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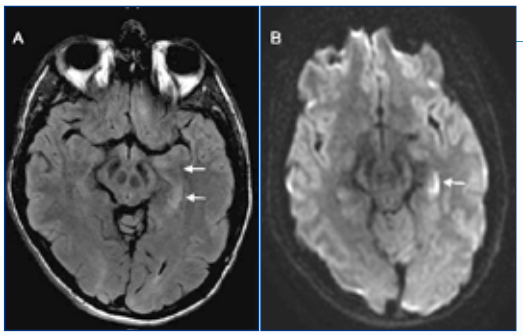


## CASE REPORTS



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# Rare Association of Autoimmune Limbic Encephalitis and Stiff Person Syndrome

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## ABSTRACT

Antibodies to Glutamic Acid Decarboxylase (GAD) have been implicated in the pathogenesis of both autoimmune Limbic Encephalitis (LE) and Stiff Person Syndrome (SPS). However, their association is quite rare. We present a case of a 48-year-old Caucasian female who presented with symptoms of recurrent severe headaches, behavioral and cognitive dysfunction, and an episode of seizure. She was found to have high titers of anti-GAD65 antibodies in both cerebrospinal fluid and serum. She was diagnosed with LE and SPS, and was started on immunosuppressive therapy with steroids and intravenous immunoglobulins (IVIG). The patient responded well to treatment with improvement in her symptoms.


**KEYWORDS:** Stiff person syndrome, SPS, Limbic encephalitis, LE, GAD 65

## INTRODUCTION

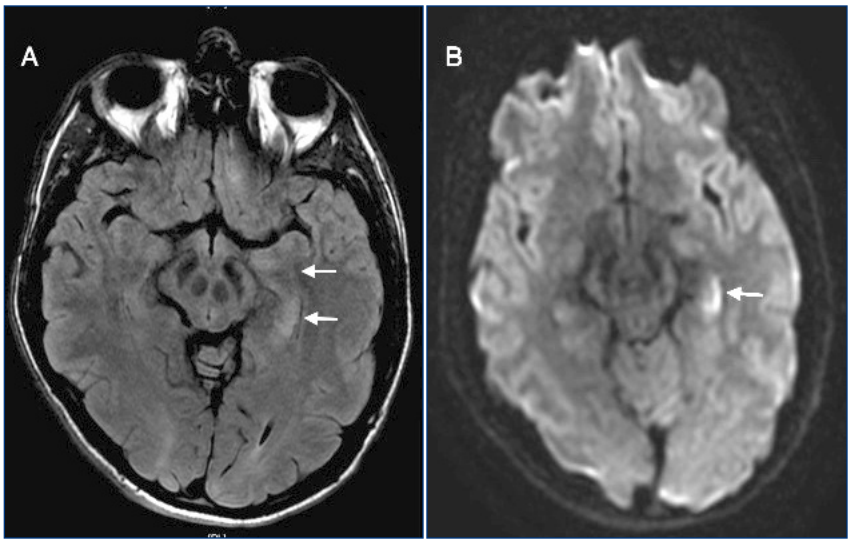
Stiff-person syndrome (SPS) is a rare neurological disorder, characterized by progressive muscle rigidity, stiffness, and painful muscle spasms.[1,2] It predominantly affects the trunk and proximal extremity muscles, leading to difficulty with ambulation and recurrent falls.[3] The likely pathogenesis of SPS is autoimmune, and most patients are found to have antibodies to glutamic acid decarboxylase (GAD).[4,5] GAD antibodies are also associated with other neurological conditions, such as cerebellar ataxia, epilepsy, palatal tremor, and autoimmune limbic encephalitis (LE).[6] Autoimmune LE is increasingly being identified as an underlying cause in individuals presenting with neurocognitive and psychiatric symptoms. Although antibodies to GAD are implicated in the pathogenesis of both SPS and autoimmune LE their association is quite rare. Here we present a rare case of concurrent LE and SPS, which was successfully treated with immunosuppressive therapy.

## CASE DESCRIPTION

A 48-year-old right-handed woman presented to the hospital after having an episode of generalized tonic-clonic seizure. She had been complaining of recurrent severe headaches, along with episodes of confusion, agitation, and hallucinations for the past two weeks. She also complained of stiffness and rigidity involving neck and back muscles, with muscle spasms, and difficulty ambulating with frequent falls. She did not have any known history of seizure disorder.

Physical exam demonstrated a heart rate of 76 beats per minute, blood pressure of 133/79, respiratory rate of 15 breaths per minute, and oxygen saturation of 99% on room air. The patient was alert but confused, and only oriented to person. Neurological examination showed grossly intact cranial nerves; motor evaluation demonstrated generalized rigidity, and muscle strength was 5/5 in all four limbs. Deep tendon reflexes were normal, Babinski reflexes were negative bilaterally, and her sensory evaluation was unremarkable. However, an evaluation of her gait was not performed. Laboratory evaluation was unremarkable, including a normal complete blood count, basic metabolic profile, liver function test, uric acid level, thyroid stimulating hormone, and hemoglobin A1c. Magnetic resonance imaging (MRI) of the brain showed signal hyperintensity involving the left

**Figure 1.** Magnetic resonance imaging of brain showing hyperintensity involving left temporal lobe on FLAIR sequence (**A**) with evidence of diffusion restriction on DWI (**B**).



temporal lobe on FLAIR sequences, with evidence of diffusion restriction on diffusion-weighted imaging (**Figure 1**). Electroencephalography (EEG) showed increased epileptogenicity in the left frontotemporal lobe. Lumbar puncture (LP) and cerebrospinal fluid (CSF) analysis showed a white cell count of 5 cells/mm$^3$ with 24% lymphocytes and 2% segmented neutrophils, protein of 42 mg/dL, and glucose of 67 mg/dL. Gram stain and cultures for bacteria, fungus, and mycobacteria were negative; PCR for HSV 1 and 2, HHV-6, West-Nile virus and JC virus were negative. Antibodies in the paraneoplastic panel (ANNA 1&2, AGNA 1, PCA 1&2, CRMP – 5, P/Q and N type calcium channel, anti-AChR, anti-amphiphysin) were also negative. However, the autoimmune evaluation of CSF demonstrated elevated anti-GAD65 antibodies, with titers of 148 IU/mL, and normal or undetectable titers for other autoantibodies, such as anti-NMDAR, anti-VGKC complex, anti-LGI, anti-Caspr 2, and anti-GABA$_B$R. In additions to CSF, serum anti-GAD65 antibodies were checked and were found to be elevated as well. Electromyography (EMG) showed continuous motor unit activity in agonist and antagonist muscles. Given the patient's clinical presentation and resulting investigational workup, a diagnosis of autoimmune LE and SPS was considered.

The patient was given one dose of intravenous methylprednisolone 1000 mg and was started on an IVIG infusion of 60 gm once daily for five days. Levetiracetam 1000mg two times per day and diazepam 5mg four times per day orally were also initiated, and the patient showed significant improvement in cognitive and behavioral symptoms. No further seizure activity was reported, and there was improvement in her muscle stiffness. The patient was transitioned to oral prednisone 60mg daily maintenance dose and discharged to an acute care rehabilitation facility.

## DISCUSSION

SPS is a rare neurological disorder, with an increased incidence in females over males (ratio of 2:1). It commonly occurs in the third to sixth decades of life.[1,7] SPS is clinically characterized by muscle stiffness and rigidity, predominantly affecting the axial and proximal limb muscles.[1,2] Stiffness and rigidity cause difficulty with posturing, gait imbalance, muscles spasms, leading to frequent falls.[2,3] Muscle spasms are often precipitated by external stimuli (tactile or auditory) and emotional stress.[3] SPS is a progressive disease, with muscle stiffness and rigidity becoming more fixed with time, and spasms becoming more frequent, leading to functional impairment and progressive disability.[1] Psychiatric disorders, such as depression, generalized anxiety disorder, panic attacks, and phobias, are also commonly associated with SPS.[8,9]

Autoantibodies to GAD have been implicated in pathogenesis of SPS, and these antibodies are found in high titers in both serum and CSF of these patients.[5] GAD is a crucial enzyme involved in synthesis of gamma aminobutyric acid (GABA), the principal inhibitory neurotransmitter in the central nervous system. The enzyme GAD is present in two isoforms, namely GAD65 and GAD67.[10] GAD65 is a membrane-bound enzyme found in GABAergic neurons in the CNS, and pancreatic beta cells in the gastrointestinal tract. GAD67 is a soluble form and is found only in the CNS. Anti-GAD65 antibodies are present in the serum and CSF of 80% and 75% of SPS patients, respectively.[2,11,12] Anti-GAD67 antibodies are found in 50% of patients with SPS, but in much lower titers when compared to anti-GAD65.[12] These antibodies are present in one percent of the normal population and five percent of patients with other neurological disorders, such as cerebellar ataxia, epilepsy, palatal tremor, and autoimmune limbic encephalitis (LE).[6,13] Diagnosis of SPS is made on clinical findings with supportive evidence from serology and EMG. Demonstration of continuous, involuntary simultaneous firing of motor units on EMG is characteristic of SPS in agonist and antagonistic muscles.[2] Immunosuppressive/immunomodulation therapy with steroids, rituximab, IVIG, and plasmapheresis has been utilized in the treatment of SPS.[14] Medications that increase GABA activity, such as diazepam and baclofen, also help to alleviate symptoms.[14]

The hallmark of autoimmune LE is the rapid development of confusion, cognitive dysfunction, behavioral symptoms, and seizures.[15,16] Furthermore, the subacute development of short-term memory deficits is a well-recognized characteristic of this disorder.[15] LE was initially described as paraneoplastic, and was found in association with certain malignancies, such as lung cancer and testicular tumors.

Onconeural (intracellular) antibodies, such as anti-Hu and anti-Ma, are elevated in paraneoplastic LE, whereas antibodies against neuronal cell surface (extracellular) proteins, such as LGI 1, Caspr 2, NMDAR, AMPAR, GABA$_B$R and glycine receptor, are commonly associated with autoimmune LE.[16,17] GAD is distinct to these as it is an intracellular antigen but not an onconeural antigen, and yet has also been associated with the pathogenesis of autoimmune LE.[18] CSF analysis typically shows lymphocytic pleocytosis in 60–80% of LE patients, with approximately 50% of patients having oligoclonal bands and an elevated IgG index.[16] Imaging with MRI or positron emission topography (PET) scan classically shows hyperintense signals in bilateral medial temporal lobes, but unilateral abnormalities or normal scans can also be found in LE patients.[15] It is important to exclude infections and metabolic etiologies that can present with a similar clinical picture before establishing the diagnosis of autoimmune LE. Treatment of autoimmune LE is by immunosuppression, with pulsed steroids, followed by high dose oral prednisone and IVIG, with or without plasmapheresis.[19]

Although cases of both SPS and autoimmune LE are described in literature, their association is very rare. Both

these disorders have been described in association with GAD antibodies, but the exact mechanism of how these antibodies interact with neural antigens is not fully known. It has been hypothesized that these antibodies interfere with synthesis of GABA in the CNS, leading to its reduced levels. This relative deficiency of GABA can lead to malfunction of major inhibitory pathways.[3,5] Therefore, it is important to highlight the role of anti-GAD antibodies as a marker for these neurological disorders, rather than the actual cause of dysfunction. Lastly, Sharma et al in 2016 described a case of SPS with autoimmune LE in a patient with type 1 diabetes mellitus (DM) associated with anti-GAD65 antibodies.[20] Our patient did not carry a diagnosis of DM at the time of her presentation. To our knowledge this is the second reported case of a of SPS with concurrent autoimmune LE.

## References


1. Rakocevic G. and Floeter MK. Autoimmune stiff person syndrome and related myelopathies: understanding of electrophysiological and immunological processes. Muscle Nerve. 2012 May 1; 45(5): 623-634. PMID: 22499087
2. Dalakas MC, Fujii M, Li M, McElroy B. The clinical spectrum of anti-GAD antibody-positive patients with stiff-person syndrome. Neurol. 2000 Nov 28; 55(10):1531-1535. PMID: 11094109
3. Levy LM., Dalakas MC, Floeter MK. The stiff-person syndrome: an autoimmune disorder affecting neurotransmission of gamma-aminobutyric acid. Ann Intern Med. 1999 Oct 5; 131(7):522-30. PMID: 10507962
4. Urban GJG, Friedman M, Ren P, Torn C, Fex M, Hampe C, Lernmark A, Landegren U, Kamali-Moghaddam M. Elevated serum GAD65 and GAD65-GADA immune complexes in stiff person syndrome. Scientific Reports. 2015 Jun 16; 5(1):11196. PMID: 26080009
5. Solimena M, Folli, F, Denis-Donini S, Comi GC, Pozza G, De Camilli P. Autoantibodies to glutamic acid decarboxylase in a patient with stiff-man syndrome, epilepsy, and type I diabetes mellitus. NEJM. 1988 Apr 21; 318(16):1012-1020. PMID: 3281011
6. Saiz A, Blanco Y, Sabater, L, González F, Bataller L, Casamitjana R, Ramio-Torrenta L, Graus F. Spectrum of neurological syndromes associated with glutamic acid decarboxylase antibodies: diagnostic clues for this association. Brain. 2008 Oct 1; 131(10):2553-2563. PMID: 18687732
7. Moersch FP, Woltman HW. Progressive fluctuating muscular rigidity and spasm ("stiff-man" syndrome); report of a case and some observations in 13 other cases. Proc Staff Meet Mayo Clin. 1956 July 25; 31(15):421-427. PMID: 13350379
8. Henningsen P, Meinck HM. Specific phobia is a frequent non-motor feature in stiff man syndrome. J Neurol Neurosurg Psychiatry 2003 Apr 1; 74(4):462-465. PMID: 12640064
9. Buechner S, Florio I, Capone L. Stiff Person Syndrome: A Rare Neurological Disorder, Heterogeneous in Clinical Presentation and Not Easy to Treat. Case Rep Neurol Med. 2015 May 27; 10 (1155):278065. PMID: 26106494
10. Towns R, Pietropaolo M. GAD65 autoantibodies and its role as biomarker of Type 1 diabetes and Latent Autoimmune Diabetes in Adults (LADA). Drugs Future. 2011 Nov 1; 36(11)847. PMID: 22869930
11. Manto MU, Laute MA, Aguera M, Rogemond V, Pandolfo M, Honnorat J. Effects of anti–glutamic acid decarboxylase antibodies associated with neurological diseases. Ann Neurol. 2007 Jun 1; 61(6):544-551. PMID: 17600364
12. Alexopoulo H, Dalakas MC. A critical update on the immunopathogenesis of Stiff Person Syndrome. Eur J Clin Invest. 2010 Aug 19; 40(11):1018-1025. PMID: 20636380.
13. Meinck HM, Faber L, Morgenthaler N, Seissler J, Maile S, Butler M, Solimena M, DeCamilli P, Scherbaum WA. Antibodies against glutamic acid decarboxylase: prevalence in neurological diseases. J Neurol Neurosurg Psych. 2001 Jul 1;71(1):100-103. PMID 11413272
14. Dalakas MC. Stiff person syndrome: advances in pathogenesis and therapeutic interventions. Curr Treat Options Neurol. 2009 Mar 1; 11(2):102-110. PMID: 19210912
15. Anderson NE, Barber PA. Limbic encephalitis - a review. J Clin Neurosci. 2008 Sep 1; 15(9):961-971. PMID: 18411052
16. Graus F, Titulaer MJ, Balu R, Benseler S, Bien CG, Cellucci T, Cortese I, Dale RC, et al. A clinical approach to diagnosis of autoimmune encephalitis. Lancet Neurol. Feb 20; 15(4):391-404. PMID: 26906964
17. Ramanathan S, Mohammad SS, Brilot F, Dale RC. Autoimmune encephalitis: recent updates and emerging challenges. J Clin Neurosci. 2014 Sep 15; 21(5):722-730. PMID: 24246947
18. Finelli PF. Autoimmune Limbic Encephalitis With GAD Antibodies. Neurohospitalist. 2011 Oct 1; 1(4):178-81. PMID: 23983853
19. Lancaster E. The Diagnosis and Treatment of Autoimmune Encephalitis. J Clin Neurol. 2016 Dec 23; 12(1):1-13. PMID: 26754777
20. Sharma CM, Pandey RK, Kumawat BL, Khandelwal D, Gandhi P. A unique combination of autoimmune limbic encephalitis, type 1 diabetes, and Stiff person syndrome associated with GAD-65 antibody. Ann Indian Acad Neurol. 2016 Jan-Mar; 19(1): 146. PMID: 27011652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# Subacromial Balloon Spacers for Massive Irreparable Rotator Cuff Tears

ALAYNA K. VAUGHAN, MD; MOHAMAD Y. FARES, MD; JASPAL SINGH, MD; JOSEPH A. ABBOUD, MD

## ABSTRACT

Massive irreparable rotator cuff tears are difficult to treat. Several different treatment options have been explored in the orthopedic realm. A 69-year-old male with a massive irreparable rotator cuff tear was originally treated with a subacromial balloon spacer around five years prior to presentation. The patient started having increasing shoulder discomfort. Treatment options were discussed following review of MRI results and the patient decided to move forward with a second balloon spacer. The patient underwent his revision procedure and noted significant improvement in his pain and function on follow-up. Revision subacromial balloon spacers constitute an effective surgical treatment option that may slow the progression of rotator cuff arthropathy and relieve pain and dysfunction in the setting of massive irreparable rotator cuff tears.

**KEYWORDS:** rotator cuff; balloon; interpositional balloon; balloon arthroplasty

## INTRODUCTION

Massive irreparable rotator cuff tears pose a challenge to shoulder surgeons.[1] This category of rotator cuff tears can be treated in many ways.[1] Management options include living with the symptoms, physical therapy, corticosteroid injections, or undergoing surgical intervention that may include debridement with tuberoplasty, partial rotator cuff repair, utilization of an allograft to attempt tendon reconstruction, superior capsular reconstruction, tendon transfer, or reverse total shoulder arthroplasty.[1,2] Each of these options entails a specific set of strengths and limitations, and may have variable outcomes depending on the patient and their symptomatology.[1,2] Additionally, when patients choose nonoperative management, they run the risk of developing worsening rotator cuff tear arthropathy over time.[1,2] As such, substantial research efforts have been put towards the treatment of massive irreparable rotator cuff tears. There is likely a subset of patients who would benefit from a less invasive treatment that can help mitigate symptoms and improve function without having to resort to shoulder replacement or more involved reconstructive procedures. The subacromial balloon spacer emerged around a decade ago, and has shown potential for a specific subset of patients with massive irreparable rotator cuff tears.[3,4]

The subacromial balloon is a bioabsorbable device that helps patients with massive irreparable rotator cuff tears by increasing the acromiohumeral distance, in theory eliminating the contact of the humeral head with the acromion seen in rotator cuff deficient patients, thus alleviating pain.[5] It also helps alter the biomechanics of the shoulder joint, and redistributes the tension of adjacent musculature in a way that compensates for the deficient rotator cuff.[5,6] As a result, the subacromial balloon has been reported to decrease pain and improve function in certain patients.[6]

Adhering to the strict indications of the device are necessary for achieving optimal results, and these include an intact subscapularis and teres minor muscles, an intact deltoid, the ability to achieve 90 degrees of active forward elevation, and minimal to moderate glenohumeral osteoarthritis.[5,6] In these patients, the balloon has shown generally positive results in the literature, and has been considered a surgical procedure that is easy to perform, minimally invasive, and cost effective when compared to other surgical alternatives.[5-7]

As with other novel surgical procedures, research regarding the balloon remains vital in order to accurately describe the benefits and the utility of this treatment option. In particular, it is important to evaluate the safety and efficacy of the balloon in the long-term, and to assess the changes conducted on the glenohumeral architecture following its placement. There has been controversy regarding the longevity of the benefits of the subacromial balloon spacer following its implantation, with some surgeons sharing the belief that the benefits disappear with its disintegration in the glenohumeral joint.[8,9] Accordingly, it is important to report and describe cases that adequately present the therapeutic effects of the balloon in the long-term, well beyond its resorption in the shoulder joint. In this report, we present the case of a 69-year-old male who underwent a subacromial balloon spacer procedure, and opted for a second revision subacromial balloon spacer procedure in the same shoulder 5 years later. To our knowledge, this is the first reported case of revision subacromial balloon placement, and by presenting it, we aim to comment on the lasting effects and safety of the subacromial balloon spacer, and help describe postoperative prognosis and rehabilitation, based on a holistic review of literature.

## CASE PRESENTATION

The patient is a 69-year-old male who presented to the office with increasing discomfort and diminished function in the right shoulder. His symptoms were consistent with rotator cuff disease, and began as pain with reaching, lifting, and overhead movement over the preceding month as well as notably diminished range of motion. The patient had a past medical history significant for heart disease, chronic obstructive pulmonary disease, and prior right sided subacromial balloon spacer procedure performed five years prior to his presentation. He was very satisfied with the procedure, evident by the improvement seen in his previous patient-reported outcome scores **(Table 1).**

**Table 1.** Patient reported functional outcomes prior to and after the first and second subacromial balloon placement procedures.

| | Pre-Operative First procedure | Post-Operative (1 year) First Procedure | Pre-Operative Second Procedure | Post-Operative (4 months) Second Procedure | Post-Operative (1 year) Second Procedure |
|---|---|---|---|---|---|
| **Functional Outcome Scores** | ASES: 26.62<br>VAS: 8<br>SANE: 13.39%<br>SST: 41.67 | ASES: 100<br>VAS: 0<br>SANE: 100<br>SST: 91.67 | ASES: 60.87<br>VAS: 4.16 | ASES: 78.00<br>VAS: 1 | ASES: 95<br>VAS: 1 |

(ASES: American Shoulder and Elbow Surgeons' score; VAS: Visual Analogue Scale; SANE: Single Assessment Numeric Evaluation; SST: Simple Shoulder Test)

On his new presentation, the patient reported new pain and poor function in his shoulder, which he attributed to overexertion and strenuous activity over the last several months. His physical exam showed active forward elevation up to 125 degrees, active abduction to 80 degrees, and external rotation to 10 degrees, with some discomfort. Patient had full passive range of motion, but was inhibited by pain and weakness. The patient had an American Shoulder and Elbow Surgeons (ASES) score of 60.87 and a Visual Analogue pain score of 4 on his visit.

Radiographic imaging taken during the first visit showed minimal changes (**Figure 1**) to prior X-rays from approximately 5 years prior (**Figure 2**). On anteroposterior (AP) view, there was mild glenohumeral arthritis with minimal joint space narrowing (Hamada Grade 2) and slight proximal humeral migration. Acromiohumeral distance was measured to be 5 mm, having been 7 mm prior to his first procedure. Mild AC joint and glenohumeral arthritis were noted as well. Subsequent non-contrast MRI of the right shoulder was performed, which showed massive full thickness tears of the supraspinatus and infraspinatus tendons with retraction to the level of the glenohumeral joint (**Figure 3**). The supraspinatus and infraspinatus tendons were found to be severely atrophied (Grade 4 Goutallier classification) , whereas the teres minor and subscapularis tendons were found to be preserved (**Figure 3**). There was no evidence of the previously implanted subacromial balloon device. These findings were consistent with his past MRI findings prior to his first balloon procedure, which also showed a high riding humeral head, tearing in his supraspinatus and infraspinatus, and mild AC and glenohumeral joint arthritis. Of note, there was minimal rotator cuff arthropathy progression, which is not typically seen 5 years after a massive irreparable rotator cuff tear diagnosis.[10,11]

After discussing potential treatment options and patient goals, the patient decided to have an arthroscopic revision subacromial balloon spacer procedure given the success he had with this same procedure five years prior. Intraoperatively, the patient findings were consistent with the MRI. Systematic examination of the joint demonstrated well preserved articular surfaces with intact subscapularis and teres minor tendons. A minimal bursectomy was performed to improve exposure and visualization. A large subacromial balloon, same size as his initial surgery, was placed in the

**Figure 1.** X-ray imaging prior to second procedure, 5 years after first X-ray, showing minimal changes in joint architecture and spacing.

**Figure 2.** X-ray imaging prior to first procedure.

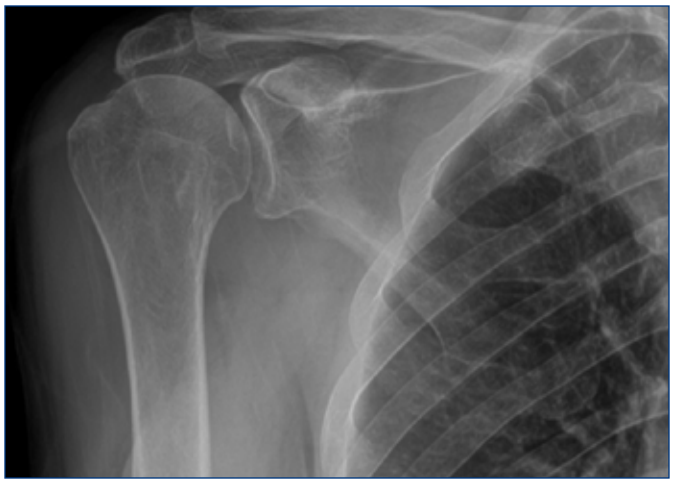
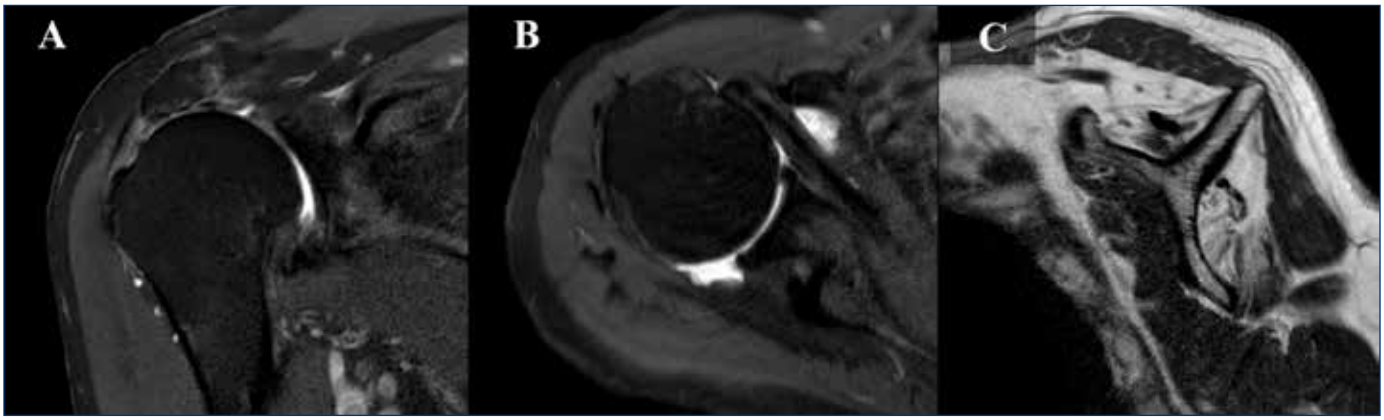


**Figure 3.** MRI findings prior to the patient's second subacromial balloon placement procedure showing:
(**A**) a massive full thickness superior rotator cuff tear (supraspinatus and infraspinatus) with retraction to the level of the glenoid,
(**B**) intact subscapularis tendon with a torn infraspinatus tendon, and
(**C**) severe fatty infiltration of supraspinatus and infraspinatus muscle tendons.




subacromial space, and the patient tolerated the procedure without any surgical complications. Surgical time was approximately 20 minutes from initial incision to closure, and blood loss was minimal. Patient was placed in a sling and instructed to return to clinic around 10 days following procedure.

On his first postoperative visit, the patient noted improvement in pain and mobility. He was instructed to start physical therapy and rehabilitation at 2 weeks following the procedure. At 4 months post-op, his ASES score improved to 78 and his VAS pain score dropped to 1. At 6 months following the procedure, the patient had no pain (VAS pain score was 0), and was able to return to his leisure activities like fishing. He was able to forward elevate his shoulder to 180 degrees, abduct to 90 degrees, and externally rotate his shoulder to 40 degrees. The patient was very content with the improvement in pain and function he received. One year out from the surgery his ASES improved to 95, and he reported resumption of his normal daily life and leisure activities without pain, and retainment of full range of motion **(Table 1)**.

## DISCUSSION

This case provides insight on the efficacy, longevity, and safety of the subacromial balloon placement procedure in the setting of massive irreparable rotator cuff tear. The patient in our report opted for subacromial balloon spacer placement initially, and the positive outcomes exhibited by the procedure prompted him to repeat it five years later. After doing the second procedure, the patient noted improvement in pain and function, as seen by his clinical results and his patient reported outcome scores. The benefits of the subacromial balloon spacer stem from its ability to increase the distance between the acromion and the humeral head.[5,6,12] The benefits of the balloon have been well documented in the literature. Vecchini et al explored two populations of patients with irreparable massive rotator cuff tears, and reported significant improvements in Constant score, range of motion, and visual analogue pain score before and after operation.[13] Similarly, Kaisidis et al conducted a retrospective study that involved 47 patients treated with subacromial balloon spacers for massive irreparable rotator cuff tears, and noted significant improvements in range of motion and patient-reported outcomes at a mean follow-up of 24.6 months.[14] One multi-center randomized controlled trial by Verma et al compared partial cuff repair to subacromial balloon spacers for the treatment of massive irreparable rotator cuff tears, and noted excellent patient-reported outcomes and range of motion measurements following both procedures, while noting a significantly earlier functional recovery and pain relief in the balloon group.[6] The trial found that the subacromial balloon provides an appropriate alternative to partial cuff repair in patients that fit that indications for the device. Several other studies showed similar results, supporting the use of this device in the setting of irreparable rotator cuff tears.[15,16] In our case, the patient had improved pain and function after both his first and second balloon procedures. Moreover, the patient was in line with the indications of the subacromial balloon spacer procedure: he had an intact subscapularis, minimal osteoarthritis, and had the ability to forward elevate the arm to at least 90 degrees.[4,17] As such, he was a good candidate for the procedure on both occasions.

This case also provides insight into the longevity of the subacromial balloon. The therapeutic effects of the first procedure persisted for years prior to reimplantation. While the literature suggests that the balloon device itself is absorbed by the body within 12 months, its effects on the glenohumeral joint are noted well beyond its absorption.[17,18] Similar

findings have been noted in the literature.[9,19,20] For example, Senekovic et al monitored the progress and the development of the balloon following implantation using ultrasonography, and noted detectable devices in only 54.5% of his cohort at 6-month follow-up.[9] Nevertheless shoulder pain and function continued improving in the majority of the patients.[9] While the persistence of improvement beyond balloon degradation has been noted in many studies, clear timelines are yet to be determined and underlying mechanisms need to be investigated.[9,19, 20]

In addition, this case demonstrated that the subacromial balloon is a safe procedure that does not cause permanent harm or detriment to the glenohumeral joint following its implantation. Upon performing the second procedure, arthroscopic evaluation of the subacromial space showed that the architecture of the joint remained similar when compared to the first procedure, as there was no negative impact on nearby structures or adjacent musculature, and there was no significant progression of rotator cuff arthropathy. This is important in that it suggests that the subacromial balloon spacer is a safe management option that may not burn bridges with regards to future revision surgeries, as seen with more invasive options like the reverse shoulder arthroplasty. As such, it can act as a salvage procedure and a rehabilitation accelerator that can delay the need for more aggressive options like shoulder arthroplasty until further stages.

## CONCLUSION

Patients who have massive irreparable rotator cuff often have limited, more invasive options such as partial cuff repair, superior capsular reconstruction, or shoulder replacement. Recently, a new option has been added to the shoulder and elbow repertoire. The insertion of a subacromial balloon spacer can be a feasible option for patients with minimal osteoarthritis and whose goals are to relieve pain from massive irreparable rotator cuff tears. Additionally, as seen in this case, patients are able to regain function after completing postoperative physical therapy.

Our case is interesting in that it suggests that the subacromial balloon spacer helped delay progression of rotator cuff tear arthropathy, as evident by the minimal closure of the acromiohumeral interval (closure of around 2 mm) and little glenoid erosion, five years after the procedure. We would expect to see worsening rotator cuff tear arthropathy five years following initial presentation. This case further supports the use of the subacromial balloon spacer in patients who meet the right indications for the procedure.

## References


1. Neri BR, Chan KW and Kwon YW. Management of massive and irreparable rotator cuff tears. *Journal of shoulder and elbow surgery* 2009; 18: 808-818.
2. Kucirek NK, Hung NJ and Wong SE. Treatment Options for Massive Irreparable Rotator Cuff Tears. *Curr Rev Musculoskelet Med* 2021; 14: 304-315. 20210928. DOI: 10.1007/s12178-021-09714-7.
3. Savarese E and Romeo R. New solution for massive, irreparable rotator cuff tears: the subacromial "biodegradable spacer". *Arthrosc Tech* 2012; 1: e69-74. 20120504. DOI: 10.1016/j.eats.2012.02.002.
4. Horneff III JG and Abboud JA. Balloon arthroplasty: indications, technique, and European outcomes. *ANNALS OF JOINT* 2018; 3.
5. Lobao MH, Canham RB, Melvani RT, et al. Biomechanics of biodegradable subacromial balloon spacer for irreparable superior rotator cuff tears: study of a cadaveric model. *JBJS* 2019; 101: e49.
6. Verma N, Srikumaran U, Roden CM, et al. InSpace Implant Compared with Partial Repair for the Treatment of Full-Thickness Massive Rotator Cuff Tears: A Multicenter, Single-Blinded, Randomized Controlled Trial. *J Bone Joint Surg Am* 2022 20220422. DOI: 10.2106/jbjs.21.00667.
7. Castagna A, Garofalo R, Maman E, et al. Comparative cost-effectiveness analysis of the subacromial spacer for irreparable and massive rotator cuff tears. *Int Orthop* 2019; 43: 395-403.
8. Johns WL, Ailaney N, Lacy K, et al. Implantable Subacromial Balloon Spacers in Patients With Massive Irreparable Rotator Cuff Tears: A Systematic Review of Clinical, Biomechanical, and Financial Implications. *Arthrosc Sports Med Rehabil* 2020; 2: e855-e872. 20201016. DOI: 10.1016/j.asmr.2020.06.011.
9. Senekovic V, Poberaj B, Kovacic L, et al. The biodegradable spacer as a novel treatment modality for massive rotator cuff tears: a prospective study with 5-year follow-up. *Archives of orthopaedic and trauma surgery* 2017; 137: 95-103.
10. Jost B, Zumstein M, Pfirrmann CW, et al. Long-term outcome after structural failure of rotator cuff repairs. *JBJS* 2006; 88: 472-479.
11. Zumstein M-A, Lädermann A, Raniga S, et al. The biology of rotator cuff healing. *Orthopaedics & Traumatology: Surgery & Research* 2017; 103: S1-S10.
12. Chevalier Y, Pietschmann MF, Thorwächter C, et al. Biodegradable spacer reduces the subacromial pressure: a biomechanical cadaver study. *Clinical Biomechanics* 2018; 52: 41-48.
13. Vecchini E, Gulmini M, Peluso A, et al. The treatment of irreparable massive rotator cuff tears with inspace balloon: rational and medium-term results. *Acta Biomed* 2022; 92: e2021584. 20220310. DOI: 10.23750/abm.v92iS3.12558.
14. Kaisidis A, Pantos P and Bochlos D. The subacromial spacer system for irreparable posterosuperior rotator cuff tears: A retrospective study of 47 patients with a two-year follow-up. *Shoulder Elbow* 2022; 14: 76-82. 20200924. DOI: 10.1177/1758573220960468.
15. Davey MS and Kaar K. Clinical outcomes at medium-term follow-up of sub-acromial balloon spacer insertion in the operative management of massive rotator cuff tears. *Ir J Med Sci* 2022; 191: 1687-1691. 20210903. DOI: 10.1007/s11845-021-02760-7.
16. Yallapragada RK, Apostolopoulos A, Katsougrakis I, et al. The use of a subacromial spacer-inspace balloon in managing patients with irreparable rotator cuff tears. *J Orthop* 2018; 15: 862-868. 20180816. DOI: 10.1016/j.jor.2018.08.004.
17. Wright MA, Abboud JA and Murthi AM. Subacromial Balloon Spacer Implantation. *Curr Rev Musculoskelet Med* 2020; 13: 584-591. DOI: 10.1007/s12178-020-09661-9.

18. Stewart RK, Kaplin L, Parada SA, et al. Outcomes of Subacromial Balloon Spacer Implantation for Massive and Irreparable Rotator Cuff Tears: A Systematic Review. *Orthop J Sports Med* 2019; 7: 2325967119875717. 20191015. DOI: 10.1177/2325967119875717.
19. Holschen M, Brand F and Agneskirchner JD. Subacromial spacer implantation for massive rotator cuff tears: Clinical outcome of arthroscopically treated patients. *Obere Extrem* 2017; 12: 38-45. 20161201. DOI: 10.1007/s11678-016-0386-9.
20. Ricci M, Vecchini E, Bonfante E, et al. A clinical and radiological study of biodegradable subacromial spacer in the treatment of massive irreparable rotator cuff tears. *Acta Biomed* 2017; 88: 75-80. 20171018. DOI: 10.23750/abm.v88i4-S.6797.

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# Obstructive Uropathy due to Bilateral Sliding Hernia in a Renal Transplant Patient with Incidental RCC in Native Kidney

BASMA MERHI, MD; GEORGE BAYLISS, MD; REGINALD GOHH, MD; ADENA OSBAND, MD; DICKEN KO, MD; PAUL MORRISSEY, MD

## ABSTRACT

**BACKGROUND:** Ureteral obstruction is a common complication after kidney transplantation. Ureteral obstruction caused by inguinal hernia, however, is a rare complication of transplantation and requires urgent surgical repair to prevent allograft loss.

**CASE PRESENTATION:** A 58-year-old man presented with allograft dysfunction 18-years after renal transplant. He was compliant with medications and given the long duration of allograft survival, a primary renal etiology was suspected. Thus, the initial work-up included allograft biopsy that was unremarkable. Three months later, worsening allograft function prompted further evaluation. At this time, allograft ultrasound and computed tomography led to the diagnosis of ureteral obstruction due to uretero-inguinal herniation of left kidney transplant secondary to bilateral sliding inguinal hernias. The patient was also found to have incidental renal cell carcinoma of the left native kidney. A percutaneous nephrostomy tube was placed and then followed by surgical repair with ureteral reimplantation, herniorrhaphy with mesh, and left native nephrectomy.

**CONCLUSIONS:** Mechanical obstruction can occur years after kidney transplantation. Even though it is uncommon, ureteral obstruction due to inguinal herniation is critical. Early detection of this complication and surgery can salvage the allograft and prolong function.

**ABBREVIATIONS:** RCC: renal cell carcinoma; PCN: Percutaneous Nephrostomy; ACKD: Acquired Cystic Kidney Disease

**KEYWORDS:** kidney transplantation, ureteral obstruction, inguinal hernia, uretero-inguinal hernia, renal cell carcinoma

## BACKGROUND

Ureteral obstruction is a common complication of renal transplantation with ureteral stones, vesico-uretero reflux, infection, and rejection being the most common causes. Most cases occur early after transplantation and are related to surgical causes or ischemic strictures. However, uretero-inguinal hernia causing ureteral obstruction is a rare complication following kidney transplant with the most common causes being redundancy of transplant ureter and anterior positioning of the ureter in relation to the spermatic cord. [1,2,3] The orientation of the kidney allograft may play a significant part in location of the ureter, with upward orientation of the renal hilum resulting in superficial location of the ureter, close to the inguinal canal and susceptible to herniation.[4] Other possible risk factors include male sex and obesity; herniation can present a decade or more delay between kidney transplantation and presentation.

## CASE PRESENTATION

A 58-year-old Caucasian man with history of hypertension, end stage kidney disease secondary to IgA nephropathy, now 18 years post second live donor kidney transplant to the left iliac fossa, presented with decreased urine output for two days, poor oral intake and nausea.

He was maintained on a triple immunosuppression regimen of prednisone, tacrolimus and azathioprine. He had enjoyed stable allograft function with baseline serum creatinine of 1.5 mg/dl until a few months before his presentation, when creatinine on routine labs rose to 2.6 mg/dL. A diagnostic allograft biopsy showed frequent peritubular capillaritis, severe arteriosclerosis, diffuse arterial hyalinosis, mild to moderate interstitial fibrosis, and tubular atrophy with negative C4d staining. Donor specific antibodies were negative and donor derived cell-free DNA was < 0.12% (normal). No radiological imaging was done at that time. With the biopsy findings, there were no changes made to his immunosuppressive medications.

Upon subsequent presentation, blood work at an outside hospital showed serum creatinine of 5.2 mg/dl, and allograft ultrasound showed hydronephrosis. He denied fever, urinary frequency, dysuria, pain at the transplant site or hematuria. Upon his transfer to our institution, vital signs revealed blood pressure of 130/80 mm/Hg, heart rate 74 bpm, saturating 99% on room air with body mass index of 24.5. Physical exam was unremarkable with no abdominal allograft tenderness on palpation and no evidence of hernia. Laboratory studies were remarkable for sodium 126 mEq/L, potassium 5 mEq/L, bicarbonate 13 mEq/L, anion gap 19, BUN 100 mg/dL with serum creatinine of 7.4 mg/dl. Urinalysis was

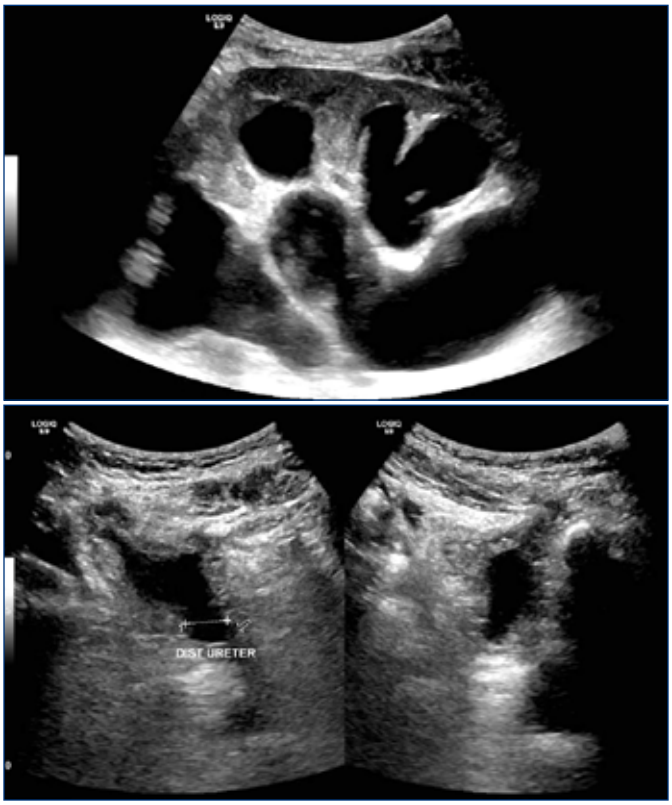
negative for blood and protein, negative for leukocyte esterase, negative for nitrite and had no evidence of red blood cells. Urine culture was negative for infection. BK virus PCR was undetectable.

We repeated allograft ultrasound at our institution, confirming severe hydroureteronephrosis of the transplant kidney extending to the uretero-vesicular junction (**Figures 1,2**).

Allograft function continued to worsen over the next day with creatinine peaking at 10.5 mg/dl and oliguria with urine output dropping to 50 ml per day. Computed tomography of the patient's abdomen and pelvis without IV contrast revealed severe hydronephrosis of the left lower quadrant transplant kidney, secondary entrapment of the ureter following herniation into the left inguinal canal, herniation of the urinary bladder into the right inguinal canal with circumferential urinary bladder wall thickening (**Figure 3**), and two suspicious native left renal masses concerning for renal cell carcinoma (**Figure 4**).

Antegrade transplant nephrostogram demonstrated severe left transplant hydronephrosis with abrupt ureter obstruction in the inguinal canal. Glidewire was able to pass the obstruction into the bladder, however a 4 french catheter could not pass the obstructed ureter. Percutaneous nephrostomy (PCN) was placed with brisk urine output of 3.7 L and improved allograft function down to 2.3 mg/dl over the next few days (**Figures 5,6**).

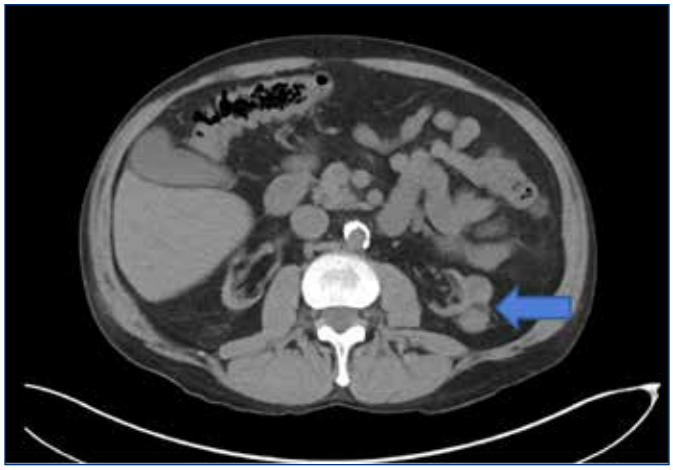
**Figure 1,2.** Ultrasound image of the transplanted kidney showing severe hydronephrosis with hydroureter.




Two weeks later, he underwent mobilization and reimplantation of the left transplant ureter, left herniorrhaphy with mesh and left native radical nephrectomy. The left PCN tube was removed. Given the extent of the surgery and the lack of symptoms, the small sliding right inguinal hernia was not intervened upon. One week after surgery, a complete recovery of his allograft function was achieved and creatinine recovered to its baseline of 1.5 mg/dl.

**Figure 3.** Abdominal computed tomography with sagittal view showing severe hydroureteronephrosis with uretero-inguinal herniation (arrow) and bladder herniation (star).


**Figure 4.** Abdominal computed tomography with axial view showing the left two renal masses in the left native kidney (arrow).



**Figures 5,6.** Anterograde nephrostogram demonstrating obstruction in the distal ureter at the level of the inguinal hernia (arrow);
**Figure 6.** Percutaneous nephrostomy placement (arrow).


Pathologic examination of the left native renal masses demonstrated a 3.1 cm mass in the upper pole, a 2.1 cm mass in the middle pole with 2 additional microscopic foci (< 5mm). histology revealed papillary renal cell carcinoma (RCC) type 1 with free ureteral, vascular, and perinephric margins and without lymph nodes invasion (T1aN0Mx).

After 2 years of follow-up, the allograft function remains stable at 1.5 mg/dl while maintained on the same immunosuppressive regimen using prednisone, tacrolimus and azathioprine.

## DISCUSSION

Our case represents an unusual and underdiagnosed cause of obstructive uropathy due to ureteral and bladder entrapment in bilateral sliding hernias in a nonobese man 18 years after kidney transplantation. After decompression of the hydroureteronephrosis with percutaneous nephrostomy, reimplantation of the left ureter was performed in addition to left herniorrhaphy. Subsequently, he had complete recovery of the allograft function. Imaging should have been obtained with the initial presentation of renal transplant dysfunction. It is likely that this represented the early signs of partial ureteral obstruction. Case reports have described this complication over the past few decades, but this is the first to demonstrate bilateral sliding inguinal hernias, complete ureteral obstruction and concomitant management of renal cell cancer as we have described.

Ureteral entrapment in a hernia is rare. It was first described in 1880 with less than 140 cases reported in the literature.[6] Uretero-inguinal hernias are more common in men, typically in the fifth and sixth decades of life. Many cases occur in patients with a history of kidney transplant given the anterior location of the transplanted ureter within the space of Retzius. It occurs more commonly on the right than the left side.[5,7] Pre-operative management with nephrostomy tube insertion with or without antegrade ureteric stent was most frequently employed first for immediate decompression of the collecting system to prevent irreversible graft dysfunction.[8-12] Hernia repair and herniorrhaphy are usually performed.[13-16] This complication should be considered in the differential diagnosis as one considers transplant ureteral obstruction as a cause of acute kidney injury in a renal allograft.[17] There is a possible role for elective repair of inguinal or incisional hernias in renal transplant patients.[18]

Our case illustrates the additional incidental findings of two small, low-grade papillary renal cell carcinomas of the left native kidney that were surgically removed with left radical nephrectomy. Asymptomatic RCC in this case could have been easily missed if radiological imaging of the abdomen was not done.

The risk of the development of *de novo* RCC in renal transplant recipients is 15–100 times higher than the general population. Due to the long-term use of immunosuppressive medications, transplant recipients are at increased risk of malignancies, with skin cancers and non-Hodgkin lymphoma the most common cancers after kidney transplantation.[14] Carcinoma of the native kidney accounts for less than 5% of all malignancies found in transplant recipients with the incidence ranging between 0.3–4.8%. The median time of the kidney transplant to the development of RCC is reported to be 4 to 5 years after transplant.[20-22]

Multiple risk factors for *de novo* RCC after kidney transplant have been identified, including acquired cystic kidney disease (ACKD), male sex, African-American races, older age (65 years and older), those with a longer pretransplant dialysis interval, a donor aged at least 50 years, immunosuppressive medications, and microscopic hematuria.[20,21] Early detection has better prognosis with the consideration of screening all transplant patients for ACKD and RCC.[23] As in our case, RCCs of native kidneys are more frequently incidental findings, low-grade and with overall favorable prognosis.[10] Nephrectomy is the main treatment as it is curative for most cases without metastases and without compromising the graft function by stopping immunosuppressive medications.[21,24,25,26]

There are no guidelines for RCC screening in kidney transplant recipients. While the American Society of Transplantation and the Kidney Disease Improving Global Outcomes Clinical Practice Guidelines for the Care of the Kidney Transplant Recipient do not recommend routine screening for renal cancer after kidney transplant, the European Association of Urology recommend annual screening of native

and transplant kidney for the detection of renal tumors.[27-29] These additional screenings may help with incremental findings of malignancies that, in transplant recipients, might be advantageous with early diagnosis and treatment.

## CONCLUSION

Mechanical obstruction of a renal allograft may develop years after transplantation and should be considered in the differential diagnosis of renal transplant dysfunction. This case emphasizes the need for imaging in patients with renal transplant dysfunction as part of the complete workup for prerenal, intrinsic renal and post renal causes of acute allograft injury. Awareness of transplant uretero-inguinal herniation as a cause of acute allograft dysfunction is important as early surgical intervention is critical to avoid allograft loss. Despite bilateral sliding inguinal hernias and complete ureteral obstruction, allograft salvage was accomplished by ureteral reimplantation and unilateral inguinal herniorrhaphy.

Furthermore, RCC in kidney transplant recipient is usually detected incidentally with the possibility of being present in the recipient's own kidneys before transplant. The possible role of native renal radiological screening for patients undergoing kidney transplantation is unclear, but nevertheless the imaging might be helpful when the studies are done for other clinical scenarios. Although more robust guidelines are needed for routine nonspecific screening and detection of RCC in renal transplant recipient, the relative cost to benefit ratios must be weighed clinically as well as economically.

### References


1. Cheung F, Debartolo MM, Copertino LM, et al. Different management options for transplant ureteral obstructions within an inguinal hernia. Case Rep Transplant 2016;2016:4730494.
2. Hakeem AR, Gopalakrishnan P, Dooldeniya MD, Irving HC, Ahmad N. Inguinal herniation of a transplant ureter: lessons learned from a case of "water over the bridge". Exp Clin Transplant 2016;14:103–5.
3. Ciancio G, Burke GW, Nery J, Huson H, Coker D, Miller J. Positional obstructive uropathy secondary to ureteroneocystostomy herniation in a renal transplant recipient. J Urol 1995;154:1471–2.
4. Chang TY, Chang CH, Lai PC, Lin WC Graft kidney hydronephrosis caused by transplant ureter inguinal hernia: A case report. Medicine (Baltimore). 2021 May 28;100(21):e25965.
5. Giuly J, François GF, Giuly D, Leroux C, Nguyen-Cat RR. Intrascrotal hernia of the ureter and fatty hernia. Hernia 2003; 7: 47–49.
6. Mckay JP, Organ M, Gallant C, et al Inguinoscrotal hernias involving urologic organs: a case series. Can Urol Assoc J 2014;8:E429–32. doi:10.5489/cuaj.225
7. Sanchez AS, Tebar JC, Martin MS, et al. Obstructive uropathy secondary to ureteral herniation in a pediatric en bloc renal graft. Am Transplant 2005;5:2074–7. doi:10.1111 /j.1600-6143.2005.00973
8. Merani S, Aufhauser DD, Maskin AT, Mezrich J, Al-Adra D.Transplant Proc. 2021 Sep;53(7):2285-2290. Not as Rare as Initially Described: Transplant Ureter Incarceration Within Inguinal Hernia. Two Cases, Literature Review, and Management Algorithm. Transplant Proc. 2021 Sep;53(7):2285-2290
9. Ingber MS, Girdler BJ, Moy JF, Frikker MJ, Hollander JB. Inguinal herniation of a transplant ureter: rare cause of obstructive uropathy. Urology. 2007;70(6):1224.e1-1224.e3.
10. DiCocco P, Orlando G, Bonanni L, et al. Scrotal herniation of the ureter: a rare late complication after renal transplantation. Transplant Proc. 2009;41(4):1393-1397.
11. Lobo N, McCaig F, Olsburgh J. Contralateral inguinal herniation of a transplant ureter causing obstructive uropathy in a renal transplant recipient. BMJ Case Rep. 2017;2017. doi: 10.1136/ bcr-2016-218071.
12. du Toit T, Kaestner L, Muller E, Kahn D. Inguinal herniation containing bladder, causing contralateral allograft hydroureteronephrosis: a case report and literature review. Am J Transplant. 2017;17(2):565-568.
13. Zmora O, Schachter PP. Sliding inguinal hernia containing the ureter: a case report. J Urol 1996; 155: 1387.
14. Giuly J, François GF, Giuly D, Leroux C, Nguyen-Cat RR. Intrascrotal hernia of the ureter and fatty hernia. Hernia 2003; 7: 47–49.
15. Rocklin MS, Apelgren KN, Slomski CA, Kandzari SJ. Scrotal incarceration of the ureter with crossed renal ectopia: case report and literature review. J Urol 1989; 142: 366– 368.
16. Percival WL. Ureter within a sliding inguinal hernia. Can J Surg 1983; 26: 283– 286.
17. Bugeja A, Clark EG, Sood MM, Ali SN. As in Real Estate, Location Is What Matters: A Case Report of Transplant Ureteral Obstruction Due to an Inguinal Hernia. Can J Kidney Health Dis. 2018 Jan 17;5:2054358117753620.
18. Bosmans I, De Boe V, Wissing KM, Vanhoeij M, Jacobs-Tulleneers-Thevissen D.A preventable cause of transplant hydroureteronephrosis: inguinal herniation of the transplant ureter: case report and review of the literature. Acta Chir Belg. 2021 Oct;121(5):340-345.
19. Kasiske BL, Snyder JJ, Gilbertson DT, Wang C. Cancer after kidney transplantation in the United States. Am J Transpl. 2004;4:905–913.
20. Klatte T, Marberger M.Renal cell carcinoma of native kidneys in renal transplant patients. Curr Opin Urol. 2011 Sep;21(5):376-9.
21. Cheung CY, Lam MF, Lee KC, Chan GS, Chan KW, Chau KF, Li CS, Chan TM, Lai KN . Renal cell carcinoma of native kidney in Chinese renal transplant recipients: a report of 12 cases and a review of the literature. .Int Urol Nephrol. 2011 Sep;43(3):675-80.
22. Penn I: Primary kidney tumors before and after renal transplantation . Transplantation 59(4):480-485,1995.
23. Klatte T, Seitz C, Waldert M, de Martino M, Kikic Z, Böhmig GA, Haitel A, Schmidbauer J, Marberger M, Remzi M. Features and outcomes of renal cell carcinoma of native kidneys in renal transplant recipients. BJU Int. 2010 May;105(9):1260-5.
24. Kristina D Suson , Justin E Sausville, Alp Sener, Michael W Phelan.Native nephrectomy for renal cell carcinoma in transplant recipients. Transplantation. 2011 Jun 27;91(12):1376-9.
25. Campbell SC, Novick AC, Belldegrun A, et al. Guideline for management of the clinical T1 renal mass. J Urol. 2009;182: 1271–1279.
26. García Álvarez T, Mazuecos Blanca A, Navas García N, Calle García L, Vallejos Roca E, Moreno Salazar A, Soto Villalba J, Collantes Mateos R, Rivero Sánchez M. Early diagnosis and treatment of renal cell carcinoma of native kidney in kidney transplantation. Nefrologia. 2011;31(5):567-72.
27. Moon A, Rogers A, Talbot D, Rix D .Renal Cell Cancer in a European Regional Renal Transplant Population: Is There a Role for Immediate Native Renal Radiological Surveillance Before and After Transplantation?. Transplant Proc. 2015 Jul-Aug; 47(6):1840-4.
28. Dunnick NR: Renal cell carcinoma: Staging and surveillance. Abdom Radiol (NY) 41(6): 1079-1085, 2016.
29. Kidney Disease: Improving Global Outcomes Transplant Work G : Kdigo clinical practice guideline for the care of kidney transplant recipients. Am J Transplant 9(Suppl 3): S1-155, 2009

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# Blown Pupil at Sea

DAVID G. LINDQUIST, MD

An otherwise healthy 4-year-old male with no past medical history was noted one morning to have a dilated right pupil. He did not complain of headache, nausea, vomiting, vision changes, or pain. He had no difficulty with speech or swallowing. His behavior was normal.

The child lives aboard a 43′ sailboat with his parents. They were 5 days departed from Bermuda, having endured winds up to 55 knots and heavy seas for the first few days. Winds were light and seas were calm the morning of the child's ocular changes. There was no reported head trauma.

**Figure 1.** Acute anisocoria in a 4-year-old boy on a 43′ sailboat shortly after a storm

The boat's captain and father of the family texted this author the photo (**Figure 1**), requesting guidance. Per text, the father reported normal extraocular motion and a non-tender neck, with no signs of ecchymosis over the child's head or neck. While there were text exchanges, there was no audio communication.

Given that the differential diagnosis of new onset anisocoria includes, but is not limited to, posterior communicating artery (PCOM) aneurysm, intracranial hemorrhage, brain tumor, Horner's syndrome, carotid artery dissection, and pharmacologic causes, how would you advise the parents?[1,2] At the time they were still 3 days out from their next landfall, beyond the reach of rescue services.

The role of digital health has been evolved rapidly with the advent of smart phones, wireless 5G networks, and AI. In ophthalmology it has been used both asynchronously and in real time.[3] The role of telehealth in austere environments is particularly intriguing, especially if evacuation is not available, as options for management of central nervous system causes of acute anisocoria are limited.[4,5] If increased intracranial pressure is the suspected cause, protecting the victim from secondary brain injury through prevention/treatment of hypotension, hypoxia, and hypothermia become important. Keeping the head elevated at 30 degrees can help minimize increases in intracranial pressure. Further interventions, especially by two nonmedical parents aboard a vessel at sea, would be challenging.

In this case, given the apparent absence of trauma, the lack of vision changes, and an otherwise normal exam as per the father's report, non-CNS causes had to be considered, including topical pharmacologic sources.

Further history revealed that the family used scopalomine patches for control of sea sickness, and that the child had rubbed his eye after touching his own patch that morning. The anticholinergic effect of scopolamine caused the unilateral mydriasis. Two hours later, the dilation had resolved, and the pupils remained equal.

## References


1. Payne W, Blair K, Barrett M. Anisocoria. In: StatPearls [Internet] Treasure Island (FL):StatPearls Publishing; 2022 Jan. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470384/
2. Cherayil NR, Tamhankar MA. Neuro-Ophthalmology for Internists. Medical Clinics of North America. 2021; 105: 511-529.
3. Yuen J, Pike S, Khachikyan S, Nallasamy S. Telehealth in Ophthalmology. 2022 doi:10.36255/exon-publications-digital-health
4. Lafleur J, Sikka N, Hood C. Wilderness-Telemedicine, a New Training Paradigm. Wilderness and Environmental Medicine. 2022; 33: 488-489.
5. Hollander JE, Sharma R. The Availabilists: Emergency Care Without the Emergency Department. NEJM Catal Innov Care Deliv. 2021; 2.


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# Asymptomatic Metastatic Pleural Calcifications from End-Stage Renal Disease

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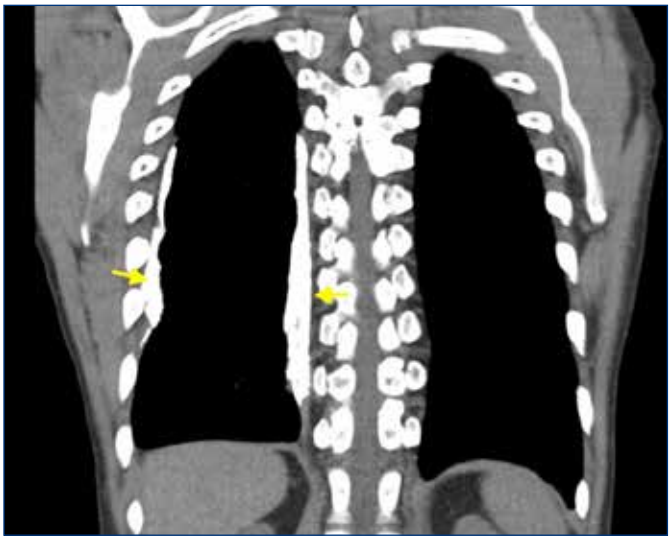
A 53-year-old man was referred to a Pulmonology clinic regarding the evaluation of an abnormal Computerized Tomography imaging (CT) obtained during kidney transplant evaluation. His medical history includes end-stage renal disease on intermittent hemodialysis, active tobacco abuse with a 30-pack-year history, and HIV on anti-retroviral therapy with a recent CD4 count above 500. He did not endorse any current or historic respiratory symptoms, specifically any dyspnea on exertion, productive cough, fevers, or pleuritic chest pain. The patient also denied any previous respiratory infections; in particular, he had denied any previous tuberculosis infection, pleural infections, or hospitalizations for bacterial lung infections. He has lived in southern Louisiana for his entire life and has not had a significant travel history. While he had worked in construction, he denied having any significant occupational exposures, specifically asbestos. There was no significant family history regarding previous respiratory conditions or connective tissue diseases.

Vital signs on presentation, including pulse oximetry, were within normal limits. His physical examination was notable for decreased breath sounds on his right lower lung base. Pulmonary function testing revealed moderate obstruction, no evidence of restriction, and normal diffusion capacity. CT imaging of his chest performed for the purposes of kidney transplant candidacy evaluation revealed diffuse calcified pleural plaques along his right pleural margin which was associated with pleural thickening. Given his history and the presented imaging findings, his diagnosis was most consistent with asymptomatic metastatic pleural calcifications in the setting of his end-stage renal disease. He was not initiated on any treatment for his pleural condition and was sent to continue further testing for his kidney transplant candidacy. (See **Figures 1A,B**.)

Asymptomatic metastatic pleural calcification is a rare entity of pleural disease. It can be described as thickened visceral and parietal pleurae, which can develop as a complication of prior intense pleural inflammation or chronic untreated effusions. This is usually caused by an empyema, hemothorax, tuberculosis, asbestos exposure, connective tissue diseases, uremia, drug induced pleuritis, or therapeutic pleurodesis.[1] Patients with end-stage renal disease can develop pleural calcifications through several proposed mechanisms. Traditionally, this is believed to be due to inflammation from uremic toxins in combination with pleural hemorrhage that eventually lead to fibrous pleuritis. Additionally, dystrophic or metastatic calcification due to hypercalcemia and hyperphosphatemia caused from renal

**Figure 1A.** Computerized Tomography scan of the chest in axial view showing a dense formation of calcium on the posterior right hemithorax. No appreciable lung parenchymal changes present.

**Figure 1B.** Computerized Tomography scan of the chest in Coronal view demonstrating pleural based calcium deposition both on the medial and lateral chest wall.



dysfunction has also considered to play a role in its formation.[2] The evaluation of this condition typically includes a chest radiograph which would demonstrate concentric pleural thickening with a decreased size of the ipsilateral hemithorax. CT imaging is useful as it can assist in determining etiology as well as elucidate if there are malignant characteristics. Treatments include conservative management with watchful waiting, or in the case of restrictive lung disease, surgical decortication.[3]

## References


1. Pierson D. Respiratory Considerations in the Patient With Renal Failure. Respir Care 2006;41(4):413-422.
2. Coskun M, Boyat F, Bozkurt B, et al. Thoracic CT Findings in Long-Term Hemodialysis Patients. Acta Radiologica 1999; 40(2):181-186.
3. Light RW, Lee YCG. Pneumothorax, chylothorax, hemothorax, and fibrothorax. In: Broaddus CV, Mason RJ, Ernst JD, King TE Jr, Lazarus SC, Murray JF, Nadel JA, Slutsky A, Gotway M, editors. Murray & Nadel's textbook of respiratory medicine, 6th ed. Philadelphia, PA: Elsevier Saunders; 2015:1439–1460.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# How Close Are You to Gestational Diabetes Mellitus?

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## ABSTRACT

The objective of this study is to evaluate if proximity to food sources, rather than density, is associated with gestational diabetes mellitus (GDM) risk. Rhode Island birth certificate data from 2015–2016 were utilized. A proximity analysis was used to determine the distance from each pregnant person's home address to the closest food source (fast food restaurant, supermarket, and farmers market/community garden). Multivariable logistic regression was used to examine the association between distance to food source and the risk of GDM. Of the 20,129 births meeting inclusion criteria, 7.2% (1,447) had GDM. Distance to food sources differed by insurance type, educational background, and race/ethnicity. There was no statistically significant association between distance to any of the food sources and GDM in the adjusted model. Other factors need to be examined to improve interventions, influence policy, and impact neonatal and maternal outcomes.

**KEYWORDS:** gestational diabetes mellitus, food environment, pregnancy, diet, food access

## INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as a glucose intolerance first detected during pregnancy.[1] Approximately 2–10% of all pregnancies are affected with GDM and 50–70% of pregnant persons with GDM go on to develop type 2 diabetes mellitus (T2DM).[1] Advanced maternal age, obesity, gestational weight gain, and family history are well-known risk factors of GDM.[1,2] Gestational weight gain is a particular focus of pregnancy counseling because it is the only GDM risk factor that is modifiable post-conception. Pregnant persons who gain more weight than recommended during pregnancy have an 50–80% increased risk of developing GDM compared to those who limit their gestational weight gain to within the IOM guidelines based on body mass index.[3]

Recently, data has suggested an association between living in neighborhoods with fewer supermarkets and increased gestational weight gain.[4] Studies have also suggested that poorer diet during pregnancy, specifically lower fruit and vegetable intake, is associated with gestational weight gain.[4-8] When GDM has been examined as a primary outcome, a few studies have also suggested that limited food resources in pregnancy increase risk.[9,10] A study in Texas recently found that pregnant persons who lived in environments with a high density of fast-food restaurants had a significantly increased risk of developing GDM.[9] Similarly, a study in Delaware found geospatial overlap between areas with poor-quality food and increased risk of requiring medication to achieve good glycemic control in patients with GDM.[11] While these findings underscore the potential that geospatial analyses may be used to better characterize what food environments are most associated with GDM, more studies are needed that examine all types of food resources collectively. Only by examining the entire food environment available to pregnant persons can we determine if shifting the type of food resources in a community is a potential intervention that might reduce GDM risk.

We therefore conducted a retrospective study to assess the relationship between the proximity to many types of food (fast-food restaurants (FFR), supermarkets (SM), and farmers markets and/or community gardens (FMCG)) and the occurrence of GDM in Rhode Island (RI). We hypothesized that GDM would be positively correlated with proximity to FFR and would be inversely related to the distance to SM and FMCG. Identifying specific food environments that are associated with GDM risk could allow for statewide public health initiatives to shift food resources in the hope of reducing GDM risk and ultimately improving maternal and neonatal health.

## METHODS

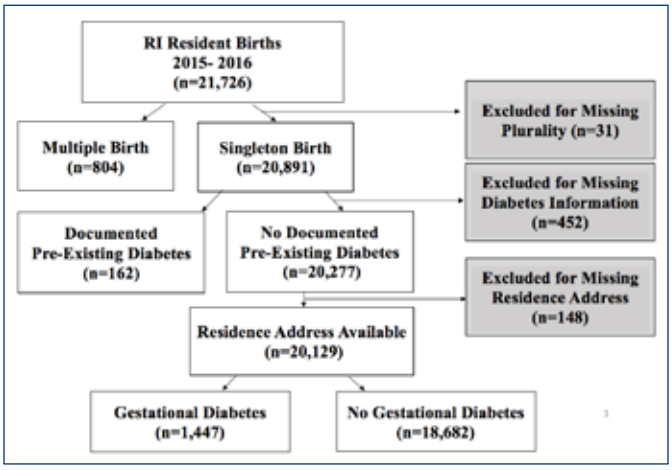
### Study Population

We conducted a retrospective analysis of births in RI from January 1, 2015 to December 31, 2016 using Rhode Island Department of Health Vital Statistics data. Pregnant persons were excluded from the analysis if the birth certificate indicated pre-existing diabetes (type I or type II diabetes), multiple gestation, or were missing information for diabetes status, plurality, or residential address (**Figure 1**).

### Measures

The primary outcome of interest was GDM defined by documentation on the birth certificate. Data on covariates

**Figure 1.** Study Sample Flow Chart




including maternal age, parity, insurance status, maternal education, marital status, race and ethnicity, cigarette smoking during pregnancy, gestational weight gain, hypertension, number of prenatal care visits, and body mass index (BMI) were also obtained from the birth certificate. Gestational weight gain was categorized as appropriate or excessive according to the Institute of Medicine (IOM) guidelines for appropriate weight gain based on prepregnancy BMI.[12] Hypertension was classified as chronic, pregnancy induced (gestational and preeclampsia), or none. While we fully acknowledge that race/ethnicity is a social construct, we included it as a covariate as many of the outcomes of interest for this study have previously been examined by race/ethnicity.

The residential address for each pregnant person was obtained from the birth certificate and was determined by the address given at the time of delivery. Unfortunately, longevity at this address was not available. A residence was classified to be in a "core city" if 25% or more children live below the poverty threshold according to the American Community Survey estimates (Rhode Island Department of Health, 2012).[13] In RI, core cities include Central Falls, Pawtucket, Providence, and Woonsocket.

For this investigation, we assessed three exposures relating to food environment. We examined distance from primary address to the closest 1) FFR 2) SM and 3) FMCG. FFR included places that sold quick, ready-to-eat food and required customers to order and pay before eating and whose primary business was take-out or had take-out or express in the name.[14] SM included both large corporate and smaller noncorporate grocery stores.[14] FMCG were operationalized as one variable to encompass healthier food sources. Food environment data on restaurants and supermarkets was downloaded in July–August 2019 from the Rhode Island Department of Health licensing website (https:// health.ri.gov/licenses/index.php). Information on farmers markets and community gardens was identified in July–August 2019 using website searches including the Rhode Island Community Food Bank, Southside Community Land Trust, Farm Fresh RI, Rhode Island Department of Human Services, and the U.S. Department of Agriculture.

### Data Analysis

Pregnant persons address at the time of delivery, as listed on the birth certificate, was geocoded. Shapefiles containing the maternal residence address and the locations of each resource (FFR, SM, and FMCG separately) in Rhode Island were imported into the ArcGIS Network Analyst. A proximity analysis was then used to determine for each pregnant person, the distance from their home address to the closest of each of the three food sources. All analyses were done using ArcGIS Desktop 10.7.1 and SAS 9.4 (SAS Institute Inc, Cary, NC).[15]

Bivariate analyses were conducted to examine the association between maternal characteristics and GDM. The mean distance to each type of food source was calculated by GDM status and other maternal characteristics. Multivariable logistic regression was used to examine the association between distance to FFR, SM, and FMCG and the risk of GDM. Potential confounders were chosen on the basis of significance on bivariable analysis and biological plausibility. Regression modeling was also adjusted for clustering at the Census tract level. All analyses were performed using SAS software version 9.4 (SAS Institute Inc, Cary, NC).[15]

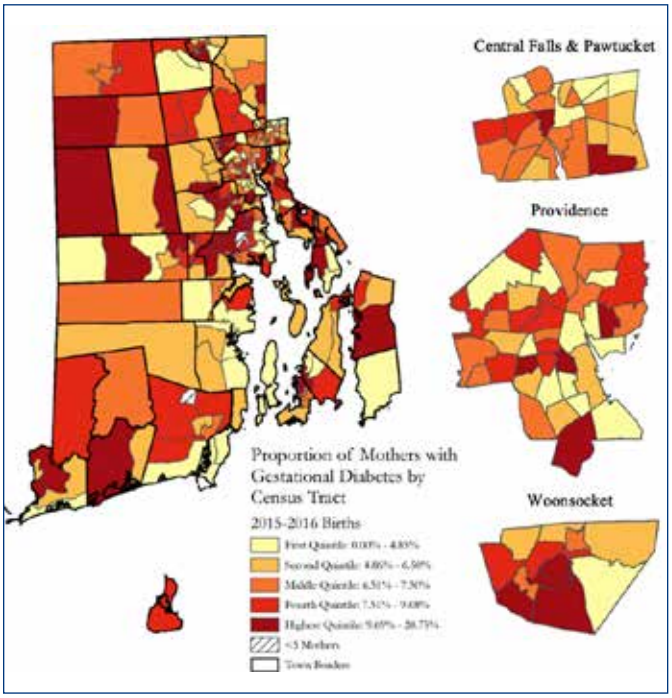
## RESULTS

Of the 21,726 births in Rhode Island between January 1, 2015 and December 31, 2016, individuals with missing information for plurality (N=31), pre-existing diabetes (N=452), and residence address (N=148) were excluded. An additional 804 were excluded due to multiple gestation and 162 due to documented pre-existing diabetes. The final sample contained 20,129 individuals, of which 7.2% (N=1,447) were diagnosed with GDM (**Figure 1**). **Figure 2** is a geospatial representation of the proportion of pregnant persons with GDM by RI census tract.

Pregnant persons with GDM were slightly older (31.6 vs 29.0 ), had a higher BMI (29.4 vs 26.1 , and more likely to be married compared to being single (61.8% vs 33.8% p <0.01) (**Table 1**). Pregnant persons with GDM were more likely to have chronic (4.9% vs 1.4% p <0.01) or gestational hypertension (9.7% vs 6.1% p<0.01) compared to those without GDM. Of the forty percent of the study population that resided in core cities, only 38.1% had GDM, compared to 61.9% that did not reside in core cities.

On average, pregnant persons lived 0.66 of a mile from fast-food restaurants, 1.5 miles from supermarkets, and 2 miles from farmers markets or community gardens (**Table 2**). Distance to each food source varied significantly by race/ethnicity with Non-Hispanic white pregnant persons living the furthest from each food source (0.88 from FFR, 1.88 from SM, and 2.67 from FMCG) compared to Hispanic pregnant persons who lived the closest to each food source (0.31 from

**Figure 2.** Proportion of mothers with gestational diabetes by census tract, Rhode Island, 2015–2016




FFR, 0.90 from SM, and 0.90 from FMCG) (all p<0.01). Pregnant persons with private health insurance lived almost twice as far from each food source compared to their counterparts who were uninsured or had public medical insurance (0.88 vs 0.43 FFR; 1.76 vs 1.15 SM; 2.6 vs 1.36 FMCG) (all p<0.01). On average, pregnant persons with a graduate level of education lived the furthest from each food source compared to those with less than high school degree (0.90 vs 0.35 FRR; 1.76 vs 1.01 SM; 2.52 vs 1.05 FMCG) (all p <0.01). Pregnant persons who gained more weight than the recommended IOM guidelines lived slightly closer to every food source compared to those who were within the recommended IOM guidelines (0.65 vs 0.71 FFR; 1.44 vs 1.55 SM; 2.00 vs 2.09 FMCG) (p<0.01 FFR/SM and p=0.01 FMCG). Residents of core cities on average lived significantly closer to FFR (0.26 vs 0.92 p <0.01), SM (0.88 vs 1.85 p <0.01), and FMCG (0.65 vs 2.91 p <0.01).

After adjusting for age, race, marital status, and BMI, there was no association between distance to FFR and GDM (adjusted odds ratio [aOR] = 1.00; 95% Confidence Interval [CI] 0.94–1.07) (**Table 3**). There was also no association between distance to SM and GDM (aOR= 1.00; 95% CI 0.96–1.03) or FMCG and GDM (aOR = 1.00; 95% CI 0.98-1.03). For every one-year increase in maternal age there was a 1.09 increased risk of GDM (aOR = 1.09; 95% CI 1.07–1.10). Non-Hispanic Asian pregnant persons were 2.55 times more likely to have GDM compared to Non-Hispanic White pregnant persons (FFR aOR= 2.55; 95% CI 2.02–3.23; SM aOR= 2.54; 95% CI 2.01–3.2; FMCG aOR= 2.56; 95% CI 2.03-3.23).

**Table 1.** Characteristics of the study population by GDM status, Rhode Island, 2015–2016

| | N | No GDM N (%) N=18,682 | GDM N (%) N=1,447 | P-Value |
|---|---|---|---|---|
| **Maternal Age, years (mean, SD)** | 20,129 | 29.0 (5.7) | 31.6 (5.5) | <0.01 |
| **Race/Ethnicity** | | | | <0.01 |
| Hispanic | 5,030 | 4,701 (25.4) | 329 (22.9) | |
| Non-Hispanic White | 11,540 | 10,724 (57.9) | 816 (56.7) | |
| Non-Hispanic Black | 1,728 | 1,625 (8.8) | 103 (7.2) | |
| Non-Hispanic Asian | 1,047 | 903 (4.9) | 144 (10.0) | |
| Non-Hispanic Other | 627 | 581 (3.1) | 46 (3.2) | |
| **Parity** | | | | <0.01 |
| Nulliparous | 8,167 | 7,638 (41.5) | 529 (37.5) | |
| Multiparous | 11,673 | 10,791 (58.6) | 882 (62.5) | |
| **Insurance Status** | | | | 0.56 |
| Public Insurance/ Uninsured | 10,070 | 9,355 (50.5) | 715 (49.7) | |
| Private Insurance | 9,899 | 9,175 (49.5) | 724 (50.3) | |
| **Maternal Education** | | | | 0.40 |
| Less than High School | 2,311 | 2,156 (13.1) | 155 (12.4) | |
| High School | 3,819 | 3,557 (21.7) | 262 (21.0) | |
| Some College | 5,309 | 4,903 (29.9) | 406 (32.5) | |
| College Degree | 3,808 | 3,551 (21.6) | 257 (20.6) | |
| Graduate/ Professional Degree | 2,425 | 2255 (13.7) | 170 (13.6) | |
| **Marital Status** | | | | <0.01 |
| Married | 10,989 | 10,096 (54.3) | 893 (61.8) | |
| Divorced/Widowed/ Separated | 646 | 583 (3.1) | 63 (4.4) | |
| Single | 8,407 | 7,919 (42.6) | 488 (33.8) | |
| **Cigarette Smoking During Pregnancy** | | | | 0.46 |
| Yes | 1,434 | 1,324 (7.1) | 110 (7.6) | |
| No | 18,695 | 17,358 (92.9) | 1,327 (92.4) | |
| **Within IOM Weight Gain Guidelines** | | | | 0.06 |
| Yes | 5,950 | 5,559 (32.5) | 391 (30.0) | |
| No | 12,434 | 11,523 (67.5) | 911 (70.0) | |
| **Maternal Hypertension** | | | | <0.01 |
| Chronic | 328 | 257 (1.4) | 71 (4.9) | |
| Gestational | 1,280 | 1,139 (6.1) | 141 (9.7) | |
| None Documented | 18,521 | 17,286 (92.5) | 1,235 (85.5) | |
| **BMI (mean, SD)** | 19,011 | 26.1 (6.1) | 29.4 (7.4) | <0.01 |
| **Resident of Core City** | | | | 0.04 |
| Yes | 8,181 | 7,630 (40.9) | 551 (38.1) | |
| No | 11,944 | 11,048 (59.1) | 896 (61.9) | |

*BMI= Body Mass Index; IOM=Institute of Medicine

**Table 2.** Distance, in Miles, to the Closest Fast-Food Restaurant (FFR), Supermarket (SM), and Farmers Market/Community Garden (FMCG) by Maternal Characteristics

| | FFR Mean (SD) | P-Value | SM Mean (SD) | P-Value | FMCG Mean (SD) | P-Value |
|---|---|---|---|---|---|---|
| **Gestational Diabetes** | | 0.78 | | 0.97 | | 0.18 |
| Yes | 0.66 (0.93) | | 1.45 (1.57) | | 2.06 (2.02) | |
| No | 0.66 (0.89) | | 1.45 (1.47) | | 1.99 (2.06) | |
| **Race/Ethnicity** | | <0.01 | | <0.01 | | <0.01 |
| Hispanic | 0.31 (0.33) | | 0.90 (0.83) | | 0.90 (1.08) | |
| Non-Hispanic White | 0.88 (1.06) | | 1.81 (1.85) | | 2.67 (2.27) | |
| Non-Hispanic Black | 0.34 (0.51) | | 0.91 (0.73) | | 0.99 (1.01) | |
| Non-Hispanic Asian | 0.51 (0.61) | | 1.21 (1.01) | | 1.84 (1.57) | |
| Non-Hispanic Other | 0.40 (0.51) | | 1.06 (0.98) | | 1.23 (1.40) | |
| **Parity** | | 0.68 | | 0.19 | | 0.002 |
| Nulliparous | 0.65 (0.89) | | 1.43 (1.54) | | 1.94 (2.03) | |
| Multiparous | 0.65 (0.89) | | 1.46 (1.58) | | 2.03 (2.03) | |
| **Insurance Status** | | <0.01 | | <0.01 | | <0.01 |
| Public Insurance/ Uninsured | 0.43 (0.64) | | 1.15 (1.32) | | 1.36 (1.65) | |
| Private Insurance | 0.88 (1.04) | | 1.76 (1.73) | | 2.6 (2.21) | |
| **Maternal Education** | | <0.01 | | <0.01 | | <0.01 |
| Less than High School | 0.35 (0.52) | | 1.01 (0.95) | | 1.05 (1.33) | |
| High School | 0.51 (0.78) | | 1.24 (1.29) | | 1.69 (1.88) | |
| Some College | 0.65 (0.91) | | 1.46 (1.67) | | 2.07 (2.09) | |
| College Degree | 0.89 (1.03) | | 1.81 (1.84) | | 2.61 (2.21) | |
| Graduate/ Professional Degree | 0.90 (0.97) | | 1.76 (1.61) | | 2.52 (2.14) | |
| **Marital Status** | | <0.01 | | <0.01 | | <0.01 |
| Married | 0.80 (1.00) | | 1.66 (1.76) | | 2.35 (2.19) | |
| Divorced/Widowed/ Separated | 0.58 (0.76) | | 1.30 (1.21) | | 1.94 (1.97) | |
| Single | 0.47 (0.70) | | 1.19 (1.26) | | 1.53 (1.77) | |
| **Cigarette Smoking During Pregnancy** | | 0.01 | | 0.46 | | 0.83 |
| Yes | 0.60 (0.89) | | 1.48 (1.64) | | 2.00 (1.99) | |
| No | 0.66 (0.89) | | 1.45 (1.56) | | 1.99 (2.06) | |
| **Within IOM Weight Gain Guidelines** | | <0.01 | | <0.01 | | 0.01 |
| Yes | 0.71 (0.94) | | 1.55 (1.75) | | 2.09 (2.09) | |
| No | 0.65 (0.89) | | 1.44 (1.51) | | 2.00 (2.06) | |
| **Maternal Hypertension** | | 0.01 | | 0.04 | | 0.21 |
| Chronic | 0.56 (0.83) | | 1.25 (1.24) | | 1.91 (2.14) | |
| Gestational | 0.62 (0.89 | | 1.37 (1.45) | | 1.90 (1.99) | |
| None Documented | 0.66 (0.90) | | 1.46 (1.58) | | 2.00 (2.06) | |
| **Resident of Core City** | | <0.01 | | <0.01 | | <0.01 |
| Yes | 0.26 (0.18) | | 0.88 (0.47) | | 0.65 (0.50) | |
| No | 0.92 (1.07) | | 1.85 (1.90) | | 2.91 (2.20) | |

*IOM= Institute of Medicine

Lastly, for every unit increase in BMI there was a 1.08 increased risk of GDM (aOR = 1.08; 95% CI 1.07–1.08).

## DISCUSSION

In this retrospective study, we hypothesized that GDM risk would increase with proximity to FFR and decrease with proximity to SM and FMCG. Instead, we found no association between distance to FFR, SM, or FMCG and GDM risk. Distance to all food sources varied in the same direction when the population was compared by many variables associated with socioeconomic status. We found that the more resources (i.e., private insurance or higher education) a pregnant person had, the further away they lived to all food sources. A lack of significant variance between food sources may suggest that unmeasured confounders such as access to vehicles, bus routes, neighborhood safety, etc. should be assessed in future studies.

Prior studies assessing food environment have had conflicting results regarding GDM. For example, a study in Texas reported that patients who lived in the zip code quartile with the highest density of fast-food restaurants had a significantly increased risk of developing GDM.[9] Whereas a study in New York City did not detect an association between the number of healthy or unhealthy retail food outlets in the neighborhood and gestational diabetes.[10] Studies comparing distance rather than density were more likely to report an association between food environment and GDM most likely due to access and availability. A retrospective study in Chicago found a lower frequency of GDM in food deserts (low-income areas that were >0.5 miles away from a major food outlet) compared to areas with food outlets within a half mile radius.[16] Similarly, a study in Delaware calculated an index of healthy versus less healthy food sources based on 0.5-mile radius also found an association between areas of poor-quality food and a higher prevalence of GDM.[16] Given that we had the mother's full residential address at the

**Table 3.** Adjusted Odds Ratios of Gestational Diabetes Mellitus by Distance to Food Source

| | FFR Adjusted OR (95% CI) | SM Adjusted OR (95% CI) | FMCG Adjusted OR (95% CI) |
|---|---|---|---|
| **Distance, miles** | 1.00 (0.94–1.07) | 1.00 (0.96–1.03) | 1.00 (0.98–1.03) |
| **Maternal Age, years** | **1.09 (1.07–1.10)** | **1.09 (1.07–1.10)** | **1.09 (1.07–1.10)** |
| **Race/Ethnicity** | | | |
| Hispanic | 1.04 (0.87–1.24) | 1.03 (0.86–1.23) | 1.04 (0.87–1.25) |
| Non-Hispanic White | Reference | Reference | Reference |
| Non-Hispanic Black | 0.86 (0.68–1.09) | 0.86 (0.67–1.08) | 0.86 (0.68–1.10) |
| Non-Hispanic Asian | **2.55 (2.02–3.23)** | **2.54 (2.01–3.21)** | **2.56 (2.03–3.23)** |
| Non-Hispanic Other | 0.99 (0.74–1.33) | 0.99 (0.74–1.32) | 0.99 (0.74–1.33) |
| **Marital Status** | | | |
| Single | 1.02 (0.88–1.17) | 1.02 (0.88–1.17) | 1.02 (0.88–1.17) |
| Married | Reference | Reference | Reference |
| Divorced/Widowed/ Separated | 1.00 (0.74–1.36) | 1.00 (0.74–1.36) | 1.00 (0.74–1.36) |
| **BMI** | **1.08 (1.07–1.08)** | **1.08 (1.07–1.08)** | **1.08 (1.07–1.08)** |

*BMI= Body Mass Index; FFR= Fast Food Restaurant; FMCG= Farmer's Market/Community Garden; OR= Odds Ratio; SM= Supermarket

time of delivery, we elected to use absolute distance in miles from each patient's home address to food source since this measure is more specific than neighborhood data and may be able to better account for the individual's surroundings. While our findings were inconsistent with the previously established relationship, it is important to note that RI is substantially geographically smaller than previously examined states which may explain some of the differences noted.

While food environment definitions are heterogeneous, many studies, including this one, have found inequities in food access.[16-20] Studies in New York, Texas, and Chicago have reported that women living in food deserts are more likely to be younger, non-Hispanic Black, low-income and have Medicaid insurance.[9-11] We found that distance to FFR, SM, and FMCG differed by insurance type, educational background, and race/ethnicity. Like prior studies, we also found that women who lived closer to each of the food sources gained more weight than is recommended by IOM guidelines during pregnancy. These differences should be interpreted through the lens of social determinants of health such as income and socioeconomic status which are often collinear with food environment. While we did not directly control for income, we clustered pregnant persons based on core cities (defined as 25% of children living below the poverty line) to account for the economic burden experienced in certain food environments. Interestingly, we found the opposite relationship that pregnant persons living in core cities were less likely to have GDM compared to their counterparts that did not live in core cities (6.8% vs 7.5% p <0.4). There are additional factors to consider such as income, differences in employment, access to prenatal care, shopping behaviors, etc., that is not readily available in birth certificate data, as we aim to understand the relationship between food environment and GDM risk.

The results of this study should be interpreted considering the following limitations. First, it was subjected to a temporal mismatch between our birth data (January 2015–December 2016) and our food environment data that was downloaded in July–August 2019 from the Rhode Island Department of Health licensing website as historical food environment data from 2015–2016 was not available. Another limitation is that we used the address listed on the birth certificate at the time of delivery as the home address for the entire duration of the pregnancy and did not have data on any previous addresses resided during pregnancy. Taken together it is plausible that our classification does not reflect the true food environment of pregnant persons throughout the course of their pregnancy. Secondly, there are unmeasured cofounders such as family history of GDM, patient-doctor-communication, transportation, safety, etc., that would be valuable to consider in our analyses. There are also several strengths of our study. Previous studies that have aimed to understand this relationship have targeted it at the neighborhood level, block level, and at the census level. Our study utilized two-step process to understand if a patient's individual risk of GDM increased or decreased given their absolute proximity to FFR, SM, and FMCG as well as clustering at the Census tract level.

In summary, understanding the role of social determinants of health is imperative to managing GDM patients. Until recently, preventative measures have largely focused on individual pregnant persons behaviors to reduce the risk of GDM. However, as GDM rates continue to climb, we must begin to evaluate specific social and environmental factors in order best support pregnant persons at risk for GDM. While the association between food access and GDM remains unclear, it is apparent that our current interventions are not effectively managing this high-risk population. Our study looks at the relationship between individual proximity to FFR, SM, and FMCG and individual GDM risk. While our data did not lend evidence that proximity to food sources is associated with GDM rates, other studies have found that a relationship does exist. Future studies should aim to better define and compare food environments so that the health consequences of food access and availability can be consistently evaluated.

## References


1. ACOG Practice Bulletin No. 190 Summary: Gestational Diabetes Mellitus. Obstet Gynecol. 2018 Feb;131(2):406-408. doi: 10.1097/AOG.0000000000002498. PMID: 29370044.
2. Ferrara A. Increasing prevalence of gestational diabetes mellitus: a public health perspective. Diabetes Care. 2007 Jul;30 Suppl 2:S141-6. doi: 10.2337/dc07-s206. Erratum in: Diabetes Care. 2007 Dec;30(12):3154. PMID: 17596462.
3. Hedderson MM, Gunderson EP, Ferrara A. Gestational weight gain and risk of gestational diabetes mellitus. Obstet Gynecol. 2010 Mar;115(3):597-604. doi: 10.1097/AOG.0b013e3181cfce4f. Erratum in: Obstet Gynecol. 2010 May;115(5):1092. PMID: 20177292; PMCID: PMC3180899.
4. Cheu LA, Yee LM, Kominiarek MA. Food insecurity during pregnancy and gestational weight gain. Am J Obstet Gynecol MFM. 2020 Feb;2(1):100068. doi: 10.1016/j.ajogmf.2019.100068. Epub 2019 Nov 22. PMID: 33313497; PMCID: PMC7725228.
5. Carreno CA, Clifton RG, Hauth JC, Myatt L, Roberts JM, Spong CY, Varner MW, Thorp JM Jr, Mercer BM, Peaceman AM, Ramin SM, Carpenter MW, Sciscione A, Tolosa JE, Saade GR, Sorokin Y; Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network. Excessive early gestational weight gain and risk of gestational diabetes mellitus in nulliparous women. Obstet Gynecol. 2012 Jun;119(6):1227-33. doi: 10.1097/AOG.0b013e318256cf1a. Erratum in: Obstet Gynecol. 2012 Sep;120(3):710. Saade, George R [added]. PMID: 22617588; PMCID: PMC3360415.
6. Champion ML, Harper LM. Gestational Weight Gain: Update on Outcomes and Interventions. Curr Diab Rep. 2020 Feb 27;20(3):11. doi: 10.1007/s11892-020-1296-1. PMID: 32108283.
7. Kew S, Ye C, Mehmood S, Hanley AJ, Sermer M, Zinman B, Retnakaran R. Neighborhood walkability and risk of gestational diabetes. BMJ Open Diabetes Res Care. 2020 Feb;8(1):e000938. doi: 10.1136/bmjdrc-2019-000938. PMID: 32086280; PMCID: PMC7039598.
8. Stafne SN, Salvesen KÅ, Romundstad PR, Eggebø TM, Carlsen SM, Mørkved S. Regular exercise during pregnancy to prevent gestational diabetes: a randomized controlled trial. Obstet Gynecol. 2012 Jan;119(1):29-36. doi: 10.1097/AOG.0b013e3182393f86. PMID: 22183208.
9. Kahr MK, Suter MA, Ballas J, Ramin SM, Monga M, Lee W, Hu M, Shope CD, Chesnokova A, Krannich L, Griffin EN, Mastrobattista J, Dildy GA, Strehlow SL, Ramphul R, Hamilton WJ, Aagaard KM. Geospatial analysis of food environment demonstrates associations with gestational diabetes. Am J Obstet Gynecol. 2016 Jan;214(1):110.e1-9. doi: 10.1016/j.ajog.2015.08.048. Epub 2015 Aug 28. PMID: 26319053; PMCID: PMC4821568.
10. Janevic T, Borrell LN, Savitz DA, Herring AH, Rundle A. Neighbourhood food environment and gestational diabetes in New York City. Paediatr Perinat Epidemiol. 2010 May;24(3):249-54. doi: 10.1111/j.1365-3016.2010.01107.x. PMID: 20415754; PMCID: PMC3734793.
11. Fonge YN, Jain VD, Harrison C, Brooks M, Sciscione AC. Examining the relationship between food environment and gestational diabetes. Am J Obstet Gynecol MFM. 2020 Nov;2(4):100204. doi: 10.1016/j.ajogmf.2020.100204. Epub 2020 Aug 17. PMID: 33345920.
12. Kotelchuck M. An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index. Am J Public Health. 1994 Sep;84(9):1414-20. doi: 10.2105/ajph.84.9.1414. PMID: 8092364; PMCID: PMC1615177.
13. Rhode Island Department of Health. (2012). Rhode Island Department of Health Guidelines for Adoption of New Core City Designation, December 2012. Retrieved February 12, 2021 from https://health.ri.gov/publications/guidelines/CoreCityData.pdf
14. Guevara E, Rogers ML, Smego R, Clark MA, Jelalian E, Vivier PM. A Spatial Analysis of the Food Environment and Overweight and Obesity Among Rhode Island Youth. R I Med J (2013). 2020 Dec 1;103(10):56-61. PMID: 33261238.
15. SAS Institute Inc 2013.SAS/ACCESS® 9.4 Interface to ADABAS: Reference. Cary, NC: SAS Institute Inc
16. Banner GC, Weaver KN, Rushovich T, York SL, Yee LM. Association between Food Deserts and Gestational Diabetes Mellitus in a Large Metropolitan Area. Am J Perinatol. 2021 Aug;38(S 01):e39-e45. doi: 10.1055/s-0040-1702991. Epub 2020 Mar 2. PMID: 32120416.
17. Battarbee AN, Yee LM. Association of Fast Food and Supermarket Density with Neonatal Outcomes of Pregnancies Affected by Gestational Diabetes. Am J Perinatol. 2019 Nov;36(13):1405-1411. doi: 10.1055/s-0038-1677478. Epub 2019 Jan 15. PMID: 30646419; PMCID: PMC7190214.
18. Young C, Laurent O, Chung JH, Wu J. Geographic Distribution of Healthy Resources and Adverse Pregnancy Outcomes. Matern Child Health J. 2016 Aug;20(8):1673-9. doi: 10.1007/s10995-016-1966-4. PMID: 26994606.
19. Laraia BA, Siega-Riz AM, Kaufman JS, Jones SJ. Proximity of supermarkets is positively associated with diet quality index for pregnancy. Prev Med. 2004 Nov;39(5):869-75. doi: 10.1016/j.ypmed.2004.03.018. PMID: 15475018.
20. Ingol TT, Kue J, Conrey EJ, Oza-Frank R, Weber MB, Bower JK. Perceived Barriers to Type 2 Diabetes Prevention for Low-Income Women With a History of Gestational Diabetes: A Qualitative Secondary Data Analysis. Diabetes Educ. 2020 Jun;46(3):271-278. doi: 10.1177/0145721720920255. PMID: 32597385; PMCID: PMC7986479.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## Disclaimer

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# Rhode Island Adolescents and Routine Vaccinations: Can We Get Back on Track?

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## ABSTRACT

**BACKGROUND:** Using data from the Rhode Island immunization registry from January 2019 through September 2022, we assessed whether adolescent routine vaccination rates are catching up on losses experienced early in the pandemic.

**METHODS:** For Q1 2020–Q3 2022, we calculated the number of adolescents ages 11–18 receiving a routine vaccine as a percentage of the same quarter in 2019 along with the cumulative difference through Q3 2022. Human papillomavirus (HPV) vaccine trends were further stratified by racial/ethnic identity and by sex.

**RESULTS:** Except for Q1 2021, the number of adolescents receiving each vaccine in each calendar quarter since Q1 2020 was below 100% of the same quarter in 2019, resulting in cumulative "losses" or "deficits" relative to pre-pandemic numbers.

**CONCLUSIONS:** We describe ways Rhode Island can expand on its existing partnerships between primary care providers, public health, and schools to address the decline in adolescent routine vaccination.


**KEYWORDS:** Immunizations, adolescents, HPV vaccine, adolescent preventive care

## INTRODUCTION

The SARS-CoV-2 (COVID-19) pandemic began to unsettle healthcare delivery in the United States early in 2020 as practices pivoted to new infection control procedures and the public drew back from nonessential medical encounters. Multiple publications have described the initial effects of the pandemic on routine childhood and adolescent vaccination in particular: while estimates varied by geography and methodology, there was a widespread and significant decline in the number of routine vaccines administered.[1-9] Two years later, many pediatric providers and parents are understandably focused on addressing escalating pediatric mental health needs,[10-12] while growing instability in health care and public health is also making routine childhood immunization and other tenets of preventive health more important than ever, both to prevent outbreaks and to reduce young people's health risks later in life.

Rhode Island (RI) traditionally performs at or above the national average for routine childhood and adolescent immunizations.[13] The Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP) recommends three routine vaccinations for adolescents: one booster dose of Tdap (to protect against tetanus, diphtheria, and pertussis), Human papillomavirus or HPV (a two-dose or three-dose series depending on age of initiation, to protect against multiple human papilloma virus-associated cancers[14]), and two doses of meningococcal conjugate (MenACWY or MCV4) vaccine, to protect against increased risk of meningococcal diseases in the types of congregate settings that adolescents and young adults may enter (dormitories, military, etc.). In RI, all three of these vaccinations are required for school enrollment. (Of note, ACIP also recommends an annual influenza vaccine, but this was excluded from the current analysis due to its periodicity and because it is not required for school enrollment). We analyzed data from the Rhode Island immunization registry from January 2019 through September 2022 to assess whether adolescent routine vaccination rates in our state are catching up on losses experienced early in the pandemic. Secondarily, we assessed for demographic variations in HPV vaccination trends.

## METHODS

The Rhode Island Child and Adult Immunization Registry (RICAIR) is Rhode Island's Immunization Information System (IIS). It maintains records of all vaccinations administered in the state. As of 2022, it also contains past and present records of vaccinations administered in Massachusetts, Connecticut, New Jersey, and New York City to RI residents. RICAIR records are strictly confidential, and access is limited to authorized users such as medical providers and school nurses. The RI Department of Health also accesses RICAIR data to conduct routine public health surveillance and identify potential population-level gaps in coverage; as this study falls under that umbrella, it was deemed exempt from IRB review.

We used 2019 as a baseline, as that was the last full year prior to the pandemic. We calculated the number of adolescents aged 11–18 who received an HPV, MCV4, and/or Tdap vaccine in each calendar quarter between Q1 2019 and Q3

2022 using SAS 9.4. For calendar quarters Q1 2020 and later, we then calculated the number as a percentage of the same quarter in 2019; the difference from the same quarter in 2019; and the cumulative difference through Q3 2022. HPV trends were further stratified by race or ethnicity and by sex. Racial and ethnic identity as well as sex are submitted to RICAIR either through Office of Vital Records birth records, or by providers. Options are Hispanic/Latino ethnicity (Yes, No, or Unknown) and the following identities for race: American Indian/Alaskan Native, Asian, Black, Hawaiian/PI, Multi, Other, Unknown, or White. We created the following categories for analysis: Hispanic/Latinx, Black (non-Hispanic), Asian (non-Hispanic), White (non-Hispanic), and all other identities. Adolescents whose racial or ethnic identity was not known to RICAIR were excluded from the stratification of HPV trends by race or ethnicity, but included in all other analyses. Sex is captured in RICAIR as Male, Female, Other (as of 2022), and Unknown. (There were no individuals with sex reported as "Other" in the study population, and 0.14% were reported as Unknown.) We recognize that the categories of race/ethnicity and sex as captured in RICAIR employed in this analysis do not capture how all adolescents identify themselves.

## RESULTS

In 2019, on average 6555 RI adolescents aged 11–18 received an HPV vaccine each calendar quarter, 6203 received an MCV4 vaccine, and 3472 received a Tdap. For the first three quarters of 2022, the average number of adolescents receiving those vaccines each quarter were 5526, 5594, and 3047 respectively. With the exception of Q1 2021, the number of adolescents receiving each vaccine in each calendar quarter since Q1 2020 was below 100% of the same quarter in 2019. After the first full-quarter impact of the pandemic in Q2 2020, when routine vaccinations were about half of their normal volume (47.7% for HPV, 52.8% for MCV4, and 49.2% for Tdap; see **Figure 1**), the proportions ranged from 80.2% (HPV in Q4 2021) to 106.8% (MCV4, Q1 2021). Although the Q-to-2019 Q ratios stabilized after Q2 2020, Q1 2021 was the only quarter in which change from the same quarter in 2019 was positive, with 106.8% of Q1 2019 receiving MCV4 and 101.9% receiving Tdap. (Even in this quarter, however, only 97.1% of Q1 2019 received an HPV vaccine). For every quarter from Q4 2020 on, the Q-to-2019-Q ratio was lower for HPV than for MCV4 and Tdap. As a result, the cumulative effect of below-2019 numbers vaccinated in each quarter was greater for HPV than for MCV4 or Tdap. By the end of Q3

Figure 1. Number of Rhode Island adolescents aged 11–18 who received vaccines in each calendar quarter Q1 2020-Q3 2022 as a percentage of the same quarter in 2019

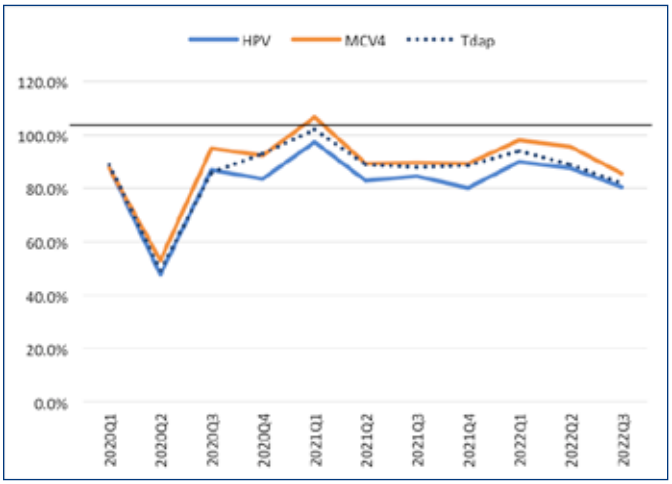



**Figure 2.** Tdap vaccination trends in Rhode Island by calendar quarter, Q1 2020–Q3 2022

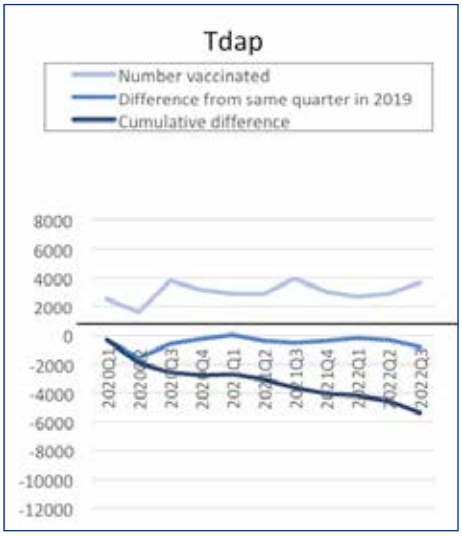



**Figure 3.** MCV4 vaccination trends in Rhode Island by calendar quarter, Q1 2020–Q3 2022

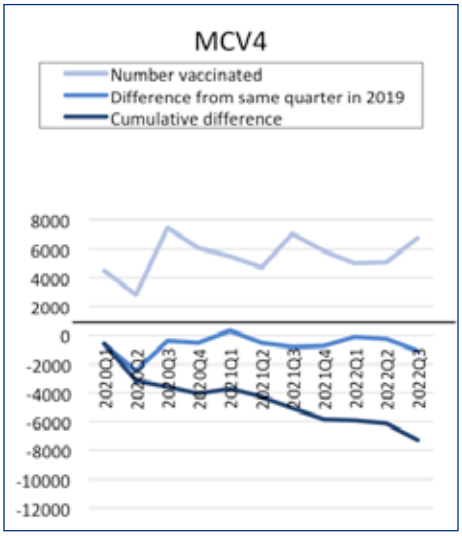
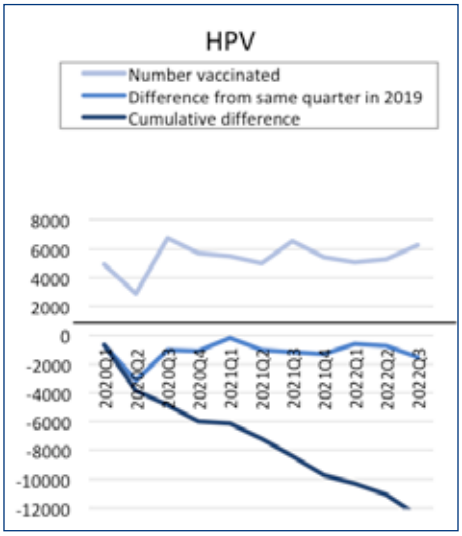



**Figure 4.** HPV vaccination trends in Rhode Island by calendar quarter, Q1 2020–Q3 2022



2022, 12,594 fewer HPV, 7266 fewer MCV4, and 5396 fewer Tdap vaccinations were administered overall than would be expected based on 2019 numbers (**Figures 2–4**).

It is perhaps easier to think of these cumulative negative differences (the darkest lines in Figures 2-4) as HPV, MCV4, and Tdap vaccine "deficits" relative to pre-pandemic numbers. Since over 90% of adolescents initiated the HPV series before age 15 (mean age 12.5 years, median age 11.9 years) and thus qualified for a 2-dose rather than 3-dose series, we would expect any Tdap: MCV4: HPV ratio to be about 1: 2: 2.1 (that is, for every 1 Tdap dose we would expect 2 MCV4 doses and 2.1 HPV doses). The ratio of the cumulative "deficit" in Figures 2-4 was instead 1: 1.35: 2.33 – that is, for every 1 Tdap "deficit" compared to 2019, there were 1.35 MCV4 doses not administered and 2.33 HPV doses not administered. HPV vaccines, that is, lost more ground than Tdap and MCV. To investigate further the disproportionate decline in the number of adolescents receiving HPV compared to MCV4 or Tdap, we assessed HPV trends by sex and racial or ethnic identity. After initially similar trends, males dropped behind females Q3 2020-Q4 2021, and by Q3 2022 had a cumulative decline of 6914 compared to 5691 for females (**Figure 5**). There was also variability among racial and ethnic identities over time. Black and Hispanic/Latinx adolescents were largely in tandem until Q1 2021, when the trend for Black adolescents began to fall several points below that of Hispanic/Latinx peers. There was more fluctuation among non-Hispanic White adolescents, although they too reached parity with a 2019 quarter only in Q1 2021 (**Figure 6**). Asian adolescents, although a much smaller population, were the only group with multiple quarters at or above 100% of the 2019 quarter and a cumulative effect just above zero by Q3 2022).

**Figure 5.** Number of Rhode Island adolescents aged 11–18 who received the HPV vaccine in each calendar quarter as a percentage of the same quarter in 2019 and cumulative change since Q1 2020, by sex

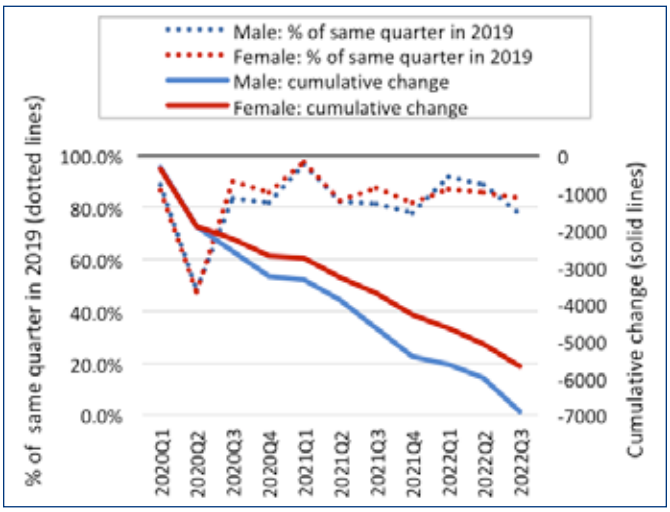
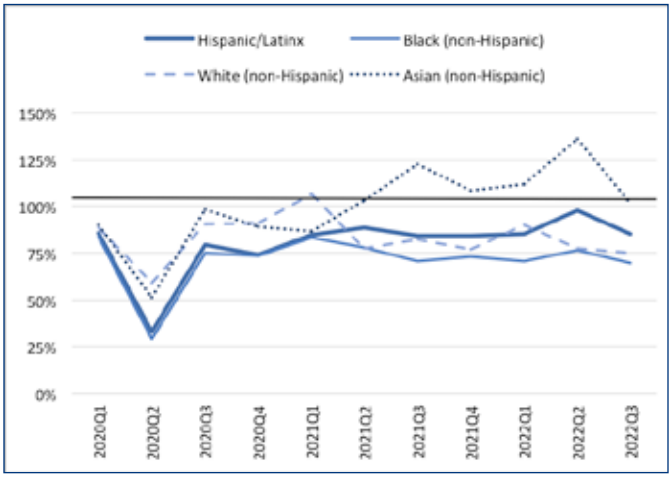



**Figure 6.** Number of Rhode Island adolescents aged 11–18 who received the HPV vaccine in each calendar quarter as a percentage of the same quarter in 2019, by racial or ethnic identity




## DISCUSSION

The number of RI adolescents receiving HPV, MCV4, and/or Tdap vaccines quarterly stabilized after Q2 2020, but has remained overall lower than during pre-pandemic baseline quarters. As a result, relatively small "deficits" each quarter have accumulated steadily since 2020. The decline in adolescents receiving vaccines is relative to a very strong pre-pandemic track record, given RI's traditionally high coverage rates, but it is still cause for concern. National and global declines in routine vaccinations since the beginning of the COVID-19 pandemic have brought renewed attention to the tremendous public health accomplishment in reducing childhood vaccine-preventable diseases – but also to how vulnerable that accomplishment is.[15,16] Progress in reducing global and local disparities appears similarly tenuous.

This may especially be the case for HPV, which is marked by both very high lifetime probability of infection[17] and dramatic reductions with the introduction of the vaccine.[18,19] In Rhode Island, the Q-to-2019-Q ratio for the HPV vaccine fell behind those for MCV4 and Tdap in late 2020 and has remained lower since. The divergence is all the more discouraging in light of the great progress made in RI since HPV vaccination became a school requirement in 2015. Vaccinations surged in that year as families complied with the new requirement, dropped somewhat in 2016 as catch-up vaccination occurred, and then remained consistent through 2019 (detailed data available upon request). It is not altogether clear why HPV vaccinations declined more than MCV4 and Tdap and among some demographic groups more than others, but the consequences – including the possible resurgence of HPV-related cancers – may be severe and not realized for some years unless adolescents are brought up to date.[14,20]

It may not be easy to encourage these adolescents and their families to reengage with vaccination as an important

part of preventive care. As the last 2.5 years made clear, the pandemic has exacerbated pre-existing limitations and inequities of the US healthcare system. At the same time, the crisis has created a rare opportunity for us to step back and envision fresh approaches to the partnership between primary care, public health, and schools that has been the foundation of RI's success in childhood vaccination. Pooling the knowledge of these partners may help us determine the real drivers behind the trends we present here, and thus potential solutions. It may make a big difference if we can identify whether declines stem from parents struggling to keep up with preventive care despite Rhode Island's high rate of insurance coverage and provider efforts to expand availability, or if the declines are manifestations of vaccine hesitancy or opposition, potentially spilling over from politicized misinformation about the COVID-19 vaccine into renewed opposition to routine childhood vaccines.

Whatever the root causes, we must consider solutions along the lines of the "Swiss cheese model"[21] brought to public awareness early in the COVID-19 pandemic: it is clear that we need multiple approaches to vaccine catch-up, rather than trying to rely on any one-size-fits-all solution. One example involves reinforcing provider recommendations, which are still the most important factor in whether adolescents receive vaccines, and the HPV vaccine in particular.[22-24] *How* providers make recommendations may matter as much as *whether* they do, and this is an area in which public health can provide valuable support to providers. For instance, RICAIR data show that adolescents regularly receive one vaccine with another left overdue. This can happen for a variety of reasons, but clearer messaging to parents may help reduce these "missed opportunities." For example, emphasizing the safety of "bundled" vaccines (administering more than one in the same visit)[24] is all the more important given a growing disconnect between fears regarding HPV vaccine safety and its actual safety.[25] Likewise, there is growing awareness of the positive effects of presenting the HPV vaccine as cancer prevention rather than focusing on prevention of sexually transmitted infections.[22] In partnership and to help support this message, RIDOH can add additional communications support to the technical assistance it already extends to providers.

Another layer of vaccine catch-up strategy is to provide options and access for adolescents who, for whatever reason, are not vaccinated with their primary care providers. RI is exceptional in its Vaccinate Before You Graduate (VBYG) school-based clinics, which were originally designed for 12th-graders but now also provide catch-up vaccines to all public middle schools and all high schools in the state. Although VBYG clinics administer far fewer adolescent vaccines than do primary care providers, a significantly larger proportion of vaccines administered via VBYG go to adolescents of color and those on public insurance (additional data available upon request). VBYG clinics thus play an important role in reducing disparities in preventive care. Expanding this model provides not only an additional setting for normalizing and encouraging vaccination, but an opportunity to encourage adolescents to attend their well-visits for additional important preventive care. As these two examples illustrate, adolescent catch-up will require not only a multi-pronged approach but active collaboration between the public health, school and primary care sectors.

## CONCLUSION

Assessing trends in RI adolescent vaccination rates is complicated by the maturing of a slightly smaller birth cohort reflecting a decline in births following the 2008 recession. However, the declines in adolescent vaccines since early 2020 are far more than this birth trend can account for, raising the possibility of setbacks in controlling vaccine-preventable diseases. Reimagining the primary care-public health partnership with a creative, multi-pronged approach will be the best path forward.

### References


1. Bramer CA, Kimmins LM, Swanson R, et al. Decline in child vaccination coverage during the COVID-19 pandemic - Michigan Care Improvement Registry, May 2016-May 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(20):630-631.
2. Ji C, Piche-Renaud PP, Apajee J, et al. Impact of the COVID-19 pandemic on routine immunization coverage in children under 2 years old in Ontario, Canada: A retrospective cohort study. *Vaccine.* 2022;40(12):1790-1798.
3. Kujawski SA, Yao L, Wang HE, Carias C, Chen YT. Impact of the COVID-19 pandemic on pediatric and adolescent vaccinations and well child visits in the United States: A database analysis. *Vaccine.* 2022;40(5):706-713.
4. Ota MOC, Badur S, Romano-Mazzotti L, Friedland LR. Impact of COVID-19 pandemic on routine immunization. *Ann Med.* 2021;53(1):2286-2297.
5. Patel Murthy B, Zell E, Kirtland K, et al. Impact of the COVID-19 pandemic on administration of selected routine childhood and adolescent vaccinations - 10 U.S. jurisdictions, March-September 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(23):840-845.
6. Saxena K, Marden JR, Carias C, et al. Impact of the COVID-19 pandemic on adolescent vaccinations: projected time to reverse deficits in routine adolescent vaccination in the United States. *Curr Med Res Opin.* 2021;37(12):2077-2087.
7. SeyedAlinaghi S, Karimi A, Mojdeganlou H, et al. Impact of COVID-19 pandemic on routine vaccination coverage of children and adolescents: A systematic review. *Health Sci Rep.* 2022;5(2):e00516.
8. Shet A, Carr K, Danovaro-Holliday MC, et al. Impact of the SARS-CoV-2 pandemic on routine immunisation services: evidence of disruption and recovery from 170 countries and territories. *Lancet Glob Health.* 2022;10(2):e186-e194.
9. Walker B, Anderson A, Stoecker C, Shao Y, LaVeist TA, Callison K. COVID-19 and routine childhood and adolescent immunizations: evidence from Louisiana Medicaid. *Vaccine.* 2022;40(6):837-840.
10. Durante JC, Lau M. Adolescents, suicide, and the COVID-19 pandemic. *Pediatr Ann.* 2022;51(4):e144-e149.
11. Lantos JD, Yeh HW, Raza F, Connelly M, Goggin K, Sullivant SA. Suicide risk in adolescents during the COVID-19 pandemic. *Pediatrics.* 2022;149(2).

12. Theberath M, Bauer D, Chen W, et al. Effects of COVID-19 pandemic on mental health of children and adolescents: A systematic review of survey studies. *SAGE Open Med.* 2022;10:20503121221086712.
13. Centers for Disease Control and Prevention. Vaccination coverage among young children (0 – 35 months). Available at https://www.cdc.gov/vaccines/imz-managers/coverage/childvaxview/index.html. Vaccine coverage among adolescents (13-17 years old). Available at https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/index.html. Accessed 11/14/22.
14. Senkomago V, Henley SJ, Thomas CC, Mix JM, Markowitz LE, Saraiya M. Human Papillomavirus-attributable cancers - United States, 2012-2016. *MMWR Morb Mortal Wkly Rep.* 2019;68(33):724-728.
15. Warren MD, Hanna MF. Vaccines are profoundly effective, and we can't stop there. *Pediatrics.* 2022;150(3).
16. Talbird SE, Carrico J, La EM, et al. Impact of routine childhood immunization in reducing vaccine-preventable diseases in the United States. *Pediatrics.* 2022;150(3).
17. Chesson HW, Dunne EF, Hariri S, Markowitz LE. The estimated lifetime probability of acquiring human papillomavirus in the United States. *Sex Transm Dis.* 2014;41(11):660-664.
18. Markowitz LE, Liu G, Hariri S, Steinau M, Dunne EF, Unger ER. Prevalence of HPV after introduction of the vaccination program in the United States. *Pediatrics.* 2016;137(3):e20151968.
19. Rosenblum HG, Lewis RM, Gargano JW, Querec TD, Unger ER, Markowitz LE. Declines in prevalence of Human Papillomavirus Vaccine-type infection among females after introduction of vaccine - United States, 2003-2018. *MMWR Morb Mortal Wkly Rep.* 2021;70(12):415-420.
20. Daniels V, Saxena K, Roberts C, et al. Impact of reduced human papillomavirus vaccination coverage rates due to COVID-19 in the United States: A model based analysis. *Vaccine.* 2021; 39(20):2731-2735.
21. Roberts S. The Swiss Cheese Model of Pandemic Defense. *The New York Times.* 12/5/2020. Available at https://www.nytimes.com/2020/12/05/health/coronavirus-swiss-cheese-infection-mackay.html?searchResultPosition=1. Accessed 11/14/22.
22. Attia AC, Wolf J, Nunez AE. On surmounting the barriers to HPV vaccination: we can do better. *Ann Med.* 2018;50(3):209-225.
23. Boitano TKL, Daniel C, Kim YI, Straughn JM, Jr., Peral S, Scarinci I. Beyond words: Parental perceptions on human papilloma virus vaccination recommendations and its impact on uptake. *Prev Med Rep.* 2021;24:101596.
24. Landis K, Bednarczyk RA, Gaydos LM. Correlates of HPV vaccine initiation and provider recommendation among male adolescents, 2014 NIS-Teen. *Vaccine.* 2018;36(24):3498-3504.
25. Sonawane K, Lin YY, Damgacioglu H, et al. Trends in Human Papillomavirus vaccine safety concerns and adverse event reporting in the United States. *JAMA Netw Open.* 2021;4(9):e2124502.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## Disclosures

The authors report nothing to disclose.

## Disclaimer

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# Diagnostic and Treatment Practices for *Helicobacter Pylori* Infection in an Academic Pediatric Hospital

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## ABSTRACT

**BACKGROUND:** In 2016, ESPGHAN/NASPGHAN issued revised guidelines for the management of *Helicobacter pylori* (*H. pylori)* infection in children and adolescents. Recommendations include performing antibiotic susceptibility testing to tailor therapy. The aim of our study was to evaluate the *H. pylori* treatment landscape in pediatric patients at our institution.

**METHODS:** We performed a retrospective study of patients diagnosed with *H. pylori* infection at a single academic children's hospital from 2015 to 2021. The frequency of each treatment regimen and their respective eradication rates were calculated. We compared trends in antibiotic prescriptions and eradication rates before and after 2016.

**RESULTS:** One hundred and ninety-six patients were included. Triple therapy with amoxicillin, clarithromycin, and a proton pump inhibiter (PPI) was the most often prescribed regimen (46.5%), followed by amoxicillin, metronidazole, and PPI (33%). Eradication rates were 70% for amoxicillin, clarithromycin, and PPI and 64% for amoxicillin, metronidazole, and PPI.

**CONCLUSION:** Our results show eradication rates for both regimens were comparable but suboptimal, highlighting the need to incorporate resistance testing into broader practice.


**KEYWORDS:** *Helicobacter pylori*, triple therapy, children, eradication

## INTRODUCTION

*Helicobacter pylori* (*H. pylori*) is a gram-negative, microaerophilic, spiral organism, which colonizes the stomach, and which is present in almost half of the world population.[1] In North America, the overall prevalence of *H. pylori* is reported to be 37%,[1] but these rates vary depending on the geographic location, ethnicity, and socioeconomic profile. *H. pylori* infection can cause peptic ulcer disease, gastric cancer, and lymphoma. Early recognition offers an opportunity to prevent important clinical sequelae.

To eradicate *H. pylori* infection, a combination of two or more antibiotics with a proton pump inhibitor (PPI) is used for the duration of at least 10–14 days. For adult patients within the United States, bismuth-based quadruple therapy including tetracycline is first-line treatment for *H. pylori*, as evidence supports this regimen as the most effective.[2,3] There is no comparable study in pediatrics. Moreover, tetracycline is generally avoided in children due to potential adverse effects. In a retrospective study of treatment outcomes of 261 children with *H. pylori* infection from 2011–2015, 87% were treated with clarithromycin-based regimens.[4] Resistance rates for clarithromycin are increasing worldwide and in North America. A multi-center, retrospective study from different geographic regions within the U.S. reported clarithromycin resistance rates of up to 31% in North America with no significant difference among the regions[5]. The goal for *H. pylori* treatment is to achieve an eradication rate of at least 90%, which becomes less likely if antibiotic resistance is more than 20% in the community.[5-7]

In 2016, joint guidelines on the diagnosis and management of *H. pylori* were published by the European Society and the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN/NASPGHAN), recommending tailored therapy through culture and sensitivity testing.[8] However, susceptibility testing is not readily available at most centers. In the absence of testing, selection of empiric antibiotic therapy should be based on national and local antibiotic resistance patterns. However, very little such data exists in United States, especially among pediatric patients. Given high resistance rates of *H. pylori* against clarithromycin, triple therapy based on amoxicillin, clarithromycin and PPI is not recommended as first line for *H. pylori* eradication when susceptibility of *H. pylori* against clarithromycin is unknown.

Given the paucity of information regarding the contemporary management of pediatric *H. pylori* infection in the US, we evaluated the *H. pylori* treatment landscape within our institution since 2015, focusing on prescribing patterns and eradication rates. Importantly, reviewing trends over this time period allowed us to examine the impact of the updated ESPGHAN/NASPGHAN guidelines on current clinical practice.

## METHODS

We conducted a retrospective study of patients less than 21 years of age at the time of diagnosis, who were tested and treated for *H. pylori* infection at a single academic children's hospital from June 2015 to February 2021. Hasbro Children's Hospital is the only children's hospital in the state of Rhode Island with the catchment area of one million people. Electronic medical records (EMRs) of patients meeting the inclusion criteria were reviewed to collect basic demographic data including age, gender, ethnicity, race, and zip code. Frequency of different treatment regimens used for *H. pylori* eradication along with their dose, duration of therapy, and the eradication rate was calculated. We also looked at pre- and post-treatment symptoms, type of test used for diagnosis of *H. pylori* infection and the test of cure (TOC) ordered. EMRs were also reviewed for the documentation of noncompliance and loss to follow up. We compared the first-choice antibiotic regimen used before and after the publication of the 2016 ESPGHAN/NASPGHAN guidelines. This study was approved by local institutional review board. Data was collected and saved via REDCap data collection software and further analyzed using SPSS V28.0.

## RESULTS

During our inclusion period, *H. pylori* was diagnosed in 196 patients, mean age 12.5 years. One hundred and twelve (57.1%) patients were female, and 84 (42.9%) were male. The predominant ethnicities were Hispanic (79, 40.3%), and White (68, 34.7%) followed by African American (32, 16.3%) and Asian (12, 6.1%) (**Table 1**). Patients reported abdominal pain as the most common symptom before *H. pylori* treatment (77%). Other symptoms included weight loss (28%), reflux (26%), vomiting (24%) and nausea (23%). Five percent of patients who were tested and treated for *H. pylori* infection were diagnosed incidentally (i.e., instances in which the *H. pylori* diagnosis was entirely unrelated to the indication for endoscopy, such as foreign body ingestion, esophageal food impaction, inflammatory bowel disease surveillance, percutaneous endoscopic gastrostomy tube placement, or confirmation of celiac disease). After *H. pylori* eradication, 81% of patients reported resolution or improvement in symptoms. All patients with hematemesis, melena and peptic ulcer disease had complete resolution of their symptoms following *H. pylori* eradication. Nine percent of patients reported ongoing abdominal pain after *H. pylori* eradication therapy. Only 0.9% of patients had persistent weight loss after the eradication therapy, compared to 28% before treatment.

Histopathology was the most common test used for the diagnosis of *H. pylori* infection (78% of cases). Stool antigen (29%) and urea breath testing (6%) were the other methods of diagnosis. Omeprazole was the most common PPI prescribed among eradication regimens, used in 90% of cases. A 14-day course of amoxicillin, clarithromycin and PPI was the most prescribed *H. pylori* eradication therapy (comprising 47% of regimens). Amoxicillin, metronidazole, and PPI was the second most common regimen, in 33% of cases. Other therapies used were metronidazole, clarithromycin, and PPI (6%), amoxicillin, metronidazole, bismuth, and PPI (3%), metronidazole, bismuth, tetracycline, and PPI (2%), and other combinations of different antibiotic regimens with PPI (9%).

A TOC was ordered by 82% of physicians and was performed in 59% of patients. Stool antigen (59%), and urea breath test (24%) were the most common TOC. TOC was negative in 70% overall, across all antibiotic regimens. We calculated individual eradication rates for *H. pylori* treatment regimens. Among all the empiric regimens, amoxicillin, clarithromycin, PPI therapy had the highest *H. pylori* eradication rate (70%) followed by amoxicillin, metronidazole, PPI therapy (64%) (**Fig. 1**).

We tracked treatment regimens over time. There was a consistent increase in prescribing metronidazole-based

**Table 1.** Demographics of study subjects

| Patient demographics n=196 | |
|---|---|
| **Age (years)** | |
| range | 1.42–19.3 years |
| mean | 12.5 year |
| median | 13.1 year |
| **Gender** | |
| Female | 112 (57.1%) |
| Male | 84 (42.9%) |
| **Ethnicity** | |
| Hispanic | 79 (40.3%) |
| Asian | 12 (6.1%) |
| African American | 32 (16.3%) |
| White | 68 (34.7%) |
| Others/Unknown/not reported | 5 (2.5%) |

**Figure 1.** Eradication rates for each prescribed antibiotic regimen. Each regimen also included a PPI

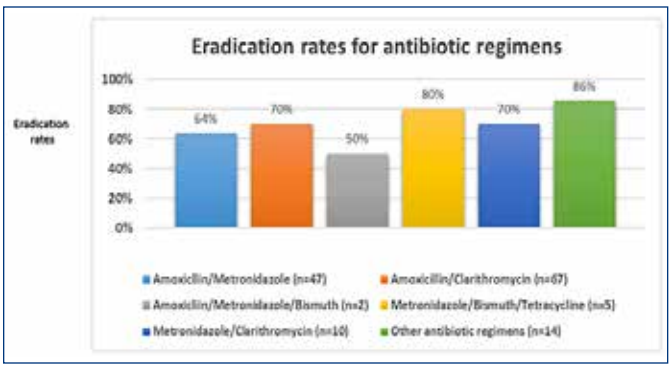


**Figure 2.** Prescribed antibiotic regimens over time. Each regimen used PPI (omeprazole in 90% of cases) in addition to the antibiotics listed.

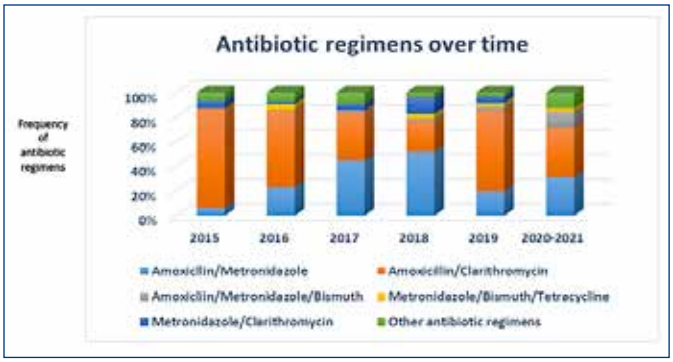
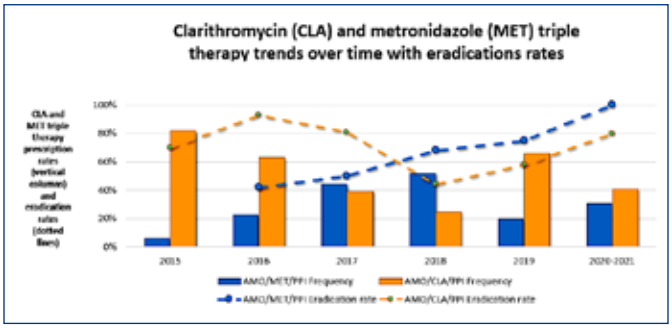



**Figure 3.** Clarithromycin and metronidazole triple therapy trends with respective eradication rates over the years




regimens from 2015 (6%) through 2018 (52%), a trend that reversed in 2019 (20%). In 2020, use of metronidazole-based regimens rose again. Clarithromycin-based therapies were more common before 2016 (81.3%) and aside from 2019, trended down over subsequent years (**Fig. 2**).

Individual eradication rates of *H. pylori* therapies varied by year. Clarithromycin-based regimens had eradication rates of 70%, 93% and 81% in 2015, 2016, and 2017 respectively. The eradication rate of amoxicillin, clarithromycin, PPI was the lowest in 2018–2019 (44–58%) (**Fig. 3**).

## DISCUSSION

This retrospective analysis documents the management of *H. pylori* at a single pediatric academic institution from June 2015 to February 2021. All our patients were treated empirically for *H. pylori* eradication. No cultures or sensitivities were performed before treatment in contrast to joint ESPGHAN/NASPGHAN guidelines[8] that recommended their use routinely before selecting a treatment regimen. A triple regimen of amoxicillin, clarithromycin, PPI was the most commonly used before 2016. After 2016, clarithromycin prescribing trended down while the use of metronidazole increased. This observation likely reflects growing awareness of the ESPGHAN/NASPGHAN 2016 guidelines since there were no new locally reported data to support or refute the use of clarithromycin-based therapies. Indeed, the eradication rates for clarithromycin-based therapies were highest from 2015–2017.

The trend away from clarithromycin- towards metronidazole-based regimens unexpectedly reversed in 2019. Though speculative, perhaps this shift reflects providers' subjective impression of the relative efficacy of amoxicillin, clarithromycin, PPI compared to amoxicillin, metronidazole, PPI triple therapy. Indeed, in 2015–2017, the eradication rate for amoxicillin, clarithromycin, PPI was > 80%. It is also possible that variation in provider preference accounts for the unexpected increase in clarithromycin prescribing in 2019. In our academic practice of approximately 12–15 providers at one time, one outlier could have had outsized effect on our data.

It has been previously reported that in the absence of peptic ulcer disease (PUD), the presence of *H. pylori* infection alone does not generally cause symptoms[9-11] and *H. pylori* eradication will not improve symptoms for these patients.[12-13] However, conflicting results demonstrate improvement in abdominal pain with *H. pylori* eradication among children.[14] The Japanese Society for Pediatric Gastroenterology, Hepatology and Nutrition (JSPGHAN) recently published updated guidelines and recommend *H. pylori* eradication therapy in symptomatic children with chronic gastritis, in the absence of peptic ulcers.[15] Adult studies suggest a noninvasive test-and-treat strategy for dyspepsia in young adult patients depending on local prevalence.[16-19] Noting a small but statistically significant improvement in dyspeptic symptoms with *H. pylori* eradication (NNT=14) investigators propose excluding *H. pylori* before diagnosing functional dyspepsia.[16,20] These strategies have not been adopted for pediatric patients and the current ESPGHAN/NASPGHAN guidelines recommend against a test and treat strategy.

Notably, in our population, 57% of patients had complete resolution of symptoms, and 24% reported improvement after *H. pylori* eradication. Only 3% of these patients had peptic ulcer disease, the remainder were only with gastritis on pathology. Our findings are similar to those from a recent retrospective study in which 58% of patients had resolution of symptoms after treatment[21] and stand in contrast to data from multiple studies which refute an association between *H. pylori* gastritis without PUD and gastrointestinal symptoms.[9-11] Recognizing the limitations of our retrospective review and the known potential placebo effect of any treatment, future work with a more rigorous, prospective design may help to clarify this relationship between uncomplicated *H. pylori* infection and gastrointestinal symptoms.

Over the last three decades, evidence demonstrates declining eradication rates for first-line *H. pylori* eradication therapies from more than 90% to 70–80%, which is consistent with reports of emerging antibiotic resistance.[22] Clarithromycin-resistance rates of greater than 15–20% have been reported in the US and throughout the world, leading to

the recommendations of susceptibility testing before using clarithromycin-based regimens. In keeping with guideline recommendations, clarithromycin was commonly substituted with metronidazole at our institution.

Interestingly, we observed that the treatment success rate with amoxicillin, clarithromycin, PPI therapy was 70% compared to amoxicillin, metronidazole, PPI rate of 64%. To our knowledge, this finding has not been previously reported in a pediatric study in the US. These results may indicate emerging metronidazole resistance in the community, which has been demonstrated in a multi-center, randomized, double-blind, placebo-controlled trial among an adult population within the US, where resistance rates for metronidazole (43.6%) were higher than for clarithromycin (17.4%).[7] Recent meta-analysis of *H pylori* antibiotic resistance in US from 2011–2021, has also reported high resistance rates for both metronidazole (42%) and clarithromycin (31%).[23]

Our study was limited due to lack of TOC results in 41% of patients and loss to follow-up in 18% of patients. Patients who reported symptom resolution – a possible surrogate for successful treatment – yet who did not submit a TOC were also excluded from analysis of eradication rates. This may account for our low *H. pylori* eradication rates relative to the other reports.[4,21]

We found lower eradication rates for both clarithromycin- and metronidazole-based triple therapies, compared to goal eradication rates of more than 90–95%, emphasizing the need to incorporate susceptibility testing into our practice. Doing so will also help fill the knowledge gap for local antibiotic resistance against *H. pylori*. The ESPGHAN/NASPGHAN recommendation to perform susceptibility testing was not embraced by our physicians. Barriers include the absence of a local culture and sensitivity capabilities, cumbersome logistics involved in handling and sending tissue specimens to a distant, out-of-state facility within the required time frame, and weeks-long lag time in receiving results before prescribing therapy. Other barriers include the lengthy process of assuring insurance coverage for susceptibility testing, which may otherwise be too costly for families.

In recent years, this process has been eased by increasing availability of newer molecular techniques and next generation sequencing for susceptibility testing. A practical guide to help clinicians find such resources has recently been published[24] and may aid in the adoption of society recommendations. Our study demonstrates a disconnect between practice guidelines and the current reality of clinical practice, but with easier access to susceptibility testing and a greater understanding of local resistance patterns, we expect to bridge that divide.

## References


1. Hooi JK, Lai WY, Ng WK, et al. Global prevalence of Helicobacter pylori infection: systematic review and meta-analysis. Gastroenterology. 2017 Aug 1;153(2):420-9
2. Fallone CA, Moss SF, Malfertheiner P. Reconciliation of recent Helicobacter pylori treatment guidelines in a time of increasing resistance to antibiotics. Gastroenterology. 2019 Jul 1;157(1): 44-53.
3. Alsamman MA, Vecchio EC, Shawwa K, et al. Retrospective Analysis Confirms Tetracycline Quadruple as Best Helicobacter pylori Regimen in the USA. Digestive diseases and sciences. 2019 Oct 1;64(10):2893-8.
4. Mathews J, Malik P, Rai A, et al. A single centre experience of treatment outcomes for Helicobacter pylori infection among inner-city children and adolescents. Acta Paediatrica. 2020 Sep; 109(9):1860-6.
5. Park JY, Dunbar KB, Mitui M, et al. Helicobacter pylori clarithromycin resistance and treatment failure are common in the USA. Digestive diseases and sciences. 2016 Aug;61(8):2373-80.
6. Graham DY, Fischbach L. Helicobacter pylori treatment in the era of increasing antibiotic resistance. Gut. 2010 Aug 1; 59(8):1143-53.
7. Hulten KG, Lamberth LB, Kalfus IN, et al. National and Regional US Antibiotic Resistance to Helicobacter pylori: Lessons From a Clinical Trial. Gastroenterology. 2021 Jul 1;161(1):342-4.
8. Jones NL, Koletzko S, Goodman K, et al. Joint ESPGHAN/NASPGHAN guidelines for the management of Helicobacter pylori in children and adolescents (update 2016). Journal of pediatric gastroenterology and nutrition. 2017 Jun 1;64(6):991-1003.
9. Bode G, Brenner H, Adler G. Helicobacter pylori and abdominal symptoms: a population-based study among preschool children in southern Germany. Pediatrics. 1998 Apr 1;101(4):634-7.
10. Macarthur C. Helicobacter pylori infection and childhood recurrent abdominal pain: lack of evidence for a cause and effect relationship. Canadian Journal of Gastroenterology. 1999 Sep 1; 13(7):607-10.
11. Dore MP, Fanciulli G, Tomasi PA, et al. Gastrointestinal symptoms and Helicobacter pylori infection in school-age children residing in Porto Torres, Sardinia, Italy. Helicobacter. 2012 Oct; 17(5):369-73.
12. Levine A, Milo T, Broide E, et al. Influence of Helicobacter pylori eradication on gastroesophageal reflux symptoms and epigastric pain in children and adolescents. Pediatrics. 2004 Jan;113(1): 54-8.
13. Ashorn M, Rägö T, Kokkonen J, et al. Symptomatic Response to Helicobacter Pylori Eradication in Children With Recurrent Abdominal Pain: Double Blind Randomized Placebo-controlled Trial. Journal of clinical gastroenterology. 2004 Sep 1;38(8): 646-50.
14. Özen H, Dinler G, Akyön Y, et al. Helicobacter pylori infection and recurrent abdominal pain in Turkish children. Helicobacter. 2001 Sep;6(3):234-8.
15. Kato S, Shimizu T, Toyoda S, et al. The updated JSPGHAN guidelines for the management of Helicobacter pylori infection in childhood. Pediatrics International. 2020 Dec;62(12):1315-31.
16. Malfertheiner P, Megraud F, O'morain CA, et al. Management of Helicobacter pylori infection—the Maastricht V/Florence consensus report. Gut. 2017 Jan 1;66(1):6-30
17. Suzuki H, Moayyedi P. Helicobacter pylori infection in functional dyspepsia. Nature reviews Gastroenterology & hepatology. 2013 Mar;10(3):168-74.
18. Ford AC, Tsipotis E, Yuan Y, et al. Efficacy of Helicobacter pylori eradication therapy for functional dyspepsia: updated systematic review and meta-analysis. Gut. 2022 Jan 11.
19. Moayyedi P. Helicobacter pylori test and treat strategy for young dyspeptic patients: new data. Gut. 2002 May 1;50(suppl 4):iv 47-50.

20. Sugano K, Tack J, Kuipers EJ, et al. Kyoto global consensus report on Helicobacter pylori gastritis. Gut. 2015 Sep 1;64(9):1353-67.
21. Bonilla S, Mitchell PD, Mansuri I. Low adherence to society guidelines for the management of Helicobacter pylori among pediatric gastroenterologists. Journal of Pediatric Gastroenterology and Nutrition. 2021 Aug 1;73(2):178-83.
22. Savoldi A, Carrara E, Graham DY, et al. Prevalence of antibiotic resistance in Helicobacter pylori: a systematic review and meta-analysis in World Health Organization regions. Gastroenterology. 2018 Nov 1;155(5):1372-82.
23. Ho JJ, Navarro M, Sawyer K, et al. Helicobacter pylori Antibiotic Resistance in the United States Between 2011-2021: A Systematic Review and Meta-Analysis. The American Journal of Gastroenterology. 2022 May 5.
24. Graham DY, Moss SF. Antimicrobial Susceptibility Testing for Helicobacter pylori Is Now Widely Available: When, How, Why. Official journal of the American College of Gastroenterology| ACG. 2022 Apr 1;117(4):524-8.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## Disclosures

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# Accuracy of Baseline Prevalence Estimates for Sample-size Calculations in Randomized Controlled Trials

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## OBJECTIVE

Sample-size calculations are an underpinning to designing a randomized controlled trial (RCT).[1] If the prevalence of a disease process is overestimated during the design phase of an RCT, the trial will recruit fewer participants and appear more feasible from a time and resource perspective. However, this overestimation increases the risk of type II error, creating a noninformative trial.[2] As a result, studies with inaccurate sample-size calculations may lack clinical utility and may even be considered unethical due to the risks undertaken by participants.[3,4] Data in the obstetrical literature suggests that the majority of RCTs inaccurately estimate the prevalence of the disease process being investigated.[5] The objective of this study was to ascertain whether the estimated prevalence of the outcome used for sample-size calculations in RCTs in all specialties is similar to the actual reported prevalence( as identified in the frequency of primary outcome in the placebo arm).

## METHODS

During a one-year study period (2021) all RCTs were manually identified and abstracted from three major journals (*JAMA, NEJM*, and the *Lancet*). In each trial, the disease prevalence for the primary outcome that was used for the sample-size calculation was identified and compared to the actual disease prevalence detected in the completed RCT. If the prevalence of the primary outcome was below the assumed rate in the study design, the trial was considered to have an inaccurate assessment of prevalence. Studies with underestimated disease prevalence rates were not considered to have inaccurate assessments, as this variation would still allow the study to detect a true association. Chi-square was used for all categorical variables, and $P < 0.05$ was considered significant.

## RESULTS

Of the 265 identified RCTs, 101 were included in the analysis. The most common reasons for trial exclusion were a primary outcome that did not include disease prevalence (e.g., time) and non-inferiority trial design. Forty-six trials (45%) had an estimated disease prevalence rate equal to or greater than the disease prevalence in the study, and 55 (55%) trials had an inaccurate assessment of the prevalence of the disease (**Table 1**). There was no difference in the estimated sample sizes, number of centers, or geographic location between trials. Trials with an accurate baseline rate were more likely to anticipate a change in the baseline rate of > 30% for sample size. There was no difference in the rate of positive trials between those with an accurate and inaccurate estimate of disease prevalence (62.2% vs. 67.2%, p=0.60). Eighty percent (80%) of trials had a disease prevalence estimate within 42% of the disease prevalence in the study, and 95% of all trials were within 83%.

## DISCUSSION

Over half of the RCTs examined here overestimated the prevalence of the disease process in the primary outcome and thus were at increased risk of a type II error. When designing RCTs researchers should consider factoring in an underestimation of disease prevalence (by as much as 40%) into their sample-size calculations, to minimize the risk of type II error. Overestimation of treatment effect, which was not examined in this paper, could also result in a type II error and examination of estimated effect size could be a focus of a future investigation. Further research to identify methods of improving disease estimates is warranted.

### References

1. Biau DJ, Kerneis S, Porcher R. Statistics in brief: the importance of sample size in the planning and interpretation of medical research. Clin Orthop Relat Res 2008;466(9):2282-8. DOI: 10.1007/s11999-008-0346-9.
2. Moher D, Dulberg CS, Wells GA. Statistical power, sample size, and their reporting in randomized controlled trials. Jama 1994;272(2):122-4. (In eng).
3. Bacchetti P, Wolf LE, Segal MR, McCulloch CE. Ethics and sample size. Am J Epidemiol 2005;161(2):105-10. DOI: 10.1093/aje/kwi014.
4. Speich B, von Niederhäusern B, Schur N, et al. Systematic review on costs and resource use of randomized clinical trials shows a lack of transparent and comprehensive data. J Clin Epidemiol 2018;96:1-11. (In eng). DOI: 10.1016/j.jclinepi.2017.12.018.
5. Ditter KC, Crowe EH, Mendez-Figueroa H, et al. Accuracy of baseline prevalence estimates for sample size calculations in obstetrical randomized controlled trials. Am J Obstet Gynecol 2022;226(6):855-856. DOI: 10.1016/j.ajog.2022.01.032.

**Table 1. Characteristics of randomized controlled trials based on accuracy of estimation of baseline primary outcome rates**

Data presented as N (%) or median (quartiles). An inaccurate estimate was defined if the prevalence of the primary outcome was below the assumed rate in the trial.

| | Sample size had accurate assessment of prevalence of disease (N=46) | Sample size had inaccurate assessment of prevalence of disease (N=55) | P |
|---|---|---|---|
| Journals, N (%)<br>JAMA<br>Lancet<br>NEJM | <br>11 (23.9)<br>14 (30.4)<br>21 (45.6) | <br>19 (34.6)<br>11 (20.0)<br>25 (45.5) | 0.36 |
| Centers, N (%)<br>Single<br>Multiple | <br>5 (11.1)<br>40 (88.9) | <br>7 (7.4)<br>50 (92.6) | 0.52 |
| Country, N (%)<br>USA Alone<br>USA and Other Countries<br>Other Countries | <br>10 (12.7)<br>17 (37.0)<br>19 (41.3) | <br>7 (12.7)<br>32 (58.2)<br>16 (29.1) | 0.10 |
| Baseline Rate Derived From, N (%)<br>Reference<br>Institutional Rate<br>No reference | <br>20 (44.4)<br>23 (51.1)<br>2 (4.4) | <br>29 (52.7)<br>22 (40.0)<br>4 (7.3) | 0.51 |
| Presumed Change in Baseline Rate, N (%)<br>< 30%<br>≥ 30% | <br>29 (63.0)<br>17 (37.0) | <br>23 (41.8)<br>32 (58.2) | **0.03** |
| Power, N (%)<br>80–89%<br>90–99% | <br>20 (46.5)<br>23 (53.5) | <br>32 (59.3)<br>22 (40.7) | 0.21 |
| Positive trials, N (%) | 28 (62.2) | 37 (67.2) | 0.60 |
| Sample Needed, Median (IQR) | 2372 (350–4000) | 2378 (260–1170) | 0.13 |
| Expected Lost to Follow-Up %, Median (IQR) | 4.10 (0–9) | 4.65 (0–9) | 0.77 |
| Assess for Eligibility for Trial | 16691.1 (735–5187) | 10477.6 (621–6112) | 0.61 |
| Ineligible, Median (IQR) | 1537.3 (160–1656) | 7013.0 (9–2264) | 0.98 |
| Declined Participation, Median (IQR) | 121.5 (0–131.5) | 270.1 (5–226) | 0.08 |
| Lost to Follow-Up, Median (IQR) | 4.1 (0–9) | 4.6 (0–9) | 0.77 |


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# Craniofacial Trauma from Electronic Scooter Use

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## ABSTRACT

**BACKGROUND:** In 2018, the City of Providence introduced a program in which electronic scooters were deployed for public use. We aim to characterize the burden of craniofacial injuries associated with these scooters.

**METHODS:** A retrospective review was conducted of all patients consulted to the plastic surgery service for evaluation of craniofacial injury between September 2018 and October 2022. Data pertaining to patient sociodemographics, site and time of injury, and craniofacial trauma were recorded.

**RESULTS:** Twenty-five patients sustaining craniofacial trauma were identified over a four-year period. Most patients required soft tissue repair (64%) and bony fractures were sustained by approximately half of all patients (52%). Admission to ICU was uncommon (16%), and there were no fatalities.

**CONCLUSIONS:** The incidence of craniofacial injury from electronic scooter use is low. However, these injuries may involve extensive surgical reconstruction and ICU admission. We advise the City of Providence to optimize best safety practices and monitoring to minimize risk.

**KEYWORDS:** craniofacial, trauma, e-scooter, vehicle

## INTRODUCTION

In the fall of 2018, the city of Providence, Rhode Island, initiated a "Shared Micromobility Program" to enhance the city's existing transportation offerings.[1] This ongoing initiative has been pioneered with the intent of "creating a safe, well-connected community." As part of this effort, a significant number of commercial electronic scooters have been deployed across the city for public use. This campaign comes about during a period of significant national expansion of the electronic scooter enterprise. Since 2010, over half a billion rides using these vehicles have been recorded in the United States.[2] Scooters may be easily accessed through a smartphone application and accompanying mobile payment by credit card. To ensure rider and pedestrian safety, the City of Providence has set a variety of measures in place. Among these, steps include that riders obey all traffic laws, do not operate these vehicles while intoxicated, and possess a valid driver's license.

At Rhode Island Hospital, the Department of Plastic and Reconstructive Surgery evaluates hundreds of patients who sustain craniofacial trauma on an annual basis. Injuries occur through a variety of mechanisms, with motor vehicle collision contributing a significant number of these injuries. Management may be limited to soft tissue laceration requiring suture repair in the emergency department; however, some patients may sustain significant additional bony injury requiring extensive surgical reconstruction in the operating room. Additionally, patients may experience other bodily injuries beyond the face, each of which require their appropriate medical or surgical management. In this study, we seek to evaluate the burden of craniofacial trauma from electronic scooter use in Providence, Rhode Island, following the introduction of these vehicles in the fall of 2018.

## METHODS

This study adheres to all pertinent institutional research policies and procedures, and institutional review board approval was obtained and maintained throughout the study period. A retrospective review of a prospectively maintained Research Electronic Data Capture (REDCap) database was performed for all patients evaluated by the plastic surgery department at Rhode Island Hospital who suffered craniofacial trauma following electronic scooter use. The study period began in September 2018, coinciding with the introduction of electronic scooters to Providence, Rhode Island, until October 2022.

Patient demographic data, such as age at presentation, sex, race, ethnicity, and occupation were extracted from the medical chart. Recorded social history included insurance status, as well as prior history of smoking, alcohol, or illicit drug use. Data relating to active substance use, such as blood alcohol concentration (BAC) and urine toxicology were also abstracted. Other factors surrounding the circumstances of injury were retrieved, such as date, time of day, mechanism (fall versus collision), and use of helmet.

Clinical characteristics relating to craniofacial injury were also recorded, including presence and region of soft tissue or

bony trauma. The necessity of surgery for craniofacial injury was also documented. Trauma to extremities, solid organs, pelvic region, spine and brain were recorded. Referral for operative management of these other injuries was also documented. Outcomes such as length-of-hospital stay, intensive care unit (ICU) admission and fatality were extracted from the medical record. Data were analyzed using IBM SPSS Version 25 (IBM Corp., Armonk, N.Y.). Patient and injury characteristics were summarized using descriptive statistics.

## RESULTS

Among 26 patients sustaining craniofacial injury following electronic scooter trauma, 1 was excluded due to insufficient data. Of the 25 included patients, the mean age was 33.5 ± 18.2 years, and 56% were male (**Table 1**). Most patients were White (64%). Included subjects were split similarly amongst employed (32%), unemployed (36%), and student (28%) occupational statuses. Most patients were insured (88%). Two-thirds of patients had a prior documented history of illicit drug use (64%).

Collectively, summer months (May–August) accounted for the greatest burden of craniofacial injury (64%) (**Table 2**). Most injuries occurred during the period of 12:00pm to 12:00am (84%). A temporal distribution of these injuries by month and time of day is shown graphically in **Figure 1**. Helmets were infrequently used (48%). Falls were the most common mechanism of injury (60%). However, collisions with stationary objects and other vehicles constituted a significant minority (40%). Blood alcohol concentration was tested in nearly half of patients (44%), and the mean BAC in tested patients was 156.5 ± 141.8 mg/dL. Urine toxicology was tested in approximately one third of patients (32%) and was most frequently positive for marijuana (37.5%, 3/8).

Of the included patients, 17 sustained significant soft tissue injury (68%), with 16 (64%) requiring repair in either the emergency department or operating room (**Table 3**). These injuries most frequently occurred to the lips (28%), nose (20%) and chin (20%). Bony fractures were experienced by approximately half of all patients (52%), with trauma most frequently occurring to the zygomaticomaxillary complex (32%), orbit (24%), and frontal bone (16%). A minority of patients were referred for operative repair of bony injuries (16%).

Other bodily injuries were common among this cohort (60%), the most frequent of which was tooth avulsion (24%) (**Table 4**). Significant trauma such as traumatic brain injury (16%) and intracranial bleeding (12%) occurred in approximately 1 in 8 patients. Of patients sustaining other bodily injuries beyond craniofacial trauma, 12% were referred for surgical management of these injuries.

**Table 1.** Sociodemographic characteristics of included patients.

| | Frequency (n = 25) | Percent (%) |
|---|---|---|
| **Age** | | |
| Mean ± SD | 33.5 ± 18.2 | |
| Median (min–max) | 34.1 (5.5– 65.2) | |
| **Sex** | | |
| Male | 14 | 56 |
| Female | 11 | 44 |
| **Race** | | |
| White | 16 | 64 |
| Asian | 3 | 12 |
| Black or African American | 0 | 0 |
| American Indian or Alaska Native | 0 | 0 |
| Native Hawaiian or Other Pacific Islander | 0 | 0 |
| Other | 6 | 24 |
| **Hispanic Ethnicity** | | |
| Yes | 5 | 20 |
| No | 20 | 80 |
| **Occupation** | | |
| Unemployed | 9 | 36 |
| Employed | 8 | 32 |
| Student | 7 | 28 |
| Not Documented | 1 | 4 |
| **Insured** | | |
| Yes | 22 | 88 |
| No | 3 | 12 |
| **Primary Insurance** | | |
| Private | 20 | 80 |
| Other | 1 | 4 |
| Medicaid | 1 | 4 |
| **Previous History of Substance Use** | | |
| Yes | 16 | 64 |
| No | 9 | 36 |
| **Previous History of Tobacco Use** | | |
| Yes | 6 | 24 |
| No | 19 | 76 |
| **Previous History of Alcohol Use** | | |
| Yes | 6 | 24 |
| No | 19 | 76 |
| **Previous History of Drug Use** | | |
| Yes | 2 | 8 |
| No | 23 | 92 |

**Table 2.** Data surrounding circumstances of electronic scooter injury.

| | Frequency (n = 25) | Percent (%) |
|---|---|---|
| **Month of injury** | | |
| January | 0 | 0 |
| February | 0 | 0 |
| March | 0 | 0 |
| April | 1 | 4 |
| May | 3 | 12 |
| June | 3 | 12 |
| July | 6 | 24 |
| August | 4 | 16 |
| September | 1 | 4 |
| October | 3 | 12 |
| November | 3 | 12 |
| December | 1 | 4 |
| **Time of day of injury** | | |
| 6pm–12am (evening) | 12 | 48 |
| 12pm–6pm (afternoon) | 9 | 36 |
| 6am–12pm (morning) | 2 | 8 |
| 12am–6am (late night/early morning) | 2 | 8 |
| **Trauma mechanism** | | |
| Fall | 15 | 60 |
| Collision with stationary object | 6 | 24 |
| Collision with vehicle | 4 | 16 |
| **Multiple riders** | | |
| Yes | 1 | 4 |
| Undocumented | 24 | 96 |
| **Helmet use** | | |
| Yes | 5 | 20 |
| No | 12 | 48 |
| Unknown | 8 | 32 |
| **Blood alcohol concentration tested** | | |
| Yes | 11 | 44 |
| **Blood Alcohol Concentration, mg/dL (mean ± SD)** | 156.5 ± 141.8 | |
| **Urine toxicology tested** | 8 | 32 |
| Marijuana (+) | 3 | 12 |
| Cocaine (+) | 1 | 4 |
| Opioids (+) | 2 | 8 |
| Benzodiazepine (+) | 1 | 4 |
| Other (+) | 2 | 8 |

**Figure 1.** Temporal distribution of electronic scooter accidents by time of day and month of year.

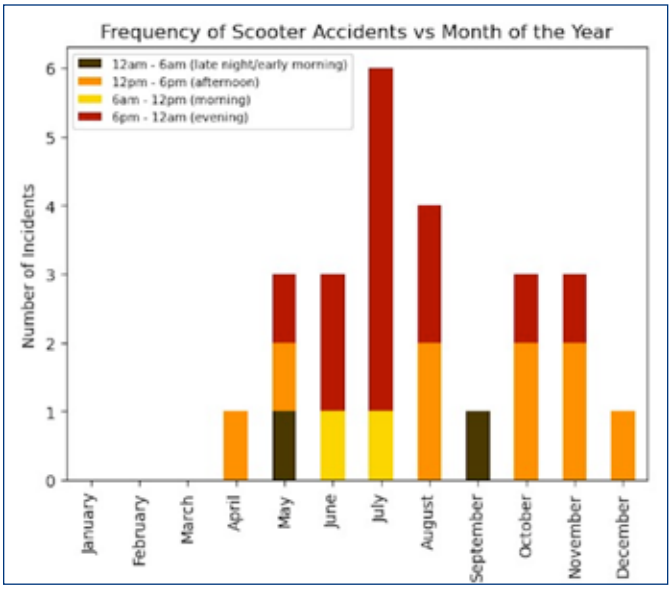


**Table 3**. Distribution of soft tissue and bony injury by anatomic region, as well as frequency of patients requiring soft tissue repair and operative intervention.

| | Frequency (n = 25) | Percent (%) |
|---|---|---|
| **Soft tissue injury** | 17 | 68 |
| Forehead | 4 | 16 |
| Nasal | 5 | 20 |
| Cheek | 2 | 8 |
| Lip | 7 | 28 |
| Chin | 5 | 20 |
| **Soft tissue repair** | 16 | 64 |
| **Bony Fracture** | 13 | 52 |
| Calvarial | 2 | 8 |
| Frontal bone | 4 | 16 |
| Orbital | 6 | 24 |
| ZMC | 8 | 32 |
| NOE | 0 | 0 |
| Nasal bone | 3 | 12 |
| Le Fort I | 0 | 0 |
| Le Fort II | 0 | 0 |
| Le Fort III | 1 | 4 |
| Mandible | 3 | 12 |
| **Surgery for fracture repair** | 4 | 16 |

**Table 4**. Distribution of bodily injuries beyond craniofacial trauma as well as frequency of their surgical management.

| | Frequency (n = 25) | Percent (%) |
|---|---|---|
| **Other bodily injury** | 15 | 60 |
| Tooth avulsion | 6 | 24 |
| Extremity injury | 2 | 8 |
| Solid organ injury | 2 | 8 |
| Pelvic injury | 1 | 4 |
| Spine injury | 1 | 4 |
| Thoracic injury | 3 | 12 |
| Traumatic Brain Injury | 4 | 16 |
| Intracranial Bleeding | 3 | 12 |
| **Surgical management of injury** | 3 | 12 |

**Table 5.** Mortality and length of hospital stay following electronic scooter injury.

| | Frequency (n = 25) | Percent (%) |
|---|---|---|
| Hospital Stay, days (mean ± SD) | 2.2 ± 4.9 | |
| ICU Admission | 4 | 16 |
| Fatal injury | 0 | 0 |

The median length of hospital stay was 0 days (range, 0–19), with 15 patients (60%) undergoing discharge directly from the emergency department. After excluding these patients, the median length of hospital stay was 2 days (range, 1–19). Two patients underwent hospital stays for a period of 17 days or greater, each of whom sustained intracranial bleeding. Approximately 1 in 7 patients required ICU admission (16%) due to non-craniofacial injuries. There were no recorded fatalities.

## DISCUSSION

In this study, we evaluated the burden of craniofacial trauma in a single center due to electronic scooter use since their public introduction by the City of Providence in the fall of 2018. We discovered that, over the four-year period of this retrospective study, there were 25 craniofacial injuries meeting inclusion criteria for which the Department of Plastic and Reconstructive Surgery was consulted. This equates to approximately 6 injuries each year. We therefore believe that the incidence of craniofacial injury is acceptably low in Providence, given that these vehicles are likely in operation for hundreds of instances each week. However, as infrequent as these injuries may occur, they can be significant requiring surgical reconstruction, ICU admission, and lengthy hospital stay.

There are several key findings from this investigation. The mean age of 33.5 years and distribution of occupation status is different from what was hypothesized. We suspected that most injuries would occur amongst high school and college students from across the Providence area, given the density of educational institutions and younger individuals in the municipality. However, we discovered that students comprise the minority of these injuries (28%) and that most of these injuries were sustained by adults beyond college age. While the patient demographic results were surprising, the temporal data surrounding the site of injury were in line with expectations. Most injuries occurred during the summer months and in the afternoon or evening time of day. We advise that the City of Providence should exercise distinct caution during these periods to ensure rider safety. Of the riders tested for blood alcohol concentration, the average value was approximately double the legal limit for operation of a motor vehicle in Rhode Island. We believe this finding may be of use to the city during periods of heightened caution. In addition, we discovered that nearly half (48%) of patients did not have documented helmet use; in one third (32%) of cases, helmet use was unknown. In the interest of safety, we additionally advise the city to encourage practicing helmet usage among riders, as well as promoting helmets available for rent. Other safety measures may take place through formal notices applied to each scooter emphasizing the risks of vehicle use while intoxicated and without a helmet. Given the low incidence of significant injury with these motorized scooters, we believe they are generally safe with proper use and best safety practices, as with operation of any motor vehicle.

The patterns of craniofacial injury observed in this study following electric scooter trauma are similar to previously published investigations.[3,4] Faraji et al noted greatest frequency of soft tissue injury among the lips, chin and forehead aesthetic units, which we recapitulate in this study.[4] Similarly, the same study identifies the greatest number of bony injuries among the orbit, zygomaticomaxillary complex and nasal bones, which we too identify. These aesthetic units and bony complexes are anteriorly based, suggesting that electronic scooter injury may involve a head-on collision or forward fall.

This study bears limitations. Our estimate of injury incidence is likely deflated, as it does not capture patients who did not present to care, as well as those patients who presented to the emergency department but were not seen by plastic surgery. Severe injuries leading in death would also not have been seen in the emergency department. Many patients with minor facial soft tissue laceration may be repaired in the emergency department without a specialty consult or not require evaluation at a tertiary care facility. However, patients with more extensive soft tissue injury would typically require specialty consultation. Notably, it is standard practice that bony trauma to the face be seen by the plastic surgery department, which typically performs approximately 70% of all facial trauma evaluations at Rhode Island Hospital. We therefore believe our reported incidence provides reasonable insight into the burden of craniofacial injury related to electronic scooter use.

## CONCLUSION

The incidence of craniofacial injury from electronic scooter use is low. However, these injuries may be significant when they do occur. Injuries most frequently take place during the summer months, occur in the afternoon or evening, and commonly involve an intoxicated operator. Like use of other motorized vehicles, rider vigilance and proper safety precautions are imperative. We advise the City of Providence to encourage best safety practices and monitoring to ensure that this shared micromobility program may continue to be effective with minimized risk for injury.

### References


1. City of Providence. Shared Micromobility Program. Accessed January 10, 2023. https://www.providenceri.gov/planning/e-scooter-share-pilot-program/
2. National Association of City Transportation Officials. Shared Micromobility in the U.S. 2020-2021. Accessed January 10, 2023. https://nacto.org/wp-content/uploads/2022/12/2020-2021_shared_micro_snapshot_Dec7_2022.pdf
3. Choi JH, Oh SS, Kim KS, Hwang JH, Lee SY. Electric Scooter-Related Trauma in Korea. *J Korean Med Sci*. 2022;37(22):e181. doi:10.3346/jkms.2022.37.e181
4. Faraji F, Lee JH, Faraji F, et al. Electric scooter craniofacial trauma. *Laryngoscope Investigative Otolaryngology*. 2020;5(3):390-395. doi:10.1002/lio2.380


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# 'Cardiac Arrest' – The CPR Song

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## INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is a major public health problem. The exact incidence of sudden cardiac arrest is unknown but is estimated to be between 180,000-450,000 in the US.[1] Only 8–11% of people that are treated by EMS survive in the United States.[2] Survival rates in the US according to CARES (Cardiac Arrest Registry to Advance Survival) 2021 were 9.1%[3] (The 2021 dataset represented about 51% of US population).

Novel strategies are needed to improve outcomes from OHCA. One such intervention is proposed and discussed in this article – the utilization of an instructional Cardio-Pulmonary Resuscitation (CPR) Song – titled 'Cardiac Arrest',[4] with the intent to positively influence bystander CPR rates in the lay public. (https://www.youtube.com/watch?v=e0il2tqaGAU)

## THE CHAIN OF SURVIVAL

The key to effective treatment of cardiac arrest is a strategy called the "Chain of Survival".[5]

The components include:

- Recognition of cardiac arrest and activation of the emergency response system
- Early cardiopulmonary resuscitation (CPR) with an emphasis on chest compressions
- Rapid defibrillation
- Advanced resuscitation by Emergency Medical Services and other healthcare providers
- Post-cardiac arrest care
- Recovery (including additional treatment, observation, rehabilitation, and psychological support)

The first 3 components are very time sensitive, and outcomes rapidly decline if treatment is not provided promptly. Moreover, there is a higher likelihood of presence of a layperson rather than a medically trained person at the time and place of a cardiac arrest. Neurologically intact survival decreases by 7–10% for every minute that a person with OHCA goes without CPR and defibrillation.[6,7] Not all links in this chain of survival are equal. Data from the NHS in England indicate that the biggest 'drop' in survival occurs in the first link.[8] Survival to hospital admission as per CARES 2021 data is only 24.7%.[3] Some well-established factors that improve survival include bystander CPR, early defibrillation and early advanced cardiac care.

## EARLY INTERVENTION AND BYSTANDER CPR

Bystander CPR may more than double survival rates. In a Japanese study from 2012 by S. Nakahara et al,[9] increased bystander CPR rates from 2005–2012 (from 38.6% to 50.9%) more than doubled the neurologically intact survival (from 3.3% to 8.2%). A European study[10] that included data from 27 countries showed a bystander CPR rate of 47.40% (range 6.3–78%). In the US, as per 2021 CARES data,[3] the survival to discharge rate for patients receiving bystander CPR was significantly higher than that of patients who did not receive bystander CPR (11.2% vs 6.7%, $p<0.0001$).

Bystander CPR rates in the US greatly vary between states and urban/rural setting and are between 10–65%.[11] In the states participating in the CARES registry (Currently 30 states participate within the US) the bystander CPR rate in 2021 was 40.2%.

For comparison, in the state of Rhode Island, the bystander CPR rate was 20%.[12] Though membership in the CARES registry improves outcomes, the state of Rhode Island does not participate in the CARES registry due to financial barriers.[13]

## EFFORTS TO IMPROVE BYSTANDER CPR

In the first few minutes after cardiac arrest, it is more likely that the patient will be surrounded by lay persons not trained to do CPR. It is estimated that only about 2.4% of the US population undergoes CPR training annually.[14] Several other modalities have been tried and have, to varying degrees, proven to be useful early interventions in the first 3 links in the chain of survival. These include CPR kiosks in public locations,[15] mass trainings of large number of people, instructional role-playing games, virtual reality programs,[16,17] and 1- to 8-minute-long video instructions for compression only CPR.[18] Additionally, to address the challenge of early appropriate intervention by bystanders and improving CPR training, several leading organizations have programs targeting such goals. World Health Organization's "Kids Save Lives",[19] American Heart Association had a goal of training 20 million people per year in CPR by 2020 and

"All Citizens of the World Could Save a Life"[20] are some such initiatives. Despite all the efforts, bystander CPR rates remain low and there remains much opportunity for novel strategies for improvement.

## CHALLENGES

Some of the factors affecting bystander initiation of early CPR, calling EMS and use of AED, include insufficient training due to 3–4-hour long duration of the classes and high cost of BLS training sessions, the need for trained instructors, lack of awareness of where and how to get training and lack of motivation. Other well-known barriers to CPR performance include fear of causing harm, fear of litigation, complexity of performing mouth-to-mouth rescue breathing, reluctance to make mouth-to-mouth contact, rescuer's physical limitations, and panic.[18,21,22,23,24]

## 'CARDIAC ARREST': THE CPR SONG

A potential way to reach the lay public, as a component of a broader health care intervention or as an independent public service message, could be music in the form of a lyrically instructional CPR song. This may be useful from memory by repeated exposure or even by playing actively if feasible, during a cardiac arrest occurrence. The specific intent is to increase bystander CPR rates in the public.

It was theorized that the ideal CPR song ought to include concise, simple and instructional lyrics that are backed by latest evidence and guidelines. Moreover, it may be updated as new evidence comes in.

The song, if set to a tempo of 110 beats per minute (bpm) could enable people to perform chest compressions at the recommended rate (100–120 bpm) and allow for a ±10 bpm margin of error.

Many individuals trained in Basic Life Support) (BPS) and Advanced Cardia Life Support (ACLS), including those working in health care, already utilize various songs and their tempo to guide the rate of initial chest compressions (for example, 'Stayin' Alive' Bee Gees, 1977, which was recorded at 104 bpm). There have been other songs and music videos endorsed by medical organizations including the American Heart Association (AHA) and the British Heart Foundation, but they tend to utilize popular songs (e.g., 'Stayin' Alive') and use their tempo to aid in appropriate chest compression rate (100–120 bpm).[25,26,27] The CPR song ("Cardiac Arrest" [4]) written by the first author is composed with the specific purpose of delivering the message of early and appropriate intervention for a cardiac arrest. Gender neutral pronouns are used to be more inclusive. The intended outcome is an increase in bystander CPR attempts and where possible, defibrillator use.

The lyrical content of the song is presented in **Figure 1** and the rationale for word selection is provided in **Figure 2**.

**Figure 1.**

| The CPR song: Cardiac Arrest |
|---|
| If you see a person unconscious<br>Ask them "hey, you okay?"<br>If you see that they are not breathing<br>Or breathing strange, don't delay |
| *Cardiac arrest*<br>*Cardiac arrest*<br>*You gotta start chest compressions right away*<br>*Cardiac arrest*<br>*Cardiac arrest* |
| You gotta call 911 right away<br>If a friend is with you<br>Send them to get a<br>Defibrillator right away |
| *Cardiac arrest…* |
| Put your palms on the center of their chest<br>Push 2 or 3 inches deep<br>Pump to save a life now<br>Keep on pumping with this beat |
| *Cardiac arrest…* |
| If you think they did drugs<br>Give them a narcan<br>Spray in the nostrils, right away |
| *Cardiac arrest…* |

**Figure 2.**

| AHA Recommendations & Comments on Lyrical Incorporation |
|---|
| **Recognize cardiac arrest immediately by checking:**<br>1. Unresponsiveness<br>2. Absence of normal breathing, such as:<br>a. Apnea<br>b. Gasping for air or "strange breathing" |
| **Lay rescuers recommended *not* to check a pulse:**<br>• Call EMS/911<br>• Initiate CPR<br>Compression-only CPR; no ventilations<br>Palm placement on the "Center of the chest"; lower half of sternum<br>Fast (100-120/min)<br>Deep (2-2.5 inches)<br>Allow chest wall recoil<br>• Few interruptions in chest compressions as possible |
| **Use of Naloxone**<br>Naloxone administration may be considered after initiation of CPR if there is high suspicion of opiate overdose.<br>(~6% OHCA due to drugs) |
| **Do not hyperventilate**<br>No mention of avoiding hyperventilation in the lyrics for ease of understanding |
| **Defibrillator**<br>• Ask someone to get a defibrillator<br>• Once you have it, use it as soon as possible<br>• Put pads on the chest. Pad placement is usually indicated on the defibrillator kit, if available.<br>• After shock is delivered, immediately resume CPR |

## DISCUSSION & FUTURE DIRECTIONS

There is much room for improvement in making the chain of survival more effective and potentially save lives. The medical field is increasingly complex and though access to information has become much easier due to the information technology and internet revolution, misinformation and conflicting information for the lay persons have emerged as public health challenges. For a public health recommendation to practically become effective and change outcomes in the real-world setting, the communication to laypersons must ideally be clear, easily understandable and uniform across multiple organizations. Communication by the medical community via art and music is underutilized and perhaps a potential avenue to bridge the communication gap between the medical community and the lay public.

Dispatcher-guided CPR or telephone-CPR (tCPR) is a promising way to improve multiple outcomes to varying degrees. A Swedish study by Bång et al[28] showed tCPR being offered by dispatchers in less than 30% OHCA cases, and CPR with dispatcher assistance completed in <15% cases (8 in all). Two reviews by Vaillaincourt et al[29] in 2011 and Drennan et al[30] in 2021 demonstrated dispatcher recognition of OHCA with 70% and 79% sensitivities respectively.

In a prospective, before-after study [31], tCPR has been associated with decreased time to commence CPR –256 to 212 seconds (p<0.001) corresponding with a tCPR rate increase from 43.5% to 52.8% (9.3%) in the same period.

In one systematic review,[32] tCPR was associated with increased survival in four studies but with a trend toward decreased survival in one. In a later study[33] by Wu Z et al, survival at hospital discharge as well as favorable functional outcome at hospital discharge were found to be improved compared to no CPR group (multivariate adjusted odds ratio for survival at hospital discharge was 1.64 (95% CI, 1.16–2.30) and for favorable functional outcome at discharge was 1.56 (95% CI, 1.06–2.31) for TCPR). Overall survival in the study remained at 11.5%.

In the above-mentioned study by Bobrow et al,[18] laypersons exposed to even an ultra-brief video (1 minute in length) were more likely to attempt hands-only CPR and showed superior skills compared to untrained laypersons. The effects of brief interventions (1 minute, 5 minutes & 5-minute video + 3-minute practice) were reflected even 3 months later after a single intervention, in increased bystander CPR attempts and quality of CPR.

A recent systematic review by Pellegrino, Vance J and Asselin N [34] found trends towards improved CPR metric performance in groups who were exposed to songs during treatment, though this only reached significance when groups were tested at >30 days from initial exposure. Additionally, they suggested that song selection should favor beats per minute closer to the midpoint of the 100–120 ideal range to allow for variation when used as mental metronomes. The tempo of 'Cardiac Arrest', consistent with that idea, is set at 110 bpm.

The authors are currently working on a public health intervention using the Intervening Mapping process[35,36] where the song is one component of a broader intervention – accompanied by an instructional video, skill exercises, and a social media community support group among others.

Constructs from the Health Belief Model[37] and Social Cognitive Theory [38] were used in making the song to impact cognitive determinants of behavior. The theoretical methods used include information chunking, repeated exposure and cues with the intent and hope to increase bystander CPR rates in the lay public and thereby attempting to increase survival and neurologically intact survival from OHCA.

An additional advantage of using art forms, including music, to disseminate accurate scientific medical ideas is its cost effectiveness (even in resource poor settings), wider reach in the society, and pan-cultural adaptability. The song can be re-composed in different languages and genres. Moreover, the ideas carried via music and art do not necessarily require high literacy rates in the intended audience, which may be a major determinant in low-resource settings globally.

Fundamental societal structures and relations of individuals within our modern society are rapidly evolving and are being redefined. Though the medical scientific community faces new challenges in disseminating accurate ideas in the public interest, the new landscape brings with it numerous opportunities for novel effective strategies.

### References


1. Kong MH, Fonarow GC, Peterson ED, et al. Systematic review of the incidence of sudden cardiac death in the United States. J Am Coll Cardiol. 2011;57(7):794-801. doi:10.1016/j.jacc.2010.09.064
2. Rea TD, Eisenberg MS, Sinibaldi G, White RD. Incidence of EMS-treated out-of-hospital cardiac arrest in the United States. Resuscitation 2004;63:17-24
3. https://mycares.net/sitepages/uploads/2022/2021_flipbook/index.html?page=12
4. CPR Song: Cardiac Arrest (https://distrokid.com/hyperfollow/drd3/cardiac-arrest, https://www.youtube.com/watch?v=e0il2tqaGAU)
5. Panchal AR, Bartos JA, Cabañas JG, Donnino MW, Drennan IR, Hirsch KG, Kudenchuk PJ, Kurz MC, Lavonas EJ, Morley PT, O'Neil BJ, Peberdy MA, Rittenberger JC, Rodriguez AJ, Sawyer KN, Berg KM; Adult Basic and Advanced Life Support Writing Group. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020 Oct 20;142(16_suppl_2):S366-S468. doi: 10.1161/CIR.0000000000000916. Epub 2020 Oct 21. PMID: 33081529.
6. Link MS, Atkins DL, Passman RS, et al. Electrical therapies: automated external defibrillators, defibrillation, cardioversion, and pacing: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 2010;122:Suppl 3:S706-S719.
7. Larsen, M. P., Eisenberg, M. S., Cummins, R. O., & Hallstrom, A. P. (1993). Predicting survival from out-of-hospital cardiac arrest: a graphic model. Annals of emergency medicine, 22(11), 1652-1658.
8. Deakin CD. The chain of survival: Not all links are equal. Resuscitation. 2018;126:80-82. doi:10.1016/j.resuscitation.2018.02.012
9. Nakahara S, Tomio J, Ichikawa M, et al. Association of Bystander Interventions With Neurologically Intact Survival Among Patients With Bystander-Witnessed Out-of-Hospital Cardiac Arrest in Japan. JAMA. 2015;314(3):247– 254. doi:10.1001/jama.2015.8068
10. Gräsner JT, Lefering R, Koster RW, et al. EuReCa ONE-27 Nations, ONE Europe, ONE Registry: A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 coun-

tries in Europe published correction appears in Resuscitation. 2016 Dec;109 :145-146. Resuscitation. 2016;105:188–195. doi:10.1016/j.resuscitation.2016.06.004
11. Mozaffarian D, et al, on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2015 update: a report from the American Heart Association. Circulation. 2015;131:e29–e322. Doi: 10.1161/CIR.0000000000000152.
12. Rybasack-Smith H, Lauro J. A History and Overview of Telecommunicator Cardiopulmonary Resuscitation (T- CPR). R I Med J (2013). 2019;102(4):20-22.
13. Rhodes J, Williams K. Data Utilization in Emergency Medical Services. R I Med J (2013). 2019;102(4):17-19.
14. Brady WJ, Mattu A, Slovis CM. Lay Responder Care for an Adult with Out-of-Hospital Cardiac Arrest. N Engl J Med. 2019;381(23):2242-2251. doi:10.1056/NEJMra1802529
15. Chang MP, Gent LM, Sweet M, Potts J, Ahtone J, Idris AH. A novel educational outreach approach to teach Hands-Only Cardiopulmonary Resuscitation to the public. Resuscitation 2017;116:22-26.
16. Heard DG, Andresen KH, Guthmiller KM, et al. Hands-only cardiopulmonary resuscitation education: a comparison of on-screen with compression feedback, classroom, and video education. Ann Emerg Med 2019;73:599-609.
17. Semeraro F, Frisoli A, Loconsole C, et al. Kids (learn how to) save lives in the school with the serious game Relive. Resuscitation 2017;116:27-32.
18. Bobrow BJ, Vadeboncoeur TF, Spaite DW, et al. The effectiveness of ultrabrief and brief educational videos for training lay responders in Hands-Only Cardiopulmonary Resuscitation: implications for the future of citizen cardiopulmonary resuscitation training. Circ Cardiovasc Qual Outcomes 2011;4:220-226.
19. Nakagawa NK, Salles IC, Semeraro F, Böttiger BW. KIDS SAVE LIVES: a narrative review of associated scientific production. Curr Opin Crit Care. 2021 Dec 1;27(6):623-636. doi: 10.1097/MCC.0000000000000872. PMID: 34495875.
20. Böttiger BW, Lockey A, Aickin R, Castren M, de Caen A, Escalante R, Kern KB, Lim SH, Nadkarni V, Neumar RW, Nolan JP, Stanton D, Wang TL, Perkins GD. "All citizens of the world can save a life" - The World Restart a Heart (WRAH) initiative starts in 2018. Resuscitation. 2018 Jul;128:188-190. doi: 10.1016/j.resuscitation.2018.04.015. Epub 2018 Apr 19. PMID: 29679697.
21. Abella BS, Aufderheide TP, Eigel B, Hickey RW, Longstreth WT Jr, Nadkarni V, Nichol G, Sayre MR, Sommargren CE, Hazinski MF. Reducing barriers for implementation of bystander-initiated cardiopulmonary resuscitation: a scientific statement from the American Heart Association for healthcare providers, policymakers, and community leaders regarding the effectiveness of cardiopulmonary resuscitation. Circulation. 2008;117:704 –709.
22. Locke CJ, Berg RA, Sanders AB, Davis MF, Milander MM, Kern KB, Ewy GA. Bystander cardiopulmonary resuscitation. Concerns about mouth-to-mouth contact. Arch Intern Med. 1995;155:938 –943.
23. McCormack AP, Damon SK, Eisenberg MS. Disagreeable physical characteristics affecting bystander CPR. Ann Emerg Med. 1989;18:283–285.
24. Michael AD, Forrester JS. Mouth-to-mouth ventilation: the dying art. Am J Emerg Med. 1992;10:156 –161.
25. https://www.youtube.com/watch?v=3vXPo7lNYzk
26. https://www.youtube.com/watch?v=iXcsHoQMGqc
27. https://www.youtube.com/watch?v=zOGAl5CrJw8
28. Bång A, Herlitz J, Martinell S. Interaction between emergency medical dispatcher and caller in suspected out-of-hospital cardiac arrest calls with focus on agonal breathing. A review of 100 tape recordings of true cardiac arrest cases. Resuscitation. 2003;56:25–34.
29. Vaillancourt C, Charette ML, Bohm K, Dunford J, Castrén M. In out-of-hospital cardiac arrest patients, does the description of any specific symptoms to the emergency medical dispatcher improve the accuracy of the diagnosis of cardiac arrest: a systematic review of the literature. Resuscitation. 2011 Dec;82(12):1483-9. doi: 10.1016/j.resuscitation.2011.05.020. Epub 2011 Jun 24. PMID: 21704442.
30. Drennan IR, Geri G, Brooks S, Couper K, Hatanaka T, Kudenchuk P, Olasveengen T, Pellegrino J, Schexnayder SM, Morley P. Basic Life Support (BLS), Pediatric Life Support (PLS) and Education, Implementation and Teams (EIT) Taskforces of the International Liaison Committee on Resuscitation (ILCOR); BLS Task Force; Pediatric Task Force; EIT Task Force. Diagnosis of out-of-hospital cardiac arrest by emergency medical dispatch: A diagnostic systematic review. Resuscitation. 2021 Feb;159:85-96. doi: 10.1016/j.resuscitation.2020.11.025. Epub 2020 Nov 27. PMID: 33253767.
31. Bobrow BJ, Spaite DW, Vadeboncoeur TF, Hu C, Mullins T, Tormala W, Dameff C, Gallagher J, Smith G, Panczyk M. Implementation of a Regional Telephone Cardiopulmonary Resuscitation Program and Outcomes After Out-of-Hospital Cardiac Arrest. JAMA Cardiol. 2016 Jun 1;1(3):294-302. doi: 10.1001/jamacardio.2016.0251. PMID: 27438108.
32. Bohm K, Vaillancourt C, Charette ML, Dunford J, Castrén M. In patients with out-of-hospital cardiac arrest, does the provision of dispatch cardiopulmonary resuscitation instructions as opposed to no instructions improve outcome: a systematic review of the literature. Resuscitation. 2011 Dec;82(12):1490-5. doi: 10.1016/j.resuscitation.2011.09.004. Epub 2011 Sep 16. PMID: 21925129.
33. Wu Z, Panczyk M, Spaite DW, Hu C, Fukushima H, Langlais B, Sutter J, Bobrow BJ. Telephone cardiopulmonary resuscitation is independently associated with improved survival and improved functional outcome after out-of-hospital cardiac arrest. Resuscitation. 2018 Jan;122:135-140. doi: 10.1016/j.resuscitation.2017.07.016. Epub 2017 Jul 25. PMID: 28754526.
34. Pellegrino JL, Vance J, Asselin N. The Value of Songs for Teaching and Learning Cardiopulmonary Resuscitation (CPR) Competencies: A Systematic Review. Cureus. 2021 May 16;13(5):e15053. doi: 10.7759/cureus.15053. PMID: 34141503; PMCID: PMC8204400.
35. Bartholomew-Eldredge LK, Markham C, Ruiter RA, Fernandez ME, Kok G, Parcel G. Planning Health Promotion Programs: An Intervention Mapping Approach. 4th ed. San Francisco, CA: Jossey Bass; (2016).
36. Fernandez ME, Ruiter RAC, Markham CM, Kok G. Intervention Mapping: Theory- and Evidence-Based Health Promotion Program Planning: Perspective and Examples. Front Public Health. 2019 Aug 14;7:209. doi: 10.3389/ fpubh.2019.00209. PMID: 31475126; PMCID: PMC6702459.
37. Abraham C, Sheeran P. (2005). The health belief model. In M. Conner & P. Norman (Eds.), Predicting health behaviour: Research and practice with social cognition models (2nd ed., pp. 28–80). Maidenhead, Berkshire, UK: Open University Press, McGraw Hill Education.
38. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

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## Disclosure

Saud Dhillon, MD, owns the intellectual copyrights to the song "Cardiac Arrest"

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# Increased Stimulant Prescribing Following the COVID-19 Pandemic – Rhode Island, 2017–2021

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## INTRODUCTION

Stimulants are the most common treatment for attention deficit/hyperactivity disorder (ADHD) and can also be used to treat other conditions, including sleeping disorders and weight management. Between 2017 to 2021, stimulant dispensations in Rhode Island (RI) increased 20.7%.[1] National data show similar increasing trends among commercially insured individuals with rates of ADHD treatment increasing 16% from 2017 to 2021.[2] Many factors are likely contributing to this increase. In 2020, the federal government waived the Ryan Haight Act, which required an in-person appointment before a practitioner could prescribe controlled substances via telehealth.[3,4] This waiver provided patients an opportunity to receive controlled substances without face-to-face evaluation from an authorized prescriber. Though telehealth accessibility is dependent on many socioeconomic factors, behavioral telehealth visits increased 32-fold in 2020 compared to 2019 and RI is among the states with the highest use of telehealth in 2020.[5,6] To reduce administrative burden and maximize insurance access, RI Medicaid no longer required recipients to submit annual recertification paperwork.[7] Additionally, many residents were affected by relocation, job loss, and social isolation.

To better understand stimulant prescribing changes during the pandemic, we aim to analyze trends in stimulant prescribing in RI at the population level.

## METHODS

We utilized data from the RI Prescription Drug Monitoring Program (PDMP) to identify all stimulant prescriptions filled for RI residents between 2017 and 2021. Unique individuals were defined based on first and last name and date of birth on each prescription. When reporting demographics by year, an individual's first stimulant prescription for that year was selected if an individual was dispensed multiple stimulants for the calendar year of interest. Demographic variables reported by the PDMP included age, sex, and insurance type. To calculate rates of prescriptions dispensed per person, we took the number of prescriptions dispensed to RI residents from that year and divided it by the RI population. When reporting diagnosis codes, to prevent bias among available codes, we excluded stimulants filled by pharmacies that had ICD-10 codes missing for more than 80% of their dispensed stimulants.[8] Roughly 50% of pharmacies and 11.6% of prescriptions were excluded from the diagnosis code analysis presented in Figure 3.

To examine trends in stimulant prescribing and Medicaid eligibility, we used annual RI population data from the Center for Disease Control and Prevention (CDC) Wonder and RI Medicaid Office's Statewide Medicaid counts.[9] To account for the Medicaid eligible population, only individuals younger than 65 years old were included in proportion estimates.

## RESULTS

The number of stimulants dispensed increased 20.7% from 35.5 prescriptions per 100 RI residents in 2017 (374,919 prescriptions) to 41.3 prescriptions per 100 RI residents in 2021 (452,739 prescriptions; **Table 1**). Out-of-state pharmacies consistently comprised less than 1% of total stimulants dispensed over this timeframe. Dispensed stimulants covered by private insurance decreased 5.8% from 268,026 in 2017 to 252,602 in 2021 while stimulants covered by the military increased 63% from 1,928 in 2017 to 3,143 in 2021. Stimulants covered by Worker's Compensation increased 12,541% from 34 in 2017 to 4,298 in 2021 and stimulants covered by Medicaid increased 108.4% from 66,614 in 2017 to 138,791 in 2021. The percent of the RI population under 65 years old covered by Medicaid increased 3.6% from 33.8% in 2017 to 35.0% in 2021. The median days' supply of stimulants, median prescriptions dispensed per person and the median pill quantity remained unchanged over this timeframe.

The number of RI residents under 18 years old filling stimulants decreased 11.6% from 13,566 in 2019 to 11,999 in 2021. Individuals aged 18–24 filling prescriptions decreased 2.0% while individuals aged 25-34 and 35–44 have increased 19.2% and 32.2%, respectively (**Figure 1**). When analyzed per capita, 6% of the RI population under 65 years old were dispensed a stimulant prescription (**Figure 2**). The percent of RI Medicaid recipients dispensed a stimulant prescription increased 59.4%, from 3.2% in 2017 to 5.1% in 2021.

Among those with known diagnosis codes, 83% of stimulants were dispensed to RI residents with ADHD diagnosis codes and 5% to residents with other childhood and adolescent behavioral/emotional disorders. Stimulants dispensed to RI residents diagnosed with a sleep disorder or were overweight/obese made up of 4.5% and 1.5%, respectively (**Figure 3**).

**Table 1.** Characteristics of Stimulants Dispensed in RI and their Consumers, PDMP, 2017–2021

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Total Stimulants Dispensed | 374,919 | 404,260 | 416,891 | 426,019 | 452,739 |
| Prescriptions Dispensed Per 100-Persons | 35.5 | 38.2 | 39.4 | 38.8 | 41.3 |
| Percent of RI Population Served by Medicaid (<65 years old) | 33.8 | 33.2 | 32.0 | 31.7 | 35.0 |
| **Payment Method** | | | | | |
| Private Insurance | 268,026 | 261,457 | 281,756 | 282,090 | 252,602 |
| Medicaid | 66,614 | 98,015 | 86,824 | 94,405 | 138,791 |
| Medicare | 18,410 | 19,718 | 19,456 | 18,815 | 26,879 |
| Military | 1,928 | 1,988 | 2,305 | 2,703 | 3,143 |
| Worker's Compensation | 34 | 447 | 242 | 2,736 | 4,298 |
| Unknown | 19,907 | 22,635 | 26,408 | 25,270 | 27,026 |
| Median Days' Supply [IQR] | 30.0 [30.0,30.0] | 30.0 [30.0,30.0] | 30.0 [30.0,30.0] | 30.0 [30.0,30.0] | 30.0 [30.0,30.0] |
| Median Stimulants Dispensed, per person [IQR] | 2.0 [1.0,5.0] | 3.0 [1.0,5.0] | 2.0 [1.0,5.0] | 2.0 [1.0,5.0] | 3.0 [1.0,5.0] |
| Median Pill Quantity [IQR] | 30.0 [30.0,60.0] | 30.0 [30.0,60.0] | 30.0 [30.0,60.0] | 30.0 [30.0,60.0] | 30.0 [30.0,60.0] |

**Figure 1.** Number of RI Residents Receiving Stimulants by Age Category (Years), PDMP, 2017–2021.

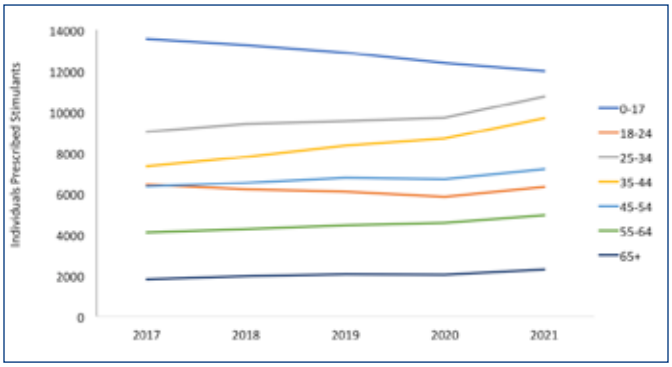



**Figure 2.** Percent of RI Population Under 65 Years Old Dispensed a Stimulant Prescription, PDMP & RI Medicaid Data, 2017–2021.

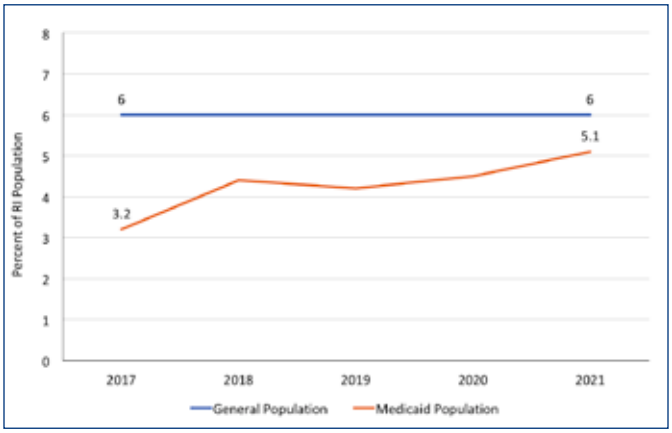
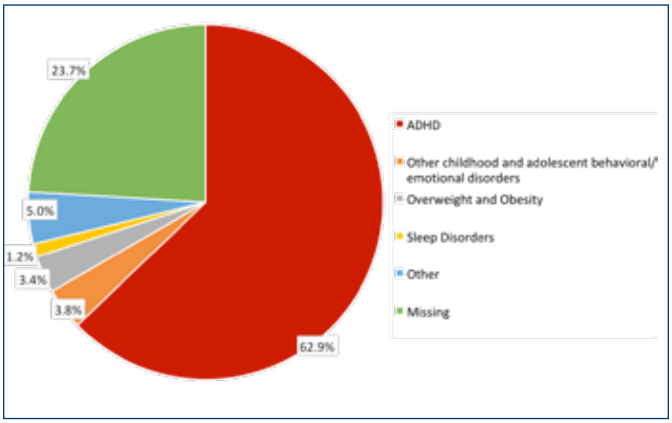



**Figure 3.** Diagnoses for RI Residents Receiving Stimulants, PDMP, 2017–2021.




## DISCUSSION

Despite regulatory changes during the pandemic, the number of stimulants dispensed per year increased but the proportion of the RI population under 65 years old receiving stimulants remained constant. This may be attributed to both an increase in the overall RI population and an increase in stimulants dispensed per person. This is supported by an increase in the number of prescriptions dispensed per person. Historically, children and adolescents have been the primary recipients of stimulants. With the decline in stimulant prescription recipients aged 0–17 years old and an increase in older age groups, the demographics of individuals who are dispensed stimulants appear to be changing. The decline in stimulant dispensing to minors after 2019 may be due to the lack of classroom supervision as teachers are typically among the first to recognize ADHD symptoms in children. During the early stages of the pandemic, children

attended school remotely where their teachers were not able to adequately assess their classroom behavior and performance.[10] In addition, among children presenting ADHD symptoms, stigmatization of childhood mental illness has caused caution among parents when considering medicating their child.[11,12]

As doctors learn more about how ADHD manifests in adults, more adults are diagnosed with ADHD. Significant life changes caused by the pandemic, such as loss of income and employment, and social isolation, could be contributing to this increase, as stress may trigger ADHD symptoms.[13,14] The rise of ADHD misinformation shared through social media may also be a factor.[15] About 1 in 8 adults with prior COVID-19 infection develop Long COVID, a symptom of which is brain fog, which shares many symptoms with ADHD and may be misdiagnosed.[16]

Along with the general rise in dispensed stimulants was the increase of stimulants paid for by Medicaid. This could be attributed to the rise in proportion of the RI population covered by Medicaid due to the eligibility renewal process pause, and the increased accessibility to healthcare through telehealth regulations. While the number of prescriptions paid by Medicaid increased, the proportion of Medicaid recipients receiving a stimulant prescription remained less than that of the general population. RI Medicaid is beginning to reinstate the annual eligibility applications, and although the Ryan Haight waiver ended in May 2023, the Consolidated Appropriations Act of 2023 has extended telehealth flexibilities through 2024.[7,17] However, the requirement for an in-person visit prior to prescribing controlled substances has not been waived through the Act.

Considering the potential decrease in Medicaid coverage, it is possible patients unable to fill their prescriptions may turn to obtaining illicit stimulants for treatment, as a similar phenomenon occurs when patients dispensed opioids have a sudden discontinuation of their prescriptions.[18,19] This is concerning as local drug supply testing has demonstrated multiple "Adderall" pressed samples contained methamphetamine.[20] This is consistent with police and news reports of rising methamphetamine contaminated Adderall pill seizures in RI.[21]

## Strengths and Limitations

A strength of this study was the use of the RI PDMP data to assess trends in stimulant dispensations within RI. This database provides data on controlled substances dispensed from in-state and out-of-state pharmacies to RI residents. The PDMP does not collect information on patient race or ethnicity, which limits demographic analyses on individuals prescribed stimulants, and prescriptions that were not dispensed. It was also not possible to evaluate whether stimulants were prescribed via a telehealth or an in-person appointment. As RI pharmacists are only required to report ICD-10 codes for opioid prescriptions, nearly a quarter of stimulants were missing a diagnosis which may impact the ability to extrapolate diagnosis findings.

Since 2017, the number of stimulants dispensed per year in RI has increased but the proportion of the RI population receiving stimulants has remained constant. As changes in Medicaid coverage and telehealth regulations continue, future work should continue to monitor stimulant prescribing and ensure accessibility and sustainability for impacted patients.

## References


1. Paiva TJ, Nitenson AZ, Antinozzi D, et al. Dispensed Opioid, Buprenorphine, Benzodiazepine, and Stimulants among Rhode Island Residents, 2017-2021. R I Med J (2013). 2023 Mar 1;106(2):27-30. PMID: 36848539.
2. Danielson ML, Bohm MK, Newsome K, et al. Trends in Stimulant Prescription Fills Among Commercially Insured Children and Adults – United States, 2016-2021. MMWR Morb Mortal Wkly Rep. 2023;72:327-332. DOI: http://dx.doi.org/10.15585/mmwr.mm7213a1
3. Ryan Haight Online Pharmacy Consumer Protection Act of 2008, Public Law 425, U.S. Statutes at Large 122 (2008): 4820-4834.
4. 88 FR 12875
5. Health Resources and Services Administration (HRSA), 2021. Prescribing controlled substances via telehealth. United States Department of Health and Human Services. (https://telehealth.hhs.gov/providers/policy-changes-during-the-covid-19-public-health-emergency/prescribing-controlled-substances-via-telehealth/).
6. United States Department of Health and Human Services (HHS), 2021. New HHS study shows 63-fold increase in Medicare telehealth utilization during the pandemic. United States Department of Health and Human Services. (https://www.hhs.gov/about/news/2021/12/03/new-hhs-study-shows-63-fold-increase-in-medicare-telehealth-utilization-during-pandemic.html).
7. Executive Office of Health and Human Services (EOHSS), State of Rhode Island. Stay Covered RI. (https://staycovered.ri.gov/medicaid-renewals) (Accessed 01 May 2023).
8. Hallowell BD, Chambers LC, Barre L, et al. Association between initial opioid prescription diagnosis type and subsequent chronic prescription opioid use in Rhode Island: a population-based cohort study. BMJ Open. 2022;12(1):e050540. doi: 10.1136/bmjopen-2021-050540. PMID: 34992104; PMCID: PMC8739418.
9. National Center for Health Statistics, Centers for Disease Control and Prevention. CDC WONDER. (http://wonder.cdc.gov/single-race-single-year-v2021.html) (Accessed 08 February 2023).
10. Al-Moghamsi EY, Aljohani A. Elementary school teachers' knowledge of attention deficit/hyperactivity disorder. J Family Med Prim Care. 2018;7(5):907-915. doi: 10.4103/jfmpc.jfmpc_183_18.
11. Lebowitz MS. Stigmatization of ADHD: A Developmental Review. J Atten Disord. 2016;20(3):199-205. doi: 10.1177/1087054712475211.
12. Children and Adults with Attention-Deficit Hyperactivity Disorder (CHADD). ADHD Weekly: Don't Let Stigma Delay Proper ADHD Treatment for Your Child. (Don't Let Stigma Delay Proper ADHD Treatment for Your Child - CHADD) (Accessed 24 May 2023).
13. Combs MA, Canu WH, Broman-Fulks JJ, et al. Perceived Stress and ADHD Symptoms in Adults. Journal of Attention Disorders. 2015;19(5):425-434. doi: https://doi.org/10.1177/1087054712459558.
14. De Miquel C, Domènech-Abella J, Felez-Nobrega M, et al. The Mental Health of Employees with Job Loss and Income Loss during the COVID-19 Pandemic: The Mediating Role of Per-

ceived Financial Stress. International Journal of Environmental Research and Public Health. 2022;19(6):3158. doi: https://doi.org/10.3390/ijerph19063158.

15. Yeung A, Ng E, Abi-Jaoude E. TikTok and Attention-Deficit/Hyperactivity Disorder: A Cross-Sectional Study of Social Media Content Quality. The Canadian Journal of Psychiatry. 2022;67(12):899-906. doi: 10.1177/07067437221082854.
16. Taquet M, Sillett R, Zhu L, et al. Neurological and psychiatric risk trajectories after SARS-CoV-2 infection: an analysis of 2-year retrospective cohort studies including 1284437 patients. The Lancet Psychiatry. 2022;9(10):815-827. doi: https://doi.org/10.1016/S2215-0366(22)00260-7.
17. Consolidated Appropriations Act, 2023, H.R.2617, 117th Cong. (2022), https://www.govinfo.gov/app/details/BILLS-117hr2617enr/.
18. The National Institute for Health Care Management (NIHCM), 2020. Beyond Opioids: Rapid Increase in Drug Deaths Involving Stimulants.(https://nihcm.org/publications/beyond-opioids-rapid-increase-in-drug-deaths-involving-stimulants).(Accessed 12 May 2023).
19. Dickson-Gomez J, Krechel S, Spector A, et al. The effects of opioid policy changes on transitions from prescription opioids to heroin, fentanyl and injection drug use: a qualitative analysis. Subst Abuse Treat Prev Policy, 2022;17:55. doi: https://doi.org/10.1186/s13011-022-00480-4.
20. Martin J, 2022. Cumberland man to plead guilty in largest meth-laced pill seizure. The United States Department of Justice. (https://www.justice.gov/usao-ri/pr/cumberland-man-plead-guilty-largest-meth-laced-pill seizure?mc_cid=b9b82040aa&mc_eid=7118687b42) (Accessed 30 March 2023).
21. Prevent Overdose RI. Local Drug Supply. https://preventoverdoseri.org/local-drug-supply/ (Accessed 22 May 2023).

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

| | REPORTING PERIOD | | |
|---|---|---|---|
| VITAL EVENTS | NOVEMBER 2022 | 12 MONTHS ENDING WITH NOVEMBER 2022 | |
| | Number | Number | Rates |
| Live Births | 918 | 11,202 | 10.6* |
| Deaths | 931 | 11,254 | 10.6* |
| Infant Deaths | 1 | 41 | 3.7# |
| Neonatal Deaths | 1 | 32 | 2.9# |
| Marriages | 460 | 6,989 | 6.6* |
| Divorces | 183 | 2,652 | 2.5* |

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

| | REPORTING PERIOD | | | |
|---|---|---|---|---|
| Underlying Cause of Death Category | MAY 2022 | 12 MONTHS ENDING WITH MAY 2022 | | |
| | Number (a) | Number (a) | Rates (b) | YPLL (c) |
| Diseases of the Heart | 203 | 2,407 | 219.3 | 3,414.5 |
| Malignant Neoplasms | 203 | 2,204 | 200.8 | 4,119.0 |
| Cerebrovascular Disease | 37 | 514 | 46.8 | 600.0 |
| Injuries (Accident/Suicide/Homicide) | 93 | 1,089 | 99.2 | 15,708.0 |
| COPD | 42 | 450 | 41.0 | 375.0 |

(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.

RHODE ISLAND MEDICAL SOCIETY

# CONVIVIUM

## SAVE THE DATE

**THURSDAY, SEPTEMBER 28, 2023**

**211ST ANNUAL MEETING and AWARDS DINNER**

**6:00 pm Reception, 7:00 pm Dinner**

**The Squantum Association, East Providence**

**Please join us as we thank our outgoing presidents, inaugurate new leadership, honor award recipients, and celebrate 211 years of organized medicine in Rhode Island.**

**Special Guest Speaker: Jack Resneck, Jr., MD, Immediate Past President of the AMA**

**Watch for your invitation soon.**

RHODE ISLAND MEDICAL SOCIETY · 1812 ·

# On Syndromes

JOSEPH H. FRIEDMAN, MD

I assume that most readers have not heard of "notalgia paresthetica" (NP). It is a "real" syndrome. I had not heard of it until I received an unsolicited email about it from God knows where. I was struck by its unusual characteristics (see below) and asked my friend, a retired pediatrician, if he had heard of it. He hadn't, so, after looking it up, I explained to him what it is. NP is a "not uncommon" syndrome of episodic unilateral itching in the upper back, T2–T6. My friend then asked if I recalled him asking about his recurrent problem of an itchy right foot and my response of, "don't know, never heard of it. Some people get weird stuff. Not to worry." He opined, probably correctly, that he clearly had a variant of this new-to-us entity, notalgia paresthetica, so that I should take it more seriously. He mildly chastised me for "blowing him off." He was pleased that he now had a bona fide, "real" disorder, "notalgia paresthetica *variant*." Itching, of course, is a common symptom of many different disorders, and many people itch for unidentifiable reasons, but only some have episodes of itching affecting half their back, and no one knows how many have an episodically itchy single foot.

The first citation for NP in PubMed was published in *Neurology* in 1978, but the authors gave credit to Astwazaturow as the first to report this entity in 1934. Given the name of the discoverer, it is easy to understand why this syndrome has not been named after him, at least in the Western world.

Learning of this disorder got me to thinking about what a syndrome is and what it means to have one. A syndrome is, of course, a collection of signs, symptoms, or laboratory findings that are linked together in a statistically and clinically significant manner to form a discrete disorder. Some are considered diseases whereas others simply stay a "syndrome." Sometimes the term is used as an umbrella descriptor to encompass several discrete disorders, such as psychotic syndromes, failed back syndrome, Parkinsonian syndrome, etc. Some of these have ICD 10 billing codes. NP, for example, has an ICD billable code, G54.8, which appears to be a non-specific code, meaning it applies to several different disorders, but it gives a degree of robustness or life to this unusual collection of symptoms. In medical-legal practice, "if you didn't chart it, it didn't happen" translates, in daily medical practice to, "if it doesn't have an ICD 10 code, it's not billable and if it's not billable it doesn't exist." So, "painful legs and moving toes," my most favored name for a neurological syndrome (not a disease, since there is no known pathology), does not have an ICD 10 code. It is therefore not billable, and therefore doesn't exist, at least for a medical visit. I can bill for the painful legs with any number of diagnoses, but not the moving toes. There are 104 citations in PubMed for painful legs and moving toes, starting in 1971, and 146 for NP, starting in 1978, which is not a large difference, making me wonder why one is billable and the other not. The number of publications about a syndrome apparently doesn't seem to influence its ability to obtain an ICD code, and therefore medical importance. Yet, much rarer syndromes, like being sucked into a jet engine, has its own billing code (V 99.73), although it boasts few publications, and who would bill for it remains a puzzle.

**The number of publications about a syndrome apparently doesn't seem to influence its ability to obtain an ICD code, and therefore medical importance. Yet, much rarer syndromes, like being sucked into a jet engine, has its own billing code (V 99.73), although it boasts few publications, and who would bill for it remains a puzzle.**

## Defining syndromes

There is value in defining syndromes. If we identify three problems in a syndrome that includes four or more, we are compelled to look for the missing problems, which is helpful for the patient. Identifying a syndrome may allow us to review the spectrum of discrete diseases that are included under the inclusive umbrella term of the syndrome. Thus, syndromic names have diagnostic implications. In addition, syndromic names may provide the relief we need to feel in "knowing" what is wrong. Giving "Long Covid" a name is reassuring to both patient and caregiver. The problem has a name.

It "exists." There is a tangible disorder. Others have it. It is not so much that, "misery loves company," as it is that no one wants to have a disorder that can't be "googled," or discussed in a meaningful fashion with others without going into personal details.

While syndromic names often precede identification of specific disease states, it sometimes works the other way, in which presumed specific diseases are found to be collections of possibly unrelated pathologies. In very recent times, in my field of movement disorders, the disorder cortico-basal degeneration, a disorder with a characteristic pathology, was found to be clinically inseparable, in occasional cases, from at least two other distinct pathological entities, all of which, so far, share some pathological features, and the clinical signs are now combined as corticobasal syndrome. But these disorders, although sometimes looking like the others, usually look quite different, so that the individual pathologies have been lumped together into the "tau-opathies," as they share abnormalities of the tau protein, although each has a different one. Occasional patients have clinical features of more than one of these disorders. I have diagnosed a patient as having a "tau-opathy" as it did not fit a single disease set of clinical criteria, but had features of a few. This turned out at autopsy to have been correct. It shared pathological features of more than one distinct tau-disorder. Using a syndrome's name can allow a degree of flexibility in diagnosis, and this can be very helpful both for guiding patient care, as well as providing an explanation to the patient of the illness, so long as we understand that attaching a syndromic diagnosis is a label and not a pathology.

We should not be fooled into thinking we know more than we do by simply attaching a name. ❖

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In 2023 to date, more than **33,000** unique viewers worldwide have read *Rhode Island Medical Journal* articles or researched topics from its archives, rimedj.org.

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10. Taiwan

### MOUNT SHASTA, CALIFORNIA

RIMJ Editor-in-Chief **William Binder, MD**, almost at the top of Mount Shasta during a May ascent he took with his two sons, checks out the latest issue of the Journal.

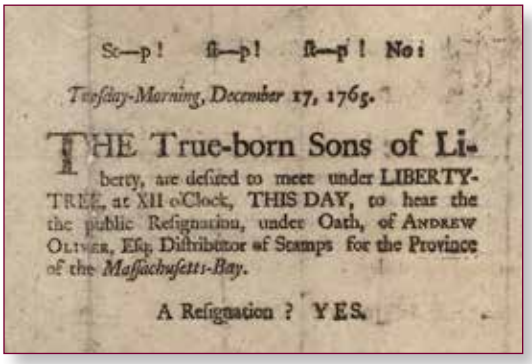
William Binder, MD, and his sons, one a mountain guide in Utah, endured a two-day trek ascending the 14,180-foot snow- and ice-clad Mount Shasta. Equipment included Alpine Touring skin bindings, avalanche beacons, a shovel, and a probe. The group camped out the first night at 10,200 feet, temperature about 15 degrees F. Setting out the next day at 4 a.m., the temperature rose to about 40 degrees F when the sun rose. Father and sons skinned up most of the way, using crampons on the steeper and harder snow pack. They journeyed up John Muir's favorite ascent – straight up Avalanche Gulch, to Misery Hill, and then on to the majestic Shasta summit. Dr. Binder's takeaway: "I passed my stress test!"

Mount Shasta, a steep-sided Cascade Range stratovolcano in Northern California, about 60 miles north of Redding, along the I-5 corridor in Northern California, looms above Little Glass Mountain, a thick obsidian flow erupted from the Medicine Lake shield volcano about 1,000 years ago. These are just two of the young volcanic areas monitored by the USGS California Volcano Observatory. [USGS PHOTO]

Wherever you may be, or wherever your travels may take you, check the Journal on your mobile device, and send us a photo: **mkorr@rimed.org**.

# 'Sons of Liberty': Physicians Fought for Independence on Bunker Hill and the High Seas

MARY KORR
RIMJ MANAGING EDITOR


Sc—p! ſt—p! ſt—p! No!

Tuſday-Morning, December 17, 1765.

THE True-born Sons of Liberty, are deſired to meet under LIBERTY-TREE, at XII o'Clock, THIS DAY, to hear the the public Reſignation, under Oath, of ANDREW OLIVER, Eſq; Diſtributor of Stamps for the Province of the Maſſachuſetts-Bay.

A Reſignation? YES.

Sons of Liberty Broadside, 1765
[MASSACHUSETTS HISTORICAL SOCIETY, PUBLIC DOMAIN, HTTPS://COMMONS.WIKIMEDIA.ORG/W/INDEX.PHP?CURID=11558332]

They called themselves the Sons of Liberty, at first clandestine cells of Colonial patriots fighting taxation and tyranny by the British government, notably in battling the Stamp Act in 1765. Their most famous and provocative act was destroying 92,000 pounds of tea in Boston Harbor in December 1773, what would come to be known as the Boston Tea Party, one of the key events that led to the Revolutionary War.

The Sons' most prominent leader was Samuel Adams; others included Paul Revere and John Hancock, legends in the annals of American history. Less well-known are the physicians among the Sons' ranks, notably **Dr. Joseph Warren**, a friend and compatriot of Samuel Adams.


Portrait of Dr. Joseph Warren (1741–1775)
[NATIONAL PARK SERVICE, BOSTON NATIONAL HISTORICAL PARK]

He was born in Roxbury, Massachusetts, on June 11, 1741, one of four children of Joseph Warren, a farmer, and his wife, Mary. He graduated from Harvard College in 1759, and over the next four years apprenticed himself to Dr. James Lloyd of Boston. Afterwards, he opened his own practice of medicine and surgery. In 1764, he married Elizabeth Hooton, who brought with her a dowry of considerable fortune. The couple would have four surviving children.

His practice and reputation as a physician grew, as did his civic-minded activities. Following the egregious Stamp Act of 1765, his participation in the Sons of Liberty and other political organizations to challenge British rule expanded. After the Boston Massacre in 1770, when British troops fired into a rebellious crowd of protesters, killing five, Warren regularly attended town meetings, arguing for the rights of the American colonies, and wrote of their efforts in numerous Boston newspapers.

In 1775, he was elected to the presidency of the Massachusetts Provincial Congress, a provisional governing body, and then commissioned as major general in the state's militia. And it was Warren who directed Paul

## Doctors of the Declaration

On July 4, 1776, 56 delegates to the Second Continental Congress in Philadelphia unanimously adopted the Declaration of Independence, drafted by Thomas Jefferson. It began:

> *When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.*


IN CONGRESS, JULY 4, 1776.

A DECLARATION

BY THE REPRESENTATIVES OF THE

UNITED STATES OF AMERICA,

IN GENERAL CONGRESS ASSEMBLED.

Front of the original Declaration of Independence
[LIBRARY OF CONGRESS]

The original parchment document was signed on August 2, 1776. Among the signatories were the following five physicians:

**Benjamin Rush** was born on Christmas Eve, 1745, Pennsylvania. He attended the College of New Jersey (later called Princeton), and chose medicine as his career. He apprenticed for six years, and then went to Scotland and the University of Edinburgh School of Medicine, where he was awarded the doctorate in 1768. Upon his return, he set up practice in Philadelphia.


Dr. Benjamin Rush

Rush was active in the Sons of Liberty and in June 1776, he was elected to represent Pennsylvania in the Continental Congress. During the war he was briefly the surgeon general to the Continental armies in the middle states and

Photograph of "The Death of Gen. Warren at the Battle of Bunker's Hill, June 17, 1775." Painted by artist John Trumbull, oil on canvas, and commissioned by the Warren family and gifted to the Museum of Fine Arts in Boston, 1977, by Howland S. Warren. [CREATIVE COMMONS, WIKIMEDIA, IN THE PUBLIC DOMAIN]

Revere and William Dawes to sound the alert that British soldiers were heading towards Lexington to arrest Samuel Adams on April 18, 1775, and fight the American militia. The news of the skirmishes at Lexington and Concord, the following day, on April 19, 1775, propelled Warren to leave his patients in the care of his assistant and join the fight, tending to many of the wounded on the battlefields.

Two months later, on the morning of June 17, 1775, Warren learned that British forces had landed at Charlestown, north of Boston. He rode over to the American fortifications on Breed's Hill and Bunker's Hill, and joined the 1,200 militia defenders as a regular volunteer. The British infantry was twice repelled. But on the third and final British assault, when the militia, depleted of ammunition, began a retreat, a British office shot him with a musket or pistol ball between the eyes. He died instantly at age 34, on the first day of organized warfare of the Revolutionary War, a true Son of Liberty.

His body was stripped of his uniform, bayoneted by British soldiers, and thrown unrecognizable into a shallow grave. A year later, after the British retreat, it was found by his brothers, Dr. John Warren, Ebenezer Warren, and Paul Revere, a silversmith, who recognized Warren by the gold wire which secured the front eye-tooth. Forensics much later confirmed the circumstances of his death.

## RI Surgeons on the High Seas

In Rhode Island, intrepid surgeons took to the sea on privateers, merchant ships engaged in maritime warfare, deemed necessary to the war effort since the Continental Navy was small and fragmented. In 1775 an Act of the Continental Congress authorized "the capture and confiscation of all British armed vessels, transports and supply ships, and directed the issuance of commissions to captains of cruisers and privateers."

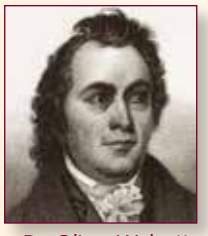
It was a daring and dangerous enterprise. **Dr. Stephen Vignernon** of Newport was lost at sea. **Dr. Usher Parsons**, in his Sketches of Rhode he participated actively in the battles of New Jersey. Following the war, he resumed his practice in Philadelphia, taking on many apprentices while increasing his role as a professor of chemistry and medicine.

Dr. Josiah Bartlett

**Josiah Bartlett** was born in Amesbury, Massachusetts, in 1729. He apprenticed in medicine and at age 21 began a successful practice in Kingston, New Hampshire. He concurrently served in the state legislature and was also a colonel in the militia. Despite a lack of formal legal training, he was chosen to be New Hampshire's Chief Justice of the Supreme Court and then governor. Bartlett never interrupted his practice of medicine. He also served as first president of the New Hampshire Medical Society.

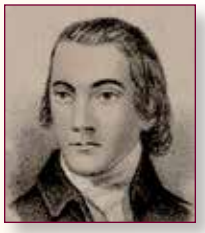
Dr. Matthew Thornton

**Matthew Thornton** was born in Ireland in 1714, migrating at an early age with his family to New England. He apprenticed in medicine, establishing a practice in New Hampshire, and served as a physician to the troops. He was chosen to enter the Continental Congress in November 1776 and was permitted to sign the Declaration at that time, the last to do so.



Dr. Oliver Wolcott
[ABOVE PHOTOS: NATIONAL LIBRARY OF MEDICINE]

**Oliver Wolcott** was born in Connecticut in 1726. He graduated from Yale and entered the military. After returning from an unsuccessful raid against New France, he completed the study of medicine and then studied law, holding numerous posts before representing Connecticut in the Continental Congress.



Dr. Lyman Hall
[LIBRARY OF CONGRESS]

**Lyman Hall** was born in Wallingford, Connecticut in 1724. He attended Yale and, in 1752, began an apprenticeship in medicine, establishing his practice in his home town. He ultimately migrated to Georgia to practice. In 1775 he was chosen to participate in the newly formed Continental Congress and was later elected governor of Georgia. ❖

Island Physicians, wrote of their perilous adventures. **Dr. Levi Wheaton**, after completing a surgical apprenticeship in Providence, signed on as surgeon to a privateer. But, "in the autumn of 1782, while cruising off the Southern coast, he was taken prisoner and carried into New York Harbor by the British frigate Vestal," Parsons wrote. "He was put in charge of the prison hospital ship Falmouth." In retrospect, Parsons noted, "this event was recalled with much pleasure, as having afforded him an opportunity of rendering some good offices to his imprisoned countrymen."

Dr. Levi Wheaton served as a surgeon on a privateer during the War of Independence and was taken prisoner by the British and sent to a prison hospital in New York City to work.

**Dr. Solomon Drowne** served as surgeon in the Continental Army from 1776–1780. He then signed on with the privateer sloop Hope out of Providence, under the command of Capt. James Munro. Drowne describes a typical day at sea in his diary, which he later published: "Oct. 15. A pleasant day. See a sail to windward... give chase. On approaching, discover her to be a Snow (type of sloop). She hauls her wind and stands from us; sails very heavy, and Capt. Munro is sanguine in the belief we shall make a prize of her. She hauls up her courses and hoists English Colours.

Dr. Solomon Drowne later published his diary of working on the high seas as a surgeon on a privateer.
[BROWN UNIVERSITY PORTRAIT COLLECTION]

"I take my station in the Cabin; where remain not long before I hear the Huzza on deck…Send our boat for the Captain & his papers…She has ten men on board and four excellent four pounders (cannons)… Her cargo from Kingston, Jamaica consists of 149 puncheons, 23 hogsheads, 3 quarter casks and barrels of rum, and 20 hogsheads muscovado sugar.

"Have our pistols hung up in the cabin, to be in readiness for the prisoners, should they take it in their heads to rise upon the watch in the night."

The British crew and cargo were impounded and the ship towed. On Oct. 23, the victorious Hope arrived in Providence with its prize, "firing 13 cannon." Drowne then returned to terra firma. After the French allied with the Colonists, he cared for the wounded soldiers in the regiments of the Marquis de Lafayette and Comte de Rochambeau, at the hospital set up in University Hall at the College of Rhode Island, now Brown University, which also served as a barracks during the Revolutionary War.

In the formative years of this country, the British branded these physicians traitors and pirates. They proudly called themselves the Sons of Liberty. ❖

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## RI AG, RIDOH halt proposed purchase of Prospect's CharterCARE and Centurion Foundation

PROVIDENCE – A proposed purchase of CharterCARE Health Partners by the Atlanta-based Centurion Foundation was halted by Rhode Island Attorney General **PETER F. NERONHA** and the Rhode Island Department of Health on May 31.

Last year, Centurion and Prospect signed an Asset Purchase Agreement (APA) for Centurion to acquire the CharterCARE Health Partners (CharterCARE) system from Prospect. The APA includes CharterCARE's related businesses, real estate assets, physician clinic operations and outpatient services:

- Roger Williams Medical Center in Providence, RI
- Our Lady of Fatima Hospital in North Providence, RI
- Blackstone Valley Surgicare in Johnston, RI
- CharterCARE Medical Associates in Providence, RI
- CharterCARE Home Health Services in Providence, RI
- Roger Williams Cancer Center in Providence, RI
- Southern New England Rehabilitation Center in North Providence, RI
- St. Joseph Health Center in Providence, RI

The Attorney General and the Rhode Island Department of Health, the two state regulators empowered to oversee hospital conversions in Rhode Island, issued the following statement regarding the status of an initial submission by Prospect Medical Holdings and The Centurion Foundation to state regulators pursuant to the Hospital Conversions Act (HCA). This submission was related to a proposed transaction involving CharterCARE.

"Following review of a submission from Prospect Medical Holdings and The Centurion Foundation delivered on May 26, 2023, regarding a proposed hospital conversion, the Attorney General and the Department of Health determined that the materials submitted do not constitute an Initial Application as required under the Hospital Conversions Act. The materials do not respond to the most recent, publicly available application form and do not include responses to transaction-specific questions.

The parties have been given notice by the Attorney General and the Department of Health that the submitted materials do not constitute an Initial Application. Under the HCA, transacting parties seeking the transfer of ownership of a hospital must complete an Initial Application and file it with both the Office of the Attorney General and the Rhode Island Department of Health, who will determine whether the application is complete. Once the application is deemed complete, the Attorney General and the Rhode Island Department of Health will then initiate a review and issue a decision on the application for transfer of ownership as to whether all statutory criteria are met and the public's interest is protected." ❖

## Department of Veterans Affairs awards $6.2M to VA Providence for Neurological Research to advance Veterans Health

PROVIDENCE – The Department of Veterans Affairs has approved a grant of $6.2 million, effective June 1, 2023, for the VA Providence Healthcare System to support a full range of translational research, from understanding basic mechanisms of nervous system function to developing and implementing novel treatments for complex neurological and mental health disorders.

The funding supports the VA Rehabilitation Research and Development Service (RR&D) Center for Neurorestoration and Neurotechnology (CfNN) located at VA Providence Healthcare System. The funding represents the 2nd renewal for CfNN, which was first funded in 2012.

CfNN is one of 12 centers funded by VA RR&D dedicated to advancing Veterans Health through neuroengineering and clinical neurorehabilitation research. CfNN's vision is to improve the physical function, mental health and functioning, and quality of life of Veterans. Since 2012, CfNN has facilitated deeply collaborative research between its scientists, VA Providence and other RR&D Center researchers, and CfNN's university and hospital affiliates.

"The multidisciplinary cutting-edge research done by investigators at CfNN has the potential to dramatically improve the lives of our Veterans suffering from neurological and mental health disorders and disabilities. With this renewal, our research team at VA Providence will continue in their endeavor bring novel device-based therapies from research labs to the clinic," said **GAURAV CHOUDHARY, MD**, Associate Chief of Staff (Research) at VA Providence.

CfNN is led by **LEIGH R. HOCHBERG, MD, PhD**, who is a neurologist at the VA, the L. Herbert Ballou University Professor of Engineering and Professor of Brain Science at Brown University, and director of the Center for Neurotechnology and Neurorecovery at Massachusetts General Hospital. He was the recipient of the 2022 VA Paul B. Magnuson Award, the highest research award in VA RR&D. "Restoring communication, mobility, mental health, and limb and sensory function are key priorities for Veterans Health. We are thrilled to have the opportunity to continue our research to develop new neurotechnology-based therapies to improve the health and function

of Veterans with neurologic or mental health disorders, and to help recruit and advance the next generation of neurorestoration researchers," said Dr. Hochberg.

**BENJAMIN GREENBERG, MD, PhD**, CfNN's Associate Director and Professor of Psychiatry and Human Behavior at Brown, said, "This is an incredibly exciting time for making real differences in brain and behavioral disorders for Veterans. We are getting better at understanding how functioning in circuits in the brain give rise to mental health or neurologic disorders. And advances in technology promise to allow us to engage those brain pathways to relieve suffering and improve the lives of Veterans with these illnesses. We're honored to be able to continue CfNN's work to support our nation's Veterans and others with neurologic disease or injury."

For more information about the center, please see centerforneuro.org ❖

## Driving to Clean Air: New report reveals that a move to zero-emission vehicles would save 288 Rhode Island lives

*American Lung Association releases report detailing benefits of transition to zero-emission passenger vehicles and electricity*

PROVIDENCE – A nationwide transition to clean, zero-emission passenger vehicles would have a dramatic impact on the air quality and health of Americans, according to a new report by the American Lung Association. The report, titled "Driving to Clean Air: Health Benefits of Zero-Emission Cars and Electricity," highlights that a widespread transition to zero-emission passenger vehicles and electricity would result in up to 288 fewer deaths and $3.2B in public health benefits across Rhode Island by 2050.

As federal and state policymakers consider new vehicle standards, the Lung Association's new "Driving to Clean Air" report illustrates the potential health benefits if all new passenger vehicles sold are zero-emission by 2035. The report also projects that the nation's electric grid will be powered by clean, non-combustion renewable energy replacing fossil fuels by 2035.

Nationally, a widespread transition to electric passenger vehicles, including cars, SUVs and light pickup trucks, would result in up to 89,300 fewer premature deaths and $978 billion in health benefits from 2020 to 2050. Here in Rhode Island, the transition would generate $3.2B in public health benefits and result in up to:

- 288 avoided deaths
- 5,430 avoided asthma attacks
- 29,400 avoided lost workdays

Rhode Island has already taken important steps towards a cleaner transportation sector, including recent proposals to adopt zero-emission trucking standards and updated zero-emission vehicle standards for passenger cars. By moving to adopt the Advanced Clean Cars II program, Rhode Island can join a growing list of states improving health locally through increasing zero-emission vehicle sales into the next decade. This program has the strong support of the American Lung Association as a key air pollution control measure. Nationally, the U.S. Environmental Protection Agency (EPA) recently rereleased a proposed rule that would create stricter emissions standards for cars and could make two-thirds of new passenger vehicles zero-emission by 2032. The EPA is currently taking comments on this proposed rule.

"Too many people across Rhode Island are impacted by the pollution caused by the transportation sector, including our children, grandparents and loved ones living with asthma, chronic obstructive pulmonary disease and lung cancer," said **DANIEL FITZGERALD**, Director of Advocacy at the American Lung Association. "We urge our state leaders to take action today to invest in the transition to zero-emission vehicles, which will improve our air quality and health."

The transportation sector is a leading source of air pollution and the nation's biggest source of carbon pollution that drives climate change and associated public health harms. According to the 2023 "State of the Air" report, approximately 120 million people in the U.S. live in areas with unhealthy levels of air pollution. Low-income communities and many communities of color too often bear disproportionate burdens from air pollution broadly, and transportation pollution, specifically.

This new report that focuses on passenger vehicles stems from the more comprehensive March 2022 American Lung Association "Zeroing In On Healthy Air" report.

Learn more and see the full report at Lung.org/EV. ❖

## Equality in Abortion Coverage Act enacted

STATE HOUSE – The Equality in Abortion Coverage Act has been signed into law. Sponsored by Sen. **BRIDGET VALVERDE** and House Majority Whip **KATHERINE S. KAZARIAN**, the EACA will provide insurance coverage for abortion care to individuals on Medicaid as well as state employees.

The House, which passed its version of the bill April 27 on a 49-24 vote, gave the identical Senate version its approval following the Senate vote. The legislation was submitted immediately to Gov. **DANIEL MCKEE**, who signed it into law.

The legislation (2023-S 0032, 2023-H 5006) eliminates sections of law that expressly prohibit the state's Medicaid programs and all health insurance provided to state employees from covering any abortion, except in cases of rape or incest or when completion of the pregnancy would be life-threatening.

Those prohibitions, up to now, have left Medicaid enrollees and state employees to pay the full cost of abortion procedures out of pocket. Roughly one-quarter of Rhode Islanders are covered by Medicaid, and another 30,000 are covered by state employee plans. Since Medicaid is for individuals who have low incomes or are disabled, supporters have argued that the ban is discriminatory and forces struggling people to have to choose between getting the procedure and food, rent and other necessities.

The bill adds Rhode Island to the ranks of 16 states, including Massachusetts, Connecticut, Vermont and Maine, whose Medicaid programs cover abortion. In compliance with the federal Hyde Amendment, which prohibits federal funding of abortion services, the EACA adds language to state law that specifies that no federal funds shall be used to pay for them, except as authorized under federal law.

"We are grateful to bill sponsor Senator Valverde, Senate Judiciary Chair Euer and the members of the Senate for affirming the need for all Rhode Islanders to have access to abortion services, and voting in support of the Equality in Abortion Coverage Act. It has been too long that those in Medicaid and the State Employee Health Plan have been denied access to abortion care. We thank all the Senators who voted yes on the EACA, joining their House counterparts who supported passage of this bill last month. As parts of the United States enact ever-stricter restrictions on abortion, here in Rhode Island we stand strongly with reproductive freedom, and will work tirelessly to make care available to all," said **NICOLE JELLINEK**, chair of the Rhode Island Coalition for Reproductive Freedom.

Both the House and the Senate bill were cosponsored by a majority of the members of each chamber. Among the Senate cosponsors were Sens. **TIARA MACK** (D-Dist. 6, Providence), **V. SUSAN SOSNOWSKI** (D-Dist. 37, South Kingstown), **JONATHON ACOSTA** (D-Dist.16, Central Falls, Pawtucket), **MELISSA A. MURRAY** (D-Dist. 24, Woonsocket, North Smithfield), Majority Leader **RYAN W. PEARSON** (D-Dist. 19, Cumberland, Lincoln), Sens. **JOSHUA MILLER** (D-Dist. 28, Cranston, Providence), **DAWN EUER** (D-Dist. 13, Newport, Jamestown), **ALANA M. DIMARIO** (D-Dist. 36, North Kingstown, Narragansett, New Shoreham) and **VALARIE J. LAWSON** (D-Dist. 14, East Providence). ❖

## Rhode Island launches online medical marijuana card registration system

PROVIDENCE – The Rhode Island Department of Health (RIDOH)'s new, user-friendly online registration system is now available for medical marijuana patients and authorized purchasers in Rhode Island. The prior system was entirely paper-based.

The web-based portal will shorten processing time and eliminate the need to fill out and mail paper documents.

The new system, known as the Rhode Island Cannabis Licensing Portal (see link below), lets existing card holders renew registrations, update personal information, and make necessary changes to their existing registration cards. New patients applying for a medical marijuana registration card will now apply through the Cannabis Licensing Portal as well. The RIDOH Cannabis Licensing Portal User Guide has step-by-step directions on how to use the online portal.

RIDOH's Medical Marijuana Program accepts, reviews, and approves patients and authorized purchaser applications and renewals. The portal may also be used by caregivers who have been selected by a card holding patient and approved by the Rhode Island Department of Business Regulation (DBR) to obtain their own marijuana registration card. Caregivers should visit the DBR Office of Cannabis Regulation for further information regarding their registration.

RIDOH will stop mailing registration reminders and renewal forms in the coming months. It is very important that patients create an account in the portal to be sure they get important messages and updates from RIDOH, including renewal reminders 60 days before the expiration date.

RIDOH approves or denies new applications and renewals within 35 days of receiving applications and all required documents. As a courtesy, RIDOH will email a renewal reminder 60 days prior to the expiration date on a patient's card if the patient has an email on file with RIDOH. ❖

## National Kidney Registry removes disincentives to living donation, adds dependent care and home blood draws to Donor Shield

The National Kidney Registry (NKR) recently announced the expansion of its Donor Shield program for living kidney and liver donors to include reimbursement for dependent care costs (for children or adult dependents of the donor) and free home blood draws for living donors. These enhancements will go into effect over the next 60 days.

The Donor Shield maximum reimbursement is $17,000 per donor: up to $12,000 for lost wage reimbursement and up to $5,000 for travel and lodging reimbursement. Dependent care will fall under the travel and lodging portion of Donor Shield and will be subject to the $5,000 cap. The maximum Donor Shield reimbursement is nearly three times higher than the government-sponsored program, which limits the maximum donor reimbursement to $6,000.

"We are thrilled to add dependent care and home blood draws to the comprehensive protections and support already offered by Donor Shield," said **MICHAEL LOLLO**, the National Kidney Registry's Chief Strategy Officer and a living kidney donor. "With the addition of dependent care and the home blood draw service, Donor Shield has eliminated, to the maximum extent possible, all disincentives to living donation."

"We utilize Donor Shield for all the living kidney donors, direct and kidney paired donation, at our center," said **DR. KANDASWAMY**, Director of Kidney Transplant at the University of Minnesota, one of the largest users of Donor Shield. "Not only is it the right thing to do for donors that give the gift of life, but it also increases the number of potential donors because it eliminates barriers that would historically prevent someone from donating a kidney."

### About Donor Shield

Donor Shield (www.donor-shield.org) is the most comprehensive program in the world supporting and protecting living kidney donors. Donor Shield is backed by the National Kidney Registry, which is the largest paired exchange program in the world. All donors that participate in a National Kidney Registry swap, Kidney for Life direct donation or donate at a Donor Shield Direct Center are automatically enrolled in the Donor Shield program. ❖

## Senators Reed and Whitehouse celebrate groundbreaking of CODAC's Integrated Care Center

PROVIDENCE – United States Senators **JACK REED** and **SHELDON WHITEHOUSE** celebrated the groundbreaking of CODAC Behavioral Healthcare's new integrated care center in Providence on June 20th.

The Rhode Island senators joined CODAC President/CEO, **LINDA HURLEY**, for a conference on the future applications of the center, followed by a tour of the building with renderings demonstrating the exciting changes for effective health environments.

"This is a celebration, a groundbreaking of CODAC Behavioral Healthcare's new integrated care center," said Senator Reed. "In each of their several locations, CODAC serves over 3000 Rhode Islanders, at a time when there is a crisis in mental health, a crisis in addiction, a crisis that needs direct service, and that's what CODAC supplies. It does so with great compassion as well as great care."

CODAC will offer a complete range of services at its newest location, including primary care, psychiatric/mental health treatment, behavioral health treatment, and treatment for substance use and opioid use disorders.

Moreover, they will provide health home services, tobacco cessation programs, and career path development, incorporating the Hope Initiative through a dedicated suite for peer recovery support services.

"This is a first-class facility, this is a first-class operation," said Senator Whitehouse. "This is about providing services at a first-rate level to the people who need it."

Neighborhood Healthcare has been invited to establish a dedicated space within the integrated center, and there are ongoing conversations about including a small pharmacy to ensure that all aspects of comprehensive care are conveniently available

under one roof. The new center will also house the CODAC corporate headquarters and feature a welcoming community space.

Senators Reed and Whitehouse had a major role in securing federal funding for the new facility, delivering support of $840,000 in addition to last year's contribution of $750,000.

The state-of-the-art treatment center will open in late 2023, consolidating care services in one central location for the benefit of Rhode Island patients. ❖

## New law will require no-cost EpiPen coverage

STATE HOUSE – A new law sponsored by Sen. Pamela J. Lauria and Rep. Michelle McGaw will require health insurers in Rhode Island to cover the full cost of life-saving epinephrine injectors, commonly known by the brand name EpiPen.

The legislation (2023-S 0575A, 2023-H 5176A), which was approved by the General Assembly June 16 and signed by Gov. Dan McKee June 22, is aimed at preventing costs from being an obstacle to those whose lives depend on the device, which is used to manage severe symptoms of an anaphylactic reaction such as throat swelling or difficulty breathing.

The new law will require private and nonprofit insurers and HMOs that provide prescription coverage to cover at least one twin pack per year of at least one type of epinephrine auto-injector and cartridges, without copayments or deductibles, for all policies issued or renewed after Jan. 1, 2025.

Mylan, the manufacturer of the brand-name Epi-Pen, raised its price by about 500 percent between 2009 and 2016, resulting in average prices of more than $600 per twin pack today. Even patients with prescription coverage may be saddled with high cost-sharing rates for the drug. In recent years, generic versions of the device have been developed, but they still cost $300 or more per twin pack.

The single-use injectors expire 18 months from when they are manufactured, so patients need to purchase new ones frequently regardless of whether they are ever used. Patients also need to have one available at all times, so they may need to keep several at once. Many of those at risk for anaphylaxis are children, who may be exposed to their allergen at school or through other children. ❖

## After leading federal COVID-19 response, Dr. Ashish Jha to resume role as dean of Brown's School of Public Health

PROVIDENCE [BROWN UNIVERSITY] – After spending 14 months on temporary leave to lead the U.S. government's COVID-19 pandemic response and recovery efforts, **ASHISH K. JHA, MD, MPH**, will return to lead the Brown University School of Public Health on July 1, as Interim Dean Ronald Aubert continues his leadership through the close of Brown's academic and fiscal years before taking on the permanent role of senior associate dean of education at the school.

Jha said his return offers an opportunity to employ insights from the nation's pandemic response as educators across the school focus on training the next generation of public health leaders.

"We are in a world drastically altered by the COVID-19 pandemic," Jha said. "For all we have accomplished to reduce illness and save lives, COVID-19 has exposed the weaknesses in our public health and health care systems. I look forward to returning to Brown to continue our groundbreaking work transforming public health education, research and practice to convert these weaknesses to strengths." ❖

## RIDOH providing resources for healthcare providers to support pregnant and postpartum patients, infants

PROVIDENCE – The Rhode Island Department of Health (RIDOH) is working to raise awareness and offer resources to healthcare providers around substance use conditions, particularly as they relate to pregnant and postpartum people and their babies and families. RIDOH wants to ensure that healthcare providers are aware of the impact that various substances can have on their pregnant or postpartum patients and have the resources to support them.

Annually in Rhode Island, at least 5% of the approximately 10,000 babies born are exposed to substances that may affect their biopsychosocial health, development, or behavior in the short and/or long term. Substances of exposure can include certain prescribed medications, illicit drugs, alcohol, cannabinoids, and tobacco.

### Resources and supports

**Parent Support Network of Rhode Island (PSNRI)**

Through PSNRI's Healing Mother and Baby Program, pregnant people living with a substance use condition can call or text 401-318-9577 to speak with an English or Spanish-speaking peer recovery coach and access free, confidential help, and support.

**RI MomsPRN**

This is a free psychiatric telephone consultation resource for healthcare providers who treat pregnant and postpartum people. Healthcare providers can call 401-430-2800 or email RIMomsPRN@CareNE.org Monday through Friday, 8 a.m. to 4 p.m. to be connected to perinatal specialists in real-time.

**Family Visiting Program**

This program provides prenatal support and services for infants and toddlers, including connecting to other families and available resources. To learn more or get connected, people can call 401-222-5960.

### Provider and Patient Education Materials

The following education materials can be ordered free of charge through RIDOH's Publication Center:

- **Provider guide** with background information, screening tools, and referral and supporting resources.
- **Brochures** for display in waiting and/or exam rooms for patients to take with them. Available in Cape Verdean, English, Portuguese, and Spanish.
- **Palm cards** for display in waiting and/or exam rooms for patients to take with them. Available in English and Spanish.
- **Posters** for display in waiting rooms, bathrooms, and each exam room. Available in English and Spanish.
- **Safe Sleep flyer** to help prenatal providers have conversations with their pregnant patients about ensuring safe sleep practices and environments. Available in English and Spanish through RIDOH's Parents & Caregivers Publication Center. ❖

# Appointments

## Jeremy Lyle Warner, MD, named Editor-in-Chief of JCO Clinical Cancer Informatics

PROVIDENCE – **JEREMY LYLE WARNER, MD, MS, FAMIA, FASCO**, has been appointed as the next Editor-in-Chief of JCO Clinical Cancer Informatics (JCO CCI), an American Society of Clinical Oncology (ASCO) journal. JCO CCI is an online-only interdisciplinary journal with a primary focus on how information systems help us learn from and improve cancer care, how they interact with each other, and how they serve to advance the field of cancer medicine.

Dr. Warner is a board-certified oncologist with Lifespan Cancer Institute and a professor of medicine at Brown University, member of Brown Medicine, the Legorreta Cancer Center, and Director of the Center for Clinical Cancer Informatics and Data Science (CCIDS).

He has served as an editor for JCO CCI for 7 years and previously served on editorial board of JCO Oncology Practice. He has authored more than 130 journal articles and 6 book chapters and co-founded the COVID-19 and Cancer Consortium (CCC19).

"I am thrilled to follow in the footsteps of the inaugural Editor-in-Chief, Dr. Debra Patt, MD, PhD, MBA, FASCO, who has positioned JCO CCI as one of the leading journals in the growing field of cancer informatics," said Dr. Warner. "I look forward to growing our scope and impact as the field of oncology, along with all fields in medicine, increasingly embraces advanced analytic approaches in what must be a responsible and ethical manner."

Dr. Warner received his medical degree from Boston University and completed his internship and residency in internal medicine at University of California San Francisco and his fellowship in hematology/oncology at the Beth Israel Deaconess Medical Center at Harvard Medical School. He also holds a Bachelor of Science degree in Electrical Engineering from Massachusetts Institute of Technology and a Master of Science in Electrical and Computer Engineering from the University of California San Diego.

Dr. Warner began serving as JCO CCI Editor-in-Chief on June 1, 2023. ❖

## Dr. Nancy Meedzan named PC's inaugural chair for new department of nursing

PROVIDENCE – Providence College (PC) has selected **NANCY MEEDZAN, DNP, RN, CNE, NEA-BC** as the Inaugural Nursing Department Chair in the College's new School of Nursing and Health Sciences. Dr. Meedzan, who is currently a professor and dean of the Cummings School of Nursing at Endicott College in Beverly, Massachusetts, will begin her tenure at PC on July 1. Dr. Meedzan will also be appointed to the faculty as a professor of nursing.

She currently serves as president of the Massachusetts Association of Colleges of Nursing, an organization comprising all the deans of the commonwealth's nursing programs, and she serves as an evaluator for the New England Commission of Higher Education.

After graduating from Boston College in 1987 with a Bachelor of Science degree in nursing, Dr. Meedzan began a nearly 20-year nursing career that involved working at several Rhode Island and Massachusetts hospitals and other medical facilities. Her academic career began at Endicott, where she was appointed an adjunct faculty member in 2004. She became an assistant professor in 2006 and advanced through the faculty ranks, becoming dean in 2019. Dr. Meedzan has also taught at North Shore Community College, Northern Essex Community College, and Massachusetts College of Pharmacy and Health Sciences University. She earned a master's degree in nursing at Salem State University in 1999 and a doctorate in nursing practice degree from Regis College in 2012.

A committed scholar whose primary interest is in global health, Dr. Meedzan is currently co-investigator of an international study of the impact of COVID-19 on patients living with HIV. She is the co-editor of the textbook Global Health Nursing in the 21st Century, and she has taken students on short-term immersion experiences to places such as Guatemala, South Africa, and the Dominican Republic to study the delivery of compassionate nursing care in places challenged to provide healthcare resources.

PC's first nursing students will begin studies in August. ❖

# Recognition

## Lifespan's Chief DEI officer Christin Zollicoffer selected by *Becker's Hospital Review*

PROVIDENCE – Lifespan's Chief Diversity Equity and Inclusion Officer **CHRISTIN ZOLLICOFFER** was selected by Becker's Hospital Review to be included in their 2023 list of "Hospital and health system diversity, equity and inclusion officers to know."

The Diversity, Equity and Inclusion (DEI) officers featured on the list are responsible for tackling health disparities, fostering inclusive workforce cultures, instituting business resource groups, providing educational training sessions and more.

The list honors DEI officers for their dedication to bettering their hospitals and health systems. The leaders are crucial to the successes of their respective organizations, and the list recognizes the importance of their contributions and significance of their accomplishments.

As Lifespan's chief diversity, equity and inclusion officer, Zollicoffer works to increase diverse representation at all levels of the organization, and to ensure that DEI considerations are incorporated into decision-making processes with the goal of fair and equitable treatment for all. She also cultivates strategic relationships to ensure that Lifespan serves as an agent for transformative change in the community ❖

## Newport Hospital's Crista Durand recognized by Becker's as 'Women Hospital Presidents to Know'

NEWPORT – Newport Hospital President **CRISTA DURAND** is among the individuals named to Becker's Hospital Review 2023 list of "Women hospital presidents and CEOs to know."

The 177 presidents and CEOs featured on this list are responsible for growing their hospitals, fostering positive workforce cultures, expanding services and facilities, increasing provider and patient satisfaction levels, and more.

This list honors female hospital executives for their dedication to bettering their hospitals for patients and providers alike.

In their profile of Durand, Becker's stated:

"Ms. Durand takes ownership of Newport Hospital's strategic, financial, clinical and operational functions. Under her leadership, the hospital is able to recruit leading physicians, meet community health needs and deliver quality care. Ms. Durand's career has centered on planning, strategy and execution, skills that assist the hospital in achieving positive financial margins and exceptional care delivery. She is a fellow of the American College of Healthcare Executives."

Durand was appointed President of Newport Hospital in 2014. She holds a bachelor's degree in financial management from Salve Regina University in Newport and a master's in business administration from Nichols College in Dudley, Massachusetts. Durand is a member of the American College of Healthcare Executives. ❖

## Rhode Island State Psychiatric Hospital (RISPH) accredited by The Joint Commission

PROVIDENCE – The recently opened Rhode Island State Psychiatric Hospital (RISPH) has been accredited by The Joint Commission, following a two-day survey during which the facility demonstrated compliance with all standards for psychiatric hospitals. Joint Commission representatives assessed the hospital's adherence to standards that address 19 areas, including life safety, environment of care, medication management and emergency management.

The hospital, which opened on Oct. 25, 2022, is now accredited for three years, with its next review expected in 2026.

"I want to extend my sincere gratitude to all of our staff for their hard work, collaboration, and assistance to ensure that our Joint Commission survey would go well," said RISPH CEO **IRINA BEYDER**. "The surveyors were impressed...that the nursing, pharmacy and the medical staff work closely together, and the environment of care documentation was very organized and well prepared. This is a credit to our hard-working staff." ❖

## *Newsweek* names W&I's 5-Ribbon hospital among its America's Best Maternity Hospitals 2023 list

PROVIDENCE – To help patients pick the best hospital for their family's needs, *Newsweek* and the global market research and consumer data firm Statista announced their ranking of America's Best Maternity Hospitals in 2023.

The list names the top 384 leading hospitals for maternity care in the U.S., divided into two performance categories: five ribbon hospitals (159 institutions) and four ribbon hospitals (225 institutions). Within each category, hospitals are listed in alphabetical order. The evaluation is based on three data sources: a nationwide online survey in which hospital managers and maternity healthcare professionals (e.g., neonatal care providers and OB/GYNs) were asked to recommend leading maternity hospitals; medical key performance indicator data relevant to maternity care (e.g., a hospital's rate of cesarean births); and patient satisfaction data (e.g., how patients rated a hospital's medical staff for responsiveness and communication).

https://www.newsweek.com/rankings/americas-best-maternity-hospitals-2023 ❖

# Obituaries

**NABIL Y. KHOURY, MD**, 89, departed this life peacefully surrounded by his loved ones on June 24, 2023. He was the beloved husband of Salwa Freij Khoury for 61 years.

He was the loving father of four: Olga Hawwa (Tawfik), Anita Chamoun (John), Robert Khoury (Mary), and Jacob Khoury (Maria), grandfather of eight, great-grandfather of three.

Born on December 20, 1933 in Nazareth, Palestine, he completed his education and medical school in Damascus, Syria in 1957. He then worked as a physician for the United Nations in Palestinian refugee camps, becoming the chief supervising physician for many of the camps in Syria.

He immigrated to the United States in 1962 with his bride and completed his Ob-Gyn residency in Boston, Massachusetts.

Following his residency, he joined a successful Ob-Gyn practice in Providence and played an integral role in initiating Ob-Gyn care for underserved women at the Providence community, Pawtucket community, and Chad Brown Health Centers.

Amongst his numerous achievements, he served as Chief of the Ob-Gyn Department at St Joseph and Fatima Hospitals and as team chief at Women & Infants Hospital. He retired as a clinical professor emeritus at The Warren Alpert Medical School of Brown University.

A physician for over 50 years, he brought over 12,000 babies into the world. Dr. Khoury was a role model for hundreds of resident physicians and medical students, receiving many teaching awards during his career.

A devout Christian, Dr. Khoury was an active participant in the life of his church serving as a member of the parish council for many years. He was a Knight Commander of the Order of Saint Ignatius of Antioch.

He enjoyed spending time with his family, ping pong, backgammon, Arabic poetry, and traveling.

Memorial gifts to the Church would be appreciated. Arrangements are entrusted to William W. Tripp Funeral Home (Tripp funeralhome.com). ❖

**THOMAS McCAULEY, MD**, 67, of Narragansett, passed away May 31, 2023.

Dr. McCauley was a 1974 graduate of LaSalle Academy. At Boston College he ranked first in his class and Phi Beta Kappa in his junior year. He later attended Brown University Medical School and became board-certified in internal medicine. Dr. Tom's ophthalmology residency was at Yale University. In addition to his private practice, he was a clinical assistant professor of surgery at Brown.

Despite all his professional achievements, what mattered most to Dr. Tom was how he wanted people to be treated. In referencing Dr. McCauley, David Chang, MD, editor of the *Journal of Cataract and Refractive Surgery*, noted the following: "We ophthalmologists are blessed with amazing knowledge, training, and microsurgical skills. Let us not forget, however, the power and influence that come from simple acts of kindness and integrity without requiring such credentials."

Dr. McCauley is survived by his best friend and life partner Michele Palazzolo and several cousins.

Donations in Dr. McCauley's memory may be made to St. Jude's Children Hospital, 501 St. Jude Place, Memphis, TN 38105 or www.stjude.org/donate ❖

**ALEXANDER P. ROBERTSON, III, MD**, 54, of Barrington, passed away on May 24, 2023, surrounded by his loving family at the HopeHealth Hulitar Hospice Center, Providence after a courageous battle with brain cancer. He was the beloved husband of Michelle (DeRoche) Robertson and proud father of three cherished daughters, Anna S. Robertson of Mashpee, MA; Hope K. Robertson of Boston, MA, and Katherine T. Robertson of Barrington.

Alex spent his childhood in West Hartford, CT where he was introduced to the medical field at an early age by his father, Russell, who was an Ear, Nose and Throat surgeon at Hartford Hospital. Alex shared his father's passion for healthcare and chose to care for those in need above all else. Alex attended high school at the Loomis Chaffee School in Windsor, CT, where he excelled academically and athletically, graduating Cum Laude in 1987, serving as a member of the varsity soccer and lacrosse teams and as a nationally ranked squash player. Following high school, he completed his undergraduate degree at Dartmouth College in Hanover, NH, graduating in 1991, where he played varsity lacrosse and squash, was a member of the Chi Herot fraternity, and graduated Cum Laude. Before entering medical school, he spent a year working on the ski slopes in Telluride, CO.

Alex earned his medical degree at the University of Virginia in 1997 before completing his residency and Trauma Fellowship in orthopedic surgery at Brown University in 2002. He furthered his medical training at Pennsylvania Hospital in Philadelphia, where he completed a fellowship in Spine.

Alex joined University Orthopedics in 2004 as an Orthopedic Spine Surgeon. He was the recipient of the 2022 Excellence in Teaching Award at The Warren Alpert Medical School of Brown University Department of Orthopedics. He also won the award in 2015; this recognition underscores his exceptional dedication to teaching and mentorship. He was a beloved and attentive

doctor and took great pride in trying to restore a better quality of life to all of his patients.

In spite of all of his medical success, he was most proud of his three daughters. A devoted father, he was always there for his girls, coaching them all in numerous sports over the years and attending every one of their events and games. He was also a loving son and brother who cherished family traditions such as the annual Robertson Thanksgiving soccer tournament.

He was adventurous and had a deep love of the outdoors. As a young boy he traveled all over the world with his father, while developing a passion for fishing. In addition, he enjoyed skiing, mountain biking, kayaking, and hiking especially with his wife Michelle and beloved dogs, Clyde and Dublin. He also enjoyed all racquet sports including tennis, paddle tennis and squash.

It is with profound gratitude that the family would like to thank the staff at HopeHealth Hulitar Hospice for their care and compassion.

Contributions in Alex's memory may be made to the Special Olympics (https://support.specialolympics.org) and the American Brain Tumor Association (ABTA) (https://give.abta.org/give/261975/#!/donation/checkout) (ABTA) 8550 W Bryn Mawr Ave, Ste 550 Chicago, IL 60631.

For online condolences, please visit www.wrwatsonfuneralhome.com ❖

**CLARENCE H. SODERBERG, Jr., MD**, 96, of East Greenwich, died peacefully on May 15, 2023. He was married to his beloved wife, the late Beverly A. (Dorman) Soderberg for 54 years.

Affectionately known by many as "Doc" or "Soda," Clarence was a graduate of Cranston High School where he served as senior class vice president and earned varsity letters in baseball, basketball and football. Clarence was the first in his family to attend college. This made him eternally grateful to his older sister, June (Soderberg) Gifford, because the family could only afford one postsecondary education.

Clarence was admitted to Brown University in 1944. However, his education was interrupted by a call to serve his country during WWII, where he trained as a heavy weapons crewman before transferring to the Medical Corp. He also served in the armed forces in Korea.

In 1949, Clarence returned home and graduated cum laude with honors in biology from Brown. He then attended Tufts Medical School where he earned his medical degree and later completed his internship and surgical residency at Rhode Island Hospital. In 1959 he began his private surgical practice at Rhode Island Hospital. One of his proudest accomplishments was being part of the team that performed the first open heart surgery in Rhode Island. He would later become the Chief of Rhode Island Hospital's Second Surgical Service. Clarence also taught surgery at Brown University Medical School where he was a Clinical Associate Professor. This position earned him the Brown University, School of Medicine Emeriti Award for "outstanding service to medical education."

While working as a surgeon, Clarence was very active in national and international clinical research groups, authoring or co-authoring over 30 papers published in prominent surgical journals. He was chief of the Cancer and Acute Leukemia Study Group at the Rhode Island Hospital, served as the Secretary and Treasurer of the Rhode Island Chapter of the American College of Surgeons and on the Executive Committee of the New England Cancer Society.

After Clarence retired in 1995, he took to oil and watercolor painting and eventually became an exhibiting/artist member of the Providence Art Club. He also became an active leader in Rhode Island Freemasonry. As a proud Mason, Clarence quickly ascended to a 32nd Degree Mason, member of the Scottish Rite, The Master of St John's Lodge No. 1 in Providence, medical director of the Palestine Temple Shriners, member of the Board of Governors at the Shriner's Children's Hospital and a Knight Commander of the Temple.

For all his achievements in medicine and his involvement in community and philanthropic affairs, Clarence was inducted into the City of Cranston Hall of Fame in 2000.

He is survived by his children: Leslie Soderberg Deiss and her husband Jeffrey, Eric A. Soderberg and his wife Kathryn, Kurt A. Soderberg and his wife Elizabeth, and his much-loved grandchildren: Jeffrey Jr. and Caroline, Eric and Ellie, and Zachary and Gregory. He is predeceased by one sister, June (Soderberg) Gifford, of Cranston. ❖