (83.3%), followed by GPT-3.5 and Gemini Advanced (72.2%). The lowest performers were GPT-4 and Gemini (63.9%). Co-Pilot and Claude scored 69.4% and 66.7%, respectively. Overall, chatbots answered 70.24% correctly, while AAOS members outperformed all except GPT-4o, averaging 73.6%.

For hip-related questions, Co-Pilot led (78.9%), followed by GPT-4o (73.7%). GPT-3.5, GPT-4, Gemini, and Gemini Advanced each scored 57.9%, while Claude had the lowest accuracy (52.6%). AAOS members again performed better, with 77.5% accuracy compared to the chatbots' 62.4%.

No significant differences were found in chatbot accuracy for pooled knee and hip questions ($p=0.112$; MD: 7.83) or response times ($p=0.898$; MD: 0.08). Gemini Advanced was the slowest (6.1s for knee, 5.3s for hip), while GPT-3.5 was the fastest (2.5s for knee, 2.6s for hip).

Performance According to Concept

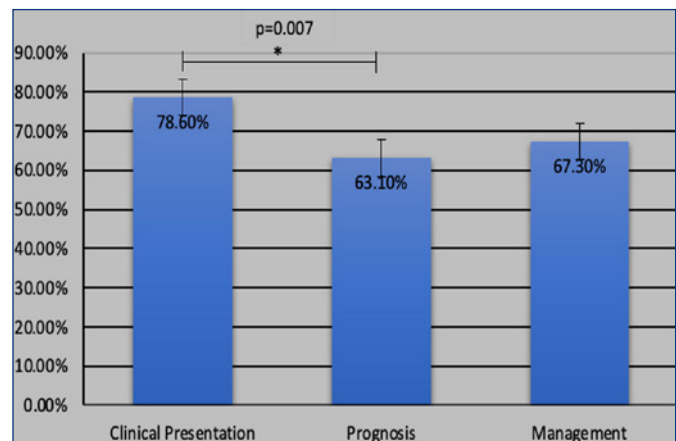
Mean accuracy was 78.6% for "Clinical Presentation," 63.1% for "Prognosis," and 67.3% for "Management."

For "Clinical Presentation," GPT-4o and Co-Pilot performed best (90%), while Gemini had the lowest accuracy (60%). In "Prognosis," GPT-4o led (79.2%), and GPT-4 performed worst (50%). For "Management," GPT-4 and GPT-4o scored highest (76.2%), while Claude and Co-Pilot had the lowest accuracy (57.1%). No significant differences were found among chatbot performances ($p=0.535$).

ANOVA showed a significant difference in chatbot accuracy across concepts ($p=0.007$). Performance on "Clinical Presentation" was significantly higher than "Prognosis" (95% C.I. = -29.07, -5.36), but no significant differences were observed between "Management" and the other two concepts.

No significant differences were found in response times across concepts ($p=0.432$). Average times were 3.7 sec for "Clinical Presentation," 3.6 sec for "Prognosis," and 3.9 sec for "Management." Gemini Advanced was the slowest overall, GPT-3.5 was fastest for "Prognosis" and Gemini was quickest for "Prognosis" and "Clinical Presentation" [Figure 2].

Figure 2. Overall Accuracy Comparison of Chatbots Based on Concept



Performance According to Difficulty

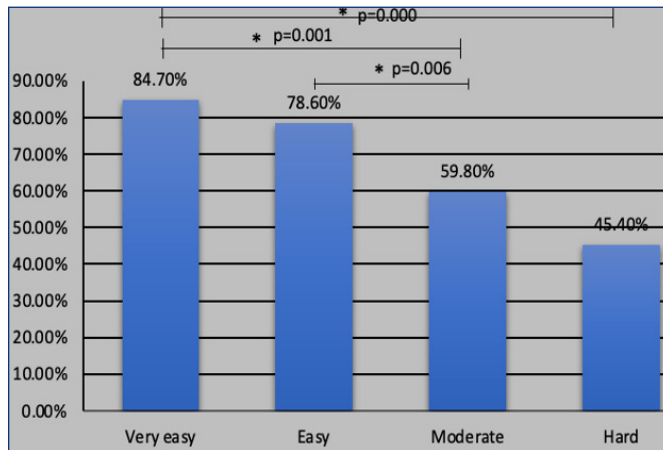
The average accuracy was 84.7% for very easy, 78.6% for easy, 59.8% for moderate, and 45.4% for hard questions.

For very easy questions, GPT-4o scored highest (100%), while Claude was lowest (71.4%). In easy questions, Co-Pilot performed best (92.9%), while Gemini scored lowest (64.3%). For moderate questions, GPT-4o, Claude, and Co-Pilot tied (68.8%), with Gemini lowest (43.7%). In hard questions, GPT-4o and Gemini led (63.6%), while GPT-4 was lowest (27.3%).

ANOVA showed no significant difference among chatbots ($p=0.097$). However, performance on very easy questions was significantly better than on hard ($p=0.000$) and moderate ($p=0.001$) ones. Easy questions also had significantly higher scores than moderate ones ($p=0.006$).

Chatbots averaged 3.6 seconds per question, with Gemini Advanced the slowest and GPT-3.5 the fastest [Figure 3].

Figure 3. Overall Accuracy Comparison of Chatbots Based on Question Difficulty



Literature Search Ability

Among the four bots providing citations, Gemini, Gemini Advanced, Claude, and Co-Pilot, the average citation existence was 84.5%, with an average relevance of 90.7%. Co-Pilot performed best, achieving 100% in both categories,

followed by Gemini Advanced (85.3% existence, 82.8% relevance). Gemini had 79.4% existence but 100% relevance, while Claude had the lowest existence (73.5%) and 80% relevance.

Kruskal-Wallis analysis showed no significant differences in citation existence ($H=3.00$, $p=0.392$) or relevance ($H=2.70$, $p=0.440$) across bots [Figure 4, Table 2].

Figure 4. Comparison of Chatbots Based on Citation Generating Ability

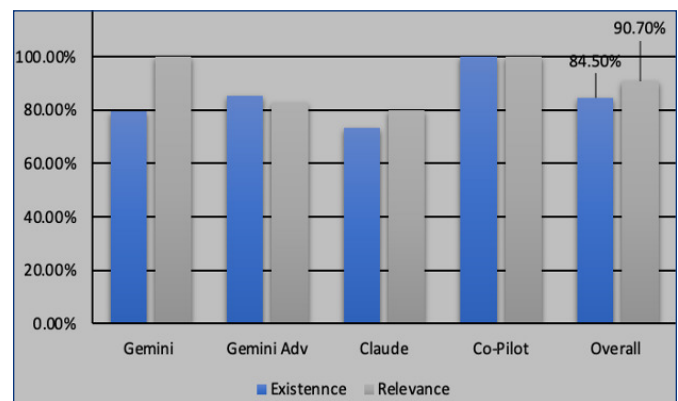


Table 2. Summary of Chatbot Performance

Category	Measure	Best Performer	Worst Performer	Mean
Overall Performance	Accuracy	80.0% (GPT-4o)	61.8% (GPT-4, Gemini)	67.5%
	Response Time	2.5s (GPT-3.5)	5.8s (Gemini Advanced)	3.6s
Knee vs Hip Questions	Knee Accuracy	83.3% (GPT-4o)	63.9% (GPT-4, Gemini)	70.24%
	Hip Accuracy	78.9% (Co-Pilot)	52.6% (Claude)	62.4%
	Knee Response Time	2.5s (GPT-3.5)	6.1s (Gemini Advanced)	3.6s
	Hip Response Time	2.6s (GPT-3.5)	5.3s (Gemini Advanced)	3.6s
Concept Performance	Clinical Presentation Accuracy	90% (GPT-4o, Co-Pilot)	60.0% (Gemini)	78.6%
	Prognosis Accuracy	79.2% (GPT-4o)	50.0% (GPT-4)	63.1%
	Management Accuracy	76.2% (GPT-4, GPT-4o)	57.1% (Claude, Co-Pilot)	67.3%
	Clinical Presentation Response Time	2.4s (Gemini)	5.2s (Gemini Advanced)	3.7s
	Prognosis Response Time	2.6s (GPT-3.5)	5.7s (Gemini Advanced)	3.6s
	Management Response Time	2.4s (Gemini)	6.3s (Gemini Advanced)	3.9s
Difficulty Performance	Very Easy Accuracy	100% (GPT-4o)	71.4% (Claude)	84.7%
	Easy Accuracy	92.9% (Co-Pilot)	64.3% (Gemini)	78.6%
	Moderate Accuracy	68.8% (GPT-4o, Claude, Co-Pilot)	43.7% (Gemini)	59.8%
	Hard Accuracy	63.6% (GPT-4o, Gemini)	27.3% (GPT-4)	45.4%
	Very Easy Response Time	2.5s (GPT-3.5)	6.2s (Gemini Advanced)	3.6s
	Easy Response Time	2.5s (GPT-3.5)	5.6s (Gemini Advanced)	3.6s
	Moderate Response Time	2.6s (GPT-3.5)	5.7s (Gemini Advanced)	3.6s
	Hard Response Time	2.5s (GPT-3.5)	5.9s (Gemini Advanced)	3.6s
Literature Search Ability	Citation Existence	100% (Co-Pilot)	73.5% (Claude)	84.5%
	Citation Relevance	100% (Gemini, Co-Pilot)	80% (Claude)	90.7%

DISCUSSION

Our findings show an overall chatbot accuracy of 67.5% for adult reconstruction questions, with GPT-4o leading at 80% and Co-Pilot at 70.9%. GPT-4 and Gemini scored lowest at 61.8%. While differences in performance were observed across models, these did not reach statistical significance, and therefore should be interpreted cautiously. Chatbots struggled with difficult questions, averaging only 45.4% accuracy. They performed best on “Clinical Presentation” (78.6%), compared to “Prognosis” (63.1%) and “Management” (67.3%), suggesting stronger descriptive knowledge than applied reasoning. Citation accuracy also varied, Co-Pilot achieved 100% for both existence and relevance, while Gemini Advanced had the lowest citation existence (73.5%) and 80% relevance. The overall moderate performance of 67.5% achieved by the chatbots in our study aligns with the current literature.^{9,20-25} GPT-4o performed the best, aligning with prior research that identifies the GPT4o architecture as being more robust in medical question-answering tasks compared to its predecessors.^{26,27} Surprisingly, ChatGPT-3.5 (67.3%) outperformed GPT-4 (61.8%) in our study, particularly on prognosis and management-related questions. This contradicts prior studies, which consistently report GPT-4 as superior.^{10,21,28,29} One plausible explanation is that GPT-4’s enhanced reasoning capabilities may overcomplicate questions requiring straightforward application of knowledge, as noted by Knoedler et al.²³ This suggests that GPT-3.5’s simpler reasoning mechanisms may have better aligned with the design of our dataset. However, given the lack of statistically significant differences, these findings should not be interpreted as definitive evidence. The performance of Gemini, formerly iterated as Google Bard, has also been a topic of contention in the literature.³⁰ Our study found Gemini’s accuracy (61.8%) to be at the lower end of the spectrum, which contrasts starkly with Vaishya et al, who reported an exceptional 100% accuracy for Google Bard.²⁹ Instead our findings align with Lubitz and Latario’s study, where Google Bard demonstrated a lackluster performance with 49.8% accuracy.²⁴ Such discrepancies could stem from differences in study design, including the type and complexity of questions posed. No significant differences, however, were found in chatbot accuracy between knee and hip questions.

The 75.0% average accuracy of the AAOS member respondents surpassed that of all chatbots, except for ChatGPT 4o (80.0%). This finding aligns with existing literature indicating that chatbots have consistently struggled to pass orthopedic examinations across various countries and in different formats.^{6,25,28,29} Similar to human respondents, the chatbots performed well on easier questions but struggled with more difficult ones. Interestingly, Maraqa et al found that ChatGPT 4o achieved scores equal to or higher than those of residents for the French orthopedic and trauma surgery exam (DES) exam.²⁶ The superior proficiency of GPT-4o across evaluations highlights its potential as a tool for orthopedic

trainees. However, further research into its evolving capabilities and limitations is essential for fully understanding its role in supplementing or enhancing traditional training methods.

GPT-3.5 had the fastest response time (2.5 sec), while Gemini Advanced was the slowest (5.8 sec), possibly reflecting a trade-off between speed and response complexity. Faster times in GPT-3.5 may indicate simpler processing, while longer times could suggest more intricate reasoning. A weak, non-significant correlation was observed between slower response times and higher accuracy. Importantly, however, these differences are unlikely to be clinically or educationally meaningful, and response time should not be considered a primary determinant of chatbot utility in this context.

The variation in chatbot accuracy across concepts, Clinical Presentation (78.6%), Management (67.3%), and Prognosis (63.1%), suggests differing strengths. GPT-4o and Co-Pilot excelled in Clinical Presentation questions, achieving 90% accuracy. This is consistent with a study by Jain et al which highlights the superior ability of the bots in answering Basic Science questions, emphasizing their ability to output rote facts.³¹ The comparatively lower performance in Prognosis and Management aligns with challenges documented in the literature, where chatbots struggle with predictive reasoning tasks.²²

Citation generation is a critical capability for chatbots in medical education. However, a major challenge is their tendency to generate ‘hallucinated’ citations, non-existent references, or citations that are irrelevant to the topic.^{32,33} Among the bots evaluated, all versions of ChatGPT reported their inability to generate real citations. In contrast, Co-Pilot excelled, achieving 100% accuracy in citation existence and relevance. Gemini Advanced and Claude also demonstrated high relevance (100% and 82.8%, respectively). These findings highlight that while many chatbots can generate citations, the quality and reliability vary widely. Based on our findings, Co-Pilot appears most adept at referencing the relevant literature for adult reconstruction questions. Consistent with existing studies, we observed that the bots can reference scientifically relevant articles, but manual fact-checking is strongly recommended.³²

Our study is one of the first to compare multiple chatbots’ abilities in answering specific orthopedic questions. Future investigations could focus on refining chatbot algorithms to improve performance on more complex, reasoning-based questions such as in prognosis and management. Enhancing citation generation accuracy and integrating up-to-date medical literature would also improve their utility in medical education. Lastly, exploring cultural and demographic variations in chatbot performance across regions and specialties could help optimize their application in diverse educational environments.

Strengths and Limitations

This study should be interpreted in the context of several limitations. The analysis was restricted to a single AAOS ResStudy Adult Reconstruction module and included only non-image-based questions, which may limit generalizability, particularly for topics requiring radiographic or intraoperative image interpretation. Although the dataset represents the complete set of eligible questions within the selected module, the overall number of questions resulted in relatively small subgroup sizes after stratification by concept, anatomic location, and difficulty, which may limit statistical power for subgroup comparisons. Response time was measured manually, introducing potential measurement bias and limiting precision. In addition, while citation analysis was performed by multiple independent reviewers with discrepancies resolved through consensus, formal inter-rater reliability metrics were not calculated. Finally, chatbot performance was assessed using a standardized, single-prompt approach, which may not fully reflect real-world use where iterative prompting and user interaction can influence responses. Despite these considerations, this study provides a structured and clinically relevant evaluation of chatbot performance on standardized orthopedic educational content. Additional strengths include the use of a standardized and clinically relevant question bank with a comprehensive evaluation framework. The use of real-world, trainee-level questions and systematic categorization by concept and difficulty further enhances the practical relevance of the findings.

CONCLUSION

This study evaluates AI chatbots' performance on adult reconstruction questions, focusing on accuracy, speed, and citation capabilities. GPT-4o led with 80.0% accuracy, followed by Co-Pilot (70.9%), while GPT-4 and Gemini scored lower (61.8%). The chatbots excelled in Clinical Presentation (78.6%) but struggled with Prognosis (63.1%) and Management (67.3%). Faster response times didn't always correlate with higher accuracy. Despite promising potential for orthopedic education, chatbots remain supplementary due to inconsistent performance and citation issues. Future research should integrate specific databases and cultural factors to improve their utility in medical education.

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Firearm Injury Prevention in Undergraduate Medical Education in the United States: Current Landscape, Barriers, and Future Directions

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ABSTRACT

BACKGROUND: Firearm injuries remain a leading cause of preventable death in the United States (US), with physicians uniquely positioned to contribute to firearm injury prevention (FIP). Despite this, there is a lack of recent national assessment of FIP inclusion in US undergraduate medical education (UME). Thus, we looked to assess how medical schools currently incorporate FIP into curricula and what challenges affect its implementation.

METHODS: We distributed a REDCap-based survey to medical education leadership at all LCME- and COCA-accredited medical schools in the US between April and December 2024, assessing FIP curricular content, timing, modes and settings of instruction, assessment strategies, extracurricular opportunities, and perceived barriers to implementation.

RESULTS: Fifty-five institutions (27%) responded, with 64% reporting the inclusion of FIP content in their curricula. Most schools (62%) introduced FIP during clinical years, particularly in pediatrics, emergency medicine, and surgery, and some schools (51%) integrated content preclinically. Common curricular topics included firearm safety counseling, access screening, and identifying risk factors. Only 27% of schools reported formally assessing FIP knowledge. The most frequently cited barriers to implementation were limited curricular time and political/ideological concerns.

CONCLUSIONS: Our findings suggest encouraging progress in the incorporation of FIP education within UME compared to the most recent previous data, but they also highlight significant variability and persistent gaps. Broader adoption of standardized FIP curricula, earlier integration during training, and development of robust assessment strategies may enhance awareness and preparedness among future physicians to address firearm injury as a vital public health issue.

KEYWORDS: undergraduate medical education; firearm injury prevention; curriculum reform; national survey

INTRODUCTION

In 2023, approximately 46,000 people died from firearm-related injuries in the US.¹ Over 96% were due to suicides or homicides, representing the leading cause of preventable death in the US.¹ Physicians have an essential role in firearm injury prevention (FIP), as they frequently encounter the physical and psychological consequences of firearm-related trauma in clinical practice.² At various institutions, students are taught to ask about firearm safety and counsel patients on FIP. However, training on FIP has been inconsistently addressed in medical school, resulting in a lack of preparedness among physicians to discuss these topics with their future patients.³ A 2016 systematic review that included articles from the 1960s to 2014 from PubMed, Scopus, Google Scholar, PsycInfo, EMBASE, and MedEdPortal databases found that FIP training is rarely incorporated in graduate and undergraduate medical education (UME).⁴ Resident physicians also report having inconsistent and insufficient discussions about firearm storage and injury prevention.⁵

Integrating FIP training into UME is a critical upstream intervention to address this gap. Early and structured training can equip future physicians with the knowledge and confidence to incorporate FIP into clinical care. While several institution-specific FIP curricula have been developed,^{6,7} evidence is limited on the broader implementation of FIP education in medical schools. Additionally, while national consensus-driven priorities for firearm injury prevention (FIP) education exist—including training in the identification of firearm-related risk in clinical encounters, development of counseling strategies for high-risk patient populations, appropriate documentation practices, and follow-up or referral pathways—there is no formal Liaison Committee on Medical Education (LCME) requirement specific to firearm injury prevention. As a result, no standardized curricular framework exists defining the required content, structure, or instructional methods for FIP training in undergraduate medical education, and current implementations vary widely in their balance of didactic instruction, case-based learning, and skills-based or simulation training. Nevertheless, understanding the depth and nature of FIP incorporation in UME is essential for identifying gaps, optimizing educational models, and promoting widespread adoption of FIP training.

In this study, we surveyed curricular leadership at US medical schools to characterize the national landscape of FIP education. We limited our survey to institutions with formal UME accreditation—Liaison Committee on Medical Education accreditation for MD programs and Commission on Osteopathic College Accreditation (COCA) accreditation for DO programs—because these bodies establish standardized curricular expectations and competencies. Accordingly, accredited programs represent the settings where systematic integration of firearm injury prevention education would most likely occur first. Specifically, we examine the prevalence and characteristics of FIP content in undergraduate medical curricula, providing insights into current practices and identifying opportunities for future development.

METHODS

The Lifespan Institutional Review Board determined that this study met the criteria for exempt status. Between April 2024 and December 2024, we distributed an email linking to an online REDCap survey to faculty responsible for medical education at 160 LCME-accredited allopathic and 41 COCA-accredited osteopathic medical schools in the US. Because the institution was the unit of analysis, we sought one response per medical school from an individual in a role expected to have broad knowledge of the undergraduate medical curriculum. Primary contacts were identified from publicly available institutional websites and selected based on the leadership position most closely aligned with medical education or curriculum oversight, such as Dean or Associate Dean of Medical Education, curriculum dean, curriculum chair, or an equivalent role. Faculty names and email addresses were obtained from institutional websites when available.

The survey invitation described the study purpose, identified the survey as a national assessment of firearm injury prevention education in undergraduate medical education in undergraduate medical curricula, and included a link to the REDCap survey [Supplemental Digital Appendix 1]. We initially sent up to three email invitations or reminders to the primary institutional contact. For institutions that did not respond after these initial attempts, subsequent survey waves included a secondary contact, when available, who also held a medical education or curriculum leadership role. In total, three initial rounds of emails were sent to primary contacts, followed by five additional survey waves that incorporated secondary contacts. The timing and number of responses by survey wave are summarized in Supplemental Table 1. [Editor's note: Email corresponding author for all supplemental material and appendices.]

Our survey gathered data on the FIP curriculum, including implementation timing, assessment strategies, whether the curriculum was required or elective, curriculum components, instructional methods, and coverage of topics such as

general injury prevention, gun violence, firearm access, and risk modification strategies. It also collected demographics of the schools (osteopathic vs. allopathic, public vs. private, geographical location), key components of firearm injury prevention (FIP) curricula, the timing of FIP topic introduction in the curriculum, future FIP initiatives at each institution, and perceived challenges in expanding or implementing FIP curricula. The survey assessed curricular timing and instructional modality but did not quantify the instructional “dose” of FIP education. Respondents were asked whether FIP content was included in the preclinical curriculum, clinical curriculum, or both, and to identify broad instructional formats such as lecture, small group, self-directed learning modules, OSCEs, or other approaches. We did not ask respondents to report the number of contact hours, number of sessions, frequency of exposure, longitudinal reinforcement, or amount of supervised skills practice devoted to FIP education. This decision was made to limit respondent burden and preserve feasibility for an initial national survey of curriculum leaders. Additionally, opportunities for student engagement outside the formal curriculum were assessed.

No formal screening questions were used. Eligibility was determined a priori based on the respondent's publicly listed leadership role in undergraduate medical education or curriculum administration. No institution submitted more than one response; therefore, no duplicate institutional responses required reconciliation or adjudication. Because the institution was the analytic unit, the primary response rate was calculated at the institutional level as the number of responding schools divided by the total number of eligible LCME- and COCA-accredited medical schools.

The survey was developed to characterize institutional-level FIP curricular practices and was not intended as a formally validated psychometric instrument. The survey was critically reviewed by educational leadership at The Warren Alpert Medical School of Brown University and was piloted among the medical student authors (CC, AL, MB, MA). No formal reliability testing was performed. Because the study sought one institutional response per medical school, interrater reliability between multiple respondents from the same institutions could not be assessed.

Survey data were collected and managed using REDCap electronic data capture tools hosted at Brown University.^{8,9} Written responses were collected regarding additional institutional initiatives for injury prevention and perceived barriers to implementing FIP curricula. Descriptive statistics were conducted using RStudio.

RESULTS

Education leadership of 55 of 201 (27%) US medical schools completed the survey. Forty-nine (89%; [49/55]) were allopathic institutions and 6 (11%; [6/55]) were osteopathic; 28 (51%; [28/55]) were public and 27 (49%; [27/55]) private.

Geographically, 18 (33%; [18/55]) were located in the South, 15 (27%; [15/55]) in the Midwest, 12 (22%; [12/55]) in the Northeast, and 10 (18%; [10/55]) in the West [Table 1]. Thirty-five institutions (64%; [35/55]) reported inclusion of FIP content in their curriculum, 12 (22%; [12/55]) did not, and 8 (15%; [8/55]) were unsure [Table 2]. One institution responded “no” to the survey item—“Does your curriculum cover firearm injury prevention, gun violence, firearm access/risk modification?”—but provided details on FIP-related curriculum components and how the curriculum was taught and was therefore included in subsequent analyses.

Overall, 34 schools (62%; [35/55]) indicated the presence of FIP content during their clinical years, while 28 (51%; [28/55]) reported delivering FIP instruction during their pre-clinical years. Of those with FIP curricula, 29 (83%; [29/35])

described it as part of required didactics, and 2 (6%; [2/35]) as elective coursework [Table 2]. The most frequently reported curriculum component was counseling on firearm safety and storage (53%; [29/55]), followed by firearm access screening of patients (47%; [26/55]), identification of

Table 2. Overview of Firearm Injury Prevention Educational Offerings Among Respondents

Does your curriculum cover firearm injury prevention, gun violence, firearm access, or risk modification?	n (%) ^a
Yes	35 (64)
No	12 (22)
Unsure	8 (15)
Year curriculum is taught?^b	
Only preclinical	13 (24)
Only clinical	19 (35)
Both preclinical and clinical years	15 (27)
N/A	8 (15)
Is the curriculum a required didactic or an elective?	
Required didactic	29 (53)
Elective	2 (4)
Unknown	24 (44)
Are there ways to assess students on the content?	
Yes	15 (27)
No	25 (45)
N/A	15 (27)

Abbreviations: N/A, not applicable; FIP, firearm injury prevention.

^a Percentages are based on total respondents (n = 55) and rounded to the nearest whole number.

^b When respondents selected both a stage (“preclinical” or “clinical”) and “N/A,” they were categorized by their stage selection. The “N/A” group included only those who selected “N/A” exclusively or made no selection.

Table 1. Demographics of Responding U.S. Medical Institutions

Type of Medical School (N=55)	n (%) ^a
Osteopathic	6 (11)
Allopathic	49 (89)
Public versus Private	
Public	28 (51)
Private	27 (49)
Geographical Region^b	
Northeast	12 (22)
Midwest	15 (27)
South	18 (33)
West	10 (18)

^a Percentages are based on total respondents (n = 55) and rounded to the nearest whole number.

^b Geographical regions were determined using definitions from the U.S. Census Bureau.

Table 3. Specific Educational and Assessment Strategies and Clinical Rotation Details for Firearm Injury Prevention Curriculum Among Respondents

Question	Respondents, N	Response, n (%)
How is the curriculum taught? ^a	55	Lecture, 27 (49); Small group, 20 (36); Self-directed learning module, 6 (11); OSCE, 2 (4); Other, 18 (33); Unsure, 5 (9); None, 11 (20)
What components related to firearm injury prevention are included in your curriculum? ^b	55	Epidemiology, 23 (42); Identifying at-risk individuals and risk factors, 24 (44); Firearm access screening questions, 26 (47); Firearm safety and storage counseling, 29 (53); Acute treatment and hospital course for firearm injuries, 19 (35); Pre-hospital treatment for firearm injuries, 11 (20); Firearm policy, gun laws, public safety, 14 (25); Unsure, 7 (13); None, 11 (20)
How are students assessed? ^c	15	MCQ/quiz/exam, 10 (42); OSCE, 4 (17); Discussions or reflection, 5 (21); Faculty evaluation, 5 (21)
Which rotation(s) is the material covered in? ^d	34	Pediatrics, 20 (59); Family medicine, 7 (21); Emergency medicine, 8 (24); Surgery, 10 (29); OB/GYN, 1 (3); Other, 10 (29)

Abbreviations: OSCE, Objective Structured Clinical Examination; N/A, not applicable; MCQ, multiple choice questions; OB/GYN, obstetrics/gynecology.

^a Schools were asked to select all applicable methods of formal instruction; one school responded “No” to the survey question - “Does your curriculum cover firearm injury prevention, gun violence, firearm access/risk modification?” - but still provided details for a curriculum and thus were included in this table.

^b Respondents were instructed to select all applicable components; one school responded “No” to the survey question - “Does your curriculum cover firearm injury prevention, gun violence, firearm access/risk modification?” - but still provided details for a curriculum and thus were included in this table.

^c This question was presented as a free-response text box (n = 15) where respondents could provide any applicable information. Responses were categorized and independently evaluated by three team members (CC, AL, MB), with conflicts resolved through discussion. Percentages are calculated based on the total number of respondents.

^d This was a free-response text box (n = 34) that asked “Which rotation(s) is the material covered in?” Responses were categorized and independently evaluated by three team members (CC, AL, MB), with conflicts resolved through discussion. Percentages are calculated based on the total number of respondents.

Table 4. Challenges, Reported Barriers, Extracurricular Opportunities, and Future Plans for Firearm Injury Prevention Education in Medical Curricula

Question	Respondents, N	Responses, n (%)
What are the perceived barriers to implementing this curriculum? ^a	44	Lack of time, 27 (61); Lack of time and lack of expertise, 3 (7); Lack of time and political/ideological challenges, 3 (7); Lack of expertise, 4 (9); Lack of expertise and political/ideological challenges, 1 (2); Political/ideological challenges, 6 (14)
Are there other engagement opportunities outside of the curriculum to practice this topic? ^b	55	Community engagement, 19 (35); Department of Health elective opportunities, 6 (11); Injury prevention centers elective opportunities, 7 (13); Other, 5 (9); N/A, 26 (47)
Are there current efforts to expand the firearm injury prevention curriculum at your medical school?	55	Yes, 23 (42); No, 32 (58)

Abbreviations: N/A, not applicable.

^a This question was presented as a free-response text box (n = 45) where respondents could provide any applicable information. Responses were categorized and independently evaluated by three team members (CC, AL, MB), with conflicts resolved through discussion. Percentages are calculated based on the total number of respondents.

^b Respondents were instructed to select all applicable components.

risk factors and at-risk individuals (44%; [24/55]), epidemiology of firearm-related injury (42%; [23/55]), acute clinical management (35%; [19/55]), firearm policy education (25%; [14/56]), and pre-hospital care (20%; [11/55]). Pediatric rotations were the most common setting for FIP discussions, followed by surgery, emergency medicine, family medicine, and obstetrics/gynecology. Fifteen institutions (27%; [15/55]) reported formally assessing students on FIP-related content. The most commonly employed assessment methods were multiple-choice examinations, followed by in-class discussions, faculty evaluations, and Objective Structured Clinical Examinations (OSCEs) [Table 3].

Of those schools reporting perceived barriers to implementing a FIP curriculum, the most common response was lack of time alone (61%; [27/44]), followed by political/ideological challenges (14% [6/44]), and lack of expertise (9%; [4/44]). Extracurricular opportunities related to FIP were also reported. The most prevalent were community engagement (35%; [19/55]), followed by participation in injury prevention centers (13%; [7/55]), and collaboration with local health departments (11%; [6/55]). Twenty-three schools (42%; [23/55]) reported ongoing efforts in expanding or implementing FIP curricula at their institutions [Table 4].

DISCUSSION

Encouraging Trends in Firearm Injury Prevention Education Implementation

Most responding schools reported incorporating FIP content in our study, demonstrating substantial progress from earlier reports that suggested minimal integration of such prevention topics in medical education.^{10,11} Interestingly, even among the 15% of institutions that were “unsure” about having an FIP curriculum, their qualitative responses showed incorporation of FIP in their preclinical curricula and their clinical rotations, particularly in surgery, emergency medicine, family medicine, and pediatrics. Hence, our study demonstrates that FIP education appears to occur

organically in clinical settings without formalized curricula. Still, schools may benefit from comprehensively reviewing their clinical curricula to identify and formalize FIP content, ensuring consistent messaging and coverage of content throughout relevant clerkships. Encouragingly, almost half of the respondents reported ongoing efforts to expand or implement FIP curricula at their institutions.

Opportunities for Improvement

In our study, FIP was more likely to be integrated into the clinical curriculum rather than the preclinical period, although it was often taught in both. However, clinical rotations represent students’ first extensive patient encounters and carry additional cognitive demands for students.¹² During the clinical years, students have important roles in managing complex patient care and may have limited capacity to absorb new content on FIP. FIP training in preclinical years can build knowledge of epidemiology, risk factors, and evidence-based counseling approaches for FIP, helping students recognize teaching moments during clinical rotations. Medical schools should consider introducing FIP training earlier in the curriculum.

Pediatrics, emergency medicine, and surgery clerkships were the most common clerkships in which FIP was discussed in our study. While these specialties have frequent exposure to firearm injuries and represent important settings for FIP discussions, a lack of FIP discussions and integration in other clerkships poses a missed educational opportunity. For instance, primary care physicians are uniquely positioned to routinely conduct screening and counseling for firearm safety, given the frequency with which they see their patients and the fact that primary care physicians regularly screen for various hazards.¹³ Similarly, geriatricians routinely counsel elderly patients on driving safety, yet very few patients receive counseling on firearm safety, despite the increased risk for firearm-related suicides among patients with cognitive decline.¹⁴⁻¹⁶ Moreover, given well-established linkages between firearm access and suicide risk,

FIP education in psychiatry clerkships presents a valuable opportunity to learn more about identifying high-risk patients and counseling them accordingly.^{13,17}

Most schools did not formally incorporate FIP content or FIP-related assessments into their curricula. Although medical school assessments have well-documented issues, they remain important for student learning.¹⁸ Additionally, lacking assessments may inadvertently communicate to students that FIP knowledge is less important or clinically relevant than other topics that are regularly tested in medical school.

Similar to a 2020 LCME survey, our study finds that examination was also the most common method for assessing FIP knowledge.¹⁰ The reliance on multiple-choice questions for assessing FIP knowledge may inadequately capture the complex communication and counseling skills required for effective patient interactions. FIP discussions often involve sensitive topics that require cultural competencies, empathy, and navigation of patient resistance. These skills may be better evaluated through OSCEs or observed clinical interactions rather than written examinations.

Implementation Barriers

Most medical school leaders reported that time constraints were a major barrier to implementing FIP education, likely reflecting curricular overcrowding in medical education.^{19,20} However, FIP content does not need to displace existing didactics; rather, FIP content could be integrated into existing courses on epidemiology, public health, preclinical courses that teach medical history taking, and clinical clerkships. Additionally, our study shows that many medical schools integrate FIP content through community engagement programs. Extracurricular approaches may help supplement the formal curriculum without competing for valuable classroom time. Community-based FIP education provides an opportunity to explore community perspectives and may help improve clinical practice and community-level health literacy.²¹

Another common barrier was the presence of political/ideological challenges. In many states, physicians are discouraged from asking patients about firearms.³ Medical schools could frame FIP education in terms of objective scientific data and from a patient safety perspective,²² similar to how medical education has historically addressed other sensitive topics.

Limitations and Future Directions

This study had several limitations. Our response rate of 27% is lower than that of previous institution-based surveys in medical education—a source of potential nonresponse bias.²³ Some medical schools (e.g., in states with greater political barriers, with less robust FIP curricula) may have been less likely to respond. Thus, the results of this study may overstate the prevalence of FIP in US medical schools. All data

were self-reported; we could not verify reported curricula or implementation quality due to respondent anonymity. Our study was subject to all other limitations of survey research, including potential bias due to wording or phrasing. Additionally, we sought a single response per institution, we could not compare responses between multiple respondents from the same medical school. Because curricular documents are not uniformly publicly available and responses were anonymous, we could not independently verify reported FIP content, curricular timing, or assessment practices. Therefore, our findings should be interpreted as self-reported institutional practices among responding schools rather than externally audited measures of curriculum implementation or quality. Lastly, we did not assess the quantitative dose or intensity of FIP instruction, including contact hours, number of sessions, frequency of instruction, longitudinal reinforcement, or supervised practice opportunities. As a result, schools reporting the same instructional modality may have delivered substantially different levels of training. For example, “lecture” could range from a brief mention within another session to a dedicated required didactic, and “small group” could reflect either limited discussion or structured skills-based practice. Future surveys should collect more granular information on curricular dose and should examine whether instructional intensity or skills-based modalities are associated with learner outcomes. Broadly, large-scale, comparative studies to evaluate the effectiveness of FIP curricula across medical schools, establish standardized guidelines for content and assessment, and investigate the impact of FIP education on patient outcomes are also needed.

CONCLUSION

In this national survey of 55 medical school leaders, we found encouraging signs of progress in FIP education in US medical schools. As of 2025, most responding medical schools reported incorporating FIP content into their curricula. However, significant opportunities still exist for optimization of curriculum timing, specialty distribution, and assessment strategies. The main barriers to implementation that were routinely cited included time constraints and political/ideological sensitivities. Addressing identified barriers may help promote more consistent and comprehensive implementation of firearm injury prevention education across undergraduate medical curricula.

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Despite High Hepatitis C Virus Testing, Treatment Gaps Remain: A Study Among Syringe Services Program Participants in Massachusetts

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ABSTRACT

BACKGROUND: People who inject drugs are less likely to initiate hepatitis C virus (HCV) treatment, and less likely to achieve sustained virologic response if they do start, than the general population. The objective of this analysis was to examine whether healthcare experiences were associated with HCV testing and treatment outcomes among people who inject drugs in Massachusetts.

METHODS: We analyzed baseline data from an HIV prevention study, which enrolled participants from two Massachusetts syringe service programs from 2020 to 2025. We assessed lifetime HCV testing and treatment outcomes, sociodemographics, substance use behaviors, and healthcare experiences (e.g., comfort with providers) and calculated bivariate associations.

RESULTS: Among 185 participants (median age of 40, 43% cisgender women), 97% had ever been tested for HCV; 71% of those tested had ever received a positive test result. However, among those who tested positive, only 41% initiated treatment. Most participants reported comfort discussing their injection drug use with a provider (79%) and feeling welcome in medical clinics (75%). Cisgender men and those feeling welcome in medical clinics reported higher proportions of treatment initiation compared to their counterparts (both $p < 0.05$).

CONCLUSIONS: Despite pervasive testing and high treatment completion rates, treatment initiation remains suboptimal. Feeling welcome in medical clinics may be an important, modifiable indicator of HCV treatment engagement. The gap between HCV testing and treatment initiation persists. Understanding factors that shape HCV testing and treatment engagement can generate actionable insights for ongoing elimination efforts in New England.

KEYWORDS: Hepatitis C; injection drug use; homelessness; needle-exchange programs; community health

INTRODUCTION

Of the approximately 2.2 million people who inject drugs (PWID) in the United States (US), 40% are estimated to be living with the hepatitis C virus (HCV).¹ With short, highly effective (i.e., 95% cure), well-tolerated,² and cost-effective³ direct-acting antiviral (DAA) regimens, HCV is curable.^{4,5} However, despite the widespread availability of DAAs, treatment engagement is suboptimal: only about 20% of Medicaid enrollees initiate treatment within six months of diagnosis,⁶ and PWID are even less likely to initiate treatment.⁶

Massachusetts has a well-established system of HCV testing, surveillance,⁷ and pathways to community-based care, while sharing similar harm reduction infrastructure (e.g., availability of naloxone and safe supplies through community-based settings), overlapping drug use patterns (e.g., decreasing injection drug use), and a public health insurance landscape (e.g., expanded access to Medicaid) with Rhode Island. It is well understood that there are overlapping networks of PWID across New England, shown by prior work on sexual mobility and substance use as well as HCV genomic clusters.^{8,9}

Prior work with PWID within and beyond New England highlights the significance of trusting provider relationships and the detrimental impacts of stigma on HCV outcomes, including HCV treatment initiation and retention in care, leading to cure.^{10–12} Understanding the factors that shape HCV testing and treatment engagement among PWID in Massachusetts can therefore generate actionable insights for Rhode Island's ongoing elimination efforts.¹³

Our objective was to examine whether participant-reported healthcare experiences (e.g., comfort with providers, feeling welcome in medical settings) were associated with HCV testing and treatment outcomes among PWID in Massachusetts, with the aim of informing evidence-based strategies relevant to New England.

MATERIALS & METHODS

Study Design

"PrEP for Health" is a randomized controlled trial (NCT 04430257) focused on improving HIV pre-exposure prophylaxis uptake and retention among PWID recruited from two syringe service programs (SSPs) in Massachusetts between 2020 and 2025.¹⁴ Eligibility included age ≥ 18 years,

past-month injection drug use, and HIV-negative status. The Institutional Review Board at Fenway Health approved all study protocols, and each participant provided written informed consent.

Data Collection

Baseline surveys assessed HCV testing and treatment experiences (e.g., lifetime testing, receipt of positive test from a clinical provider, treatment initiation, treatment completion), sociodemographics (e.g., age, gender identity), substance use patterns (e.g., substances used in the past month, frequency of injection in the past month, drug-related overdose in the past three months), healthcare access and utilization (e.g., recent injection-associated infection, past-year HIV testing), and healthcare experiences (e.g., comfort with providers, feeling welcome in medical settings). Additional measure details are outlined in the Supplementary Materials. [Editor's note: Email the corresponding author for all supplementary material and tables.]

Analysis

We stratified variables by HCV testing and treatment experiences, and calculated medians and interquartile ranges for continuous variables and frequencies and row percentages for categorical variables (column percentages are shown in **Supplementary Table 1**). We report proportions and *p*-values from Chi-square tests for categorical variables with cell sizes ≥ 5 , Fisher's exact test for categorical variables with cell sizes < 5 , or Wilcoxon Rank Sum test for continuous variables. Bolded text indicates that a finding was statistically significant; **Supplemental Table 2** outlines the type of test and corresponding *p*-value for each statistical test.

RESULTS

Overall Sample

Among 185 participants, the median age was 40 years, 69% identified as non-Hispanic White, 55% as cisgender men, and 90% reported past-month homelessness or unstable housing [Table 1, Table 2]. Ninety percent of participants reported past-month homelessness or unstable housing, and over one-quarter (26%) had experienced a drug-related overdose in the past three months. Most people reported having a healthcare provider with whom they felt comfortable discussing their injection drug use (79%) and feeling welcome in medical clinics (75%).

HCV Testing & Treatment

Of the 179 (97%) participants who had ever been tested for HCV, 71% ($n=127$) had ever received a positive HCV test result. Among participants who had ever received a positive test ($n=127$), only 41% ($n=52$) had ever initiated treatment, and 32% had ever completed treatment ($n=41$). Among participants who had ever initiated treatment, 79% ($n=41$) reported completing treatment [Figure 1].

Table 1. Sociodemographics and other key variables of interest among a cohort of 185 people who use drugs in Massachusetts, across self-reported prior HCV testing and receipt of positive result. Row percentages are shown below; bolded values indicate statistical significance of $p < 0.05$.

	Overall, N=185	Tested, n=179 (97%)	Received positive result, n=127 (71%)
Age (years), median (IQR)	40 (34, 47)	40 (35, 47)	40 (36, 47)
Gender identity ^a			
Cisgender man	102 (55.1)	98 (96.1)	71 (72.5)
Cisgender woman	79 (42.7)	77 (97.5)	53 (68.8)
Non-binary or transgender	4 (2.2)	4 (100.0)	3 (75.0)
Race/ethnicity ^b			
White and non-Hispanic	128 (69.2)	125 (97.7)	95 (76.0)
Other race(s) and/or Hispanic of any race	57 (30.8)	54 (94.7)	32 (59.3)
Level of education			
Some high school	40 (21.6)	36 (90.0)	28 (77.8)
High school or GED	73 (39.5)	72 (98.6)	51 (70.8)
At least some college	72 (38.9)	71 (98.6)	48 (67.6)
Location of recruitment			
Cambridge	137 (74.1)	132 (96.4)	99 (75.0)
Lawrence	48 (26.0)	47 (97.9)	28 (59.6)
Homeless/unstably housed, past month ^c	167 (90.3)	161 (96.4)	113 (70.2)
Incarcerated, past three months ^d	25 (13.5)	23 (92.0)	17 (73.9)
Substances used, past month			
Opioids ^e	173 (93.5)	167 (96.5)	119 (71.3)
Stimulants ^f	175 (94.6)	169 (96.6)	121 (71.6)
Downers or sedatives ^g	130 (70.3)	127 (97.7)	94 (74.0)
Frequency of injection, past month			
One day a week or less	34 (18.5)	30 (88.2)	19 (63.3)
2 or more times per week	150 (81.5)	148 (98.7)	108 (73.0)
Overdose, past three months	49 (26.5)	48 (98.0)	36 (75.0)
STI testing, past three months	102 (55.1)	102 (100.0)	72 (70.6)
Comfort with provider			
Yes	146 (78.9)	144 (98.6)	100 (69.4)
No	39 (21.1)	35 (89.7)	27 (77.1)
Felt welcome in medical clinics ^h			
Yes	139 (75.1)	133 (95.7)	97 (72.9)
No	46 (24.9)	46 (100.0)	30 (65.2)

Footnotes: Please refer to the Supplementary Materials.

Table 2. Sociodemographics and other key variables of interest among a cohort of 185 people who use drugs in Massachusetts, across self-reported prior HCV treatment (tx) initiation and completion. Row percentages are shown below; bolded values indicate statistical significance of $p < 0.05$.

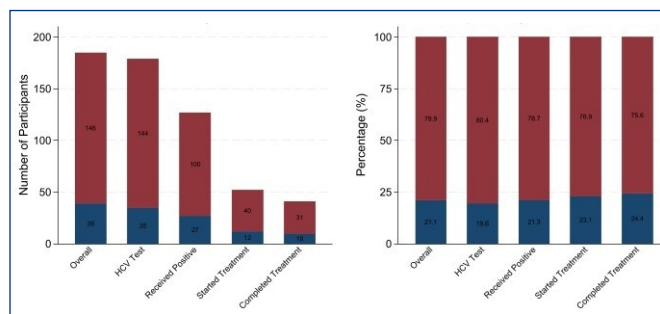
	Overall, N=185 (100%)	Initiated tx, n=52 (41%)	Completed tx, n=41 (79%)
Age (years), median (IQR)	40 (34, 47)	45 (37, 50)	46 (39, 51)
Gender identity ^a			
Cisgender man	102 (55.1)	37 (52.1)	28 (75.7)
Cisgender woman	79 (42.7)	13 (24.5)	12 (92.3)
Non-binary or transgender	4 (2.2)	2 (66.7)	1 (50.0)
Race/ethnicity ^b			
White and non-Hispanic	128 (69.2)	40 (42.1)	32 (80.0)
Other race(s) and/or Hispanic of any race	57 (30.8)	12 (37.5)	9 (75.0)
Level of education			
Some high school	40 (21.6)	10 (35.7)	9 (90.0)
High school or GED	73 (39.5)	21 (41.2)	15 (71.4)
At least some college	72 (38.9)	21 (43.8)	17 (81.0)
Location of recruitment			
Cambridge	137 (74.1)	44 (44.4)	34 (77.3)
Lawrence	48 (26.0)	8 (28.6)	7 (87.5)
Homeless or unstably housed, past month ^c	167 (90.3)	45 (39.8)	35 (77.8)
Incarcerated, past three months ^d	25 (13.5)	7 (41.2)	7 (100.0)
Substances used, past month			
Opioids ^e	173 (93.5)	47 (39.5)	37 (78.7)
Stimulants ^f	175 (94.6)	47 (38.8)	37 (78.7)
Frequency of injection, past month			
One day a week or less	34 (18.5)	8 (42.1)	6 (75.0)
2 or more times per week	150 (81.5)	44 (40.7)	35 (80.0)
Overdose, past three months	49 (26.5)	15 (41.7)	12 (80.0)
STI testing, past three months	102 (55.1)	31 (43.1)	24 (77.4)
Comfort with provider			
Yes	146 (78.9)	40 (40.0)	31 (77.5)
No	39 (21.1)	12 (44.4)	10 (83.3)
Felt welcome in medical clinics ^g			
Yes	139 (75.1)	45 (46.4)	36 (80.0)
No	46 (24.9)	7 (23.3)	5 (71.4)

Footnotes: Please refer to the Supplementary Materials.

Figure 1. HCV Testing and Treatment Cascade

[A] Absolute counts by trusted healthcare provider

[B] Proportions by trusted healthcare provider

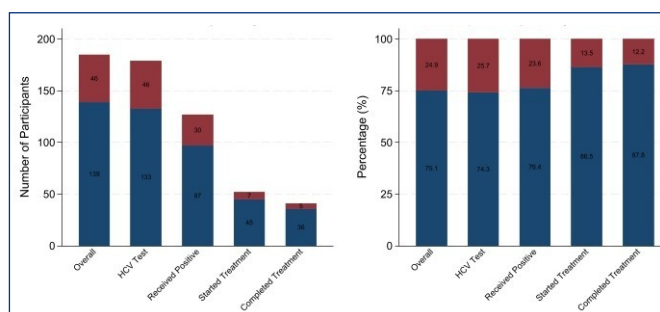


Dark blue: No trusted provider; Maroon: Trusted provider

Note: Bars stratified by trusted healthcare provider status

[C] Absolute counts by feeling welcome

[D] Proportions by feeling welcome



Dark blue: Felt welcome or neutral; Maroon: Did not feel welcome

Note: Bars stratified by report of feeling welcome in medical offices/clinics, in general

Sociodemographics

Cisgender women reported lower proportions of ever initiating treatment (25%, compared to 52% of cisgender men; $p < 0.01$). However, among women who had initiated treatment, 92% reported finishing treatment (compared to 76% of cisgender men; $p = 0.26$). Testing patterns did not differ by race/ethnicity; however, participants of a race(s) other than White and/or Hispanic received a positive test result less frequently (59%, compared to 76% of non-Hispanic and White counterparts; $p = 0.03$).

Substance Use Patterns

Participants who reported injecting drugs once a week or less reported less HCV testing (88%, compared to 99% among those who reported injecting ≥ 2 times per week; $p < 0.01$) and less receipt of positive test results (63%, compared to 73% of participants who reported injecting more often; not statistically significant with $p = 0.29$), yet they reported similar proportions of treatment initiation and completion.

Access & Utilization of the Healthcare System

Participants who had received treatment for an injection-associated infection (e.g., abscesses, endocarditis; $n = 51$) in

the past year exhibited a higher proportion of positive test results (80%) than the overall sample (71%), although this difference was not statistically significant ($p=0.10$).

Healthcare Experiences

Ninety-nine percent of participants who had a provider with whom they were comfortable discussing their injection drug use had ever been tested, compared to 90% of those who did not ($p<0.01$). Among participants who felt welcome in medical clinics ($n=139$), 133 (96%) reported ever being tested for HCV, and 41% had ever initiated treatment (compared to only 23% among those who did not feel welcome; $p=0.03$). Overall, 61% percent ($n=112$) of participants reported both positive healthcare experiences (e.g., having a provider, feeling welcome), whereas 6% ($n=12$) reported both negative experiences [Supplemental Table 3].

DISCUSSION

Among SSP-recruited participants in Massachusetts, lifetime HCV testing was nearly universal (97%), and most (71%) had ever received a positive test result. However, less than half (41%) of participants with a positive test result had ever initiated HCV treatment. Although more favorable than national trends,⁶ our observed gap between testing and treatment is concerning, given Massachusetts's longstanding infrastructure supporting community-based pathways to HCV care. While high testing rates may reflect how effectively SSPs and other community-based organizations are supporting this vulnerable population in accessing testing, the comparatively lower levels of treatment initiation highlight a critical area for improvement. This observed gap is significant across New England, where HCV elimination efforts are ongoing. We also found that, following HCV treatment initiation, most people complete treatment, underscoring the success of community-situated treatment pathways.

Notably, we observed signals that patient-reported healthcare experiences may impact some HCV treatment outcomes. Feeling welcome in medical clinics emerged as a potential indicator of treatment engagement and a modifiable lever for improving treatment uptake. Three-quarters of participants reported having a provider with whom they felt comfortable discussing their injection drug use with; unfortunately, this may not be easily replicated in jurisdictions with less robust harm reduction and public health infrastructure. Rhode Island's existing network of SSPs and its state-level commitment to harm reduction position it favorably to build on this model, though intentional investment in provider training and in fostering welcoming environments will likely be necessary to achieve this at scale, and could be more challenging in larger settings such as hospitals.

Some sociodemographic differences warrant acknowledgment, though our descriptive and exploratory focus limits extrapolation. Cisgender women reported lower treatment initiation (25%) but higher completion rates (92% among those who initiated), suggesting a need for low-threshold and gender-responsive models to improve treatment uptake in specific settings (e.g., detox facilities, homeless shelters). Participants identifying as race(s) other than White and/or Hispanic received positive test results less frequently; we cannot determine whether this reflects true differences in prevalence or differences in the disclosure of positive results. These patterns may support future lines of research to improve HCV care delivery and retention.

Although these data were collected from PWID in Massachusetts, they are relevant for policymakers and public health practitioners in Rhode Island. Estimates suggest that Rhode Island has the highest rate of HCV infection in New England (1,190 people/100k), surpassing Connecticut (650 people/100k) and Massachusetts (710 people/100k).^{15,16} Recognizing this, Rhode Island published an HCV elimination strategy for 2023, naming HCV as a public health priority and emphasizing robust reporting, opt-out testing, increased access, and community partnerships as central pillars of the plan.¹³ Alongside this strategy, HCV became a reportable disease in 2021.^{17,18} Despite this progress, the elevated burden of HCV in Rhode Island relative to its neighbors underscores that substantial work remains.

This study has limitations. Temporal misalignment between current participant-reported healthcare experiences and historic treatment episodes precludes causal inference. Our survey lacked important details about test results and treatment indications; for example, "receipt of a positive test" could mean a positive antibody test (without a treatment recommendation) or a viral test (with or without a treatment recommendation). Without this information, our results may be overestimating the treatment gap, since some people who received a positive test were not actually indicated to start HCV treatment. Additionally, our sample consisted of people already connected to SSPs (at least at baseline assessment), perhaps representing a population already engaged in harm reduction and broader healthcare services, which may limit generalizability. However, we think Rhode Island's robust harm reduction infrastructure,^{19,20} well-established HCV elimination strategy,¹³ and overlapping networks of PWID^{8,9} suggest that the results of our study are applicable to PWID in Rhode Island.

Among this sample of SSP-recruited PWID, lifetime HCV testing was nearly universal, but fewer than half reported ever initiating treatment. Feeling welcome in medical clinics, as one indicator of patients' healthcare experience, may represent an important and modifiable signal of HCV treatment engagement.

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Health, Justice, and Community: Findings from Rhode Island's Health and Justice Research Symposium

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ABSTRACT

On April 17, 2026, the Center for Health and Justice Transformation (CHJT) convened the Rhode Island Health and Justice Research Symposium at Brown University. The event united researchers, clinicians, community advocates, policymakers, and people with lived experience of the criminal legal system to share findings, build connections, and identify shared priorities. This article synthesizes the proceedings of the symposium along five themes: Evidence-Based Interventions, Pressing Tensions, Existing Barriers, Open Questions, and Shared Vision. Across all five, a single thread recurred: Rhode Island's position as a national innovator in carceral health rests not on the agility afforded by its comparatively small size, but on its collaborative relationships and institutional capacity.

KEYWORDS: carceral health; criminal legal; health equity; lived experience; juvenile legal; overdose prevention

BACKGROUND

The United States (US) incarcerates the greatest number of people of any nation globally.¹ This carceral system inflicts disproportionate harm on communities already burdened by poverty, structural racism, and inadequate access to healthcare.^{1,2} Yet within this landscape, Rhode Island (RI) has emerged as a national example for carceral health innovation. RI was the first state to implement a system-wide, comprehensive medication for opioid use disorder (MOUD) program spanning all formulations,³ and the first to officially authorize overdose prevention centers (OPCs)⁴ as a public health intervention that affords people the opportunity to more safely consume drugs without risk of arrest.

On April 17, 2026, the Center for Health and Justice Transformation convened the RI Health and Justice Research Symposium, co-sponsored by the Brown University School of Public Health's Center for Advancing Health Policy Research, its Center for Alcohol and Addiction Studies, and Rhode Island Hospital's COBRE on Opioids and Overdose. The symposium had three goals: to share emerging findings from RI's criminal justice and health research ecosystem; build connections across disciplines, institutions, and sectors; and identify shared priorities for research and policy.

After a welcome from the Director of the Center for Health and Justice Transformation, Dr. Justin Berk, the keynote address was delivered by the Dean of the Brown University School of Public Health, Dr. Francesca Beaudoin, who framed RI's achievements as evidence that cross-disciplinary effort can transform care for incarcerated and justice-involved people. Three panels followed, covering reentry, arrest and pre-trial justice, and juvenile justice, alongside 10 research speed talks presenting findings from ongoing and completed studies based at Brown University and Brown University Health. Closing remarks were delivered by the US Representative for Rhode Island, Gabe Amo, alongside a plenary discussion led by the Associate Director of Behavioral and Social Sciences at the Brown University School of Public Health, Dr. Brendan Saloner.

Rhode Island's successes are often attributed to its small size, which eases coordination across agencies and provides the agility to rapidly implement statewide initiatives with widespread adoption and penetration. This article instead locates the state's success in its collaborative focus and institutional capacity. The symposium's contributions span five areas: Evidence-Based Interventions, Existing Barriers, Pressing Tensions, Open Questions, and A Shared Vision.

1) EVIDENCE-BASED INTERVENTIONS (EBIS)

Across the symposium, Brown-affiliated researchers presented evidence in support of specific interventions that improve health for justice-involved people across the criminal legal spectrum.

EBI #1: Medication for Opioid Use Disorder (MOUD) in Carceral Settings

In 2017, RI was the first state to implement a system-wide, comprehensive MOUD program in corrections,³ an intervention that led to significant declines in fatal overdose among people with opioid use disorder.⁵ Dr. Josiah "Jody" Rich characterized continuity of addiction treatment at release as a critical clinical transition point: the period immediately following release represents the period of highest overdose mortality risk for people who were receiving MOUD in custody.⁶⁻⁹ This risk is largely preventable when continuity of care is maintained, and mortality is elevated when it is not.^{10,11} Brown researchers have demonstrated a significant

reduction in post-incarceration fatal overdoses following implementation of Rhode Island's statewide jail and prison MOUD program,^{5,12} a replicable model since adopted across the US. Future research can optimize the outcomes of this initiative by determining how to most effectively link people released from incarceration with continuity of care, including studying which formulations of MOUD are most likely to retain recently-released patients in treatment (e.g., extended-release injectable buprenorphine).¹³⁻¹⁵

EBI #2: Overdose Prevention Centers (OPCs)

RI became the first state to legally authorize OPCs, which are spaces where people who use drugs may bring pre-obtained substances to use under trained staff supervision. OPCs are an internationally recognized public health intervention to reduce overdose,^{16,17} build trust,¹⁸ and provide linkages to services and other forms of harm reduction.¹⁹ In January 2025, Project Weber/RENEW began operating the first state-authorized OPC in the country. The Director of Strategy at Project Weber/RENEW, Annajane Yolken, MPH, presented operational data: in approximately 14 months of operation, the OPC recorded 10,071 visits from 819 unique participants, managed 105 overdoses with only two EMS calls for service, and found that 78% of participants would have consumed their drugs alone without access to the site. Notably, 87% of participants were unhoused, underscoring the OPC's role as a point of contact for people largely disconnected from formal health systems, and who would be at elevated risk of arrest as people who use drugs in more exposed, public places, and therefore engaging in riskier and more rushed consumption. This work is being evaluated by researchers at the Brown School of Public Health, led by Dr. Brandon Marshall, through the NIDA-funded SAFER program.²⁰ Additionally, Dr. Brandon del Pozo contributed evidence that New York City's OPCs produced no increase in crime or disorder in surrounding neighborhoods following OPC opening,²¹ and he has made the case that careful site selection in RI contributed to the program's acceptability and success.²² Additional evidence on OPCs is compiled at OPCinfo.org.

EBI #3: Transitions Clinic: Community Health Workers (CHWs) as the Care Model

The RIH Transitions Clinic model pairs formerly incarcerated CHWs with patients recently released from correctional facilities, providing primary care, care coordination, and navigation during the highest-risk window following release. RI's Transitions Clinic has demonstrated the model's local feasibility, while nationally, these models are associated with a 51% reduction in emergency department utilization, a 50% reduction in preventable hospitalizations, hospital stays shortened by nearly a full day, and 25 fewer incarceration days from parole violations in the first year; each dollar invested yields \$2.55 in reduced criminal justice system costs.²³⁻²⁶

EBI #4: Safety Planning to Reduce Suicide Risk at Reentry

National data show that approximately one in five adult suicides occur among individuals recently released from jail.²⁷ Dr. Lauren Weinstock presented findings from her SPIRIT Trial,²⁸ a randomized trial of a Safety Planning Intervention across jail facilities at the Rhode Island Dept. of Corrections (RIDOC) and the Genesee County Jail in Flint, MI. A randomized controlled trial of the intervention found that safety planning reduced subsequent post-release suicide attempts by 55%.²⁹ The intervention is brief, scalable, and well-suited to rapid implementation.

She Thrives: Interdisciplinary Innovation for Justice-Involved Women

Through a collaboration between the People, Place & Health Collective at the Brown University School of Public Health and community-based organization OpenDoors, "She Thrives" is a program that administers GLP-1 agonists as off-label treatment for substance use disorder in justice-involved women. Jacqueline Goldman, MSc, presented early data from 13 participants showing 77% adherence to GLP-1 treatment at eight months, with evidence of reductions in substance use and improvements in housing stability. The program received national media attention, including coverage in *The New York Times*.³⁰ Women's incarceration has grown at twice the rate of men's, yet women remain dramatically underrepresented in correctional health research, a gap this work begins to address.

Therapeutic Interventions Behind the Walls: A Yoga Randomized Controlled Trial

Dr. Lisa Uebelacker presented findings from a yoga pilot at RIDOC, offering evidence that therapeutic interventions delivered inside correctional facilities can produce durable behavioral health benefits that extend beyond the walls.³¹ In the 10-week trial, 40 participants reported using breathing and self-regulation techniques both during sessions and in the facility itself, with high satisfaction and decreased depression and anxiety symptoms, and several reported "staying out of seg" (i.e., avoiding disciplinary segregation) through mindfulness skills acquired in yoga.

Decarceration as Public Health: The Rhode Island Training School

At the national level, some of the most robust evidence for decarceration in the field focuses on youth detention. Brown Economist Dr. Anna Aizer's causal analysis of juvenile justice outcomes drew national attention, including a recent feature on *The New York Times Daily* podcast.³² Using a natural experiment of random assignment to different judges, Dr. Aizer isolated the causal effect of detention on life-course outcomes. Incarceration was associated with long-term harms: fewer than 1% graduated high school

by age 19, and 44% were incarcerated by age 25.³³ Judicial detention decisions about juveniles can shape education, employment, health, and future legal-system involvement well into adulthood.

Against that backdrop, the Rhode Island Training School (RITS) offers a case study in decarceration as a public health intervention. The reduction in the RITS population over recent decades has been accompanied by investments in therapeutic programming, educational continuity, and mental health services. Dr. Elizabeth Lowenhaupt, medical and psychiatric director of RITS and past board president of the National Commission on Correctional Health Care, has helped set national standards for the health care of incarcerated youth, linking local practice to national standard-setting in ways that give RI's reforms broader significance.

Across this work, RI's progress was attributed to a collaborative, interconnected network of institutions and community organizations [Table 1].

Table 1. Select institutions and community organizations in Rhode Island's health and justice ecosystem.

Resource	Description
Center for Health and Justice Transformation (CHJT)	Symposium convener; hub linking research, clinical services, and community partnerships.
Collaborative Justice-Involved Research and Training (CJRT) Program	NIDA-funded program training investigators in HIV, substance use, and health equity for justice-involved populations.
Rhode Island Department of Corrections (RIDOC)	Site of the statewide MOUD program; longstanding partner in correctional health research.
Brown University	Research infrastructure supporting this work, including CAHPR and CAAS.
Project Weber/RENEW	Operates the first state-authorized OPC in the country; largest harm reduction organization in the state.
Rhode Island Freedom Collective	Grassroots organization of people with lived experience; provides Welcome Back Packs and peer support at release.
OpenDoors	Reentry support provider for formerly incarcerated Rhode Islanders; community partner in the She Thrives program.
Rhode Island Hospital Transitions Clinic	Community health worker-centered reentry model connecting released individuals to health and social services.
Justice Assistance	Nonprofit providing community-based supervision, diversion, and reentry services.
Committee on Racial and Ethnic Fairness in the Courts	Rhode Island Judiciary body working to identify and reduce racial and ethnic disparities in the courts.
Diversion Court	Rhode Island's drug diversion and recovery court; active 20 years, routing individuals with substance use disorders toward treatment rather than incarceration.

Abbreviations: CAAS = Center for Alcohol and Addiction Studies; CAHPR = Center for Advancing Health Policy Research; MOUD = medication for opioid use disorder; NIDA = National Institute on Drug Abuse; OPC = overdose prevention center.

2) EXISTING BARRIERS

Several concrete but addressable barriers were discussed.

Nursing Home Discrimination and Compassionate Release

A statewide “secret shopper” study of all 74 licensed Rhode Island nursing homes examined availability for individuals granted parole through compassionate release. The study found that facilities were 3.41 times more likely to reject admission for an incarcerated patient. After disclosure of a serious-offense history, facilities were 11.39 times more likely to reject, rendering approximately 90% of Rhode Island nursing homes effectively unavailable to this population.³⁴ As presenter Dr. Michelle Suh noted: “People will remain incarcerated because no nursing home will take them.” This problem is not unique to RI: individuals 55 and older are the fastest-growing segment of the incarcerated population (a 400% increase from 1993 to 2013),^{35,36} carrying healthcare costs roughly three times higher than younger incarcerated persons.³⁷

Telephone and Connectivity Access at Release

The reentry panel of the symposium identified guaranteed access to a working cell phone and data plan as a critical necessity at time of release. Without it, individuals cannot contact family, navigate service systems, access benefits, reach healthcare providers, or apply for employment, and even well-designed clinical interventions become very difficult or impossible to utilize.

Juvenile Detention Policies

RI has not established a minimum age for juvenile incarceration, meaning children of any age can be held in a detention facility; approximately 30 other states, including Texas, have established minimum ages.³⁸ A related structural barrier is that incarceration is sometimes the only available pathway to treatment, mental health services, or stable housing for justice-involved youth with serious behavioral health needs, a failure of the surrounding system that is taken up as a distinct ethical tension below.

3) PRESSING TENSIONS

Beyond discrete barriers, the symposium surfaced tensions that the field will have to confront directly.

Officer Awareness of Drug-Seizure Harms Versus the Mandate to Enforce

Dr. Brandon del Pozo presented findings on the consequences of drug seizures: arresting indi-

viduals for drug sales ultimately increased overdose and harm rather than reducing it. His Police Opioid Seizure Temporal Risk (POSTeR) model demonstrated that seizures biologically and behaviorally increase exposure to fatal overdose,³⁹ a finding quantitatively demonstrated in a related study using data from Indianapolis.⁴⁰ Officers interviewed in RI acknowledged that seizures likely increased overdose risk, and understood the reasons why, but felt institutionally compelled to respond to community frustration with visible drug use, illuminating the gap between individual awareness and systemic behavior and the need for diversion pathways that give officers genuine alternatives to arrest.⁴¹ Dr. Del Pozo characterized policing as a structural determinant of health, with direct implications for law enforcement reform.⁴²

Incarceration as De Facto Treatment for Youth

Panelists confronted the problem that incarceration is sometimes the only available pathway to treatment, mental health services, or stable housing for justice-involved youth. When carceral settings become the primary point of access to these supports, panelists argued, the policy response must be to fund community alternatives, not to accept detention as a de facto treatment pathway, or as one of the unintended benefits of incarceration.

The Risk of People With Lived Experience (PWLE) Tokenism

The commitment to including PWLE carries its own tension: even if properly motivated, inclusion can amount to tokenism, or participation that is symbolic rather than meaningful and well-integrated, or sought for the appearance of legitimacy rather than to solicit and incorporate the expertise it represents.⁴³ The challenge is to distinguish genuine integration, in which PWLE shape research questions, program design, and advocacy priorities, from participation that leaves existing power and research and practice hierarchies untouched.

4) OPEN QUESTIONS

Alongside this evidence, the symposium surfaced questions in the field that require careful deliberation. Three stood out.

Q1: How Can Decision-makers Best Incorporate Meaningful Partnership With PWLE in Program Initiatives?

Across every session, presenters and panelists stressed that academic expertise alone is insufficient to fully understand or effectively address the health harms of incarceration. PWLE hold knowledge that cannot be generated in a laboratory or extracted from administrative data.

Kyle Campbell of the RI Freedom Collective illustrated the value of lived expertise through the “parking lot problem:” the cascade of logistical and emotional demands a

recently released person faces the moment they step out of a facility and into the parking lot. In the critical first 72 hours following release, individuals face a cascade of logistical and emotional demands with little institutional support.⁴⁴ Campbell described the life-skills gaps that incarceration creates or exacerbates (e.g., how to use a smartphone or otherwise utilize emerging technologies, navigate a mental health system, find housing, prepare for a job interview). He stressed how people leaving incarceration often carry a diminished sense of self-worth, i.e., self-stigma, and how essential it is to affirm that they are deserving of support, dignity, and care.⁴⁵ What remains unresolved is how to move from well-intentioned inclusion to genuine structural integration—that is, how to build PWLE expertise into the design of research and programs from the outset, rather than incorporating it after key decisions have already been made.

Q2: How Can Interdisciplinary Work Be Leveraged to Make Positive Change?

A recurring insight was that the criminal legal system, and its health consequences, cannot be understood or addressed through any single disciplinary lens. Education, economics, policing, judicial decision-making, housing policy, and public health were all discussed as foundational challenges that affect health outcomes well before and after incarceration itself. From the Watson School, Dr. Benjamin Buka and Dr. Chloe Haimson presented research on “sundown towns:” communities with a demonstrated history of racial exclusion predict modern prison-town status at 1.5–2x odds ratios, arguing that the geography of incarceration is itself a product of structural racism. The open question is how to facilitate genuine collaboration across disciplines so that their distinct bodies of knowledge inform one another to create deep, contextualized knowledge.

Q3: How Can Evidence-Based Interventions Be Scaled and Sustained?

The field has strong evidence that certain interventions work, but limited understanding of how to implement them at scale and sustain them. Sustainability questions sit within a broader pattern documented across carceral health. While an estimated 17 years elapse before research evidence reaches routine clinical practice in the community, adoption in jails and prisons is slower still, a delay authors have previously termed the “prison implementation penalty.”⁴⁶

Implementation science offers a structured response, using established frameworks to identify contextual barriers, match strategies to them, and measure outcomes such as fidelity, acceptability, and reach. RI’s progress illustrates that the penalty is not fixed: the interventions described above advanced not because the barriers were absent but because coalitions, funding pathways, and sustained evaluation were brought to bear against them. In this way, RI can be viewed as the preliminary grounds for initiatives that can be implemented and scaled in larger state settings.

5) A SHARED VISION

The symposium's closing plenary, with remarks from US Representative Gabe Amo and discussion led by Dr. Brendan Saloner, crystallized a shared agenda for the future.

Broader Collaboration and Coalitions

No single discipline, institution, or intervention is sufficient. The expansive, cross-cutting nature of the criminal legal system demands cross-cutting responses across its intercepts, with community-engaged work at every stage: pre-arrest diversion, pretrial, during incarceration, upon release, and during community supervision. Building and sustaining connections across disciplines, institutions, and sectors is itself a core part of the work.

Rhode Island As a Replicable Model Built on Collaboration

Rhode Island's concentration of research expertise, strong community partnerships, justice-focused training pipeline through CJRT, and sustained relationships among academic institutions, RIDOC, and state agencies have created a durable ecosystem for advancing health in justice settings. The symposium demonstrated that rigorous, community-engaged, policy-relevant research is not only feasible in justice-involved settings, but can directly inform practice and systems change.

Rhode Island's small size may facilitate coordination, but size alone does not explain its success. The essential ingredient is sustained institutional collaboration: shared priorities, trusted relationships, meaningful involvement of people with lived experience, and infrastructure that connects research to policy and implementation. These conditions are not unique to Rhode Island; they can be intentionally cultivated elsewhere. Rhode Island, therefore, offers more than a collection of successful initiatives; it provides a replicable model for building the partnerships and capacity needed to improve health, advance equity, and transform systems of care for people affected by the criminal legal system.

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Epidemiology of Table Tennis-Related Injuries Presenting to Emergency Departments in the United States, 2005–2024: A NEISS Database Analysis

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INTRODUCTION

With a global following estimated at 300–350 million active players and nearly 850 million fans, table tennis is a staple of international recreation.^{1–3} Participation is surging; countries such as Australia report recent growth rates approaching 47%.⁴ Yet the sport offers more than leisure: regular play supports cardiovascular health, coordination, balance, and cognitive function.^{5–7} It also holds therapeutic value for specialized groups, including patients managing spinal cord injuries, Parkinson's disease, and dementia.^{5,6}

Although broadly considered a safe, low-contact activity, table tennis is not free of risk. A recent systematic review cataloged tenosynovitis, muscle strains, sprains, and ligament damage as frequent complaints.⁸ Players face repetitive overhead motions, rapid directional shifts, and sustained postural stress, all of which invite overuse injuries affecting the shoulder, lower back, and lower extremities.^{8,9}

Historically, medical literature has fixated on elite athletes, leaving the recreational majority, who represent the bulk of the player base, largely unexamined.^{8,10,11} Data from professionals offer conflicting incidence rates, swinging wildly from 2.8% to 64.8%.^{12,13} Furthermore, because most studies originate outside the United States, American injury patterns remain opaque.

To bridge this gap, we analyzed data from the National Electronic Injury Surveillance System (NEISS). Maintained by the U.S. Consumer Product Safety Commission, NEISS provides a probability sample of emergency department (ED) visits, offering a reliable window into activity-related trauma.^{14,15} Researchers widely apply this database to map epidemiological trends across sports.^{16–18}

This study aimed to conduct an epidemiological assessment of table tennis injuries presenting to U.S. emergency departments between 2005 and 2024. Our objectives were to determine annual incidence and identify shifts over time, map injury patterns by age and sex, identify common diagnoses, body regions, and mechanisms, and evaluate clinical severity and disposition.

METHODS

Study Design and Data Source

We conducted a retrospective epidemiological analysis using NEISS. This database collects records from approximately

100 stratified probability-sampled hospitals across the United States. Statistical weighting assigns a value to each case, enabling the estimation of national injury burdens.

Case Selection

We isolated table tennis injuries using NEISS product code 1271 for the period spanning January 1, 2005, through December 31, 2024. The dataset included all ED visits linked to this code.

Variables and Statistical Analysis

We extracted variables regarding patient demographics (age, sex, race), injury specifics (diagnosis, affected body part, disposition), and timing. Age stratification defined four cohorts: youth (0–19 years), young adults (20–44 years), middle-aged adults (45–64 years), and seniors (≥65 years). We calculated annual incidence rates per 100,000 person-years using U.S. Census Bureau estimates, and generated national projections via NEISS sample weights. Each NEISS case is assigned a sample weight by the U.S. Consumer Product Safety Commission, reflecting the inverse probability of that hospital being selected in the stratified probability sample. National injury estimates were derived by summing these individual case weights across all 910 sampled cases, yielding a projected total of 35,096 injuries over the 20-year study period (an annual average of approximately 1,755 ED visits). Annual incidence rates per 100,000 person-years were then calculated by dividing each year's weighted estimate by the corresponding U.S. Census Bureau population estimate and multiplying by 100,000. Linear regression assessed temporal trends, defining significance at $p < 0.05$.

RESULTS

Overall Incidence

Between 2005 and 2024, U.S. emergency departments treated 910 unweighted cases, representing an estimated 35,096 injuries nationally (95% CI: 33,341–36,851). The average annual incidence rate stood at 0.55 injuries per 100,000 person-years. The mean patient age was 38.65 years (95% CI: 35.85–41.44). Men dominated the cohort, accounting for 64.4% of cases (95% CI: 60.4–68.4%)—a male-to-female ratio of 1.83:1.

Temporal Trends

Annual incidence rates fluctuated between 0.30 and 0.93 per 100,000 person-years. Rates rose from 0.50 in 2005 to 0.93 in 2024, an 86.8% relative increase. COVID-19 restrictions caused a distinct drop in 2020 (0.30 per 100,000), followed by a rebound. Despite the visual upward trajectory, linear regression revealed no statistically significant trend over the two decades (slope = 0.0018, $p = 0.7392$) [Figure 1].

Figure 1. Table Tennis Injuries: National Estimates (2005–2024)

The estimated annual number of table tennis-related injuries treated in U.S. emergency departments from 2005 to 2024 is visualized. The data demonstrate year-to-year variability with a recent sharp rise in 2024. Overall, injury counts remain relatively stable through the mid-2010s, followed by fluctuations and a marked increase in the most recent year.

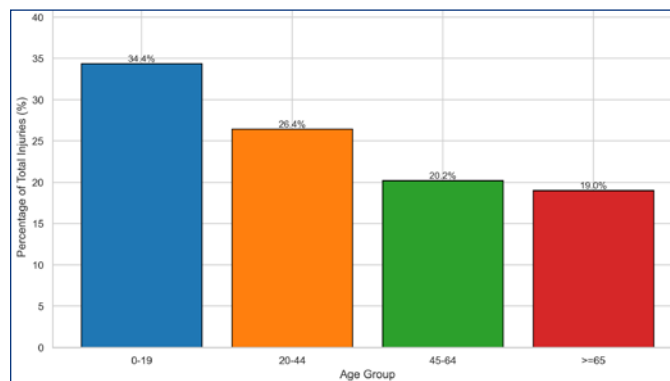


Age-Stratified Distribution

Youth players (0–19 years) incurred 34.4% of injuries, followed by young adults (26.4%), middle-aged players (20.2%), and seniors (19.0%). Combined, players under 45 sustained 60.8% of all injuries, while those 45 and older comprised the remaining 39.2% [Figure 2].

Figure 2. Table Tennis Injuries by Age Group (2005–2024)

The proportion of table tennis-related injuries from 2005 to 2024 is shown by age group. Individuals aged 0–19 experienced the highest share of injuries (34.4%), followed by adults aged 20–44 and 45–64. The ≥65 group accounted for the lowest proportion of cases.



Injury Type and Body Part

Lacerations proved the most frequent diagnosis (24.1%), narrowly outpacing sprains/strains (21.3%). Internal organ injuries (16.1%), fractures (13.3%), and dislocations (10.8%) followed. Anatomically, the face bore the brunt of trauma (15.9%), followed by the head (11.3%), lower trunk (9.4%), hand (8.9%), and knee (8.2%). The specific combination of facial lacerations appeared most often (13.0%), with knee sprains/strains second (6.3%). Together, facial cuts and lower-extremity sprains comprised nearly a quarter of all specific diagnoses [Figures 3,4].

Disposition

Most patients (90.5%) received treatment and were released. Admissions accounted for 5.8%, with negligible rates for transfers (0.7%) or observation (0.1%).

Figure 3. Top Body Parts Injured in Table Tennis (2005–2024)

The distribution of body regions affected in table tennis-related injuries from 2005 to 2024 is visualized. Facial injuries comprised the highest proportion (15.9%), followed by head, lower trunk, hand, and knee injuries. Upper-extremity regions such as the shoulder and upper arm accounted for smaller proportions.

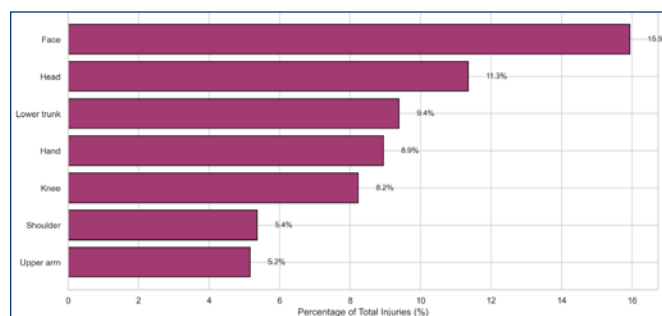


Figure 4. Top Diagnoses in Table Tennis Injuries (2005–2024)

The distribution of diagnoses among table tennis-related injuries from 2005 to 2024 is displayed. Lacerations (24.1%) and sprains/strains (21.3%) were the most common diagnoses, followed by internal organ injury and fractures. Less frequent diagnoses included dislocations, intracranial injuries, and foreign bodies.

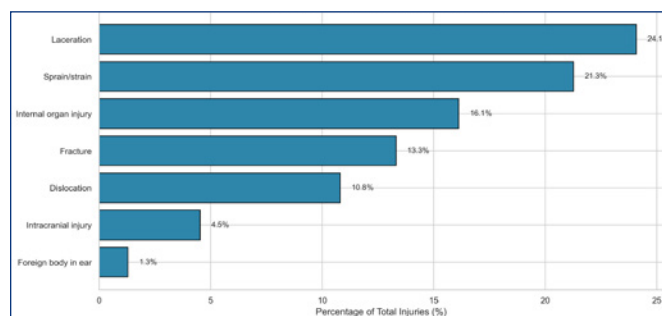
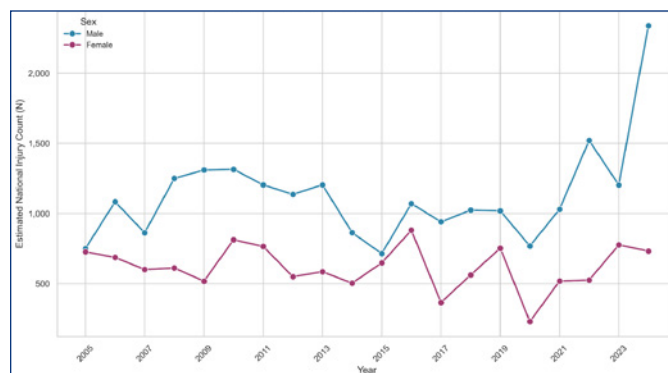


Figure 5. Table Tennis Injuries by Sex: National Estimates (2005–2024)

The estimated annual number of table tennis-related injuries stratified by sex from 2005 to 2024 is displayed. Males consistently account for the majority of injuries across all years. Both groups exhibit fluctuations over time, with 2024 showing the largest increase, driven primarily by male cases.



Sex-Stratified Patterns

Injury profiles differed by sex. Males presented most often with lacerations (28.2%) and sprains/strains (19.5%), sustaining high rates of facial trauma (18.0%). Conversely, females suffered primarily from sprains/strains (24.9%) and fractures (19.8%). Anatomically, women injured the face (12.4%) and knee (10.2%) most frequently [Figure 5].

Alcohol Involvement

Out of 910 sampled cases, 294 had a recorded response to the NEISS alcohol-involvement field, which captures a binary Yes/No indicator of alcohol presence as documented by the treating clinician. Of these, 10 (3.4%) were flagged as ‘Yes’. A narrative text analysis of these 10 cases frequently described falls and lacerations consistent with intoxication-related loss of coordination.

DISCUSSION

We identified 35,096 national cases from 2005 to 2024, with an annual average of 1,755 ED visits. The incidence rate of 0.55 per 100,000 person-years aligns with international data that table tennis carries a lower risk than other racket-based sports.^{8,10}

Temporal Trends and COVID-19 Impact

Incidence rose 86.8% from 2005 to 2024, but the trend was not statistically significant ($p = 0.7392$). This growth may result from increased participation, more comprehensive reporting, or patients having a lower threshold for visiting the ED.¹⁹ The 2020 all-time low (0.30 per 100,000) reflects pandemic lockdowns^{20,21}; as facilities closed, injury rates fell.^{22,23} The rebound after 2021 suggests a return to pre-pandemic activity levels.

Age-Stratified Implications

Over 60% of injuries affected players under 45, possibly due to higher participation or more aggressive play. However, the 39.2% of injuries among middle-aged and senior players shows that the sport is played by people of all ages.²⁴ Aging players face unique risks, such as reduced bone density and muscle mass, which can increase fracture potential and other injury risks.^{5,6} Furthermore, due to declined proprioception and balance, aging players risk falling from rapid lateral movement in the reaction-based sport.^{5,6,25}

Injury Patterns and Mechanisms

Lacerations to the face (13.0%) were a significant source of injury, in contrast with studies on elite populations.^{8,10} These lacerations may result from falls, contact with the paddles, and collisions with the table. As the NEISS coding does not provide sub-regional anatomical specifications, the location of the facial lacerations cannot be localized to a specific region on the face, thus limiting our ability to assess injury proximity to the eye. However, narrative analysis of the 119 unweighted, facial-laceration cases revealed that paddle or racket strikes were the predominant mechanism ($n=66$, 55.5%), followed by contact with the table edge ($n=38$, 31.9%). Falls without direct object contact accounted for a small proportion of cases ($n=7$, 5.9%), while ball-related facial lacerations were rare ($n=1$, 0.8%). This pattern suggests that protective eyewear may be relevant, as the majority of facial lacerations results from paddle strikes, many of which involved the periorbital region such as the eyebrow and eyelid, rather than from falls or contact alone. Use of protective eyewear could be considered, as it is popular in other racket sports but not widely used in table tennis.^{26,27} Alternatively, for lacerations that present on the cheeks or forehead, protective measures such as face masks may be more appropriate than eyewear.

Sprains and strains (21.3%) reflect the sport’s physical demands of rapid pivoting and direction changes.^{8,9} Lower-trunk injuries align with biomechanical evidence of asymmetric rotational loading during strokes.²⁸

Injuries reported as “internal organ” (16.1%) likely indicate strains of the trunk or chest wall rather than visceral damage.¹⁴ Upper-extremity injury rates appeared lower in this study than in studies of professionals,^{8,9} possibly due to the intensity gap between recreational and competitive play.

Sex-Specific Patterns

Men exhibited higher overall incidence and higher likelihood of sustaining lacerations (28.2%) and facial trauma (18.0%), possibly due to more aggressive play styles.²⁹ Previous studies found that male forehand topspin swings generate significantly more speed and power than female forehand topspin swings, engaging larger muscle groups, and potentially increasing the risk of injury.³⁰ Women suffered more fractures (19.8% vs. 9.8%) and knee injuries (10.2% vs.

7.2%). These findings are in line with established epidemiological differences in musculoskeletal health and statistics reported in previous studies examining the rates of male and female injuries in gender-comparable sports.^{31,32} Differing biomechanics, neuromuscular control, and bone mineral density likely contribute.^{32,33} Prevention programs should account for these biological distinctions.^{32,33}

Prevention Strategies

These findings suggest some interventions that could reduce injury. If facial lacerations are confirmed to cluster near the eyes in future studies, adoption of protective eyewear may be warranted; current literature reports that eye injuries occur at a median rate of 93% across racket sports without eyewear use, suggesting meaningful protective potential.^{26,27,34} While we cannot confirm the precise sub-regional distribution of facial lacerations from NEISS coding alone, narrative analysis suggests that paddle strikes frequently involved the periorbital area. This mechanistic pattern supports a targeted rationale for eyewear, though future studies should formally document eye-proximity data before issuing definitive recommendations.

Older players should have age-appropriate training to mitigate risks of fall and fracture.²⁴ Sex-specific conditioning, focusing on neuromuscular control for women and protective equipment for men, could address the different injury patterns.³⁵⁻³⁷ Additionally, equipment modifications, such as better table padding, could reduce lacerations. Alcohol use may also represent a modifiable risk factor in recreational table tennis. As noted, a subset of cases involved alcohol consumption, with several narratives describing intoxicated players falling, diving recklessly, or being struck during recreational drinking contexts. Given the established cultural association between recreational table tennis and alcohol consumption, awareness campaigns targeting recreational players about the injury risks of playing while intoxicated may be warranted.

Strengths and Limitations

Although this study provides valuable insights, it has some limitations. NEISS only records ED visits, missing injuries treated in primary care or ignored, possibly underestimating the total incidence.³⁸ Without exposure data, we cannot calculate rates per hour of play. Also, inconsistency in documentation, especially in narrative descriptions and coding practices, limit the ability to analyze injury mechanisms.³⁹ Furthermore, lacerations may prompt ED visits more regularly than sprains or strains, which might be managed with less urgency. This may artificially inflate the relative proportion of lacerations in the NEISS dataset and underestimate the true incidence of soft-tissue injury. Additionally, alcohol use could only be assessed through narrative text fields, in which documentation was inconsistent, as only 294 of 910 cases explicitly noted whether alcohol was

consumed. Of these, 10 (3.4%) confirmed alcohol involvement. The remaining 616 cases neither confirmed nor excluded alcohol use, likely underestimating its true contribution as a risk factor.

Future Directions

Future research should conduct video analysis or biomechanical studies to analyze the specific mechanisms of table tennis injury, and experimental trials should evaluate the performance of specific interventions.⁴⁰⁻⁴² These approaches would address current limitations of injury surveillance databases, which lack detailed kinematic and contextual information necessary to characterize injury mechanisms. Future studies should also assess the feasibility of targeted interventions in protective eyewear, neuromuscular training in older players, and technique modifications in real-world recreational settings.

CONCLUSION

Table tennis remains a relatively safe sport, but injuries affect players of all demographics. Distinct age and sex patterns emerge from the data, indicated primarily by biomechanical differences and play styles. Lacerations, specifically to the face, occur most frequently, followed by lower-extremity sprains. The significant injury rate among older adults highlights the need for specific safety modifications. These epidemiological insights should guide clinical practice and safety recommendations. As table tennis grows, targeted prevention is essential to maximize benefits and limit harm.

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Examining Food Insecurity and Health Among Rhode Island Adults

CALI M. MCATEE, MPH; KATE BALESTRACCI, PhD, RDN

BACKGROUND

Food insecurity is defined as experiencing limited or uncertain availability of nutritionally adequate and safe foods or uncertain ability to acquire acceptable foods in socially acceptable ways.¹ In the United States, food insecurity continues to be prevalent, with food insecurity disproportionately affecting certain populations.² Those experiencing food insecurity often rely on social safety net programs, including federal food assistance programs, food pantries and hot meal sites, and nonfood social safety net programs such as housing/rental assistance and Temporary Assistance for Needy Families.³ Food insecurity is also associated with adverse health outcomes, including chronic diseases, and higher healthcare use and costs.^{4,5} This study examines the burden of food insecurity among adults in Rhode Island (RI), describes the prevalence across demographic groups, and compares selected health indicators among adults who report being food insecure with those who do not.

METHODS

Data were obtained from the 2025 RI Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a state-based telephone survey of adults ≥18 years old and is used to measure risk behaviors and health. Survey data are weighted to obtain state population estimates. The survey was completed by 5,435 RI adults in 2025, representing a weighted population of 914,730.

Food insecurity was measured with the state-added question: “How often in the past 12 months would you say you were worried or stressed about having enough money to buy nutritious meals? Would you say – Always, Usually, Sometimes, Rarely, Never”. Respondents who answered “Always,” “Usually,” or “Sometimes” were considered as being food insecure.

Analyses were conducted to measure: 1) burden of food insecurity, 2) prevalence of food insecurity by demographics, 3) prevalence of health indicators among adults who reported food insecurity compared to adults who were food secure. Chi-square tests were conducted to test for significant differences between demographics and health indicators, using a p-value <0.05. Demographics assessed included gender, race/ethnicity, age, education level, marital status, employment status, federal poverty level (FPL), and whether children were in the household. Analyzed health indicators

included fruit consumption, vegetable consumption, fair or poor overall health (measured from “Would you say that in general your health is excellent, very good, good, fair, poor?”), frequent physical distress (≥14 days in last 30 where physical health was not good), frequent mental distress (≥14 days in last 30 where mental health was not good), depression, obesity (Body Mass Index ≥30), diabetes, hypertension, high cholesterol, cardiovascular disease, physical inactivity (measured from “During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?”), and current tobacco use. All analyses were conducted using SAS Version 9.4. Weighted frequencies and percentages were used for all data figures.

RESULTS

In 2025, 24.6% of RI adults were “always”, “usually”, or “sometimes” worried or stressed about having enough money to buy nutritious foods. Food insecurity was reported more often for respondents who were female, Hispanic, 18–29 years old, had less than a high school education, were divorced, separated, or widowed, and unable to work [Table 1]. Individuals living below 400% of the FPL experienced food insecurity at a significantly higher prevalence than those living at or above 400% FPL, at 36.8% and 7.8%, respectively. Experiencing food insecurity was also more common among adults who had children in the household (31.1%) compared to those who did not (21.9%).

Half (50.2%) of adults reporting food insecurity consumed fruit less than once a day and nearly one-third (33.5%) consumed vegetables less than once a day, compared to 36.3% and 19.3% of food secure adults, respectively [Table 2]. Food insecurity was strongly associated with greater prevalence of health indicators including fair or poor health, frequent physical and mental distress, depression, and tobacco use, relative to food secure adults. The prevalence of obesity (40.3%), diabetes (17.5%), and cardiovascular disease (11.0%) were also significantly higher in adults who experienced food insecurity. Among food insecure individuals, 31.9% reported being physically inactive compared to 17.9% of food secure individuals. There were no significant differences in the prevalence of hypertension or high cholesterol between respondents who experienced food insecurity and those who did not.

Table 1. Demographics of Rhode Island adults reporting food insecurity

	Weighted N	%	95% CI
Gender*			
Male	76,782	21.6	19.1–24.2
Female	102,540	27.4	25.0–29.9
Race, ethnicity*			
NH White	88,113	17.6	15.8–19.4
NH Black	11,864	35.3	26.9–43.8
NH Other or Multiracial ^a	23,935	39.0	31.0–47.1
Hispanic	49,960	43.8	38.4–49.3
Age*			
18–29 years	39,295	30.6	25.1–36.0
30–44 years	51,810	29.1	25.0–33.2
45–64 years	61,127	27.8	24.8–30.8
65 years and older	25,642	13.4	11.3–15.5
Education*			
Less than high school	35,688	50.8	43.4–58.3
High school diploma or GED	57,656	29.6	25.8–33.5
Some college	54,020	27.1	23.7–30.6
Graduated college	30,279	11.6	9.9–13.4
Marital status*			
Married	56,348	16.7	14.5–18.9
Divorced, separated, widowed	45,084	31.6	28.0–35.3
Never married or member of unmarried couple	74,496	30.9	27.3–34.6
Employment Status*			
Employed	94,440	23.5	21.1–25.9
Unemployed	18,246	40.9	32.2–49.7
Unable to work	24,739	58.6	51.0–66.3
Other/not in labor force ^b	36,003	16.1	13.5–18.6
Federal poverty level*			
At or above 400% FPL	18,402	7.8	5.5–10.0
Below 400% FPL	128,843	36.8	34.0–39.6
Children in household*			
Yes	63,146	31.1	27.2–34.9
No	113,336	21.9	20.0–23.9

*Results of the chi-squared test were statistically significant ($p < 0.05$)

CI = Confidence Interval, NH = Non-Hispanic, FPL = Federal Poverty Level

^aincludes adults who identify as American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, or Other

^bincludes homemakers, students, and retired individuals

DISCUSSION

The passing of H.R.1 in 2025 changed who is eligible to receive Supplemental Nutrition Assistance Program (SNAP) benefits. Between January 2025–May 2026, there was a 13% decline in participation in RI and nearly 5.5 million people lost their SNAP benefits nationwide.⁶ Additionally, the cost of groceries continues to rise, with food prices 3.0% higher in July 2026 compared to July 2025.⁷ This combination is likely to result in an increase in food insecurity, which can lead to strain on the emergency food system.

RI is combating food insecurity through several mechanisms. Collaboration, communication, and cohesive efforts

are sought through statewide dissemination of the RI Food Access Bulletin from the Healthy Eating and Active Living (HEAL) program at RI Department of Health and by way of food access-focused groups, which include state agencies and community partners. Legislative efforts have also highlighted importance and focus on food access. In June 2026, the RI State Legislature mandated a Food as Medicine (FAM) Taskforce to create a report of FAM recommendations around food access in the state. Additionally, state funds were allocated for fruit and vegetable incentive programs at both retailers (Department of Human Service's Eat Well, Be Well program) and farmers markets (Farm Fresh Rhode Island's Bonus Bucks program) to stretch the dollar of those using SNAP benefits and encourage consumption of fruits and vegetables. Lastly, the state continues to stay abreast of federal changes. The Office of Lieutenant Governor, RI Commerce, and the HEAL program are informing SNAP retailers of stocking standard changes required to continue to accept SNAP.

Given that people experiencing food insecurity are less likely to consume fruit and vegetables, it is important to promote produce consumption through federal food assistance programs, including the Special Supplemental Nutrition Program for Women, Infants and Children that offers a standard monthly cash-value benefit designated for fresh, frozen or canned produce and fruit/vegetable incentive vouchers at farmers markets; SNAP that offers produce incentives through Eat Well, Be Well and Bonus Bucks at grocery stores and farmers markets, respectively; and Senior Farmers Market Nutrition Program which is distributed through the Department of Environmental Management alongside RI Office of Healthy Aging. It is also imperative to increase access to produce in communities at high risk of becoming food insecure through improvements to the food environment. This includes grocery or corner store initiatives, pop-up farmers markets or mobile markets, and urban and community gardens.⁸

Further, because food insecurity is associated with chronic disease risk, social service programs must collaborate with one another. Many public health and clinical programs rely on the two-question Hunger Vital Sign tool as a screener for food insecurity. Universal adoption of this tool, along with development of a system to reduce barriers to accessing food resources is warranted. Additionally, programs such as produce prescriptions and medically tailored meals can offer tailored, nutritious foods to help manage chronic diseases.

The findings from the study are subject to a few limitations. First, data are self-reported and subject to recall and social desirability bias. Thus, the respondents might not have wanted to report they experienced food insecurity. Second, there may have been differences in how individuals interpreted "nutritious meal" and what they considered to be nutritious. Third, the study cannot determine causality, and any observed associations between food insecurity and

Table 2. Prevalence of health indicators among Rhode Island adults by food security status

	Food Insecure			Food Secure		
	Weighted N	%	95% CI	Weighted N	%	95% CI
Consumed fruit less than one time a day	89,997	50.2	46.0–54.4	199,343	36.3	34.1–38.5
Consumed vegetables less than one time a day	60,112	33.5	29.5–37.5	105,730	19.3	17.4–21.1
Fair or poor health	65,891	36.9	32.9–40.9	66,228	12.1	10.6–13.5
Frequent physical distress	45,386	26.0	22.1–29.9	51,007	9.5	8.3–10.7
Frequent mental distress	58,025	33.8	29.7–38.0	53,098	9.8	8.4–11.2
Depression	72,797	40.9	36.8–45.0	116,600	21.3	19.5–23.2
Obesity	66,236	40.3	36.0–44.7	149,103	29.1	27.0–31.2
Diabetes	31,233	17.5	14.5–20.5	59,702	10.9	9.6–12.2
Hypertension	69,439	39.0	35.0–43.0	188,128	34.3	32.3–36.4
High cholesterol	57,894	37.9	33.8–42.1	185,503	37.7	35.6–39.8
Cardiovascular disease	19,522	11.0	8.8–13.2	44,011	8.1	7.0–9.1
Physical inactivity	57,066	31.9	28.1–35.7	97,838	17.9	16.1–19.6
Tobacco use	30,224	17.0	13.6–20.3	33,189	6.1	5.1–7.1

Bolded values are statistically significant results of the chi-squared test ($p < 0.05$)

CI = Confidence Interval

health indicators may be affected by unmeasured or uncontrolled factors. Lastly, the survey included a single-item question to assess food insecurity. It would be helpful to include a multi-item module to provide a more complete and accurate measurement.

National food insecurity data was captured yearly using a comprehensive survey until it was discontinued in 2025. In its absence, it is especially important that RI gathers state-level data on the burden of food insecurity. It would be beneficial to include the six-item USDA Food Security Module on the RI BRFSS survey to gather more comprehensive data on level of household food insecurity. It may also be helpful to include state-added questions for individuals identified as food insecure to assess their knowledge and utilization of resources and food assistance programs. RI Life Index, an annual survey that captures Rhode Islanders' perceptions of health and well-being, should be paired with BRFSS data to truly understand the health of the population.

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**VITAL STATISTICS**

JEROME M. LARKIN, MD

DIRECTOR, RHODE ISLAND DEPARTMENT OF HEALTH

COMPILED BY ZUHEIL AMORESE, DEPUTY STATE REGISTRAR

PUBLIC HEALTH

Rhode Island Monthly Vital Statistics Report

Provisional Occurrence Data from the Division of Vital Records

VITAL EVENTS	REPORTING PERIOD		
	MARCH 2026	12 MONTHS ENDING WITH MARCH 2026	
	Number	Number	Rates
Live Births	900	10,678	10.1*
Deaths	932	10,531	9.9*
Infant Deaths	4	39	3.7#
Neonatal Deaths	4	26	2.4#
Marriages	269	6,437	6.1*
Divorces	236	2,422	2.3*

* Rates per 1,000 estimated population

Rates per 1,000 live births

Underlying Cause of Death Category	REPORTING PERIOD			
	SEPTEMBER 2025	12 MONTHS ENDING WITH SEPTEMBER 2025		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	184	2,324	211.8	2,380.0
Malignant Neoplasms	197	2,176	198.3	4,340.0
Cerebrovascular Disease	37	469	42.7	515.0
Injuries (Accident/Suicide/Homicide)	53	754	68.7	8,616.5
COPD	28	470	42.8	410.0

(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.



RIMS hosts Convivium 2026, celebrating 214 years of advocacy and achievement, honoring medical pioneers and pathfinders

EAST PROVIDENCE — The 214th Annual Meeting of the Rhode Island Medical Society (RIMS) took place on September 24th at the historic Squantum Association in the Riverside section of East Providence.

In celebration of Rhode Island's 250th anniversary, former Rhode Island Medical Society Executive Director **Newell E. Warde, PhD**, guest speaker of the evening, reflected on the Society's history, highlighting the physicians, milestones, and defining moments that helped shape medicine in Rhode Island for more than two centuries.



Newell E. Warde, PhD, Convivium guest speaker and former RIMS Executive Director, and **Steven R. DeToy**, recipient of the Dr. John Clarke Award, and former RIMS Director of Government & Public Affairs.



Dina T. Himelfarb, MD, passes the RIMS Presidential Medallion to newly inaugurated President **Mariah H. Stump, MD, MPH**.

The evening marked important leadership transitions, including the inauguration of incoming RIMS President **Mariah H. Stump, MD, MPH**, alongside the 2026–2027 officers: President-elect **Christopher DiMarco, MD**; Vice President **Tanuja Gandhi, MD**; Treasurer **Matthew J. Smith, MD, MHL**, and Secretary **Steven Schechter, MD**.

A highlight of the evening was the presentation of nine awards honoring outstanding physicians for their leadership, innovation, and service. From lifetime contributions in civic leadership and humanitarianism, to pioneering work in medical care, to the rising stars recognized with the "4 Under 40" award, each honoree is a testament to the profound impact physicians have in shaping the health and well-being of Rhode Islanders.



[PHOTOS BY TYLER NADEAU]

2026 Award Recipients

The Society honored the following nine recipients of this year's awards.



Caroline Troise, MD, received the Halifax Award, presented by RIMS Immediate Past President **Dina T. Himelfarb, MD** (left) and RIMS President **Mariah H. Stump, MD, MPH**.

Halifax Award

Caroline Troise, MD

*Anchor Medical Associates;
Rhode Island Free Clinic*

Given in recognition of outstanding medical volunteerism, the Halifax Award is named in commemoration of the Rhode Island medical and nursing communities' swift and generous response to the catastrophic explosion that devastated the city of Halifax, Nova Scotia, on the morning of December 6, 1917, causing 11,000 instantaneous casualties, including 2,000 deaths. Recipients of this award demonstrate outstanding citizenship and medical volunteerism, a commitment to serving the public good, and engagement and fostering involvement of physicians in community activities.

Dr. Charles L. Hill Award

Kenneth A. Williams, MD

*Adult Medical Director,
LifePACT Transport Team*

Established in 1981, this award recognizes a RIMS member physician for leadership and service. Dr. Charles L. Hill, for whom this award is named, was president of the Medical Society in 1979–1980. As one of the highest honors bestowed by

RIMS, this award celebrates a physician who has made significant contributions to science, education, and/or patient care in Rhode Island, and has substantially advanced the goals of the medical profession. Recipients must demonstrate a significant impact on the medical community, strong character, and leadership with equity and inclusion.

Recognition for Humanism in Medicine Award

Leslie Robinson-Bostom, MD

Brown Health Dermatology

This award was established in 2015 and is given for humanism in medicine, in recognition of a career and calling that medicine is at once the most scientific of the humanities in the most humanistic of the sciences. This award honors recipients who exemplify the qualities of care and compassion in the pursuit of patient care and/or teaching and mentorship. Recipients demonstrate the humanistic qualities of the patient-provider relationship and serve as an example to others.



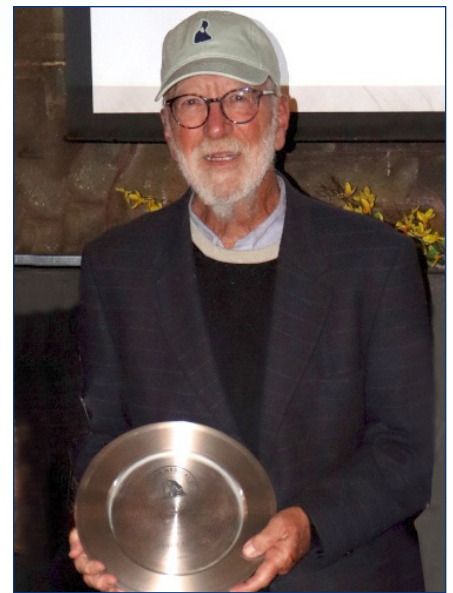
Leslie Robinson-Bostom, MD, was presented with the Humanism in Medicine award.

Dr. Herbert Rakatansky Award

Fadya El Rayess, MD, MPH

*Brown Department of Family Medicine/
Care New England*

This award was established by vote of the council in 2008 to recognize individuals who have distinguished themselves through exemplary professionalism and/or humanitarian service in the field of medicine. The first recipient was Herbert Rakatansky, MD, on September 27, 2008. Recipients of this award exemplify integrity, compassion, and a dedication to improving the lives of others, often in challenging environments or with underserved populations.



Steven R. DeToy received the Dr. John Clarke award

Dr. John Clarke Award

Steve DeToy

*Former Director of Government
& Public Affairs, RIMS*

This award was established in 2014 and is given to individuals who have made exceptional contributions to Public Health through outstanding civic leadership and service. It recognizes individuals who have made a significant impact on the health-care landscape in Rhode Island through strong leadership and commitment.

**4 Under 40 Award****Gillian Chase, MD***Women & Infants Hospital***Charles Hackett, MD, FAAFP***Care New England/Brown University
Dept. of Family Medicine***Maria Koenigs, MD***University Otolaryngology***Julia Shinnick, MD***Care New England*

This award recognizes physicians practicing in Rhode Island who are early in their career journeys and demonstrate a strong commitment to the profession and impact on the community. Recipients show leadership in patient care, education, research, and/or advocacy. This award recognizes their potential and the impact they have made in Rhode Island.

**Gillian Chase, MD****Julia Shinnick, MD****RIMS staff: Matthew Lawrence, Lisa Carcieri, Executive Vice President Stacy Paterno****Past President Gary Bubly, MD; Tyler Nadeau of RIMS****Past Presidents Michael Migliori, MD; Yul Ejnes, MD; Frederic Christian, MD****Past President Sarah Fessler, MD; Immediate Past President Dina T. Himelfarb, MD****Special Recognition****Michael E. Migliori, MD, FACS***Former Chair, RIMS Public Laws Committee*

RIMS is proud to recognize Michael E. Migliori, MD, FACS, for more than 25 years of extraordinary service as Chair of the RIMS Public Laws Committee. Throughout his tenure, Mike has been a steadfast presence at the State House and a trusted voice for Rhode Island physicians and patients. His leadership helped advance landmark efforts including the creation of OHIC, harm reduction centers, protections for the Physician Health Program, primary care prior authorization reform, and Rhode Island's healthcare provider shield law—while also helping RIMS prevent countless proposals that could have negatively affected medicine and patient care. A former RIMS President and AMA delegate, Mike's dedication, judgment, and persistence have helped shape RIMS advocacy for more than a generation.



The spirit of Convivium is one of connection and gratitude, celebrating not only the achievements of individual physicians, but also the collective strength of Rhode Island's medical community, united in its mission to improve health for all Rhode Islanders. ❖

IT ALL STARTS HERE! JOIN OR RENEW IN 2026 **RHODE ISLAND MEDICAL SOCIETY**

The Rhode Island Medical Society is the statewide home for physician advocacy, education, wellness, and leadership. This past year, RIMS delivered meaningful wins for Rhode Island physicians, including:

- » **MAJOR PRIOR AUTHORIZATION REFORM**
- » **STRONGER CLINICIAN WELLNESS PROTECTIONS**
- » **MEDICAID RATES TO 100% OF MEDICARE**
- » **12 SPECIALTY SOCIETIES SUPPORTED AND 35+ EDUCATION PROGRAMS**
- » **CONFIDENTIAL SUPPORT THROUGH THE PHYSICIAN HEALTH PROGRAM**

Your membership strengthens our voice at the State House and supports the future of medicine in Rhode Island.

JOIN OR RENEW TODAY AT
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Questions about individual or group membership?
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Rediscovering Lewis Leprilete Miller, MD: A Forgotten Pioneer of Rhode Island Medicine

MARY KORR; ARUN K. SINGH, MD, FACS, FRCS

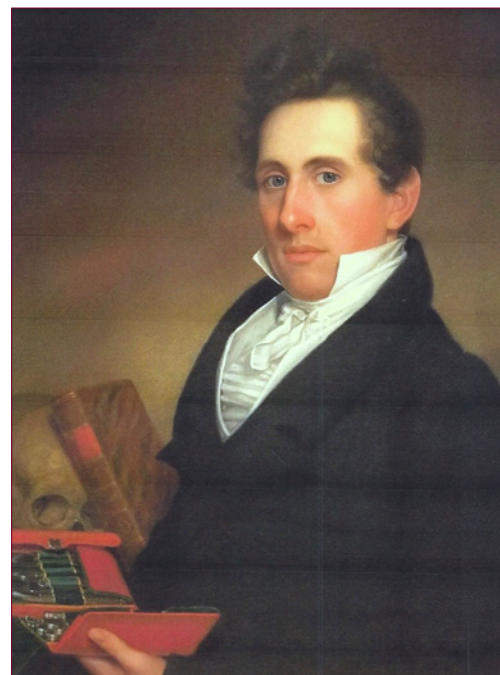
Every generation of physicians inherits the legacy of those who came before. Medical history often celebrates physicians whose discoveries transformed medicine, yet many whose greatest contributions were leadership, compassion, and service have gradually faded from memory. **LEWIS LEPRILETE MILLER, MD**, (1798–1870), belongs to that distinguished group. This article draws upon historical records, contemporary newspaper accounts, and surviving family artifacts to rediscover a physician whose life exemplified the highest ideals of medicine.

The Doctor Behind the Portrait

The companion portraits of Dr. Miller and his wife, **ELECTRA SMITH**, remained in the Miller family for more than 160 years before I (AS) acquired them more than three decades ago directly from Dr. Miller's last descendant. In the portraits, Dr. Miller is seated near a table in formal attire, holding a red leather case with surgical instruments. In the background is a skull and a Bell's Anatomy book—symbols of a young physician devoted to science and learning. His wife is portrayed with quiet dignity, reflecting the strength that sustained many physicians' families during an era when medicine demanded extraordinary personal sacrifice.

Initially, I admired the pictures simply as fine examples of early American portraiture. Gradually, however, they prompted larger questions. Who was this physician? Why had his family preserved these portraits for nearly two centuries? Why had one of Rhode Island's most accomplished physicians been largely forgotten?

The search for answers led me through archives, newspaper accounts, Brown University records, and the proceedings of the Rhode Island Medical Society. Together they revealed the remarkable life of a physician whose influence extended far beyond the operating room.



Portrait of **Lewis Leprilete Miller, MD**, and his wife, **Electra Smith Miller**, shortly after their marriage. The companion portraits, believed to have been painted between 1822 and 1825, have been attributed to either Chester Harding or Samuel Waldo and William Jewett.

Medical background

Lewis Leprilete Miller was born in Franklin, Massachusetts, in 1798 into a family deeply rooted in medicine. His father, **NATHANIEL MILLER, MD**, was among Franklin's most respected physicians and surgeons. He named his son after his own mentor, **LEWIS LEPRILETE, MD**, a pioneering ophthalmic surgeon remembered for advertising one of America's earliest cataract extractions in 1782, and for introducing Benjamin Franklin's invention of bifocal spectacles to the public.¹

From an early age, Lewis was introduced to the discipline and responsibilities of medical practice. After graduating from Brown University in 1817, he received his medical degree from Brown Medical School in 1820.² Soon after completing his education, Dr. Miller married Electra Smith of Bristol, Rhode Island, whose family occupied a prominent place in New England society. Within a few years, the young couple settled in Providence, where Dr. Miller's skill, integrity, and compassion would establish him as one of Rhode Island's foremost surgeons.

Entering practice decades before anesthesia, antisepsis, antibiotics, or modern hospitals, he belonged to a generation of

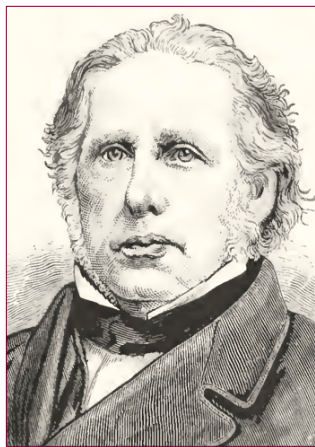
physicians who relied primarily upon careful observation, sound judgment, technical skill, and the confidence of their patients.

By the mid-19th century, Dr. Miller had become one of Rhode Island's leading surgeons. Patients sought his care from throughout the region, while younger physicians looked to him for guidance. According to an acquaintance of Dr. Miller's, "his office consisted of two or three rooms, comprising a surgery, waiting, and a reception room. These were neatly though not elaborately furnished—the general custom of a physician's office at that time." He wrote that Dr. Miller's "great reputation extended beyond the state. Probably no surgeon before or since has excelled him in those qualities that make up a great surgeon."³

The \$50 Operation

Professional honors tell us what a physician accomplished. Stories reveal who the physician truly was. Among the many recollections preserved after Dr. Miller's death, none better illustrates his character than the story of the desperately ill child whose life depended upon immediate surgery. Dr. Miller was consulted, and after examining the child, he quietly announced that he would operate—but only after receiving \$50 in advance. The room fell silent. For a widowed mother in a working family in the mid-19th century, \$50 represented an enormous sum. Shock quickly turned to resentment. Some whispered that the famous surgeon cared more about money than mercy.

As Dr. Miller prepared to leave, family members and neighbors blocked the doorway and passed a hat until the money had been collected. Only then did he begin the operation. The surgery was successful. Before anyone could thank—or criticize—him,



This image of Dr. Miller appeared in a history of his home town in Franklin, Mass.

[MORTIMER BLAKE. HISTORY OF THE TOWN OF FRANKLIN, MASS. 1878–1879]

Dr. Miller quietly placed every dollar into the mother's hands. "Besides surgery, your child will need food, warmth, and water if recovery is to be complete," he told her. Without another word, he departed.⁴

What moments earlier had appeared to be greed was revealed as extraordinary compassion. Dr. Miller understood that successful treatment did not end with an operation. Recovery also depended upon nourishment, shelter, and hope. Whether embellished through generations or preserved exactly as it occurred, the story endured because it reflected the physician his community knew him to be.

Leadership in Rhode Island Medicine

His colleagues respected not only his technical skill but also his calm judgment and unwavering professionalism. These qualities naturally led to positions of leadership. In 1846, Dr. Miller was elected President of the Rhode Island Medical Society, one of the profession's highest honors. His election reflected the confidence and esteem of physicians across the state.⁵

Ether anesthesia had recently transformed surgery, and physicians increasingly recognized the need for organized hospitals where patients could receive specialized care and medical education could flourish. Dr. Miller stood at the forefront of this transformation in Rhode Island. Working along with **USHER PARSONS, MD**, and **THOMAS POYNTON IVES**, a wealthy philanthropist, as well as other civic leaders, he became a strong advocate for establishing a modern hospital to serve the people of Rhode Island. Years of planning and fundraising ultimately resulted in the creation of Rhode Island Hospital, an institution that would become one of New England's leading centers for patient care, education, and research. Dr. Miller's vision and leadership earned him recognition as one of its founding physicians.

For him, the hospital represented far more than another building. It embodied a new vision of medicine—one that united scientific knowledge, skilled surgery, compassionate nursing, and medical education.

Scholar and Physician

Dr. Miller believed that medicine demanded lifelong learning. Throughout his career he assembled an extensive medical library, reflecting the intellectual curiosity that characterized competent physicians of his generation. Following his death, the collection became part of Brown University's holdings and is now preserved in



Vintage postcard of Rhode Island Hospital, circa 1906.

[RHODE ISLAND COLLECTION, PROVIDENCE PUBLIC LIBRARY]



Portrait of an older Dr. Lewis L. Miller presented to the Rhode Island Medical Society in 1905. [RHODE ISLAND MEDICAL JOURNAL, AUG. 2019]

the John Hay Library. It remains a lasting reminder that he considered scholarship inseparable from patient care.

By the 1860s, Dr. Miller had earned the admiration of his patients, the respect of his colleagues, and a lasting place in Rhode Island medicine. His greatest challenge, however, still lay ahead.

The Final Chapter

By the mid-1860s, Dr. Miller had achieved what few physicians of his generation could claim. During more than 40 years of practice, he had become one of Rhode Island's most respected surgeons, earned the confidence of his patients, the admiration of his colleagues, and helped lay the foundation for Rhode Island Hospital.

In 1867, however, his remarkable career came to an abrupt end when he suffered what contemporaries described as a "paralytic shock," almost certainly a stroke. Forced to retire, the surgeon who had restored the health of countless patients now faced the same uncertainty and physical limitations experienced by those he had spent a lifetime treating.

Although illness ended his surgical practice, it did not prevent him from witnessing the fulfillment of one of his greatest professional ambitions. When Rhode Island Hospital opened its doors in October 1868, Dr. Miller insisted on attending despite his disability. Confined to a wheelchair, he watched as the institution he had helped bring into existence welcomed its first patients. It was a profoundly moving moment. The surgeon who had devoted his life to caring for others entered the hospital not as a physician, but as a patient.

An elegant ebony walking cane, preserved by his family, offers a poignant reminder of those final years. Engraved with

the inscription "L. L. Miller to L. Howe," it is one of the few surviving personal possessions directly associated with his life.⁶ Whether intended as a presentation gift or later returned to the family remains unknown. More than a historical artifact, the cane symbolizes a universal truth: even the most accomplished physicians ultimately become patients.

Two years later, on March 8, 1870, he died at the age of 72, and was buried in Providence's Swan Point Cemetery beside his wife, and among many of Rhode Island's distinguished physicians and civic leaders.

Legacy

Dr. Miller's contemporaries remembered him less for individual operations than for the qualities that defined his character. The *Biographical Cyclopedia of Representative Men of Rhode Island*,⁷ published only a decade after his death, described him

in words that remain as meaningful today as they were in the 19th century: "He possessed firmness of nerve and calmness of temperament, combined with great gentleness of manner. As a surgeon he acquired an enviable reputation, and his services were in constant demand."

More than 150 years later, Dr. Miller's legacy remains woven into the fabric of Rhode Island medicine. Rhode Island Hospital continues the mission he helped establish; his medical library is preserved in Brown University's John Hay Library, and his leadership endures through the Rhode Island Medical Society.

For more than three decades, Dr. Miller's portrait has greeted me each morning. It is a daily reminder that while medicine continually advances, the ideals of our profession remain unchanged. More than a century and a half after his death, he continues to remind us that the enduring legacy of a physician is measured not only by the lives we save, but by the compassion, integrity, and humanity with which we serve our patients. ❖

Antique cane belonging to Dr. Miller. It features an ebony shaft with a gold collar and plaque inscribed: L.L. Miller to L. Howe. [RHODE ISLAND MEDICAL JOURNAL, AUG. 2019]



Gravestone of the Miller family in Swan Point Cemetery, Providence.



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South County Health (SCH) joins the Mayo Clinic Care Network

WAKEFIELD, RI, AND ROCHESTER, MINN. — South County Health (SCH) and Mayo Clinic recently announced SCH has become the first healthcare organization in Rhode Island to join the Mayo Clinic Care Network, a select group of independent healthcare organizations carefully vetted by Mayo Clinic and granted special access to Mayo Clinic's knowledge, expertise and resources.

The milestone represents a significant advancement for healthcare in Rhode Island and serves as a foundational step in South County Health's vision to create a new model for independent community healthcare—one that combines world-class clinical expertise, advanced digital capabilities, and local, patient-centered care. As part of the Mayo Clinic Care Network, South County Health healthcare professionals can quickly access Mayo Clinic's latest research, diagnostic and treatment recommendations whenever they feel it will benefit their patients.

"Today marks a defining moment for South County Health and the communities we serve," says **AARON ROBINSON**, president and CEO of South County Health. "Becoming a member of the Mayo Clinic Care Network brings together the best of both worlds: trusted local care and the knowledge, expertise, and resources of one of the world's leading healthcare organizations, while preserving the personalized, community-based care that has always been at the heart of South County Health."

South County Health healthcare professionals can consult Mayo Clinic expertise when they determine it would

benefit a patient, at no additional cost to the patient. This can provide additional clinical input while supporting care close to home. The Mayo Clinic Care Network membership expands the tools and expertise available to local clinicians, enhancing the high-quality care already available

"We are pleased to welcome South County Health into the Mayo Clinic Care Network," says **RYAN UITTI, MD**, medical director, Mayo Clinic Platform. "Their commitment to quality, safety and patient-centered care aligns well with the values of the Mayo Clinic Care Network."



in the community and providing additional support for complex cases and specialized needs.

As a member of the Mayo Clinic Care Network, South County Health clinicians will have access to:

- **AskMayoExpert** – Provides trusted, expert information to help healthcare professionals find the right answers when they need them. Created and used by Mayo Clinic physicians, all the information in AskMayoExpert is regularly reviewed and represents the latest in Mayo Clinic's medical expertise.
- **eConsults** – Direct connections to Mayo Clinic specialists for complex cases.
- **eBoards** – Multidisciplinary case reviews with Mayo Clinic experts and other network members.
- **Mayo Clinic Platform** – Advanced digital and AI-enabled clinical tools.

South County Health was selected to join the Mayo Clinic Care Network by demonstrating a commitment to quality and patient-centered care. Founded in 2011, the Mayo Clinic Care Network reached a 15-year milestone as a global community of more than 50 member organizations, representing 80 hospitals and nearly 20,000 physicians.

"For many independent health systems across the country, the traditional path to sustainability has required sacrificing independence to gain access to the resources, scale and expertise needed to compete in a rapidly changing healthcare landscape," Robinson adds. "We believe there is another path. This is about creating a model that improves administrative work and advances clinical care. That means a stronger local health system today and greater access to world-class healthcare for generations to come." ❖

Brown University Health announces FY27 budget actions to address financial challenges and support future growth

PROVIDENCE — As its 2027 fiscal year begins October 1, 2026, Brown University Health is taking strategic steps to address ongoing financial pressures, strengthen long-term sustainability and continue investing in patient care, facilities, technology and its workforce.



“Healthcare organizations across the country continue to face significant financial pressures, and Brown Health is no exception,” said **JOHN FERNANDEZ**, president and CEO of Brown University Health. “Rising pharmaceutical, labor and supply costs, combined with increasing levels of uncompensated care, insurer denials and bad debt, are creating unprecedented challenges. The actions we’re taking will help strengthen our financial foundation while protecting access to care and supporting future growth.”

Brown Health expects charity care, insurer denials and bad debt to increase from \$275M in FY25 to \$346M in FY26, an increase of \$71M year over year, as the number of uninsured and underinsured patients continues to grow following recent federal policy changes.

Investing in Care, Facilities, Technology and Employees

Even as it addresses these challenges, Brown Health will continue making investments to improve access, enhance the patient experience and support long-term growth.

FY27 investments include:

- **Clinical capabilities:** Up to \$100 million over five years for equipment upgrades and replacements, including linear accelerators (LINACs), MRI scanners and CT scanners.
- **Facilities:** \$210 million in FY27 for major projects underway at The Miriam Hospital, Rhode Island Hospital and other Brown Health locations.
- **Employees:** A planned merit increase for employees in January 2027.
- **Technology:** \$15 million in FY27 and \$100 million over five years for digital, data and automation initiatives.

Efficiency Measures

Brown Health continues to pursue administrative efficiencies, technology enhancements and non-clinical workforce changes to manage costs and keep services open. To help offset rising costs and preserve access to care, Brown Health is implementing additional measures including:

- A Voluntary Separation Program for eligible supervisors, managers and directors age 60 or older with at least five years of service as of Sept. 30, 2026. Approximately 200 employees are eligible.

- An executive restructuring completed in September 2026 that eliminated or consolidated several senior leadership positions.
- Beginning Jan. 1, 2027, employee health plan coverage for GLP-1 medications prescribed solely for weight loss will end because of rising costs. Coverage will continue for employees using these medications to treat diabetes.

Despite these actions, Brown Health projects a \$64 million FY27 gap relative to its goal of achieving a 2.75% operating margin which is critical to making the investments needed for patient care, infrastructure, technology and to support and retain a talented workforce. Brown Health will continue pursuing opportunities to improve performance, strengthen revenue cycle operations and manage expenses.

“Building a financially sustainable organization is essential to our ability to serve patients, support our workforce and invest in the future,” Fernandez said. “These decisions position Brown Health to continue delivering high-quality care and meet the evolving needs of the communities we serve.”

For the nine months ending June 30, 2026, Brown Health reported \$3.63 billion in operating revenue and \$3.64 billion in operating expenses, resulting in an operating loss of approximately \$13 million. The organization’s FY26 year-end financial report will be released later this year. ❖

Brown University Health celebrates opening of Cancer Institute at Saint Anne's Hospital

FALL RIVER, MASS. — Brown University Health marked an important milestone for cancer care in southeastern Massachusetts with a ribbon-cutting ceremony celebrating the opening of the Brown University Health Cancer Institute at Saint Anne's Hospital.

The October 20 event brought together Cancer Institute leaders, physicians and community representatives to recognize a new chapter for cancer care in the region.

The Cancer Institute at Saint Anne's Hospital includes:

- Saint Anne's comprehensive cancer services including radiation oncology, medical oncology, and an infusion center providing chemotherapy, immunotherapy and targeted therapies.
- The Dartmouth oncology program
- Physicians from Brown Health's broader Cancer Institute bringing the capabilities of Brown University Health's academic health system directly to patients in the communities Saint Anne's serves

"This is an exciting moment for Saint Anne's and for the patients and families who rely on us for their care," said **JULIE ABILHEIRA, RN, MS**, president of Massachusetts Hospitals for Brown University Health. "Being part of Brown University Health allows us to bring the expertise and resources of an academic health system directly to the communities we serve."

The Brown University Health Cancer Institute will strengthen access to research, innovation and clinical expertise for patients in a region where many have historically traveled to Boston for advanced cancer care.

"Cancer care is increasingly complex, and patients benefit when they have access to a broad network of specialists, advanced technology and the expertise of an academic health system," said **DAVID E. WAZER, MD**, director of the Brown



University Health Cancer Institute. "The Brown University Health Cancer Institute at Saint Anne's Hospital strengthens that connection for patients in southeastern Massachusetts, allowing us to bring advanced cancer care and expertise closer to where they live."

The ribbon-cutting program included remarks from Brown University Health, Cancer Institute, and Saint Anne's Hospital leaders. **TINA RIZACK, MD**, medical director of hematology and oncology, **RAYMOND DUGAL, MD**, chief of radiation oncology at Saint Anne's Hospital, and **HOWARD P. SAFRAN, MD**, chief of hematology/oncology at Brown Health also shared their excitement of the strengthened ties to the Cancer Institute. ❖

Brown University Health experts lead international review on preventing dangerous bloodstream infections in patients requiring long-term IV access

PROVIDENCE — A new State-of-the-Art Review led by **LEONARD A. MERMEL, DO**, medical director of epidemiology and infection prevention at Brown University Health, provides clinicians with a practical roadmap for preventing, diagnosing and managing recurrent catheter-related bloodstream infections in these medically vulnerable patients. The review

was published October 9 in the journal *Clinical Infectious Diseases*.

The article, "Recurrent and Relapsing Catheter-Related Bloodstream Infections in Patients Requiring Long-term Vascular Access", addresses care for patients who rely on long-term intravenous access for treatments such as cancer therapy, hemodialysis and total parenteral nutrition.

These patients often face a difficult reality, the catheter causing an infection may also be the device they need to receive lifesaving treatment.

"These infections can be especially challenging because the catheter is often essential to a patient's survival," said Dr. Mermel. "The goal is not only to treat the infection but to do so in a way that safely

preserves access to the therapies patients depend on. This review brings together practical strategies that can help clinicians make those decisions and improve outcomes."

The review emphasizes a multidisciplinary approach involving infectious disease specialists, vascular-access teams, interventional radiologists, pharmacists, nurses, patients and families. Key recommendations include prompt diagnosis using blood cultures drawn from both the

catheter and a peripheral vein, individualized decisions about catheter removal versus preservation, use of antimicrobial lock therapy when appropriate, and strategies to prevent future infections while maintaining long-term vascular access.

The authors note that bloodstream infections remain among the most serious complications facing patients who require long-term catheters. Recurrent infections can increase morbidity, complicate treatment plans and threaten

future access to lifesaving therapies. The review highlights evidence-based approaches to reducing those risks while supporting continuity of care.

Co-authors include researchers from the United States and Europe, representing institutions including Brown University, the University of Rhode Island, Geneva University Hospitals, the University of Arizona College of Medicine-Phoenix and Banner University Medical Center-Phoenix. ❖

Brown Health Medical Group Primary Care launches membership-based primary care practice in Cranston

Membership fee covers enhanced services and program benefits and is \$2,400 per year

CRANSTON — Brown Health Medical Group Primary Care (BHMGPC), the largest primary care group in Rhode Island, has introduced Primary Care Select, a new membership-based primary care service option in Cranston to further expand its care options available to Rhode Islanders.

"To meet patient demand for primary care options, we have created Primary Care Select which offers patients another alternative to meet their healthcare needs through enhanced access from dedicated physicians with limited panel sizes, and the time needed to deliver truly personalized care," said **EDWARD MCGOOKIN, MD**, Chief of Primary Care, Brown Health Medical Group Primary Care. "We are committed to providing all of our patients high-quality care and a patient experience that fosters long-term patient relationships."

Primary Care Select offers members access to private, board-certified physicians committed to supporting their unique healthcare needs. It provides enhanced access and dedicated physicians connected to an integrated network of Brown University Health providers, specialists, hospitals, and services. Primary Care Select members will also have access to MyChart, Brown University Health's secure patient portal, for convenient access to health information and care management. Members will receive longer personalized visits, direct communication with their physician, and preventive care in a comfortable and nurturing setting. Physicians will partner closely with members through a shared decision-making model to guide members' overall health and wellbeing. Brown Health Medical Group Primary Care Select offers a connected and seamless primary care experience.

Now accepting new members, Primary Care Select will provide personalized prevention plans and direct access through members' preferred communication channels (phone, portal, or text) and will coordinate members' preventive and specialty care. It will be staffed by:

AMI MUEHLBERG, DO, a new Brown University Health internal medicine physician who specializes in health, wellness, lifestyle medicine and women's health with a focus on prevention, longevity, and optimizing day-to-day health. She is passionate about helping members take a proactive approach to living healthier, longer lives.

KYLE JOHNSON, DO, previously a Brown University Health Care 365 physician focusing on sick visit and urgent care, specializes in adult primary care with experience in hospital-based internal medicine, primary care, and urgent care. His clinical interests include prevention, chronic disease management, acute care, and geriatrics.

Primary Care Select membership is available to individuals aged 18 and older for an annual out-of-pocket fee. The membership fee covers enhanced services and program benefits and is \$2,400 per year. Primary Care Select membership does not apply to or expedite access to hospital, emergency department, urgent care or specialty care visits.

Insurance will continue to be billed for covered primary care services, laboratory testing, imaging, specialist care, and other services covered under an individual's health plan. Brown Health Medical Group Primary Care accepts all major insurers.

Brown University Health is committed to investing in and growing primary care services and is advancing a growth strategy to serve 30,000 additional patients over the next three years by adding 27 clinicians, while preserving high-quality care and reducing healthcare workforce burnout. Brown Health Medical Group Primary Care is continuing to welcome new patients into practices with access throughout the state for traditional primary care services, and has accepted more than 18,000 new patients into primary care over the past year. ❖

Care New England hosts ribbon-cutting for the East Greenwich Ambulatory Care Center

Full-service facility features The Michael Wagner, MD, Center for Primary Care

EAST GREENWICH — Care New England Medical Group (CNEMG) celebrated the opening of its new East Greenwich Ambulatory Care Center with a ribbon-cutting and the dedication of the Michael Wagner, MD, Center for Primary Care. Located at 1405 South County Trail, the 45,000-square-foot, three-story medical center provides a modern, state-of-the-art setting designed to meet the community's growing healthcare needs.

The new center brings a broad range of ambulatory services together under one roof, making it easier for patients to access coordinated, high-quality care.

"Our goal is to bring the vast majority of a patient's ambulatory needs to a single, accessible location," said **ROGER MITTY, MD, MBA**, President of the Care New England Medical Group. "By bringing multiple specialties and diagnostic services together under one roof, we are making it easier for patients to receive coordinated, consistent care close to home."

The Center for Primary Care occupies the entire second floor and honors Dr. Wagner, President and CEO of Care New England, who will transition to Chairman of the Board in early 2027.

Dr. Wagner joined CNE in 2022 and has led the system through a period of significant transformation and growth.

Under his leadership, Care New England strengthened its operations, implemented a unified Epic electronic health record platform, completed strategic planning and rebranding initiatives, secured \$100 million in capital for future investment, and returned to positive operating performance.

"Watching Care New England grow to the point of opening this spectacular new facility has been one of the highlights of my career," said Dr. Wagner. "I am deeply honored by this dedication and grateful to the team who have worked so hard to make this vision a reality."

The event was attended by several elected officials, including Lt. Governor **SABINA MATOS**, Senator **BRIDGET VALVERDE**, Representative **EVAN SHANLEY**, and several members of the East Greenwich Town Council, who joined in celebrating this milestone.

The center offers an extensive range of clinical specialties and services, including:

- Primary Care
- Orthopedics
- Medical & Surgical Weight Loss



Pictured left to right: **Roger Mitty, MD, MBA**, President, Care New England Medical Group; **Michael Wagner, MD**, President and CEO, Care New England; Lt. Governor **Sabina Matos**, and **Tracey Wagner**.

[PHOTOS COURTESY OF CARE NEW ENGLAND]

- Cardiology
- OBGYN
- Behavioral Health
- Primary Care for Older Adults
- General Surgery
- Plastic Surgery
- Pulmonary Medicine
- Laboratory Services
- Diagnostic Imaging Services, including mammography and ultrasound

Designed with a forward-thinking, patient-first approach, the facility features digital check-in kiosks, virtual registration options, and a layout that supports efficiency, privacy, and comfort.

The East Greenwich Ambulatory Care Center also strengthens clinical collaborations with Care New England's Kent, Butler, and Women & Infants Hospitals, helping provide patients with coordinated care pathways between outpatient and hospital-based services. ❖



Morton Hospital opens new palliative care program

TAUNTON, MASS. — Morton Hospital, part of Brown University Health, is launching a new palliative care program to provide specialized support for patients facing serious illness and their families. The program is the first dedicated palliative care program for Brown University Health's Massachusetts hospitals.

Developed in collaboration with HopeHealth, the referral-based program provides specialized support for patients living with serious illness and serves as an added resource for patients, families, and care teams. Common reasons for consultation include symptom management, goals-of-care discussions, advance care planning, support with complex medical decision-making, recurrent hospitalizations, functional decline, and difficult family or care transitions.

"Palliative care is about caring for the whole person and making sure patients and families feel informed, heard and supported as they navigate their illness," said **JILL O'BRIEN, MD**, chief medical officer, Morton Hospital. "We're proud to bring this important service to Morton and grateful to HopeHealth for working with us to make it possible. It represents another way we can meet patients where they are and provide the compassionate, comprehensive care they deserve."

Patients will be connected with the palliative care program through referrals from their provider.

"We are delighted to partner with Morton Hospital to expand access to palliative care in southeastern Massachusetts. By bringing our expertise together with the team at Morton, we can provide patients and families with the added support, guidance, and compassionate care they need when facing serious illness," said **DIANA FRANCHITTO**, president and CEO of HopeHealth.

The launch also marks an important step in expanding access to palliative care within Brown University Health's Massachusetts hospitals. Morton will serve as the first Brown Health Massachusetts location for the program, with the health system exploring opportunities to bring palliative care services to Saint Anne's Hospital in the future. To learn more and to make a referral to HopeHealth palliative care at Morton Hospital call (844)-671-4673. ❖

Bradley Hospital awarded NIH grant to advance research on sleep, circadian rhythms and youth mental health

EAST PROVIDENCE — Bradley Hospital, the nation's first and leading psychiatric hospital dedicated exclusively to children and adolescents, has been awarded Phase 2 funding from the National Institutes of Health (NIH) through its Centers of Biomedical Research Excellence (COBRE) program to continue and expand groundbreaking research through the Center for Sleep and Circadian Rhythms in Child and Adolescent Mental Health.

"Sleep and circadian rhythms play a critical role in the mental health and well-being of children and adolescents, yet much remains to be understood about these complex relationships," said **MARY A. CARSKADON, PhD**, Director of the COBRE Center and Bradley Hospital's Sleep and Chronobiology Research Laboratory. "This NIH award recognizes the importance of this work and enables us to further advance research that has the potential to transform how we understand, prevent and treat mental health conditions in young people."

The Center is the first and only NIH-funded research center in the United States dedicated specifically to understanding the relationships among sleep, circadian rhythms and pediatric mental health. The award builds upon the successes of the Center's initial Phase 1 COBRE funding, which established critical research infrastructure, developed collaborative partnerships and supported emerging investigators focused on these vital areas of study.

The new Phase 2 award will support significant enhancements to the Center's research capabilities, including the acquisition of advanced scientific instrumentation and the development of a state-of-the-art biospecimen laboratory. The funding will also strengthen opportunities for junior faculty researchers, expand interdisciplinary collaboration and enhance research mentorship programs.

The Center's work is expected to contribute to a deeper understanding of the connections between sleep health and mental health while informing new approaches to prevention, diagnosis and treatment for youth experiencing behavioral health conditions.

"This funding strengthens Bradley Hospital's position as a national leader in pediatric behavioral health research," said **JARED M. SALETIN, PhD**, Director of the COBRE Center's Sleep and Circadian Methods Research Core and Associate Director of Bradley Hospital's Sleep and Chronobiology Research Laboratory. "The expanded infrastructure and scientific resources made possible through this award will accelerate innovation, support the development of future research leaders and help address the growing behavioral health needs of children and adolescents." ❖

New app available to help RI adults quit smoking and vaping

PROVIDENCE — The Rhode Island Department of Health (RIDOH) and QuitNowRI are now offering the QuitLogix® app to Rhode Island adults looking for support quitting tobacco and nicotine products.

The app is free, available in English and Spanish, and can be downloaded in the Apple App Store and the Google Play Store. It is available for Rhode Islanders age 18 and older.

"This app puts resources for quitting tobacco and nicotine right at people's fingertips," said Director of Health **JERRY LARKIN, MD**. "If you smoke or vape, quitting may be one of the most important health decisions you ever make."

The app, released in October, offers the same core features available to QuitNowRI participants enrolled in the web program, including guidance on building a quit plan and rewards for achieving quit milestones.

Tobacco use remains the leading preventable cause of death and disease nationally and statewide. In Rhode Island, about 1 in 10 adults smoke, and about 1 in 15 use e-cigarettes. People who combine coaching with treatment in the form of FDA-approved nicotine replacement therapy (NRT) are more likely to quit.

QuitNowRI can assist any Rhode Islander with quitting smoking, vaping, and other tobacco product use. This service offers customized coaching and NRT for those who are medically eligible. QuitNowRI also includes specialty programs for people with behavioral health conditions, people who are pregnant or postpartum, and people who use menthol tobacco and nicotine products.

To get started or learn more about QuitNowRI, interested participants can:

- Download the QuitLogix® app
- Call 1-800-QUIT-NOW
- Text START to 300500
- Visit QuitNowRI.com

Teens ages 13 to 17 can get free help quitting tobacco and nicotine products from My Life, My Quit™, also available as an app. ❖

BCBSRI seeks applicants for LGBTQ+ Safe Zone certification

PROVIDENCE — Blue Cross & Blue Shield of Rhode Island (BCBSRI) is accepting applications from care settings for certification through its LGBTQ+ Safe Zone program. Applications for the current certification cycle are due Dec. 15, 2026.

For the past 10 years, Safe Zones have helped LGBTQ+ Rhode Islanders connect with care settings committed to providing welcoming and affirming experience. Certification signals that an organization has taken meaningful steps to strengthen its policies, practices, staff training, and patient or client experience. Certified care settings are included in BCBSRI's Safe Zone directory, which helps Rhode Islanders identify care that meets their needs.

"Celebrating 10 years of the Safe Zone Program is especially meaningful as the network has grown to well over 100 care settings across Rhode Island that are helping people feel seen, respected and welcome when they seek care," said **SCOTT GOWRIE**, Safe Zone program lead at BCBSRI. "We encourage healthcare facilities and community-based organizations to reach out to learn more about the program or for help with the application process."

With 117 certified Safe Zones in more than 25 Rhode Island cities and towns, the program reaches communities across the state.

The certification program provides a structured starting point for care settings seeking to create a more welcoming and affirming experience for LGBTQ+ patients and clients. Its clear criteria help care settings assess and strengthen supportive policies and procedures, staff training, interactions with patients and clients, and their physical environment. Many Safe Zones report that pursuing certification also gives their teams an opportunity to formalize their commitment and share it with employees and the people they serve, and gain visibility among Rhode Islanders seeking affirming care.

Care settings interested in certification should review the criteria and application process and submit an application by Dec. 15, 2026. There is no cost to apply or maintain certification. Questions may be directed to bcbsrisafezone@bcbsri.org. ❖

URI, CCRI announce new RN-to-BS program to strengthen RI's nursing workforce

WARWICK — The University of Rhode Island and the Community College of Rhode Island officially launched a new, fully online Registered Nurse to Bachelor of Science (RN-to-BS) program during a signing ceremony on Oct. 1. The collaboration provides CCRI nursing alumni with an accessible and adaptable route to achieve their Bachelor of Science degree at URI, all while maintaining the high academic standards and clinical focus required by Rhode Island's medical facilities.



URI President **Marc Parlange** and CCRI President **Rosemary Costigan** sign an agreement between the two schools on a fully online Registered Nurse to Bachelor of Science (RN-to-BS) program during a signing ceremony on Oct. 1.

The new initiative underscores a mutual commitment between CCRI and URI to broaden educational opportunity, bolster the local healthcare pipeline, and address the state's shifting medical demands. Tailored specifically for active nursing professionals, the RN-to-BS curriculum merges top-tier academics with the practical flexibility needed to juggle employment, family life, and career growth. With new lower tuition for the RN-to-BS program and significant scholarship opportunities, the program makes earning a bachelor's degree more accessible, seamless, and affordable for Rhode Island's future nurses.

URI is proud to partner with CCRI to strengthen the pipeline of highly trained nurses who care for Rhode Islanders, and to expand pathways for working professionals to advance their education and careers," said URI President **MARC PARLANGE**. "As Rhode Island's public research university, URI is committed to strengthening workforce development across the state while advancing the health, wellness, and prosperity of the people and communities we serve. This partnership is a powerful example of how our institutions can work together to meet the evolving needs of Rhode Island's healthcare workforce."

The new initiative will allow for a seamless transition for those CCRI nursing graduates who wish to pursue their bachelor's degree—without requiring them to step out of the workforce.

"CCRI is proud to give our nursing alumni a direct, practical path to a bachelor's degree without asking them to step away from the patients and communities they already serve," said CCRI President **ROSEMARY COSTIGAN**. "Partnering with URI on this RN-to-BS program reflects our shared commitment to strengthening Rhode Island's healthcare workforce."

URI nursing Dean **DANNY WILLIS** noted the impact baccalaureate-prepared nurses have on the healthcare system, improving quality and safety outcomes. Research shows that hospitals and healthcare organizations with more B.S.-educated nurses have reduced risk for mortality and reduced 7-day and 30-day readmission rates.

"The University of Rhode Island College of Nursing is excited to partner with CCRI in this endeavor to increase the number of baccalaureate-prepared nurses, which will impact the nursing workforce in Rhode Island," Willis said. "Today's signing represents a shared commitment and collaboration to Rhode Island's nurses, our healthcare organizations and, most importantly, to the communities and the patients we collectively serve. Strengthening Rhode Island's nursing workforce requires such collaboration. We need these educational pathways that meet nurses where they are, support their continued professional growth and development, and help prepare them for the increasingly complex healthcare needs of our state."

Through this initiative, eligible students may receive conditional admission to URI after completing their first full semester in CCRI's nursing program, allowing them to seamlessly advance into URI's Bachelor of Science curriculum after graduation without putting their careers on hold. The streamlined transition not only fosters personal career development but also serves the wider healthcare community, mirroring both state and national campaigns

to boost the number of nurses holding a bachelor's degree.

URI Online RN-to-BS students receive a research-based, compassion-focused education from top educators and pioneering researchers who make up the college's faculty. With 24 core credit hours that can be completed in as little as 15 months, the program gives students a strong foundation to help them understand and manage the complexity of the ever-changing healthcare system. ♦



CCRI's Knight mascot takes URI's Rhody Ram's blood pressure prior to the signing ceremony. [PHOTOS COURTESY OF URI]

FDA approves first heart valve designed to grow with children

SILVER SPRING, MD — The U.S. Food and Drug Administration recently approved the Autus Size-Adjustable Valve, a surgically implanted pulmonary heart valve for pediatric patients with congenital pulmonary valve disease. This innovative device may reduce the need for repeat open-heart surgeries in children with heart defects.

The Autus Size-Adjustable Valve is the first heart valve designed to be expanded after surgery to keep pace with a child's growth, and the first valve approved in the United States to use polymeric material rather than animal-derived tissue for its inner flaps.

"For far too long, children with congenital heart defects who need pulmonary valve replacement have had very limited surgical options, and those options have historically required multiple open-heart surgeries as children grow," said Acting FDA Commissioner **KYLE DIAMANTAS, JD**.

Heart defects are among the most common types of birth defects in the United States, affecting about 1 in every 100 births. Among these conditions are pulmonary valve abnormalities — including pulmonary valve stenosis, in which the valve is narrowed, and pulmonary valve atresia, in which the valve fails to form normally — both of which restrict blood flow from the heart to the lungs. According to the Centers for Disease Control and Prevention, pulmonary valve atresia and stenosis together affect around 4,200 babies in the United States each year.

While treatment can improve blood flow and help repair these congenital defects, some children may be left with significant pulmonary regurgitation, or leakage of blood back through the pulmonary valve. Over time, this can weaken or enlarge the right ventricle and create a

need for pulmonary valve replacement as the child grows.

"For children born with congenital heart disease, valve replacement timing has always been a difficult decision—wait too long and you risk harm to the child, but intervene too early and they may need multiple open-heart surgeries as they grow," said **MICHELLE TARVER, MD, PhD**, director of the FDA's Center for Devices and Radiological Health.

The Autus Size-Adjustable Valve can be initially implanted as small as approximately 13 millimeters in diameter—the right size for a toddler or preschool-aged child—and later widened using a small inflatable tube (balloon catheter) as the child grows, eventually reaching up to 22 millimeters, which is comparable to an adult-sized pulmonary valve.

In addition, the Autus Size-Adjustable Valve uses polymeric material for its leaflets. Traditional valves use tissue derived from animals, which tends to harden and break down faster in children, often requiring earlier repeat surgery. One-year follow-up data suggest the Autus valve's synthetic leaflets hold up well over time. This is the first time the FDA has approved a valve that uses polymeric leaflet material for any indication.

The FDA's approval is based on data from a clinical study, which enrolled 62 pediatric patients across 12 sites. At the six-month follow-up, the first 60 patients demonstrated acceptable hemodynamic performance, and there was no more than mild leakage back through the valve. All patients in the study had a successful procedure, with no deaths, blood clots requiring additional treatment, strokes or other clot-related complications. Three patients experienced a fracture in the valve frame and two patients had reduced movement of one of the valve leaflets but

none of these events resulted in symptoms for the patients. Additionally, valve performance began deteriorating in two patients who started to outgrow it. Both patients had their valves successfully expanded without an invasive surgical procedure, but the experience is limited. Longer-term studies are being conducted to better understand these risks, and to collect more data to show that expansion can maintain a functional valve that may lead to fewer surgical procedures for patients.

The Autus Size-Adjustable Valve is the first pediatric approval to come out of the FDA's Total Product Life Cycle Advisory Program (TAP), a voluntary program for device developers intended to spur more rapid development of high-quality, safe, effective and innovative medical devices for all patients. The FDA previously granted the Autus Size-Adjustable Valve Breakthrough Device designation, which is meant to expedite the development and review of devices that provide for more effective treatment or diagnosis of life-threatening or irreversibly debilitating diseases or conditions.

The Autus Size-Adjustable Valve was approved through the premarket approval pathway, the FDA's most stringent type of medical device marketing application. The pathway is used for certain Class III devices, which generally pose the greatest risk. Before approving a device, the FDA reviews scientific evidence, including nonclinical and clinical data, to determine whether there is reasonable assurance that the device is safe and effective for its intended use and whether the benefits outweigh the known risks.

Edwards Lifesciences received approval for the Autus Size-Adjustable Valve, developed by Autus Valve Technologies Inc. ❖

Deep learning model using ECGs during sleep studies can predict cardiovascular outcomes

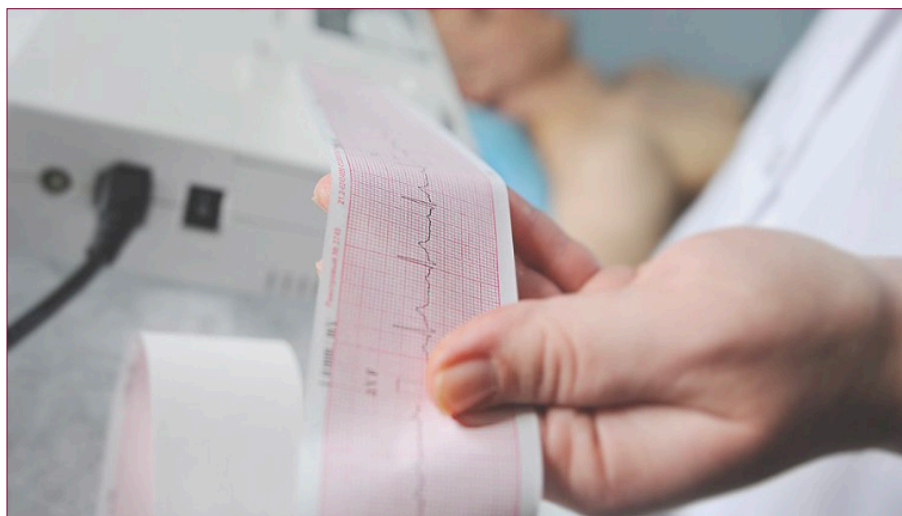
Integrating ECGs into sleep disorder screening could enhance detection and guide clinical decision-making

BETHESDA, MD — A research team supported by the National Institutes of Health (NIH) has found that electrocardiograms (ECGs) administered during sleep and paired with sleep stage information can be used to determine risk for future adverse cardiac events. The study, which used a deep learning approach, suggests that using ECGs to predict which patients have a greater risk for poor heart-related outcomes could help guide clinical decision-making. The findings were published in the journal *Sleep*.¹

“This new approach has the potential to identify individuals at risk for cardiovascular disease years before clinical symptoms arise,” said **DAVID GOFF, MD, PhD**, acting director of NIH’s National Heart, Lung, and Blood Institute (NHLBI). “Evaluating whether this information improves traditional risk prediction is an important next step. In the future, proven analytical approaches like this could be integrated into existing diagnostic tests for patients undergoing sleep studies as a screening tool for multiple adverse cardiovascular outcomes.”

Testing conducted overnight during sleep, known as polysomnography, is the standard method of diagnosing sleep disorders such as insomnia and obstructive sleep apnea, which are recognized as cardiovascular risk factors. ECGs are recorded during these tests but are not often analyzed. The research team in this study wanted to see if these recordings could be used to predict 10-year risk of cardiovascular outcomes such as atrial fibrillation, stroke, myocardial infarction, and heart failure, as well as all-cause mortality.

The researchers applied a deep learning system using single-lead ECGs from sleep studies combined with expert-annotated sleep stage data. The model was fine-tuned on a dataset of 15,809 patients at Massachusetts General Hospital in



Boston, and performance was assessed on two datasets that included 9,810 patients from Emory University Hospital in Atlanta and 12,576 patients from Beth Israel Deaconess Medical Center in Boston. Outcomes were derived from electronic health records.

The team found that the model was able to sort people into groups with different levels of long-term cardiovascular risk, showing that people with higher scores were at higher risk. The deep learning model also retained its predictive value when adjusted for common cardiovascular risk factors such as age, sex, BMI, diabetes, and hypertension, as well as sleep-related characteristics such as sleep apnea severity, arousals, and sleep efficiency. The model could predict atrial fibrillation, heart failure, and death from any cause.

The scientists believe that additional optimization of the model is needed to determine prediction for myocardial infarction and stroke. Overall, they found that predicting cardiovascular outcomes from the ECG channel in sleep studies is a promising approach.

“Importantly, we found that adding the score from our deep learning model improved prediction of cardiac outcomes beyond established risk factors,” said **GARI CLIFFORD, DPhil**, study author, chair of the Department of Biomedical Informatics at Emory University School of Medicine, and professor of Biomedical Engineering at Georgia Institute of Technology. “Adding these scores into sleep studies has great potential for improving early detection of cardiovascular disease, determining who is most at risk, and being more proactive in patient care.”

In addition, this method, which uses just one ECG lead or electrical signal, is easier to collect than the usual 12-lead setup. Therefore, it offers a simple way to collect useful ECG data in just one night of sleep, making the approach highly accessible through simple, low-cost patches.

Reference

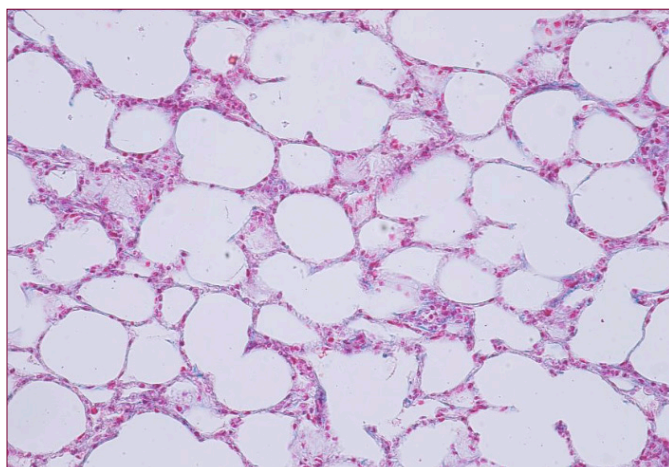
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Human lung organoids with a built-in immune system could transform respiratory disease research

In NIH-funded study, the models orchestrated adaptive immune responses to viral infection

BETHESDA, MD — A new organoid model built with human lung fragments may help us answer key questions about one of the body's first lines of defense against respiratory pathogens. In a National Institutes of Health (NIH)-supported study,¹ researchers at the Stanford University School of Medicine elicited virus-specific immune responses from these organoids and showed that administering a virus booster weakened subsequent infections.

The findings suggest the lung mucosa's immune system alone may provide significant protection, which adds to growing evidence that vaccination strategies designed to train up the body's frontline defenses are a worthwhile pursuit. The models may also be ideal testing grounds for such interventions.



"These organoids retain key immune cells and functions of lung mucosa long-term, allowing investigators to examine local tissue immunity separately from the other parts of the body's immune system," said **JOHN H. POWERS III, MD**, acting director of NIH's National Institute of Allergy and Infectious Diseases (NIAID). "This platform may provide a replacement for animal models for some types of evaluations and may provide insights that tests in animal models could not capture."

In the new study, the researchers transferred pieces of intact distal lung tissue from more than 220 patient volunteers into a unique cell culture system that simulated the lung's life-sustaining gas exchange. The authors sustained organoids within this 3D air-liquid interface for up to several months, during which they found many critical immune cell populations

thriving. More specifically, they confirmed that the T cells present were permanent residents of the tissue and maintained their virus-sensing capabilities.

With these components of the immune system present in the model, the team next sought to determine whether it was also fully functional. Infecting organoids with SARS-CoV-2, the researchers saw that the lung models countered with not only generic immune reactions such as inflammation, but also adaptive responses, as T cells became reactive to SARS-CoV-2 specifically.

They also tested the impact of pre-stimulating the organoids with fragments of the virus prior to infection, essentially simulating a kind of vaccination. Again, the organoid's immune cells learned how to better detect and dispatch SARS-CoV-2, which diminished future infections.

"The exact role of local immunity in human lungs has long been a hotly debated subject, but we believe these organoids will be a conduit for clear answers. Already, we've unveiled indications that resident T cells may be much more persistent than previously thought," said corresponding author **CALVIN KUO, MD, PhD**, a professor of hematology at Stanford Medicine.

The authors believe that their findings and future work in these models could provide a strong basis for local vaccination, which may complement or replace traditional vaccines that induce adaptive immunity systemically.

Their scope may also widen greatly in the future. The researchers believe their models could potentially help elucidate the role of tissue-resident immune responses in a variety of other pulmonary diseases, such as chronic obstructive pulmonary disease (COPD), asthma, and bacterial infections.

NIH supported this research through NIAID grants T32 AI007502, K08AI163369, U19AI057229, R01AI127877, R01AI130398, and U19AI116484, National Heart, Lung, and Blood Institute (NHLBI) grant T32HL129970, National Institute of General Medical Sciences (NIGMS) grant T32GM007365, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) grant R01DK130414, and National Cancer Institute (NCI) grant OT2CA278713.[®]

Reference

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A precision T-cell therapy stalls treatment-resistant cancers in clinical trial

Experimental drug invika halts progression of refractory tumors by selectively stimulating tumor-fighting T cells

BETHESDA, MD — Early results of the first clinical trial to evaluate the drug invikafusp alfa (invika) in humans indicate that the pioneering treatment may be capable of managing cancers that have rebuffed most other interventions, including standard immunotherapy. A study led by researchers at the National Institutes of Health (NIH), Mass General Brigham and Memorial Sloan Kettering found that, at optimal doses, invika was well tolerated and, in patients whose solid tumors had resisted standard immunotherapy, halted disease progression in most and shrank tumors in some.

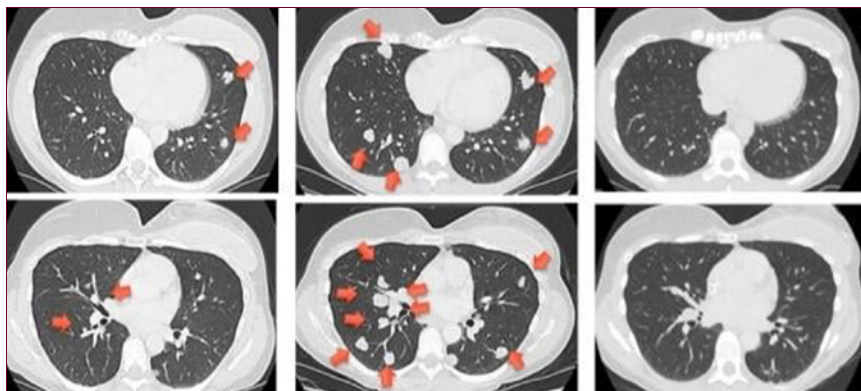
“Patients whose tumors are advanced—particularly tumors that don’t respond well to immunotherapy—often have their backs against a wall. Few options remain once you reach that point, but these results highlight a more precise means of stimulating anti-tumor immunity that could provide another solution,” said co-corresponding author **JAMES GULLEY, MD, PhD**, clinical director at the Center for Cancer Research (CCR), part of NIH’s National Cancer Institute (NCI).

While immunotherapies have already transformed treatment for several cancers, many patients benefit from them for only a short time, or not at all. Tumors frequently adapt to immune checkpoint blockade (ICB) therapies, such as pembrolizumab, limiting long-term benefits. Other strategies aim to rally T cells, the frontline soldiers of adaptive immunity, but usually do so indiscriminately, commonly leading to severe side effects.

Scientists designed the protein invika to engage a small subset of T cells, two groups of tumor-infiltrating lymphocytes specifically. By activating only this narrow population rather than T cells broadly, invika is designed to drive anti-tumor activity while avoiding the severe side effects that less selective approaches can cause. Preclinical studies also conducted at CCR indicate that the drug hits its intended marks and stimulates anti-tumor activity in animal models. This new study describes the next step for invika, detailing the results of phase 1 and initial phase 2 experiments in humans.

The researchers leading the trial recruited patients with a wide variety of cancers, the majority of which had not responded well to ICB. In phase 1, they treated study participants with varying dosages of invika every two weeks to evaluate the drug’s safety and determine the optimal dose. While several participants experienced flu-like side effects, these were expected and generally manageable with additional medication and supportive care. After identifying the lowest dose at which desired effects peaked, the researchers advanced to phase 2, treating participants at this optimal dose.

Of the 27 participants treated with the optimal dose across both phases, disease did not progress in 16 (59.3%) of them. Four (14.8%) participants experienced greater than 30% decreases in the size of targeted tumors, two of whom had metastatic colorectal cancer with tumors of a notoriously treatment-resistant type and were receiving invika as their seventh-line therapy.



CT scans of a study participant with immune checkpoint blockade-resistant colorectal cancer, taken six months before invika treatment (left), at the start of invika treatment (center), and after more than nine months of invika treatment (right). Arrows indicated pulmonary metastases.¹

Another responsive participant had stage 4 non-small cell lung cancer, again with tumors that had repelled multiple therapies including ICB. In participants receiving non-optimal levels, invika did not appear to have significant benefit.

In these patients, the study authors found that the drug fostered growth in the target T-cell populations without affecting any other T cells. They linked the four instances of tumor reduction to the largest shifts in target populations, though, as the authors expected at this early stage, immune activity alone did not always produce a measurable clinical response.

“These results are early, and although signs of immune activity don’t always translate into benefit to patients at this stage, it is new and exciting to see activity in patients whose cancers had stopped responding to immunotherapy—a group of people with very few options left,” said co-first author **NICHOLAS TSCHERNIA, MD**, a physician-scientist early investigator in the CCR at NCI. “These findings give us a reason to keep studying this new type of immunotherapy, particularly by combining it with other cancer treatments to continue to seek improved results.”

The treatment sponsor, Marengo Therapeutics, previously announced that the U.S. Food and Drug Administration (FDA) granted a Fast Track designation to invika to accelerate its evaluation as a treatment for antigen-rich, metastatic colorectal cancer. More recently, FDA has granted the same designation to invika for similar solid tumors, regardless of tissue type, following prior therapy including checkpoint inhibitors.

The ongoing clinical trial is still seeking study participants. Patients interested in enrolling in this study may contact NCI’s toll-free number 1-800-4-Cancer (1-800-422-6237) (TTY: 1-800-332-8615) or email NCIMO_referrals@mail.nih.gov. More information can also be found at <https://www.trials.cancer.gov>. ❖

Reference

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Appointments

Angela Caliendo, MD, PhD, and Methodius Tuuli, MD, MPH, MBA, named to Dean positions at AMS

PROVIDENCE [BROWN UNIVERSITY] — In a communications from Dean **MUKESH K. JAIN, MD**, it was announced that **ANGELA CALIENDO, MD, PhD**, The Warren Alpert Foundation Professor of Medicine, has been appointed to the role of Senior Associate Dean for Clinical Leadership and External Affairs within the Division of Biology and Medicine effective Oct. 1, 2026. Dr. Caliendo will partner closely with academic department chairs to advance strategic goals, support chair leadership development, and provide guidance across our clinical departments. She will oversee key academic investments, including the Innovation and Academic Assessment Fund, guide senior executive searches, and steward academic centers during leadership transitions. Additionally, Dr. Caliendo will help represent the Medical School with select state and regional partner organizations to support The Warren Alpert Medical School's initiatives and visibility.



A. Caliendo, MD, PhD

Dr. Caliendo will continue to serve as executive vice chair of the Department of Medicine and as interim director of the Legorreta Cancer Center.

METHODIUS TUULI, MD, MPH, MBA, Chace-Joukowsky Professor of Obstetrics and Gynecology and chair of the Department of Obstetrics and Gynecology, has been appointed Senior Associate Dean for Translational Science Programs effective Jan. 1, 2027. In this role, Dr. Tuuli will provide overall scientific

and strategic leadership for Advance Rhode Island Clinical and Translational Research Network (RI-CTR-N), driving its Phase III vision and "Collaborate to Innovate" mission in alignment



M. Tuuli, MD, MPH, MBA

with National Institute of General Medical Sciences CTR-N program requirements. Collaborating closely with executive committees, core leaders, institutional partners, and advisory bodies, he will oversee the center's governance, fiscal management, and programmatic performance. Dr. Tuuli will direct strategic investments across all Advance RI-CTR-N cores and lead federal reporting to the NIH, ensuring that research infrastructure, methodological training, and resources are targeted toward Rhode Island's most pressing health priorities, including chronic disease, mental health, and maternal and child health.

In addition, Dr. Tuuli will help foster collaboration between basic science departments, clinical faculty, and affiliated health systems to support translational research. He will also serve as an executive champion for clinical trials, helping advocate for streamlined processes and data-sharing opportunities throughout our biomedical ecosystem. Dr. Tuuli will foster workforce and investigator development across all career stages and chair the Honors Committee for the Division of Biology and Medicine. He will also continue in his academic leadership role as department chair and as executive chief of obstetrics and gynecology for Care New England Health System. ❖

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Victor Gazivoda, MD, surgical oncologist, joins CharterCARE Medical Associates



PROVIDENCE — CharterCARE Medical Associates recently announced that **VICTOR GAZIVODA, MD**, has joined its team of specialists in Surgical Oncology. He will be based at Roger Williams Medical Center.

Board-certified in General Surgery, Dr. Gazivoda's clinical interests focus on advanced robotic and minimally invasive surgery, specifically in gastrointestinal and

hepato-pancreato-biliary disease sites. His primary clinical objectives are to optimize patient recovery and oncologic

outcomes. Additionally, he has clinical expertise in the surgical management of soft tissue sarcomas, malignant cutaneous lesions, and endocrine tumors.

A graduate of Cornell University and St. George's University School of Medicine, Dr. Gazivoda completed his Complex General Surgical Oncology Fellowship at H. Lee Moffitt Cancer Center and Research Institute in Tampa, Florida. He completed his Surgical Oncology Research Fellowship at Rutgers Cancer Institute of New Jersey and his General Surgery Residency at Maimonides Medical Center in Brooklyn. He is an active member of the American College of Surgeons, Society of Surgical Oncology, and Society of American Gastrointestinal and Endoscopic Surgeons. ❖

Appointments



Richard Charest

CharterCARE Health of Rhode Island (CHRI) appoints Richard Charest as its new CEO

PROVIDENCE — CharterCARE Health of Rhode Island (CHRI) has announced the appointment of **RICHARD CHAREST** as its new Chief Executive Officer, following the retirement of Jeffrey Liebman, effective November 1, 2026.

Liebman, who has led CharterCARE since 2018, guided the organization through significant challenges, including the bankruptcy and subsequent sale by its former owner, Prospect Medical. The CHRI Board of Directors expressed appreciation for Liebman's leadership and dedication throughout this period of transition.

Charest brings 26 years of executive healthcare leadership experience in Rhode Island, with a background spanning non-profit, for-profit and government hospitals. Most recently, he served as Rhode Island's Secretary of Health and Human Services since 2023. His experience includes leading financial and operational turnaround efforts for healthcare organizations, including Landmark Medical Center.

A Focus on Stability, Growth and Quality Care

CHRI Board Chair **BEN MINGLE** emphasized that Charest's extensive experience makes him well-positioned to lead CharterCARE through its next chapter.

"Our Board felt that Rick's experience and skill set made him uniquely qualified over other candidates to step right in and begin executing on our comprehensive strategic turnaround plan," said Mingle.

While acknowledging recent financial pressures, Mingle highlighted several positive developments across the organization, including increasing patient volumes, the recruitment of new physicians and specialists, expanded programs and services, and continued investments in equipment and facilities.

He also reinforced the Board's commitment to maintaining high-quality clinical services and preserving access to essential healthcare for Rhode Island communities.

"Our Board is acutely aware of the critical role our hospitals play in our state's health care system, and we are laser-focused on doing what is needed to preserve our mission and our community's access to quality health care," Mingle added.

Looking Ahead

As incoming CEO, Charest will focus on strengthening CharterCARE's financial stability, improving operations and advancing the organization's strategic turnaround plan.

"I look forward to tackling the challenge of leading CharterCARE Health of Rhode Island," said Charest. "We must deliver on the strategic turnaround plan to stabilize finances and strengthen operations of these essential safety-net hospitals. I commit my best efforts to CharterCARE's board, providers, and employees to make this happen."

With new leadership and a continued focus on operational improvements, CharterCARE remains committed to supporting its healthcare professionals, strengthening its hospitals and delivering quality, accessible care to the Rhode Island communities it serves. ❖



Mark Dunlop, MD, joins Brown Health Medical Group Pulmonology, Critical Care, and Sleep Medicine

PROVIDENCE — **MARK DUNLOP, MD**, has joined Brown Health Medical Group Pulmonology, Critical Care, and Sleep Medicine. Dr. Dunlop is a pulmonary and critical care physician specializing in treating complex lung and breathing conditions, including interstitial lung

disease, pulmonary hypertension, and advanced bronchoscopy.

Dr. Dunlop completed his medical degree at New York Medical College, his internal medicine residency at Beth Israel

Deaconess Medical Center in Boston, and his fellowship in pulmonary and critical care medicine at Brown University. He is board certified in internal medicine by the American Board of Internal Medicine.

Dr. Dunlop's research focuses on improving care for people with serious lung and breathing problems. He has written and presented on lung disease, intensive care, and the use of advanced treatments to support patients who are critically ill. He is a member of the American College of Chest Physicians, the American Thoracic Society, and the Alpha Omega Alpha Honor Medical Society. ❖

Appointments



Allyson L. Hughes, MD, joins the Center for Advanced Lung Care at Brown University Health

PROVIDENCE — **ALLYSON L. HUGHES, MD**, has joined the Center for Advanced Lung Care at Brown University Health. Dr. Hughes

specializes in pulmonary, critical care, and sleep medicine, including complex sleep apnea, circadian rhythm disorders, and central hypersomnias.

Dr. Hughes earned her medical degree from the University of Kentucky College of Medicine. She completed her residency in internal medicine at the University of Tennessee/St. Thomas Hospital in Nashville and served as chief resident at Yale New Haven Health/Bridgeport Hospital. She then completed fellowship training in pulmonary and critical care medicine at the University of Massachusetts, followed by a sleep medicine fellowship through Harvard Medical School's Beth Israel Deaconess Medical Center/Boston Children's Hospital/Mass General Brigham program.

Her academic work includes published research and clinical writing on pulmonary hypertension, sleep and breathing disorders, critical care, and patient access to care. She has also contributed textbook chapters and presented nationally and regionally on topics in pulmonary, critical care, and sleep medicine.

She is an assistant professor of medicine, clinical educator, in pulmonary, critical care, and sleep medicine at The Warren Alpert Medical School of Brown University. ❖



Nobel Laureate Craig C. Mello, PhD, to advance RNA research at Brown University

PROVIDENCE (BROWN UNIVERSITY) — In a letter to the Division of Biology and Medicine community in October, Dean of Medicine and Biological Sciences **MUKESH K. JAIN, MD**, announced that Brown alumnus and Nobel Laureate **CRAIG C. MELLO, PhD**, will be joining

the Division as a professor of molecular biology, cell biology and biochemistry and a faculty member at the Giuliani RNA Center. Dr. Mello will move his research program to the William A. and Ami Kuan Danoff Life Sciences Laboratories in the summer of 2027.

Dr. Mello earned his Bachelor of Science in biochemistry and molecular biology from Brown in 1982 and his PhD from Harvard University in 1990. He was a postdoctoral fellow at the Fred Hutchinson Cancer Research Center before moving to the University of Massachusetts Chan Medical School, where he was most recently the Blais University Chair in Molecular Medicine and distinguished professor of RNA therapeutics and molecular medicine.

In 2006, Dr. Mello shared the Nobel Prize in Physiology or Medicine with Andrew Z. Fire for the discovery of RNA interference (RNAi), first reported in 1998. Their work showed that double-stranded RNA can trigger potent, sequence-specific silencing of matching cellular RNAs. In effect, RNAi acts as a programmable molecular search system: a short RNA sequence guides the cell's silencing machinery to complementary RNA molecules, allowing researchers to silence virtually any gene. The discovery transformed the study of gene function and opened a new therapeutic modality in which synthetic RNAs can be designed to silence disease-causing genes. RNAi has since led to multiple approved medicines and a broad pipeline of therapies in development. It also helped establish RNA-guided control as a fundamental mechanism governing gene expression.

Dr. Mello was a Howard Hughes Medical Institute investigator from 2000 to 2024 and is a member of the National Academy of Sciences. He co-founded the UMass RNA Therapeutics Institute in 2008 and helped to grow it into a world-class center for fundamental RNA biology and the development of RNA-based therapeutics. His work has been recognized with many of science's highest honors, including the Wiley Prize, the Gairdner Foundation International Award, and the Paul Ehrlich and Ludwig Darmstaedter Prize. He received an honorary doctorate from Brown in 2007. Dr. Mello has helped found multiple biotech ventures that focus on RNA-guided treatments for a variety of genetic diseases.

Dr. Mello will continue his long-standing commitment to rigorous fundamental science and looks forward to drawing on the interdisciplinary strengths of the Danoff Laboratories and the broader Brown community to explore how organisms store, process and transmit biological information, and how those insights can be harnessed to improve human health. He is also keen to engage with undergraduate and graduate students, both in the classroom and laboratory, to inspire the next generation of curiosity-driven scientists and physicians. ❖

Appointments



Edith Antonio, MD, joins Southcoast Health Obstetrics & Gynecology

NEW BEDFORD, MA — **EDITH ANTONIO, MD**, has joined Southcoast Health Obstetrics & Gynecology, seeing patients in New Bedford. She earned her Bachelor of Arts in Neuroscience and Behavior from Barnard

College in New York, NY. She continued her education and obtained her Doctor of Medicine from Columbia University Vagelos College of Physicians and Surgeons in New York. She completed her residency in obstetrics and gynecology at Brown University/Women & Infant's Hospital of Rhode Island.

Dr. Antonio's clinical interests include fibroids, menopause, and gynecological surgery, with a particular focus on helping patients navigate their reproductive and gynecologic health with confidence and support. ❖



Edward J. Testa, MD, joins Southcoast Health Orthopedics

FALL RIVER, MA — **EDWARD J. TESTA, MD**, joins Southcoast Health Orthopedics specializing in shoulder and elbow surgery and seeing patients in Fall River. He earned his Bachelor of Science in Biology and his

Doctor of Medicine from Tufts University in Medford, Mass. He completed his residency in orthopedic surgery at Brown University/Rhode Island Hospital.

Dr. Testa completed advanced fellowship training in Sports Medicine and Shoulder & Elbow Surgery at OrthoCarolina in Charlotte, North Carolina, as well as additional fellowship training in Orthopedic Trauma at Brown University. He also pursued international shoulder surgery training in Switzerland, gaining further expertise in the management of complex shoulder pathology and reconstructive surgery. During his fellowship at OrthoCarolina, he served as an assistant team physician for the Carolina Panthers, Charlotte FC, and Charlotte Knights (AAA), providing experience in the care of professional and elite athletes. ❖



Chase Samsel, MD, named VP, CMO, at Bradley Hospital

EAST PROVIDENCE — Bradley Hospital has appointed Chase Samsel, MD, as its vice president and chief medical officer, bringing to the role extensive experience in child and adolescent psychiatry, clinical leadership, medical education, and the care of children and adolescents with complex medical and behavioral health needs.

Dr. Samsel also serves as a clinical assistant professor of psychiatry and human behavior at The Warren Alpert Medical School of Brown University. As vice president and chief medical officer, he will help lead Bradley Hospital's clinical programs and advance its mission of providing high-quality, evidence-based pediatric behavioral health care.

Prior to joining Bradley Hospital, Dr. Samsel held several clinical and leadership positions at Boston Children's Hospital, including medical director of the Psychiatry Consultation Service and associate training director for the Child and Adolescent Psychiatry Fellowship and Triple Board Residency programs. In these roles, he helped lead multidisciplinary teams, developed innovative clinical pathways, and advanced behavioral health care within pediatric medical settings.

A board-certified child and adolescent psychiatrist and physician, Dr. Samsel has dedicated his career to supporting children and families through integrated, multidisciplinary care. His expertise spans pediatric consultation-liaison psychiatry, transplant psychiatry, pediatric delirium, catatonia, eating and feeding disorders, palliative care, and initiatives aimed at reducing pediatric mental health boarding.

"Throughout my career, I've been drawn to opportunities that bring behavioral health and pediatric medicine closer together for the benefit of children and families. Bradley Hospital has long been a leader in that work, and I'm excited to join an organization that is so deeply committed to improving the lives of young people. I look forward to partnering with our clinical teams to build on that legacy and continue advancing innovative, compassionate care," said Dr. Samsel.

Dr. Samsel earned his medical degree from the Medical College of Georgia at Augusta University. He completed his Triple Board residency in pediatrics, adult psychiatry, and child psychiatry through The Warren Alpert Medical School of Brown University, where he served as chief resident. He further pursued advanced training through a psychoanalysis fellowship at the Massachusetts Institute for Psychoanalysis and a child psychodynamic psychotherapy fellowship at the Boston Psychoanalytic Society and Institute.

An accomplished clinician, educator, and researcher, Dr. Samsel has contributed extensively to the field of pediatric behavioral health and has been recognized as a Distinguished Fellow of the American Academy of Child and Adolescent Psychiatry. He has co-authored numerous peer-reviewed publications, contributed chapters to leading medical textbooks, and presented his work nationally and internationally. His scholarly interests focus on improving care for medically complex pediatric patients and advancing best practices in child and adolescent psychiatry. ❖

Obituaries



DAVID CARPENTIER, MD, passed away peacefully on September 24, 2026, surrounded by his children. He was born in Rhode Island on June 7, 1954, to Mary Carpentier and the late Peter A. Carpentier.

After graduating from the University of Rhode Island, he attended the Universidad Autónoma de Guadalajara School of Medicine in Mexico and subsequently transferred to and graduated from Brown University School of Medicine. Thereafter he traveled to New York to begin residency in Emergency Medicine at Long Island Jewish Medical Centre and upon completion became the Assistant Director of the Emergency Department at Queens Hospital Center. Eventually, Rhode Island called him home where, after some years of practice in the Emergency Departments of Newport and Fatima hospitals, he established an Urgent Care Center: Cranston Medical, Inc. in his childhood city of Cranston where nearly all of Cranston came to be treated by Dr. C or Dr. Dave as he was often referred to, or to simply socialize.

He loved golfing, kayaking, sailing, music of all genres, and capturing the beauty of the world and its people through photographs. But most of all he loved shooting clays at Addieville and fly-fishing along Rhode Island, New Hampshire, and Connecticut rivers.

He is survived by his son, Blake Carpentier, and his wife, Marisa; his granddaughter, Wren Carmen Carpentier; his daughter, Taylor Carpentier; and the mother of his children, Dr. Dawna A. Blake. He is also survived by longtime partner Patty Allison Fairweather, and her children and grandchildren. He leaves behind his beloved mother, Mary Carpentier, and his brothers Peter J. Carpentier, and his wife, Brenda; Paul Carpentier and his husband, Dennis DelSignore; and his sister, Sharon Carpentier. He also leaves behind his niece, Dr. Bianca Carpentier, her husband, James Wheeler, and his grandnieces, numerous aunts, uncles, and cousins.

He is remembered most fondly not simply for what he accomplished, but for the life he shared with those around him. He cherished his family and kept friendships that spanned decades. Although our hearts ache feeling the presence of his absence and the absence of his presence, we rejoice in the memory of him, his stories, his lessons, and his laughter.

The family extends heartfelt gratitude to the healthcare providers, especially the nurses, as well as case managers, support and janitorial staff of the Brigham and Women's Hospital for their dedication to serving David's needs.

In his memory, please send donations in his name to St. Jude's Children's Hospital (<https://www.stjude.org>) or the Mayfly Project (<https://themayflyproject.com>). ♦



CHRISTOPHER MICHAEL ERSTLING, MD, born November 1, 1947, died October 9, 2026 at the John Clarke Nursing Center in Middletown, RI.

He was born in New York City and moved to New Jersey with his family, where he graduated from Bergen Catholic High School as a national merit scholar and senior class president. He graduated from Seton Hall University in 1969 and from the New Jersey College of Medicine in 1973.

Dr. Erstling completed his internship at the University of Pittsburgh and embarked on a career in psychiatry, practicing at Western Psych at the University of Pittsburgh Medical Center and Shadyside Hospital, as well as in private practice. He was a graduate of the Pittsburgh Psychoanalytic Institute, president of the Pittsburgh Psychiatric Society, and a member of the University Club of Pittsburgh.

In 1994, he and his family moved to Rhode Island, where the family had spent many summers. In Newport, he practiced at the Newport Mental Health Center, and later at Newport Hospital, where he served as Chief of Psychiatry. He also practiced at Butler Hospital in Providence and taught courses at Brown University. He finished his illustrious career proudly serving American veterans as a psychiatrist at the Middletown VA Clinic.

In his free time, he read voraciously, sailed his cat boat on the Sakonnet River, listened to jazz and played the stand-up base, and supported local visual artists.

He will be remembered for his professional accomplishments and his impact on his community, but most of all, for his steadfast support of his family, providing an environment where they could thrive, achieve, and enjoy all the opportunities life would offer.

He leaves behind his devoted wife, Dr. Susan Erstling of Newport, loving daughters Emily Erstling of New York City and Kate Erstling of Hampton Falls, NH, and son-in-law Timothy Frazier and grandson Wiley Frazier, also of Hampton Falls, in addition to many other family members and a community of peers and people whom he has helped find peace and recovery over the years.

Donations in his memory may be sent to John Clarke Senior Living, 600 Valley Rd., Middletown, RI 02842, johnclarkeseniorgiving.org.

Arrangements are by the O'Neill-Hayes Funeral Home. For online tributes, please visit oneillhayes.com.



DAVID J. LUZ, MD, 83, a humble, well-respected surgeon for over 40 dedicated years at Kent Hospital, passed away with his loving family beside him, on October 1, 2026 at Rhode Island Hospital. He was the beloved husband of Beverly E. (Smith) Luz for 48 years, the loving father of Sarah E.

Luz and her husband, Daniel Neal, and the adoring grandfather of Zoe E. Neal.

Born in Providence, he was the son of the late Joseph A. and Mary (Ray) Luz. He graduated from LaSalle Academy in 1961. He went on to earn a bachelor's degree and then a master's degree

in biology from Providence College. He graduated as a Doctor of Medicine from the University of Bologna, Italy, in 1975.

Family and friends considered him to be a Renaissance man with many varied interests: woodworking, world history, archaeology, cooking, landscaping, drawing, painting, boating, and fishing. He also loved to travel, counting Hawaii among his favorite places. He found great solace in nature, including the neighborhood birds and animals.

Memorial donations to Habitat for Humanity-West Bay (www.habitatwestbay.org) or Foster Forward (www.fosterforward.net) would be appreciated. Arrangements are with Iannotti Funeral Home, Coventry, RI, iannottifh.com. ❖