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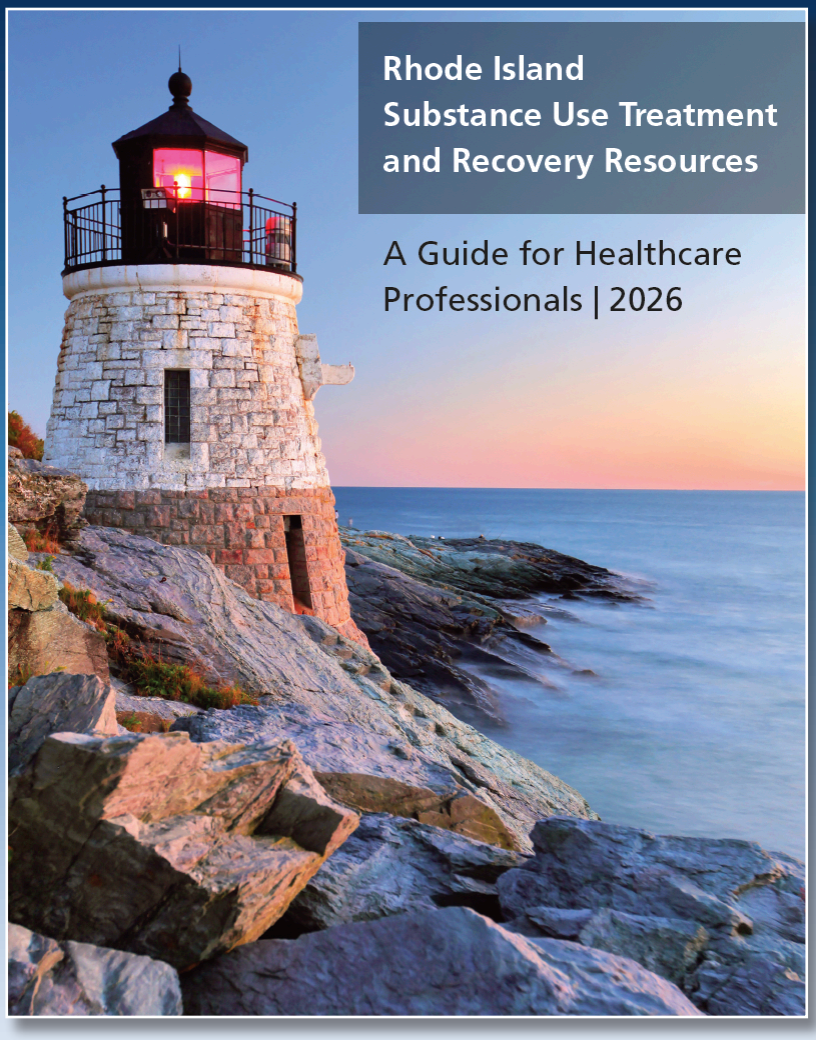

SPECIAL SECTION

BEHAVIORAL HEALTH, PART 2

GUEST EDITORS: SUZANNE E. McLAUGHLIN, MD; NATALIE FENN, PhD; PAUL M. WALLACE, MD

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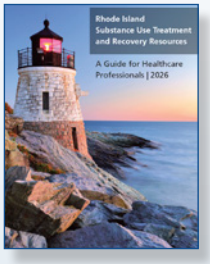
September: National Recovery Month

September is National Recovery Month, an annual observance dedicated to raising awareness about substance use disorders, mental health conditions, and the reality that recovery is possible. The observance is coordinated by the Substance Abuse and Mental Health Services Administration (SAMHSA), the federal agency responsible for behavioral health programs in the United States. For more information, visit: https://www.samhsa.gov/about/digital-toolkits/recovery-month/toolkit



RI Substance Use Treatment and Recovery Resources

Rhode Island offers a variety of behavioral health resources and services for people experiencing mental health and/or substance use conditions. Healthcare professionals are encouraged to use this resource guide to refer patients and/or clients of all ages (from children to adults) to services ranging from immediate crisis management and harm reduction to treatment and recovery support services.

Additional resources are available via the Rhode Island Department of Behavioral Healthcare, Developmental Disabilities & Hospitals (BHDDH) and PreventOverdoseRI.org.

The resource guide is available at: https://health.ri.gov/sites/g/files/xkgbur1006/files/publications/guides/RI-Substance-Use-Treatment-and-Recovery-Resources.pdf

SPECIAL SECTION
Behavioral Health, Part 2

SUZANNE E. MCLAUGHLIN, MD; NATALIE FENN, PhD; PAUL M. WALLACE, MD
GUEST EDITORS

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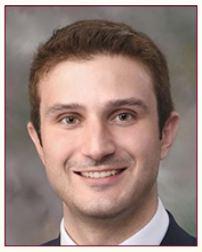
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Biological Embedding of Adverse Childhood Experiences: Neurobiological and Immune Mechanisms Linking Early-Life Stress to Addiction Vulnerability

SAMANTHA E. CLARK, MA; MOLLIE MONNIG, PhD; PETER MONTI, PhD

ABSTRACT

Adverse childhood experiences (ACEs) are associated with elevated risk for substance use disorders (SUDs), yet prevailing accounts often emphasize psychosocial pathways and reward-circuit recalibration without fully articulating immunobiological mechanisms that may converge on these processes. This narrative review advances a biological embedding framework linking early adversity to SUD vulnerability through two partially overlapping pathways: 1) stress–reward neurodevelopmental recalibration and 2) immune embedding with downstream neuroimmune feedback. Drawing on epidemiologic and mechanistic studies across developmental psychopathology, addiction neuroscience, and psychoneuroimmunology, we synthesize evidence that ACE exposure can produce enduring alterations in stress-regulatory systems (e.g., hypothalamic-pituitary-adrenal axis and autonomic function) alongside low-grade inflammatory phenotypes characterized by altered cytokine signaling and glucocorticoid sensitivity. We then highlight convergent evidence that peripheral immune activation can influence central reward and affective processes via microglial priming, cytokine-mediated modulation of monoaminergic systems (particularly dopamine), and tryptophan-kynurenine metabolism, potentially contributing to anhedonia, negative affect, and craving-relevant reinforcement dynamics. Next, we describe limitations of the present review and of the broader evidence base, as well as priority research directions. We conclude by arguing that integrating immune embedding with stress-reward recalibration may clarify one pathway by which ACEs confer SUD vulnerability and may inform trauma-informed, neurobiologically grounded approaches to prevention and treatment.

KEYWORDS: Adverse childhood experiences; substance use disorder; alcohol use disorder; biological embedding; inflammation

INTRODUCTION

Substance use disorders (SUDs) emerge from complex, multilevel processes that begin long before substance use initiation. Among the early-life conditions that shape these trajectories, adverse childhood experiences (ACEs) stand out as particularly consequential. ACEs comprise 10 forms of household-level adversity—including abuse, neglect, and chronic family dysfunction—that capture recurrent disruptions in caregiving environments during formative periods of development.[1,2] Across epidemiologic studies, higher ACE burden is associated with earlier initiation,[3] more rapid escalation,[4] and more persistent, hazardous substance-use trajectories.[4-6] These associations extend to SUD onset[7] and severity[3,4,8] and typically show dose–response gradients.[3,4,8] Clinical data parallel these trends. Individuals entering SUD treatment commonly report substantial early adversity,[9] and higher ACE scores often coincide with more severe disorder presentations,10 greater psychiatric comorbidity,[11] and more limited improvement during treatment.[12,13] Such findings indicate that ACEs are not merely correlates of substance misuse but formative conditions that alter developmental risk architecture, shaping how individuals engage with stress and reward across the lifespan.

The developmental impact of ACEs is increasingly understood through the framework of biological embedding, whereby early adversity calibrates the developing brain and body in enduring ways, shaping the maturation and long-term functioning of key regulatory systems.[14] In particular, two partially overlapping pathways appear especially influential in shaping vulnerability to substance use: 1) a stress–reward neurodevelopmental pathway, in which chronic activation of stress physiology alters the maturation and connectivity of limbic–prefrontal circuits; and 2) an immune-embedding pathway, in which sustained inflammatory activity feeds back on the brain through neuroimmune signaling. Together, these alterations may operate both independently and in concert, establishing a biological milieu in which substance exposure more readily promotes maladaptive, self-reinforcing use patterns. The sections that follow review epidemiologic evidence linking ACEs to substance-use trajectories and then synthesize mechanistic findings that clarify how early adversity becomes biologically embedded through these two pathways. We conclude with a description of limitations and future research directions.

EPIDEMIOLOGICAL FINDINGS ON ACES AND SUBSTANCE USE

ACEs are notable for the consistency and magnitude of their association with substance-related outcomes. Across large cohort and survey studies, higher ACE scores are linked to characteristic alterations in substance-use trajectories, including earlier initiation,[3] more rapid transition from experimentation to regular use,[4] and greater persistence of high-risk patterns into adulthood.[4,5] These developmental shifts correspond with substantial increases in risk. Individual ACE categories are associated with roughly two- to four-fold higher odds of early initiation of illicit drug use, and risk increases in graded fashion with higher cumulative scores.[15] At the highest levels of adversity, this gradient steepens further, with individuals reporting four or more ACEs exhibiting approximately four- to twelve-fold higher odds of problematic alcohol or drug use compared with those reporting none.[16,17] Importantly, these associations broadly generalize across alcohol, opioids, stimulants, and polysubstance involvement,[8] suggesting that early adversity confers a broad liability toward dysregulated reinforcement rather than a narrow, drug-specific vulnerability.

NEUROBIOLOGICAL EMBEDDING OF ACES (PATHWAY 1)

Stress System Adaptations

One way early adversity may shape SUD risk is by recalibrating the developing stress-response system, particularly the hypothalamic-pituitary-adrenal (HPA) axis. In typical development, cortisol secretion follows a diurnal rhythm and is tightly regulated by glucocorticoid receptor (GR)-mediated negative feedback.[18] Chronic childhood adversity, however, can disrupt this calibration. Excessive or recurrent HPA activation during sensitive developmental periods can induce adaptive but ultimately dysregulating changes in HPA set points and responsivity.[19-22] Studies of children and adults with high ACE exposure frequently document altered diurnal cortisol patterns, including flattened slopes and elevated afternoon or evening cortisol, as well as atypical cortisol reactivity profiles, with either blunted or exaggerated responses to acute stress depending on the timing, chronicity, and severity of adversity exposure.[19-24] These findings align with widely cited stress-response models positing an initial phase of hyperreactivity followed by counter-regulatory hyporeactivity under sustained demand.[20]

A common thread across these endocrine phenotypes is diminished GR sensitivity. Evidence from peripheral and central studies suggests that chronic early stress weakens the body's ability to regulate the HPA axis through cortisol, its primary glucocorticoid hormone. Peripherally, adolescents with adversity histories show elevated cumulative cortisol output alongside reduced suppression of T-cell activation by dexamethasone, consistent with partial glucocorticoid resistance.[25] At the neural level, ACEs such as childhood maltreatment have been linked to increased methylation of the exon 1F NR3C1 promoter and reduced GR mRNA expression in hippocampal tissue.[26] Moreover, because GRs are densely expressed in the amygdala, hippocampus, and prefrontal cortex, weakened feedback can prolong or dysregulate cortisol signaling in these regions, increasing susceptibility to structural and functional alterations.[24,27]

Neuroimaging findings provide support for this mechanistic account. In some functional imaging studies, ACE exposure is associated with heightened amygdala reactivity to emotional or threatening cues and reduced recruitment of medial and lateral PFC regions during cognitive control or reappraisal tasks in both adolescents and adults.[28,29] Structural imaging work similarly reports reduced hippocampal and, in some samples, smaller medial PFC and amygdala volume among those with documented childhood trauma.[28,30] Diffusion tensor imaging extends evidence from regional effects to circuit integrity, documenting weaker white-matter connectivity in frontal-limbic pathways, including tracts linking the amygdala and PFC.[29] Collectively, these results suggest a developmental calibration toward a stress-sensitized phenotype, wherein rapid bottom-up threat detection is more readily engaged and prefrontal modulation and hippocampal contextualization are less effective.[28,29] This phenotype is clinically meaningful because heightened negative affect in the setting of diminished regulatory capacity can make the rapid affective relief produced by substances especially reinforcing, amplifying risk for escalation and compulsive patterns of use.[31]

Reward System Adaptations

ACEs may also shape the development of the brain's reward circuitry.[8,32] The mesocorticolimbic dopamine system—encompassing dopaminergic neurons in the ventral tegmental area (VTA) and projections to the PFC, nucleus accumbens (NAc), amygdala, and hippocampus—underlies motivation, pleasure, and reinforcement learning.[32] This system undergoes protracted maturation from childhood through adolescence, making it particularly sensitive to environmental input.[32] Converging evidence suggests that early adversity can recalibrate this circuit, often in the direction of reduced responsiveness to natural rewards.[8,32] At the behavioral level, children and adolescents exposed to maltreatment or neglect frequently show dampened responsiveness to positive outcomes and altered reward-based learning.[8,32] On tasks that require rapid responding to obtain incentives, maltreated youth may respond more slowly, earn fewer rewards, or fail to adjust behavior when contingencies change.[8,32] They also often display increased impulsivity and risk-taking, which may reflect attempts to compensate for a muted sense of reward or difficulty integrating feedback about long-term consequences.[8,32] Mechanistically, these behavioral patterns are consistent with a reward system that is less responsive to everyday reinforcers and more prone to seek intense or immediate stimulation.

Neuroimaging work also provides support for altered reward processing following ACE exposure. Functional MRI studies report reduced activation of the ventral striatum during anticipation or receipt of rewards in individuals with childhood trauma histories.[32] This blunted ventral striatal response has been observed across various types of rewards, including monetary gains and social approval, and in both adolescent and adult samples.[32] Longitudinal studies further suggest that reduced ventral striatal activation during adolescence may help explain associations between early adversity and later depressive symptoms,[32] which themselves are robustly associated with problematic substance use.[33,34] Studies also report altered functional connectivity between reward regions and prefrontal areas, potentially reflecting compensatory or maladaptive attempts at regulation.[32] Although molecular data in humans are more limited, animal models of early stress show enduring changes in dopamine receptor expression and firing patterns in mesolimbic pathways, consistent with a shift in the sensitivity and tuning of the reward system.[32,35]

The clinical implications of a hyporesponsive reward system are substantial. If typical sources of pleasure and motivation fail to produce adequate dopaminergic signaling, individuals may experience chronic anhedonia and low drive,[36] which can make the pharmacological effects of substances especially salient.[35] Psychoactive drugs provide a rapid and large-amplitude increase in dopaminergic activity in the NAc, temporarily overcoming endogenous reward deficits.[35] In this context, substances can function not only as tools for numbing negative affect,[31] but also as means of briefly normalizing a chronically blunted reward state. This dual role, i.e., relief of distress and enhancement of otherwise muted reward, provides a powerful learning signal that can set the stage for repeated use and, eventually, addiction.[8,31]

IMMUNE EMBEDDING OF ACES (PATHWAY 2)

In parallel with these neuroendocrine and neural alterations, early adversity is increasingly understood to leave a durable imprint on the immune system. These alterations can be understood in part through stress-related shifts in autonomic regulation. Repeated activation of the sympathetic branch—which mediates the "fight-or-flight" response—promotes sustained catecholamine release,[37] engaging transcriptional programs that bias immune cells toward proinflammatory gene expression, notably via nuclear factor κB (NF-κB)–mediated signaling.[25] Concurrently, chronic recruitment of the HPA axis can generate persistent elevations in glucocorticoids, fostering partial resistance across time.[25] As this resistance emerges, glucocorticoids lose their typical capacity to restrain inflammatory signaling pathways, including NF-κB, allowing proinflammatory activity to persist.[25] These pressures may help account for the increased basal levels of inflammatory mediators, including interleukin-6 (IL-6), tumor necrosis factor–α (TNF-α), and monocyte chemoattractant protein-1 (MCP-1), commonly observed in ACE-exposed individuals.[25,38-41]

Inflammation, in turn, communicates extensively with the brain. Circulating cytokines can access the central nervous system via humoral routes across the blood–brain barrier,[42] as well as through neural pathways such as vagal afferents.[43] Within the CNS, microglia and other glial cells respond to peripheral inflammatory signals by releasing additional cytokines, reactive oxygen species, and neuroactive metabolites that modulate synaptic plasticity and neurotransmission central to mood and motivation.[44] For example, inflammatory signaling can reduce dopamine synthesis by depleting tetrahydrobiopterin, an essential cofactor for tyrosine hydroxylase, and increase dopamine reuptake through upregulation of presynaptic transporters, effectively dampening dopaminergic tone in striatal regions.[45] In parallel, cytokine-induced activation of the kynurenine pathway can shift tryptophan metabolism toward neuroactive metabolites that influence glutamatergic transmission and neurotoxicity.[46] The net result is a neurochemical milieu characterized by anhedonia, fatigue, and motivational deficits—symptoms that overlap with both depression and early addiction vulnerability.[47]

Importantly, these immune processes may intersect directly with substance exposure. Alcohol, for example, increases intestinal permeability, facilitating translocation of bacterial lipopolysaccharide (LPS) into circulation.[48,49] LPS engages toll-like receptor 4 (TLR4) and stimulates NF-κB–mediated cytokine production, amplifying cytokine release and promoting systemic immune activation.[50] Preclinical models indicate that TLR4 activation enhances alcohol intake, raising the possibility that gut-derived inflammation may feed back to sustain some types of substance use.[51] Human studies similarly show that elevated inflammatory markers such as IL-6 and C-reactive protein are associated with heavier substance use and poorer treatment outcomes. For example, in opioid use disorder, higher circulating IL-6 predicts greater ongoing drug use, poorer methadone adherence, and increased risk of early dropout.[52] Parallel neuroimmune evidence for alcohol use disorder indicates that chronic heavy drinking elevates central cytokines, including MCP-1 and IL-6, and engages neuroinflammatory cascades linked to craving and negative affect.[53] From this perspective, inflammation functions not only as a downstream consequence of ACEs and substance use but may also serve as an active mechanistic contributor that shapes reward sensitivity, negative affect, and craving.

LIMITATIONS OF PRESENT REVIEW

The account developed in this review is necessarily selective. For clarity and space, ACEs were treated as a cumulative exposure, and substance use outcomes were discussed

at an aggregate level, prioritizing shared biological pathways over fine-grained distinctions. Yet both domains are heterogeneous in ways that almost certainly matter for etiology. Different ACE constellations (e.g., threat-related versus deprivation-related exposures) likely engage partially distinct neurodevelopmental mechanisms,[28] even as they converge on overlapping stress, reward, and immune phenotypes. Likewise, alcohol, opioids, stimulants, cannabis, and polysubstance patterns differ in their pharmacology, social context, and temporal course. Collapsing across ACE categories and substances is useful for highlighting general liability but risks obscuring subtype-specific mechanisms and opportunities for tailored intervention. Future work that systematically compares dimensional representations of adversity and profiles of substance use, while simultaneously modeling socioeconomic hardship, community violence, and other socioecological stressors, will be critical for distinguishing what is common versus specific across these pathways.[8,28]

The mechanistic evidence reviewed here also rests on several important methodological constraints. Many of the most detailed biological data are derived from preclinical models that allow precise control of timing, dosage, and context of early stress and drug exposure but cannot fully capture the complexity of human adversity or the social meanings of substance use. Available human studies often rely on retrospective reports of ACEs, which are vulnerable to recall bias and are predominantly observational. Longitudinal cohorts with prospectively assessed adversity, repeated multimodal biomarkers, and careful attention to the timing and chronicity of exposures are relatively rare. Moreover, the present review focused exclusively on biological embedding and did not systematically address developmental processes (e.g., social learning, parental/peer modeling, cultural norms) that interact with biological vulnerabilities to shape real-world use trajectories. Resilience processes were also excluded from the present review. Yet emerging work suggests that supportive caregiving, stable relationships, and resource-rich environments can buffer or even recalibrate regulatory systems following adversity.[54,55] Moving forward, the most informative research will likely be explicitly translational and multilevel: integrating animal and human paradigms; combining neuroendocrine, immune, and neuroimaging measures with dense behavioral and contextual data; using quasi-experimental and causal inference methods where possible; and testing interventions that target stress regulation, reward engagement, and inflammatory processes as modifiable mechanisms. Such work is essential for moving beyond documenting risk to identifying levers that can alter developmental courses set in motion by early adversity.

CONCLUSION

ACEs may increase SUD vulnerability through biological embedding across stress, reward, and immune systems. Although this review focused primarily on ACE-related adaptations, rather than providing a comprehensive synthesis of neurobiology in established SUD, existing addiction research indicates that many of these same systems are perturbed in chronic substance use.[31] For some individuals, then, addiction may emerge in the context of a brain and body already calibrated toward high stress sensitivity, low natural reward, and elevated inflammatory tone, with substance exposure further exaggerating these patterns over time. Viewing SUD through this lens has important implications. Conceptually, it encourages integrated models that bridge developmental trauma research, addiction neuroscience, and psychoneuroimmunology, rather than treating these as siloed literatures. Clinically, it supports trauma-informed, neurobiologically grounded approaches to prevention and treatment.

For ACE-exposed youth at elevated risk, early prevention efforts and interventions that reduce ongoing stress exposure, support caregiving quality, and foster emotion regulation, reward engagement, and health-promoting behaviors may help recalibrate stress, reward, and immune systems before substance use begins. For treatment-seeking adults with significant adversity histories, incorporating strategies that directly target stress dysregulation, reward deficits, and inflammatory burden—alongside traditional substance-focused approaches—may improve outcomes beyond what is achievable with pharmacotherapy or psychosocial treatment alone. Finally, the concept of biological embedding underscores that while early adversity can have profound and lasting effects, these effects are not necessarily irreversible. The same plasticity that allows stress and inflammation to shape developing neural circuits also creates opportunities for repair and adaptation across the life course. Continued research into the mechanisms linking ACEs to SUD, and into interventions capable of modifying those mechanisms, holds promise for reducing the burden of addiction by addressing its developmental roots.

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Impact of Maternal Smoking During Pregnancy on Fetal and Neonatal Neurobehavioral Development: A Narrative Review

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ABSTRACT

BACKGROUND: Maternal smoking during pregnancy (MSDP) remains a common source of prenatal drug exposure worldwide. MSDP has been shown to increase fetal health risks and interfere with fetal development. Although newborns prenatally exposed to other substances (e.g., opiates, benzodiazepines) have been shown to have increased stress and withdrawal symptoms, few studies have explored the effect of MSDP on the fetal and neonatal periods.

METHODS: We performed a comprehensive search for empirical research articles investigating the effects of MSDP on fetal and neonatal neurobehavior and signs of abstinence in PubMed and PsycINFO databases. Our search yielded 11 fetal and 14 neonatal empirical articles published between 1980 and 2025.

RESULTS: In the fetal period, MSDP-exposed fetuses showed decreased fetal heart rate variability, and fetal movement and reactivity vs unexposed fetuses. In the early neonatal period (birth to five days), MSDP-exposed newborns showed increased excitability, irritability, need for handling, arousal, and alertness. In the late neonatal period (10 to 35 days), studies found MSDP to have an effect on neonatal self-regulation, attention, quality of movement, abnormalities in reflexes, lethargy, need for handling, and stress signs.

CONCLUSIONS: Our review of the literature revealed that MSDP has been associated with alterations in behavior suggestive of potential abstinence symptoms, especially found for excitability, irritability, hypertonicity, attention, reflex abnormalities, and stress/abstinence signs. Additional rigorous research needs to delineate the impact of MSDP on fetal and neonatal signs of abstinence to improve infant health.

KEYWORDS: pregnancy; smoking; infant; fetal; behavior; neurodevelopment; tobacco

INTRODUCTION

Although prevalence of cigarette use in pregnancy has declined in the US (approximately 5% of live births), rates are disproportionately higher in poor, young, Indigenous and Non-Hispanic White, and underserved populations, and in studies involving biochemical verification of tobacco use.[1] Further, rates of prenatal use of other nicotine and tobacco products (e.g., electronic cigarettes, hookah) continue to increase, and cigarette exposure remains a relevant behavioral health concern and common prenatal drug exposure worldwide.[2] In contrast to recreational use of other substances, cigarette use most commonly represents a repeated, daily habit that leads to consistent nicotine exposure to fetuses. Although rates of spontaneous quitting are increasing, a recent systematic review suggests that pregnant women who continue to smoke during pregnancy will do so into the last trimester.[2] This behavior continues to represent a major behavioral and public health problem, yet limited literature exists examining fetal and neonatal outcomes of maternal smoking during pregnancy (MSDP).

MSDP has the potential to interfere with fetal development in several ways, including intrauterine growth restriction, neuronal development, and epigenetic programming of placenta.[3-5] Neurobehavioral development can also be disrupted. Neurobehavior can be defined as the bidirectional relationship between biological impacts of the nervous system and behavioral output, such that infant neurobehavior is the one of the earliest observations of the integration of neurological, cognitive, emotional, and behavioral functioning.[6] Our recent paper used a novel, fetal, neurobehavioral-assessment system (FENS) to examine the relationship between MSDP and fetal neurobehavior.[7] We found fetuses exposed to MSDP had heightened fetal activity and increases in isolated head and limb movements. For infant outcomes, MSDP has been known to cause neonatal morbidity, mortality, and sudden infant death syndrome.[8-10] A meta-analysis investigated the impact of MSDP on pregnancy outcomes in 28 birth cohorts, with findings suggesting that MSDP is associated with small gestational size and preterm birth.[11] This relationship has been well-demonstrated in the literature, and therefore our review will solely focus on neurobehavior and not gestational growth or birthweight.[11,35]

A systematic review from Frogratt and colleagues reviewed 17 peer-reviewed articles investigating prenatal tobacco exposure on infant neurobehavior and temperament within the first year of life.[12] Within their review and meta-analysis, findings indicate that exposed infants had medium effect sizes for negative affect, attention, excitability, irrita-

bility, and orientation and small effect sizes for muscle tone, regulation, and difficult temperament.[12] Reporting on infant neurobehavior in the first year is an important developmental milestone, yet literature cites that there are observable differences in neurobehavior during fetal and neonatal development that can suggest the earliest signs of fetal/neonatal stress and possible signs of nicotine abstinence.

The current narrative review expands on the work of Frogratt and colleagues to investigate the impact of MSDP on fetal and neonatal neurobehavioral development and to determine if we can observe any possible alterations in neurobehavioral development that could suggest stress/abstinence in utero or neonatal period.[12] Thus, the focus of the current narrative review expands the literature by characterizing associations between MSDP and fetal and neonatal neurobehavior, including stress/abstinence symptoms.

METHODS

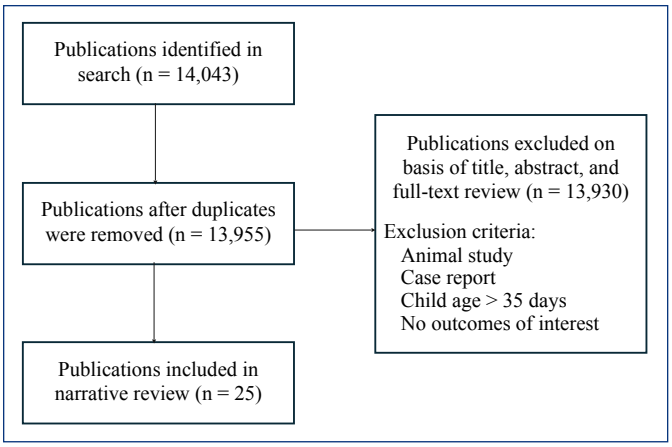
Eligibility Criteria and Search Strategy

A systematic review and meta-analysis on the impacts of maternal smoking during pregnancy and child neurobehavior within the first year of life was published in 2020. To extend findings to include the fetal and neonatal periods, the authors believed a narrative review with some systematic review methods would provide a thorough extension of the existing and niche literature.[12] Examining this specific window can provide insight into possible signs of neonatal abstinence to improve early detection and intervention. We performed a comprehensive literature search for empirical research articles investigating effects of MSDP on fetal and neonatal neurobehavior. We considered only peer-reviewed, original studies written in English published from 1980 to 2025. Two independent researchers screened studies for eligibility. PubMed and PsycINFO database searches used the search terms "pregnancy, maternal, and prenatal," "tobacco, cigarette, smoke, and smoking," and "neurobehavior, neurodevelopment, behavior, fetal, newborn, and neonatal," as well as backward searched of reference lists and forward searched of article citations. For the purposes of this narrative review, we define the early neonatal period as 0–5 days, and the late neonatal period as 10–35 days. Exclusion criteria included animal studies, case reports, infants over the age of five weeks, and studies that had intrauterine growth/birthweight as their only outcome. Our search yielded 25 empirical articles published between 1980 and 2025 for final analysis.

Selection and Data-Collection Process

Data collection was conducted by two independent researchers. The following information was extracted from each study: a) percentage of sample with MSDP exposure, b) average cotinine level for tobacco-exposed group (if reported), c) average cigarettes per day, d) number of neurobehavioral timepoints, e) type of tobacco, f) MSDP measurements, g) infant measurements, h) gestational or infant age, i) results, and j) study limitations.

Figure 1. Study Selection Diagram



Study Selection

The search resulted in 14,043 studies, and 13,955 were included after removal of duplicates. Broad terms were utilized to ensure research across disciplines, with varying terminology for pregnancy, smoking, and fetal/neonatal health, which resulted in a need to carefully review each study for relevance. After study titles and abstracts were reviewed, 13,930 studies were excluded for being animal studies, case reports, cohort studies about environmental or public health factors (e.g., pollution), examining outcomes outside of the fetal/neonatal window, examining fetal growth and birthweight as the sole outcome, and not being relevant to the goals of our review. Thus, 25 studies were given a full-text review [**Figure 1**].

Study Characteristics

The 25 studies included in the narrative review analyzed 2,850 infants and 419 fetuses with 1,408 of the infants/fetuses exposed to MSDP. Fourteen studies examined newborn neurobehavior outcomes and 11 studies examined fetal neurobehavioral outcomes. The neonatal studies were put into three categories: 1. Early Neonatal Outcomes (e.g., birth to five days postpartum), 2. Late Neonatal Outcomes (e.g., 10 to 35 days postpartum), and 3. Longitudinal Outcomes (e.g., any study with multiple measurement points between birth and 35 days postpartum). Fetal studies came from five countries and neonatal studies came from six countries.

RESULTS

Fetal Outcomes

Fetal neurobehavioral development was measured in 419 fetuses during 20- to 38-weeks' gestation. The primary constructs assessed were fetal heart rate variability and fetal

activity. Across 11 studies, 235 mothers engaged in smoking during pregnancy (56% of all pregnancies), and measured neurobehavioral outcomes using the Behavioral Reactivity Scale adapted from the Neonatal Behavioral Assessment Scale and Fetal Neurobehavioral Coding System. Fetal heart rate and motor activity was assessed using vibroacoustic stimuli, and maternal smoking during pregnancy was measured using salivary, carbon monoxide, and plasma samples, in addition to self-reporting cigarette use. Several studies reported decreased heart rate variability in fetuses with MSDP exposure, which can be a proxy for fetal distress.[13-15] Several studies also reported lower movement in fetuses with MSDP exposure, which included overall movements or solely trunk movements.[7,13,15,16] Some studies found differences in fetal activity such that fetuses with MSDP exposure had more small, isolated head and limb movements; whereas other studies found that fetuses were less reactive to stimuli or did not find any difference in fetal movements.[17-20] Cowperthwiate and colleagues found that fetuses exposed to MSDP had delayed recognition of maternal voice compared with non-exposed fetuses, and Thaler and colleagues (1980) reported increased breathing in MSDP-exposed fetuses.[21,16] Lastly, Gringas and colleagues did not report a significant difference in developmental or behavioral outcomes between exposed and non-exposed infants.[23]

Early Neonatal Outcomes

Early neonatal outcomes were measured from birth to five days postpartum in 1,868 infants. Across eight studies, 756 infants had MSDP exposure and their neurobehavioral outcomes were measured using NICU Network Neurobehavioral Scale, Finnegan scores, Graham-Rosenblith Behavioral Examination of the Neonate, Lipsitz score, Brazelton Neonatal Behavioral Assessment Scale, and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. One of the key features noted across studies was increased excitability and irritability, and increased difficulty with regulation and consolability.[23-27] Several studies also document increased arousal as well as decreased alertness and attention.[23,7,27,28] Two studies reported the impact of withdrawal and abstinence on infants.[23,25] Interestingly, two studies had conflicting results related to muscle tone, such that Law and colleagues reported hypertonicity, and Godding and colleagues reported hypotonicity and decreased reflexes.[25,28] Lastly, there was a trend in the literature suggesting a dose-response relationship between cigarettes per day, cotinine levels, stress, and neurobehavioral functioning. Law and colleagues documented a dose-response relationship between more cigarettes per day/increased cotinine levels, and increased stress and signs of abstinence, such that as cigarette use and cotinine levels increased abstinence symptoms increased.[25] Godding and colleagues also observed a dose-response relationship between cotinine levels and reduced neurological functioning as measured by a neurological exam and Finnegan scores, such that increased cotinine levels have an inverse effect on neurological functioning in infants exposed to tobacco.[28]

Late Neonatal Outcomes

Late neonatal outcomes were measured from 10 to 35 days postpartum in 555 infants. Across four studies, 179 infants had MSDP exposure and their neurobehavioral outcomes were measured using NICU Network Neurobehavioral Scale and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. Multiple studies both found decreased self-regulation.[29-31] Froggatt and colleagues also reported decreased motor quality and an increase in abnormal reflexes. Stroud and colleagues also reported that infants with MSDP exposure had an increased need for handling and increased arousal and excitability.[29,30] Yolton and colleagues reported both neurobehavioral and racial differences across infants with MSDP exposure.[31] MSDP-exposed infants demonstrated lower attention and quality of movement as well as increased stress and lethargy compared to infants without exposure.[31] Notably, racial differences between Black and White infants were observed across arousal, excitability, attention, and hypotonicity. Of particular significance, Wiebe and colleagues was the only study in the systematic review that reported there were not any differences between infants with and without exposure to tobacco across irritability, attention, and stress dysregulation.[32]

Longitudinal Neonatal Outcomes

Studies that included a longitudinal design for examining neonatal outcomes had multiple measurement points between birth and 35 days postpartum in 404 infants. These two studies included 196 infants with MSDP exposure, and their neurobehavioral outcomes were measured using Network Neurobehavioral Scale and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. Only two studies have examined the longitudinal effects of MSDP with both assessing different neurobehavioral domains. Stroud and colleagues reported decreased attention and self-regulation across the first month of life, as well as increased lethargy and need for handling.[4] Epsy and colleagues found differences in attention at two days postpartum, yet those effects dissipate by four weeks postpartum. There also were not any significant differences in stress dysregulation and irritability across MSDP-exposed and non-exposed infants.[33]

DISCUSSION

This review aimed to synthesize the research on MSDP on fetal and neonatal neurobehavior to see if there could be early possible signs of stress or abstinence. Broadly, our review indicates that there are significant differences in fetal and neonatal neurobehavior as it relates to MSDP, which could suggest neonatal abstinence.

Further, fetal and neonatal neurobehaviors discussed in this review overlap with the clinical presentation of neonatal abstinence syndrome, including irritability, excessive crying, and difficulty soothing the baby.[34] Our review can expand on these findings by identifying early neurobehavioral patterns in utero and within the first month of life. With regards to fetal outcomes, the synthesis of our review yielded that fetuses with MSDP exposure had lower heart rate variability and, on the whole, lower fetal activity.[13-15,17-19] This finding comes with some nuance about the type and timing of fetal movement, such that MSDP may have increased isolated movements of their head and limbs (e.g., tremors) yet fewer trunk movements.[17] Taken together, these findings could suggest the presence of fetal distress as an immediate consequence of MSDP and, broadly, throughout gestation. However, further rigorous research is warranted as some studies did not find any significant differences across MSDP exposure.[20] For the early neonatal period, the literature suggests associations between MSDP exposure and hypertonicity, greater need for handling, more stress signs, and greater irritability within the first few days of life.[23-28] Two studies identified signs of stress, withdrawal, and abstinence.[23,25] In the late neonatal period, MSDP exposure was associated with worse self-regulation, increased need for handling, greater arousal and excitability, lower scores on attention, poor quality of movement, and increased stress signs.[29-31] For longitudinal studies, findings suggest that MSDP in the first month of life is associated with decreased attention and self-regulation, increased lethargy and need for handling, and no differences in irritability and stress dysregulation.[4,33] In sum, this review uniquely follows the trajectory of fetal and neonatal neurobehavioral development with alterations in behavior, suggestive of possible nicotine-abstinence symptoms. Decades of literature has documented the adult symptoms of nicotine withdrawal, including irritability, fatigue, and anxiety, and our review demonstrated a possible overlap with fetal and neonatal symptoms of withdrawal.[35]

From a clinical perspective, these findings can offer additional information about fetal and neonatal health to supplement smoking-cessation interventions. This information can be beneficial for both general smoking-cessation programs and prenatal smoking-cessation interventions to educate women on the immediate health impacts of prenatal smoking exposure. Similarly, our review can inform intergenerational behavioral-health interventions, as our findings could promote new postpartum and neonatal-care standards. For example, evidence-based protocols for neonatal abstinence syndrome, such as eat, sleep, console, could be useful for neonates with MSDP exposure.[36] Ultimately, our findings can further the scientific understanding of fetal and neonatal neurobehavioral development as it relates to nicotine abstinence and, in turn, inform behavioral-health i nterventions for mother and baby.

Although all of the studies in this review identify significant outcomes associated with MSDP, there are limitations. Many have a small sample size, low levels of smoking exposure, or used an unvalidated neurobehavior measure. Several studies did not include biochemical verification to measure nicotine exposure, which would have strengthened the ability to identify the impacts of MSDP. Furthermore, only two studies conducted assessments in the early neonatal period and repeated in the later neonatal period. Future research needs to delineate the impact of MSDP on fetal and newborn signs of abstinence to improve infant health.

CONCLUSIONS

MSDP is associated with poor infant outcomes, yet 5% of women continue to smoke during pregnancy.[1] Substantial research concludes that smoking during pregnancy has a causal effect on birthweight.[35,37] However, few studies have determined whether MSDP has an effect throughout gestation and into the neonatal period. MSDP exposure was associated with lower fetal heart rate variability, as well as hypertonicity, greater stress signs, and more need for handling in neonates. Neonatal studies, both in the first few days of life into the first month, suggest increased excitability, arousal, stress, and need for handling. These fetal and neonatal neurobehavioral alterations due to MSDP are suggestive of potential stress and abstinence symptoms. Given the known withdrawal effects of smoking cessation in adults and withdrawal symptoms caused by other drugs, we provide early evidence for possible fetal and neonatal abstinence from nicotine from observable differences in neurobehavioral development.

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Glucagon-Like Peptide-1 Receptor Agonists Therapy: The Biological Bridge Across Comorbidities in Behavioral Health

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INTRODUCTION

When providing comprehensive treatment to people with behavioral health conditions, comorbidity is the rule, rather than the exception. Approximately 50% of people with a mental illness also have a diagnosis of at least one additional chronic health problem, such as pulmonary, infectious, or cardiovascular diseases, with obesity and substance use disorders (SUDs) serving as significant predictors of individual health problem severity.[1] Patients with mental illnesses, including schizophrenia, major depression, and bipolar disorder, are known to exhibit a "mortality gap," with a reduced life expectancy compared to the general population.[2] Patients with schizophrenia, for example, exhibit a reduced life expectancy of 10–20 years.[3,4] Notably, despite the increased risk of suicide with severe mental illness, the primary cause of death in this group is cardiovascular disease. These findings reflect the importance of addressing comorbid physical health problems such as respiratory diseases, cancer and, most prevalently, cardiovascular disease resulting from obesity and hypertension.[5]

In this context, glucagon-like peptide-1 receptor agonists (GLP-1 RAs) represent an intriguing tool to potentially treat metabolic and mental health comorbidities simultaneously. Randomized clinical trials (RCTs) have established the efficacy of GLP-1 RAs in improving metabolic outcomes, and emerging preclinical and observational human data also suggest that GLP-1 RAs influence pathways relevant to stress[6] and reward processing[7,8] that could positively impact behavioral health outcomes, particularly in the realm of SUD. While these effects require further investigation using adequately powered RCTs with primary neuropsychiatric endpoints,[9] initial research suggests favorable impacts on mental health. As GLP-1 RAs become more widely available and are tested in a larger patient population, it is important to consider the current neuroscience and clinical evidence that shows how these tools may evolve for combined management of metabolic and mental health needs.

NEUROSCIENCE OF GLP-1 RECEPTOR AGONISM

GLP-1 is an endogenous peptide produced in the endocrine L cells of the intestine and the nucleus tractus solitarius of the brain, and its receptors are located in a host of regions throughout the gut and brain.[10] While early GLP-1 RA drugs were single-molecule therapies, the therapeutic landscape has since expanded to include dual-agonist approaches. Examples include FDA-approved tirzepatide, a GLP-1/Gastric Inhibitory Peptide (GIP) RA, and the investigational drug CagriSema, a combination of GLP-1/amylin analogue cagrilintide, which engage two pharmacologically distinct targets to maximize metabolic and behavioral outcomes. These dual agonists exert a powerful "double-hit" by operating simultaneously on receptors in the periphery and central nervous system. Peripherally, they enhance glycemic control and slow gastric emptying. With respect to alcohol, this blunts and delays the increase in blood alcohol concentration,[11] which can reduce immediate reinforcing effects.[12] Centrally, these medications penetrate the blood-brain barrier to target two distinct pathways: the GLP-1 component modulates dopamine signaling in the nucleus accumbens to dampen reward-seeking, and the second agonist (i.e. GIP or amylin) works synergistically in the hypothalamus and brainstem to increase satiety and further reduce the salience of addictive triggers. More recent Phase II and Phase III trials are systematically investigating this dual-target mechanism not only to improve metabolic dysfunction (weight loss and insulin sensitivity) but also to reduce behavioral responses, such as craving, that reinforce SUDs.

The more nuanced question that remains to be answered about GLP-1 RAs is: how exactly do they exert their effects on metabolic and reward pathways? A growing body of research suggests that the answer may lie in GLP-1 RAs modulating a shared biological substrate: chronic, systemic inflammation. Inflammation is a shared risk factor for metabolic and mental health disorders and can perpetuate comorbidity. For example, depression increases cortisol and inflammation, which can increase risk for type 2 diabetes.[13] Conversely, the physiological stress of chronic illnesses like diabetes or migraines promotes an inflammatory state that increases risk for major depressive episodes.[14] More recent clinical research is now also evaluating inflammation as a link between the development of PTSD[15] and comorbid alcohol use disorder (AUD).[16]

GLP-1 RA-mediated reduction of peripheral inflammation is well established, and its effect is greater than other FDA-approved anti-diabetic drugs.[17] They act as powerful anti-inflammatory agents, lowering circulating cytokines (e.g. IL-6),[18] C-reactive protein (CRP),[19] and inhibiting activation of microglia, the immune cells of the brain.[20] This attenuation of systemic and central inflammation is thought to help mood symptoms by alleviating the "fog" associated with depression,[21] and reduce the salience of rewarding stimuli, effectively quieting both, and substance-related craving in patients with SUD.[22] Importantly, real-world data obtained from patient electronic health records has shown that GLP-1 RAs are associated with a lower risk of suicidal ideation and self-harm compared to other diabetes medications,[23,24] though whether this can be attributed to decreased neuroinflammation remains to be tested. Future studies will need to examine possible anti-neuroinflammatory mechanisms of GLP-1 RAs more closely, ideally with a combination of biomarker and neuroimaging approaches to determine whether GLP-1 RAs decrease central inflammation in a manner that functionally alters reward or limbic circuits.

CLINICAL TRIAL HIGHLIGHTS

After early trials demonstrated the ability of GLP-1 RAs to reduce metabolic dysfunction, additional studies sought to investigate the effectiveness of GLP-1 RAs on a broader array of conditions spanning physical and behavioral health. In particular, the ability of GLP-1 RAs to reduce craving-like preoccupation with food (i.e., "food noise"),[25-27] along with GLP-1 receptor expression in addiction circuitry, and reports of incidental decreases in substance use while on GLP-1 RAs spurred interest in these medications as treatments for AUD[28] and other SUDs.[29] To date, GLP-1 RA effects on AUD have been the most studied, with encouraging initial results.

While the first GLP-1 RA RCT testing found no reduction in heavy drinking days with exenatide compared to placebo,[30] subanalysis identified decreased drinking among individuals with BMI >30, raising the question of whether GLP-1 RAs might be more effective at reducing drinking in obese individuals. Another RCT evaluating nicotine abstinence following smoking cessation found no difference in abstinence with dulaglutide due to a strong placebo effect.[31] However, a secondary analysis found that dulaglutide *was* associated with a significant decrease (29%) in weekly drinking.[32] Notably, the dulaglutide study population was predominantly obese, adding further support to GLP-1 RAs potentially exhibiting stronger effects in this population. GLP-1 RA mediated reduction in drinking is also supported by an RCT that found semaglutide reduced alcohol craving and drinks per drinking day.[33] Clinical trials for other SUDs remain in early stages but will also examine GLP-1 RAs for cocaine use disorder (NCT07227948),[34] cannabis use disorder (NCT07523633), and opioid use disorder (NCT04199728,[35] NCT06548490).

Clinical trials are also exploring the utility of GLP-1 RAs in other meaningful areas of mental health, particularly with respect to mitigating the metabolic side effects of antipsychotic use. A recent study in Denmark found that semaglutide significantly decreased blood glucose, decreased body weight, and increased physical quality of life among patients with schizophrenia, obesity, and prediabetes.[36] Additional work demonstrates similar effects in patients on clozapine without affecting clozapine concentration or worsening psychotic symptoms.[37] These findings are particularly meaningful, as the metabolic side effects of antipsychotics are a common reason for treatment discontinuation. While it remains to be seen whether GLP-1 RAs could be a primary treatment for conditions like bipolar disorder or psychotic disorders, they may indirectly improve mental health outcomes by mitigating antipsychotic-induced metabolic side effects and thereby increasing adherence to treatment. Clinical trials in the future should examine the impacts of GLP-1 RAs on antipsychotic initiation and adherence.

CONCLUSION

Overall, research suggests that there is great potential for GLP-1 RA therapies to address comorbid medical and mental health conditions, though additional studies are needed. GLP-1 RAs are currently approved for metabolic indications, and RCTs will need to specifically test GLP-1 RAs with a variety of mental health outcomes before these medications can be utilized for such purposes. If supported by the evidence, their use would be well-suited for collaborative care settings, particularly with respect to management of SUDs. Within an integrated care system, GLP-1 RAs could facilitate treatment by curbing dysregulated appetite, improving physical functioning, and/or reducing craving intensity, potentially allowing for more effective engagement with behavioral therapies. By addressing comorbid conditions through a shared mechanism of inflammation, GLP-1 RAs represent an exciting area of ongoing research with multiple potential disease applications.

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Implementing Mental Health and Substance Use Screening at a Sexual Health Clinic

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ABSTRACT

PURPOSE: Sexual and gender minority (SGM) individuals experience heightened mental health problems and substance misuse. Improved approaches to screening for behavioral health in this population are needed. We evaluated the implementation of a digital intake platform incorporating behavioral health screenings at a sexual health clinic serving SGM individuals.

METHODS: Patients presenting to a sexual health clinic March 2021 through April 2023 were screened for depression, hazardous drinking, and illicit substance use using a digital intake platform. To identify SGM subpopulations most in need of services, we evaluated relationships between demographic and sexual health factors and depression, hazardous drinking, and illicit substance use.

RESULTS: In total, *N*=1,277 people presented for care; 28% identified as gay/lesbian, 30% as bisexual+ (attracted to more than one gender), and 12% as transgender/gender diverse. Thirteen percent reported a sexually transmitted infection in the past 12 months, 11% screened positive for a depressive disorder, 50% for hazardous drinking, and 26% for illicit substance use. Individuals 18–39 years were more likely to be depressed than adults 40+, and transgender/gender diverse individuals had 1.93-fold greater odds of depression than cisgender men. Regarding substance use, cisgender men had 2.42-fold greater odds of use compared to cisgender women, and lesbian/gay individuals had 5.08-fold increased odds compared to heterosexual individuals.

CONCLUSION: A digital intake platform for behavioral health screening identified SGM at risk for depression and substance use challenges within a sexual health clinic. This protocol was able to identify subpopulations at higher risk for these disorders, increasing opportunities for recognition and response.

KEYWORDS: sexually transmitted infections; mental health; substance use; sexual and gender minorities

INTRODUCTION

Sexual and gender minority (SGM) groups experience a significant burden of mental health problems and substance misuse.[1-4] Meta-analytic data demonstrate that sexual minority individuals are 2.5 times more likely to have a lifetime history of a mental health condition and twice as likely to report a current mental health condition than their heterosexual counterparts.[5] These numbers are even higher among transgender adults, who have prevalence rates of depression between 28% and 64%.[6-8] SGM individuals also report higher rates of substance use than cisgender heterosexual individuals.[3,9,10] According to data from the 2021–2022 National Surveys on Drug Use and Health, about one-third of bisexual males, bisexual females, and gay males met criteria for a substance use disorder within the past year, and one-fourth of lesbian females met criteria.[11] Given the high disease burden of these conditions among SGM individuals, new approaches are needed to screen and implement behavioral health services for this population.

Screening, which results in early detection and treatment of behavioral health problems, can improve quality of life, help contain healthcare costs, and reduce complications from co-occurring behavioral health and medical comorbidities.[12] Major clinical organizations including the United States Preventive Services Task Force recommend screening in primary care settings specifically for mental health and substance use.[13,14] However, national surveys of mental health screenings by physicians have been found to be significantly low (<5%),[15] largely driven by a lack of adequate resources and infrastructure.[12] It is crucial to mitigate these gaps in screening, especially among SGM populations given the high burden of disease. In prior studies, SGM individuals reported greater difficulty accessing healthcare than heterosexual, cisgender individuals. In a study of N=2,031 SGM individuals, 18.8% reported healthcare denial or lower quality care within the past year for medical settings and 12.5% for mental health settings.[16] Novel approaches to engaging SGM for the purposes of behavioral health screening and treatment are needed.

Sexual health clinics may be ideal settings to screen and engage SGM populations for mental health conditions like depression, as well as alcohol and substance use disorders.[17–19] Sexually transmitted infections (STIs) frequently co-occur with mental health and substance use disorders.[20-23]

Compared to heterosexual and cisgender individuals, SGM individuals experience increased risk of these co-occurring conditions.[20] These intersectional epidemics of STIs, mental health and substance use disorders—or syndemics—occur at higher rates within SGM populations due to stressors associated with living beyond societal norms of heterosexuality and binary expressions of gender (e.g., man or woman). According to minority stress theory, SGM individuals experience unique and chronic stressors such as stigma and discrimination, which then require individuals to adapt to a hostile social environment in ways that negatively affect mental and physical health outcomes.[5,24,25] Moreover, holding multiple marginalized social identities (e.g., identifying as African American/Black and experiencing racism; living in a low-income household and experiencing classism) confers additional risk for STIs, mental health conditions, and substance use disorders.[26]

Screening for mental health conditions and substance use disorders at sexual health clinics presents a public health opportunity to identify and treat SGM populations experiencing a high burden of these conditions. However, little is understood about how to best identify, diagnose and connect SGM individuals to behavioral health services. In 2021, our sexual health clinic implemented a digital intake platform that systematically screens all individuals presenting for services. The current study explored this platform's ability to identify depression, hazardous drinking, and illicit substance use among those screened. To better understand SGM subgroups most in need of behavioral health services, we examined relationships between demographic and sexual health factors as independent variables, and depression, hazardous drinking, and illicit substance use as dependent variables.

METHODS

Participants and Procedures

We reviewed demographic and behavioral data of patients who presented to a sexual health clinic from March 2021 through April 2023. The community clinic is co-located with a primary care center serving predominantly SGM patients in an urban area of New England. The sexual health clinic offers screenings for all major STIs, including HIV, syphilis, gonorrhea, and chlamydia. Given the increased burden of mental health conditions and substance misuse in the SGM community, we developed a digital intake platform that leverages FileMaker (Developed by Claris International, a subsidiary of Apple, Inc.). Use of this HIPAA-compliant platform does not require additional consent from patients and is considered part of standard patient care within the sexual health clinic. All patients systematically complete a brief demographic and clinical survey during the intake process. This platform allows the clinic to create unique, adaptable, and integrated data systems and reporting tools, which includes the addition of validated clinical screening measures for mental health conditions, STI history, and substance use. Patients complete measures either at a kiosk system in the lobby or through their individual cellphones. The FileMaker system allows for bi-directional Application Programming Interface (API) communication and can push self-reported data into a patient's electronic medical record (EMR) in real-time to support clinical decision-making based on patient responses. FileMaker can also pull data from the EMR and organize it into a clean, functional data report with population health metrics, including mental health and substance use screening. The system also integrates with the clinical laboratory reporting system. This approach has allowed the clinic to easily pull reports that detail a patient's demographics, sexual health behaviors, mental health screening, substance use screening, clinical visit and laboratory results. As part of the current study, we de-identified demographic and behavioral health data collected from this system prior to analysis. Procedures for retrospective data analyses were approved by our institution's IRB and all research was completed in accordance with the Declaration of Helsinki.

Data and Measures

The digital intake platform contains questions on the following variables:

Demographic Data: Patients completed items regarding their age, gender, race, ethnicity, sexual orientation, and household income [**Table 1**]. To preserve statistical power in bivariate and multivariate analyses, researchers created new categories of gender, race, ethnicity, and sexual orientation as follows: Those who self-identified as transgender, gender queer, gender non-binary, and other identities existing beyond cisgender, binary definitions of gender (man, woman) were classified as transgender/gender diverse. Those who identified as a racial minority or Hispanic/Latino/a/x were classified as a person of color. Those who identified their sexual orientation as bisexual, queer, pansexual, and other identities for those attracted to more than one gender were classified as bisexual+.

Sexual Health: Patients reported their current HIV status (living with HIV Yes/No), and past 12-month STI acquisition (Yes/No).

Depression: Patients completed the Patient Health Questionnaire-2, a two-item measure that captures low mood and anhedonia within the past two weeks (e.g., Over the last 2 weeks, how often have you been bothered by the following problems? Little interest or pleasure in doing things. Not at all =0; Several days =1; More than half the days =2; Nearly every day =3).[27] Scores range from 0–6, and those scoring 3 or higher were coded as living with a depressive disorder.

Hazardous Drinking: Patients completed the Alcohol Use Disorder Identification Test–Consumption (AUDIT-C) to screen for hazardous drinking.[28] Participants responded to a set of three questions regarding alcohol use with responses summed to produce a total score (e.g., How often did you

have a drink containing alcohol in the past year? Never =0; Monthly or less =1; 2 to 4 times a month =2; 2 to 3 times per week =3; 4 or more times per week =4). The AUDIT-C uses sex-based cut-off values of 3 or higher for females and 4 or higher for males. For transgender adults, research has suggested using a universal cut-off score of 3 or higher.[29] For the purposes of this study, we used a universal cut-off score of 3 or greater to determine hazardous drinking given our focus on SGM individuals.

Illicit Substance Use: Patients completed an adapted version of the ASSIST to screen for past three-month illicit substance use.[30] Patients were asked to select if and how often they used the following drugs in the past three months: poppers, cocaine, prescription stimulants (not used as prescribed), methamphetamine, inhalants, sedatives or sleeping pills, hallucinogens, street opioids, prescription opioids, and other drugs. Individuals scoring 1 or greater (they endorsed using one or more substances) were coded as 'Yes' to having engaged in illicit substance use and those scoring 0 (they endorsed using zero substances) were coded as 'No'. Patients were also asked about cannabis use, which was evaluated as a separate category. Cannabis use was not incorporated into the illicit substance use scoring code, as cannabis had been legalized in the state at the time of analysis.

DATA ANALYSIS

Descriptive statistics including frequencies were calculated for demographic, sexual health, mental health, hazardous drinking, and substance use variables. We conducted initial chi-square and Fisher's exact tests to determine bivariable associations between each of our independent variables (age, gender, race, ethnicity, sexual orientation, household income, living with HIV, past 12-month STI) and our three dependent variables (depression, hazardous drinking, illicit substance use). We then conducted three logistic regressions to examine associations between demographics and sexual behaviors as independent variables and depression, hazardous drinking, and illicit substance use as dependent variables. Associations significant from our bivariable analyses were included into our regression models for multivariable analyses. For all regressions, we first examined whether an independent variable as a category was significantly associated with each dependent variable (e.g., is age associated with depression?). We next reviewed sub-levels for each independent variable to determine which groups significantly differed (e.g., do 18–29 year olds differ in depression levels from adults 50+?). For the depression model, we entered age, gender, and income as independent variables. For the hazardous drinking model, we utilized gender, sexual orientation, race, and income. For the illicit substance use model, we used gender, sexual orientation, race, income, and HIV status. Statistical significance was determined at $p<.05$ and analyses were performed using SPSS version 29.0.

RESULTS

A total of *N*=1277 individuals presented to the sexual health clinic during the study period. Of these, 37% identified as straight/heterosexual (30% bisexual+, 28% gay/lesbian); 63% cisgender man (24% cisgender woman, 12% transgender/gender diverse); 50% White (21% Black/African American); and 24% Hispanic/Latino/a/x. Approximately 2% reported living with HIV and 13% past 12-month STI acquisition. Regarding mental health and substance use, 11% met criteria for a depressive disorder, 50% met criteria for hazardous drinking, and 26% engaged in past three-month illicit substance use [**Table 1**]. Most commonly reported illicit drug use included poppers (16%), hallucinogens (9%), prescription stimulants (6%), and cocaine (5%), followed by

Table 1. Characteristics of Patients Presenting to a Sexual Health Clinic (N=1277)

Variable	Results (n, %)
Age	
18–29	681, 53%
30–39	393, 31%
40–49	117, 9%
50+	86, 7%
Household Income	
<$10,000	147, 12%
$10,001–20,000	127, 10%
$20,001–35,000	174, 14%
$35,001–50,000	155, 12%
$50,001–75,000	153, 12%
$75,001–100,000	99, 8%
$100,001+	111, 9%
Gender	
Cisgender Man	800, 63%
Cisgender Woman	301, 24%
Transgender/Gender Diverse	151, 12%
Race-Ethnicity	
White	634, 50%
Hispanic/Latino/a/x	300, 24%
Black/AA	271, 21%
Not listed	63, 5%
Multiracial	59, 5%
Asian	51, 4%
American Indian/Native Alaskan	17, 1%
Native Hawaiian/Pacific Islander	4, 0.3%
Sexual Orientation	
Gay/Lesbian	361, 28%
*Bisexual+	383, 30%
Straight	472, 37%
Sexual Health	
Living with HIV	28, 2%
Past 12-month STI	168, 13%
Behavioral Health	
Depression	142, 11%
Hazardous drinking	635, 50%
Illicit substance use	326, 26%

*Bisexual+ encompasses individuals identifying as bisexual, pansexual, queer, and other sexual identities for those attracted to more than one gender.

Table 2. Bivariable Relationships Between Characteristics and Behavioral Health Conditions

Characteristic	Depression			Hazardous Drinking			Illicit Substance Use		
	No (%)	Yes (%)	p	No (%)	Yes (%)	p	No (%)	Yes (%)	p
Age			<.001*			.075			**.126**
18–29	551 (85)	100 (15)	b	302 (47)	339 (53)	a	493 (76)	160 (25)	b
30–39	337 (93)	27 (7)	b	156 (43)	207 (57)	a	251 (69)	115 (31)	b
40–49	98 (92)	9 (8)	a	48 (45)	58 (55)	a	79 (73)	30 (28)	a
50+	70 (92)	6 (8)	a	45 (59)	31 (41)	b	55 (72)	21 (28)	a
Gender			**<.001***			**.026***			**<.001***
Cisgender Man	684 (91)	70 (9)	b	323 (43)	421 (57)	b	541 (72)	216 (29)	a
Cisgender Woman	252 (87)	39 (13)	a	149 (52)	138 (48)	b	251 (86)	42 (14)	b
Transgender/Gender Diverse	115 (78)	32 (22)	b	75 (51)	73 (49)	a	83 (56)	65 (44)	b
Race-Ethnicity			.779			**.001***			**<.001***
Person of Color	517 (89)	65 (11)	a	289 (51)	283 (50)	b	470 (81)	114 (20)	b
White non-Hispanic/Latino/a/x	476 (88)	64 (12)	a	220 (41)	320 (59)	b	344 (63)	200 (37)	b
Sexual Orientation			.133			**<.001***			**<.001***
Lesbian/Gay	308 (90)	33 (10)	a	121 (36)	214 (64)	b	203 (60)	138 (41)	b
Heterosexual/Straight	402 (90)	47 (10)	a	223 (51)	216 (49)	b	407 (90)	46 (10)	b
Bisexual+	317 (86)	52 (14)	b	175 (47)	199 (53)	a	232 (63)	138 (37)	b
Income			**.003***			**<.001***			**.049**
$10,000 or less	117 (85)	21 (15)	a	81 (61)	52 (39)	b	104 (75)	35 (25)	a
$10,0001–20,000	103 (83)	21 (17)	a	62 (51)	60 (49)	a	98 (78)	27 (22)	b
$20,001–35,000	143 (85)	25 (15)	a	74 (45)	92 (55)	a	123 (73)	45 (27)	a
$35,001–50,000	129 (84)	24 (16)	a	73 (48)	79 (52)	a	111 (73)	42 (28)	a
$50,001–75,000	138 (92)	12 (8)	a	57 (38)	92 (62)	b	94 (63)	55 (37)	b
$75,001–100,000	84 (90)	9 (10)	a	41 (43)	54 (57)	a	60 (64)	34 (36)	a
$100,001+	103 (98)	2 (2)	b	36 (34)	71 (66)	b	70 (67)	35 (33)	a
Living with HIV			.968			.711			**.021***
No	732 (89)	88 (11)	a	360 (44)	453 (56)	a	572 (70)	250 (30)	a
Yes	24 (88)	3 (12)	a	12 (43)	16 (57)	a	12 (44)	15 (56)	b
Choose not to disclose/Unknown	29 (91)	3 (9)	a	16 (52)	15 (48)	a	23 (70)	10 (30)	a
Past 12-month STI			1			.769			1
No	279 (89)	35 (11)	a	128 (41)	181 (59)	a	205 (65)	109 (35)	a
Yes	147 (89)	18 (11)	a	70 (43)	93 (57)	a	108 (66)	57 (35)	a

Post-hoc analyses: In the p value column, each letter denotes a subset of categories whose column proportions do not differ significantly from each other at the .05 level.

sedatives (4%), methamphetamine (2%), opioids (2%), and inhalants (1%). More than half the sample (55%) reported past three-month cannabis use. Chi Square and Fisher's exact test results are presented in **Table 2**. Logistic regression results are presented in **Table 3**.

The logistic regression model for depression found that age was significantly associated with depression (p=.022). While no sub-category levels of age differed significantly in regression results, chi-square analyses suggested that those 18–29 years old were more likely to exhibit depression than those 40+. Gender as a category was not significantly associated with depression in the regression model. However, sub-category results showed that identifying as transgender/gender diverse was associated with 1.93 times (95% confidence interval [CI] 1.13–3.32) greater odds of depression compared to cisgender men (p=.017). Income as a category was not significantly associated with depression in the regression model. However, sub-category results and chi square analyses revealed that those earning more than $100,000 had reduced odds of depression compared to those earning less than $10,000 (odds ratio [OR] = 0.17, 95% CI 0.04–0.77).

The logistic regression model for hazardous drinking found that compared to those earning less than $10,000,

Table 3. Logistic Regression Results of Factors Associated with Behavioral Health Conditions

Characteristics	Depression			Hazardous Drinking			Illicit Substance Use		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Age									
18–29	ref	ref	**.022***						
30–39	2.91	.87–9.73	0.082						
40–49	1.4	.40–4.91	0.604						
50+	2.13	.54–8.37	0.28						
Gender									
Cisgender Man	ref	ref	0.057	ref	ref	0.576	ref	ref	**.004***
Cisgender Woman	1.23	.77–1.99	0.389	0.87	.61–1.24	0.426	0.41	.23–.75	**.004***
Transgender/Gender Diverse	1.93	1.13–3.32	**0.017***	0.8	.50–1.29	0.366	1.19	.69–2.06	0.54
Race-Ethnicity									
White non-Hispanic/Latino/a/x				ref	ref		ref	ref	
Person of Color				0.86	.64–1.15	0.306	0.61	.42–.89	**0.01***
Sexual Orientation									
Lesbian/Gay				ref	ref	0.409	ref	ref	**<.001***
Heterosexual/Straight				0.82	.56–1.18	0.281	0.2	.11–.36	**<.001***
Bisexual+				1.01	.68–1.51	0.953	1.3	.82–2.06	0.261
Income									
$10,000 or less	ref	ref	0.081	ref	ref	**.049***	ref	ref	0.359
$10,0001–$20,000	1.23	.63–2.43	0.548	1.36	.81–2.30	0.245	0.57	.27–1.24	0.156
$20,001–$35,000	0.99	.52–1.89	0.982	1.83	1.12–2.99	**.016***	0.89	.44–1.79	0.747
$35,001–$50,000	1.3	.67–2.53	0.432	1.67	1.01–2.77	**.045***	0.91	.45–1.81	0.78
$50,001–$75,000	0.6	.28–1.30	0.198	2.02	1.22–3.35	**.006***	1.11	.57–2.16	0.755
$75,001–$100,000	0.79	.34–1.87	0.596	1.49	.84–2.63	0.172	0.81	.39–1.71	0.585
$100,001+	0.17	.04–.77	**0.021***	2.39	1.34–4.24	**.003***	0.58	.28–1.20	0.143
Living with HIV									
No							ref	ref	0.141
Yes							2.44	.98–6.11	0.057
Choose not to disclose/Unknown							0.77	.25–2.38	0.654

*statistically significant at the .05 level

earning $20,001–75,000 or more than $100,000 was associated with 1.67–2.39 increased odds of hazardous drinking (p=.049). The logistic regression model for illicit substance use found that identifying as lesbian/gay was associated with 5.08 times greater odds of illicit substance use (95% CI 2.78–9.26) compared to straight individuals (p<.001). Cisgender men had 2.42 greater odds of use (95% CI 1.33–4.39) compared to cisgender women (p=.004). Identifying as a person of color was associated with reduced odds of illicit substance use compared to those identifying as white non-Hispanic/Latino/a/x (OR = 0.61, 95% CI .42–.89).

DISCUSSION

The current study evaluated the impacts of using a digital intake platform to screen individuals for depression, hazardous drinking, and substance misuse at an urban sexual health clinic. The platform enabled the clinic to successfully screen individuals who might not have been identified otherwise and found high rates of people screening positive for a depressive disorder (11%), hazardous drinking (50%), and illicit substance use (26%). In the year prior to implementing this digital intake platform, screening was conducted only if provider requested. Out of 368 sexual health visits conducted between March 2020 through February 2021, the PHQ-2 was completed three times while the AUDIT-C was completed once. Thus, the clinic recognized the need for a more systematic approach, especially given the clinic opened in March 2020 at the height of the COVID-19 pandemic.

This also mirrors the experience of several New York City sexual health clinics that saw an increase from 17% to 51% of those screening positive for a substance use disorder after they implemented an evidence-based early intervention model.[31] In the current study, younger adults 18–29 were more likely to report depression compared to older adults 40+ ($p<.001$), and transgender individuals had 1.93 increased odds of depression compared to cisgender men. Rates of hazardous drinking were high across all populations with half of the sample reporting problematic drinking. Finally, lesbian and gay individuals had 5x increased odds of illicit substance use compared to straight individuals, and cisgender men had approximately 2x increased odds of illicit substance use compared to cisgender women.

Our findings regarding depression are consistent with prior research demonstrating that younger adults are struggling to a greater extent with their mental health compared to older adults.[32] Given 90% of the sample was 18–29 years old, this finding highlights the importance of ongoing mental health screening within STI clinics to readily identify young adults in need of mental health services. These findings also corroborate prior studies documenting higher rates of depression among transgender/gender diverse populations compared to cisgender individuals.[6,8] The medical literature has documented associations between socio-political stress, anti-transgender legislation, and depression.[33] A 2023 survey study investigating the effects of anti-trans policies on transgender mental health showed that those who were scared about their rights being taken away had 1.66 higher odds of experiencing depression, while those with knowledge of local state-level protections had 0.44 reduced odds.[33] Data for the current study were collected from 2021–2023 at the cusp of over 533 national anti-transgender legislative proposals, which may have contributed to higher levels of depression experienced among transgender/gender diverse patients in this sample.[34] In the midst of ongoing political turmoil, sexual health clinics are poised to identify depression and other mental health problems to serve this diverse population.

Rates of hazardous drinking were high across multiple demographic groups, with 50% of the sample meeting criteria for hazardous drinking. This is consistent with data showing increased rates of alcohol use following peak COVID-19 transmission in the United States from 2020–2021.[1] Incomes above $20,000 were associated with 1.67–2.39 greater odds of hazardous drinking compared to those earning less than $10,000. However, it is important to note that hazardous drinking is not synonymous with alcohol use disorder. We chose to utilize a more conservative cut-score of 3 on the AUDIT-C to determine hazardous drinking, so it is possible that those screening positive would not meet criteria for alcohol use disorder. It is important for clinicians to further assess the role of alcohol use in a patient's life and whether an individual desires to change their use.

Approximately a quarter of patients (26%) reported past three-month illicit substance use. Consistent with prior research, identifying as lesbian or gay was associated with increased odds of illicit substance use, as was identifying as a cisgender man. There are many stressors that contribute to substance use behavior, including mood-related challenges, interpersonal stressors, and trauma histories.[35] SGM populations may experience additional unique, chronic stressors related to experiences of marginalization such as discrimination that contribute to substance use.[5,25] Given the rise of fentanyl and other synthetic opioids contaminating the drug supply contributing to over 70% of overdose deaths, it is essential to educate patients using substances about safe drug use practices.[36] Given the high prevalence of substance use in the sample, sexual health clinics may be an ideal setting for medication-based treatment as well as harm reduction education programs.

This study has several limitations. First, it should be noted that this study employed a cross-sectional survey design, and thus we cannot determine causal relationships between demographics, sexual behaviors, and behavioral health conditions. We also utilized demographics as proxies for marginalization (e.g., race as a proxy for racism). Future studies might consider using measures that capture discrimination as independent variables, and then link experiences of discrimination (e.g., heterosexism, racism) as risk factors to health outcomes rather than demographics.[37] Additionally, this study focuses on depression as one dimension of mental health, which is known to disproportionately impact SGM individuals. Clinics might also consider implementing the GAD-2, given current medical recommendations to screen for anxiety. As with most screening tools, healthcare professionals trained in culturally competent care with SGM individuals should assess patients further to determine the appropriate level of care. And while screening is an important first step, future studies should evaluate treatment uptake after referrals are made in order to assess care coordination across the full healthcare delivery spectrum.

CONCLUSION

Implementing a digital intake platform can enhance screening for mental health conditions and substance misuse among SGM presenting for sexual health services. This screening protocol was able to identify specific subpopulations at higher risk for these disorders and facilitate opportunities for care.

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Distinct Patterns of Intentional and Unintentional Overdose Among Psychiatric Patients With Bipolar and Substance Use Disorders

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ABSTRACT

BACKGROUND: Co-occurrence of Bipolar Disorder (BD) and Substance Use Disorder (SUD) increases the risk of negative mental health outcomes, including both intentional (i.e., suicide self-poisoning) and unintentional overdose (i.e., accidental). While it is clear that both forms of overdose are a relevant concern, less is understood about the differences in phenomenology between intentional and unintentional overdose among this high-risk group.

METHODS: Demographic and clinical characteristics were drawn from a sample of patients at a Rhode Island hospital during their baseline session of a larger psychosocial intervention clinical trial.

RESULTS: Among 171 participants with co-occurring BD-SUD, 77% reported a history of any type of overdose, 48% reported a history of unintentional overdose, 56% reported a lifetime suicide attempt via intentional overdose, and 28% reported experiencing both intentional and unintentional overdose. Collectively, antidepressant/antipsychotic/mood-stabilizing medications were the most frequently reported substances for intentional overdose, followed by sedating medications and alcohol. Opioids were the most frequently reported substance for accidental overdose, followed by alcohol and stimulants. Polysubstance use was indicated for 62% of intentional overdose events and 43% of accidental overdose events. Compared to participants with a history of intentional overdose only, those who have experienced both types of overdose were significantly younger and more likely to have co-occurring alcohol use disorder and drug use disorder.

CONCLUSIONS: Our findings suggest that psychotropic medications traditionally used to treat BD and other psychiatric disorders are often implicated in intentional overdose. Additionally, our results highlight the need for a focus on prevention of polysubstance overdose across the intentionality spectrum.

KEYWORDS: Bipolar Disorder; Substance Use Disorder; overdose; suicide

INTRODUCTION

Bipolar Disorder (BD), involving extreme fluctuations in mood, energy, and activity levels (known as manic/hypomanic and depressive episodes),[1] is characterized by a profoundly elevated risk of premature mortality, largely driven by high rates of suicide and intentional self-harm.[2,3] Individuals with BD face a suicide risk approximately 20–30x higher than the general population,[4] and estimates suggest up to 50% of individuals with the diagnosis attempt suicide at least once in their lifetime.[5] While suicide methods vary, intentional self-poisoning is a predominant mechanism of lethality for this group, particularly among women.[6] These intentional overdoses are often characterized by use of prescribed medications, rather than illicit substances,[6,7] possibly related to increased access to psychiatric medications in the context of complex treatment regimes.[8,9]

In parallel, people diagnosed with Substance Use Disorders (SUD) are at high risk of unintentional overdose death, fueling an epidemic in the United States (U.S.) that has claimed more than 800,000 lives over the past decade.[10] Unlike the intentional overdoses prevalent in BD, overdose deaths in the context of SUDs are overwhelmingly classified as accidental.[11] Mortality in this context is heavily predicted by the presence of opioids, along with the proliferation of illicitly manufactured fentanyl and physiological vulnerability following periods of abstinence.[12] Overdose deaths from substances other than opioids are also on the rise in the U.S.[13]

BD and SUDs are commonly co-occurring psychiatric disorders. In fact, the National Epidemiologic Survey on Alcohol and Related Conditions indicates that approximately 40–70% of U.S. adults with BD will experience a co-occurring SUD in their lifetime.[14] This comorbidity fosters an environment that elevates risk for both intentional and unintentional overdose.[15] Consequently, patients with co-occurring BD and SUD face a substantial increase in overdose death risk, such that the risk is significantly higher than for those with either disorder alone.

The Rhode Island (RI) population experiences increased risk for negative outcomes at the intersection of BD and SUD. Recently, the state ranked 16th in the nation for rates of illicit drug use and opioid-related fatalities,[16] creating a high-risk context for individuals with mood disorders. While overdose death rates have been declining since 2022, 329 Rhode Islanders died from accidental drug overdose in

2024.[17] Similarly, the latest confirmed data from the Centers for Disease Control and Prevention found 126 suicide deaths in RI in 2022,[18] and provisional estimates of suicide-related emergency department visits in 2025 suggest increasing rates since 2024.[19]

The overdose crisis in RI has traditionally been segmented into intentional suicide vs. accidental overdose fatalities; however, local data suggest a different picture for these dual-diagnosis individuals (i.e., those who meet diagnostic criteria for a SUD and co-occurring psychiatric disorder). A recent analysis of state overdose deaths revealed that while individuals with a history of intentional overdose were significantly more likely to have a known mental health diagnosis (77.9%), about 15% of unintentional overdose victims also had a documented diagnosis of BD.[20] This finding underscores a critical vulnerability in that RI patients with BD are not only at heightened risk for intentional self-poisoning, but they are also disproportionately represented in accidental drug-related deaths.[20,21]

The Current Study

While overdoses are clearly a serious public health concern in RI, less is understood about the differences in phenomenology between intentional and unintentional overdose for dual-diagnosis individuals. The current study sought to address gaps in the literature by characterizing intentional and unintentional overdose patterns among BD-SUD patients in a hospital in RI. While the general RI population has an accidental overdose event rate of <1% annually, we hypothesized that (1) our hospital sample would report rates exceeding 40%. This estimate is based on recent literature indicating 36–49% of individuals with severe SUDs experience a lifetime non-fatal accidental overdose.[22,23] Similarly, given estimates that 32–36% of individuals with BD attempt suicide (with self-poisoning a predominant method),[24] we hypothesized that (2) rates of intentional overdose in our sample would exceed 20%. We also hypothesized that (3) antidepressant/antipsychotic/mood-stabilizing medications would be more frequently implicated in intentional self-poisoning events, while opioids would be more frequently reported for unintentional overdoses. Lastly, we sought to explore how participants who report a history of both types of overdose compare on demographic variables to those with intentional overdose alone and accidental overdose alone.

METHODS

Data for this analysis were drawn from the baseline assessment of a larger randomized controlled trial designed to evaluate the efficacy of a specialized psychosocial intervention for English-speaking adults with co-occurring bipolar and substance use disorders taking at least one mood-stabilizing medication (ClinicalTrials.gov Identifier: NCT04202393). The parent study recruited adult hospital patients meeting DSM-5 criteria for BD (I, II, or unspecified) and a current co-occurring SUD (alcohol and/or drug). Following recruitment during acute hospitalization, participants were randomized to receive either a multicomponent psychosocial intervention involving individual and family sessions, or an enhanced treatment as usual condition with additional assessment and care coordination. Only baseline overdose history and sample characteristics were analyzed in the current report. Patients were recruited from 2020–2025.

Measures

All participants completed a brief demographics questionnaire at baseline.

Eligibility Criteria: BD and SUD diagnoses were determined using the Mini-International Neuropsychiatric Interview (MINI),[25] which is a brief, structured diagnostic interview for DSM-5 disorders, designed for use in clinical practice and research settings. Extensive validation studies have demonstrated that the MINI possesses high reliability and validity when compared to established gold-standard measures.[26] Medication use was measured through the Brief Adherence Rating Scale (BARS),[27] which is a clinician-administered instrument consisting of questions regarding the patient's knowledge of their medication regimen and missed doses. The BARS has demonstrated reliability and validity.[28]

Intentional Overdose: The Columbia Suicide Severity Rating Scale (C-SSRS)[29] is a well-validated measure of suicidal ideation and behavior in clinical samples.[30] After assessing for a history of suicide attempt, the C-SSRS interviewer obtains information regarding the suicide method. If a participant endorsed lifetime history of intentional overdose on the C-SSRS, they were asked to identify and answer descriptive questions (including which substances were involved) about their most recent intentional overdose on the Overdose Interview (see below).

Accidental Overdose: The Overdose Interview (ODI) was developed by the authors and used in prior studies (e.g., Johnson et al., 2020). Participants were asked if they had ever in their lifetime experienced an accidental overdose, described as, "…taking too much of a substance or a combination (including medications, alcohol, and/or drugs) that causes immediate negative health effects without ANY intention to die or wish to die." Participants provided descriptive details regarding their most recent accidental overdose event, including which substances were involved.

Substance Categorization: Substances were categorized according to their primary central nervous system effects, with an emphasis on pharmacologic mechanisms and behavioral outcomes relevant to acute risk states (e.g., disinhibition, perceptual alteration, or sedation). This approach is consistent with established frameworks (e.g., DSM-5[31]) that group substances based on shared neurobiological effects rather than legal status or route of administration. See **Table 1** for additional details regarding substances included in each category.

Data Analysis Plan

Analyses were conducted using SPSS version 31. Prevalence estimates were obtained to identify the percentage of the sample reporting a history of intentional overdose, accidental overdose, and both types of overdose. These groups were then compared on demographics and the participant reported substance types using independent-samples *t* tests and χ^2 tests, as appropriate. Among the 176 participants with baseline data, 5 were missing the full ODI measure and were therefore excluded from analyses, leaving a final sample of $n = 171$.

RESULTS

Hypotheses 1 & 2

We hypothesized that our hospital sample would report (1) rates of accidental overdose exceeding 40% and (2) rates of intentional overdose exceeding 20%.

Among 171 participants with co-occurring BD-SUD, 77% ($n = 131$) reported a history of any type of overdose, 48% ($n = 82$) reported a history of unintentional overdose, 56% ($n = 96$) reported a lifetime suicide attempt via intentional overdose, and 28% ($n = 47$) reported experiencing *both* intentional and unintentional overdose.

Hypothesis 3

We hypothesized that antidepressant/antipsychotic/mood-stabilizing medications would be more frequently implicated in intentional self-poisoning events, while opioids would be more frequently reported for unintentional overdoses.

Among those who reported an intentional overdose ($n = 96$), antidepressant/antipsychotic/mood-stabilizing medications were the most frequently reported substance (42%), followed by sedating medications (38%) and alcohol (34%). A majority of participants (62%) noted their intentional overdose event involved use of more than one substance (i.e., polysubstance overdose). For participants who reported an accidental overdose ($n = 82$), opioids were the most frequently reported substance (59%), followed by alcohol (33%), and stimulants (24%). Just under half of the participants (43%) indicated polysubstance use during their accidental overdose event. See **Table 1** for additional substance frequencies.

Table 1. Substances Involved in Overdose Events

Substance	Intentional Overdose ($n = 96$)	Accidental Overdose ($n = 82$)
Alcohol	33 (34%)	27 (33%)
Opioid	23 (24%)	48 (59%)
Sedative	36 (38%)	12 (15%)
Stimulant	13 (14%)	20 (24%)
Antidepressant/Antipsychotic/ Mood-stabilizing medications	40 (42%)	6 (7%)
Over-the-counter medication	13 (14%)	3 (4%)
Cannabis and related plant-based psychoactives	6 (6%)	8 (10%)
Perceptual-altering substances	2 (2%)	4 (5%)
Polysubstance	59 (62%)	35 (43%)

Note: Opioid category is inclusive of both prescribed (e.g., Percocet) and illicit (e.g., heroin) opioids; Sedative category is inclusive of medications that are primarily sedating (e.g., benzodiazepines, sedative-hypnotics); Stimulant category is inclusive of primary stimulant agent, both prescribed (e.g., Adderall) and illicit (e.g., cocaine); Antidepressant/Antipsychotic/Mood-stabilizing medications category is inclusive of the listed traditional therapeutic psychiatric medications; Over-the-counter medications category is inclusive of non-prescription medications (e.g., Benadryl); Cannabis and related plant-based psychoactives category is inclusive of THC, CBD, and Kratom; Perceptual-altering substances category is inclusive of recreational drugs with hallucinogenic qualities (e.g., ecstasy, LSD); Polysubstance category is inclusive of any overdose event that involved more than 1 substance (e.g., alcohol + opioids, sedative + antidepressant medication, etc.).

Exploratory Analyses

How do participants who report history of both types of overdose compare on demographic variables to those with intentional overdose alone or accidental overdose alone?

When compared to participants in the intentional overdose only group, those who reported both types of overdose were significantly younger (36.9 years vs. 41.4 years, $p = .02$) and significantly more likely to have co-occurring alcohol and drug use disorder (rather than either disorder alone; 87.9% vs. 65.6%, adjusted residual = 2.1). There were no significant differences in demographic characteristics between participants in the accidental overdose-only group and those who reported both types of overdose.

DISCUSSION

In support of Hypotheses 1 and 2, baseline data from a larger clinical trial indicate a concerning prevalence of overdose history among patients admitted to a psychiatric hospital with co-occurring bipolar and substance use disorders, with 77% reporting at least one lifetime overdose event. The fact that 28% of this sample reported a history of both intentional and unintentional overdose is notable. This overlap suggests that for many dual-diagnosis patients, the distinction between a "suicide attempt" and an "accidental overdose" may be fluid or possess similar underlying pathology, such as mood instability and tendency to self-medicate (i.e., using non-prescribed substances with the intent to alleviate psychological distress or manage symptoms of a mental health condition). While we can theorize that these rates may be driven by the convergence of mood instability, acute distress, and intoxication-related impairment, it is important to recognize the other ways in which mental health comorbidities increase overdose risk.

Specifically, there is a paradox in that the multiple medications sometimes used to treat co-occurring BD and SUD can introduce significant risks by complicating medication regimens, which increases the likelihood of treatment

non-adherence, and by providing increased access to lethal means via medications. Because these dual-diagnosis patients are often prescribed complex polypharmacy medication regimens (e.g., a combination of mood stabilizers and adjunctive anxiolytics to manage symptom severity),[32] they are routinely in possession of large quantities of medication that carry significant risk of toxicity.[33] Agents used in standard care, such as lithium, possess narrow therapeutic indices, meaning that a standard quantity prescribed can easily constitute a fatal dose if ingested impulsively as an intentional overdose during a crisis.[34] Furthermore, the risk of unintentional toxicity is amplified when sedating medications like benzodiazepines or sedating antipsychotics are combined with use of alcohol or opioids, which can significantly lower the threshold for accidental overdose death through synergistic depression of the central nervous system.[35] Consequently, clinicians must weigh the stabilization benefits of pharmacotherapy against the reality that the very medications prescribed to prevent clinical deterioration may, without rigorous safeguards, facilitate overdose events.

Historically, many overdose prevention efforts have prioritized addressing opioid use to mitigate accidental overdose; however, in line with Hypothesis 3, we found that collectively antidepressant/antipsychotic/mood-stabilizing medications were the substances most frequently identified in intentional self-poisoning events, followed by alcohol and sedating medications. Furthermore, 62% of intentional overdoses involved polysubstance use, often combining medications with alcohol, which highlights a critical area for clinical intervention. Conversely, opioids remained the primary driver of unintentional overdoses, followed by alcohol and stimulants. This reflects broader national and local trends, where the proliferation of illicit substances, including fentanyl, increases mortality. However, the high prevalence of alcohol consumption across both overdose categories suggests that alcohol remains a ubiquitous catalyst for overdose, possibly by exacerbating the impulsivity and cognitive disinhibition inherent in both BD and SUD. Therefore, it is important to focus on preventing psychiatric medication overdoses among individuals at higher risk of suicide in this community, as well as reducing the practice of mixing medications with alcohol.

Regarding exploratory analyses of group comparisons [**Table 2**], we found that participants in the group reporting both types of overdose were significantly younger and more likely to have co-occurring alcohol and drug use disorder than those reporting only intentional overdose. This finding highlights an important group to be targeting in overdose prevention efforts across the full intentionality spectrum. Mainly, it appears that the BD-SUD overlap is compounded even further when considering polysubstance use and co-occurring SUDs. As providers assess for comorbid conditions, it may be helpful to flag those with multiple SUDs as potential beneficiaries of additional overdose risk management.

Table 2. Between Group Comparisons

	Both Types of OD (n = 47)	Intentional OD only (n = 49)	Comparison Both vs. Intentional only	Accidental OD only (n = 35)	Comparison Both vs. Accidental only
Variable	**m (SD)**	**m (SD)**	**p-value (t)**	**m (SD)**	**p-value (t)**
Age	36.9 (*9.4*)	41.4 (*12.0*)	.02	39.0 (*12.1*)	ns
Variable	**n (%)**	**n (%)**	**p-value (χ^2)**	**n (%)**	**p-value (χ^2)**
Birth Sex			ns		ns
Male	24 (*51.1*)	22 (*44.9*)		24 (*68.6*)	
Female	23 (*48.9*)	27 (55.1)		11 (*31.4*)	
Race/Ethnicity			ns		ns
White	34 (*72.3*)	40 (*81.6*)		28 (*80.0*)	
Black	4 (*8.5*)	3 (*6.1*)		0 (*0.0*)	
Multiracial	6 (*12.8*)	4 (*8.2*)		5 (*14.3*)	
Hispanic	8 (*17.0*)	3 (*6.1*)		2 (*5.9*)	
Marital Status			ns		ns
Single	36 (*76.6*)	28 (*57.1*)		24 (*68.6*)	
Married/ Domestic partner	3 (*6.4*)	4 (*8.2*)		8 (*22.9*)	
Separated/Divorced/ Widowed	8 (*17.0*)	17 (*34.7*)		3 (*8.6*)	
Household Income			ns		ns
Under $20,000	27 (*60.0*)	32 (*65.3*)		22 (*64.7*)	
Over $20,000	18 (*40.0*)	12 (*34.7*)		12 (*35.3*)	
Employment Status			ns		ns
Full or part time	20 (*42.6*)	26 (*53.1*)		13 (*37.1*)	
Unemployed	11 (*23.4*)	7 (*14.3*)		9 (*25.7*)	
Disabled	12 (*25.5*)	15 (*30.6*)		13 (*37.1*)	
Substance Use Disorder			.03		ns
Alcohol Use	2 (*6.1*)	10 (*31.3*)	*	3 (*11.1*)	
Non-alcohol	2 (*6.1*)	1 (*3.1*)		2 (*7.4*)	
Both alcohol and non-alcohol	29 (*87.9*)	21 (*65.6*)	*	22 (*81.5*)	

Note: m (*SD*) indicates variables for which means and standard deviations are depicted; n (%) indicates number and percentage. OD = overdose. Comparisons were not made between intentional and accidental overdose. *Adjusted residual > ±1.96.

CLINICAL AND PUBLIC HEALTH IMPLICATIONS

In light of these results, several clinical shifts are recommended:

Integrated Prevention: Providers should avoid siloing intentional and unintentional overdose interventions into mutually exclusive categories; rather, we recommend that for patients with co-occurring BD and SUD, screening for suicide risk be paired with harm reduction strategies (e.g., naloxone distribution), even for patients who outwardly appear to be low risk for intentional or unintentional overdose.

Medication Management: Given the role of psychiatric medications in intentional overdose, clinicians should emphasize lethal means counseling and consider the safety of prescribing patterns for high-risk individuals. Through de-prescribing (i.e., discontinuing inappropriate or excessive medications), prescribers can reduce overdose rates by mitigating access to medications with higher risk profiles.[36]

Polysubstance Awareness: Public health campaigns in RI and beyond should focus on the high rates of polysubstance use, particularly the combination of medications with alcohol, which was prevalent across the intentionality spectrum in our sample. There is a need to increase education regarding the ways in which the chemical effects of one substance can compound the effects of another. For example, the depressant effects of alcohol may exacerbate the depressant effects of benzodiazepines, leading to higher overdose risk. Alternatively, the mood-altering effects of alcohol may lead to impulsive decisions to take higher doses of a medication, also increasing overdose risk. Similar to public health campaigns that have educated consumers about the impact of fentanyl in the RI drug supply (e.g., the *Assume Fentanyl* campaign and the *No Matter Why You Use* campaign), we hope to reduce both intentional and unintentional overdose rates by highlighting dangers of mixing substances.

CONCLUSION

This study highlights a critical vulnerability among psychiatric patients with dual diagnoses. While accidental opioid overdose is understandably a major public health priority, this study identifies intentional self-poisoning with antidepressants, antipsychotics, and mood-stabilizing medications as another prominent area of concern among patients with BD and SUD. Our data highlight a need to integrate the management of psychiatric medications with efforts to reduce the risks associated with illicit substance use, as well as the need for a focus on prevention of polysubstance overdose across the intentionality spectrum.

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Disclosure of Suicidal Thoughts and Behaviors Among Adolescent Psychiatric Inpatients: Differences by Sexual and Gender Minority Status

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ABSTRACT

Rates of adolescent suicide have risen over the last 10 years, creating a public health crisis. Disclosure of suicidal thoughts and behaviors (STBs) is one help-seeking strategy available to adolescents. Estimates from prior studies on the frequency of youth STB disclosure vary considerably. It is crucial to understand patterns and rates of STB disclosure for youth at elevated risk for suicide, including those who have been psychiatrically hospitalized or who hold sexual and gender minority (SGM) status. To examine STB disclosure in this high-risk population, the current study examined self-report of STB disclosure behaviors, including to whom, how, and when disclosure occurred, as well as the outcome of the disclosure in a sample of psychiatrically hospitalized youth with prior STBs (N=163).

Data showed that the most common recipients of disclosures were caregivers, health professionals, and in-person friends. The most frequently endorsed method of disclosure was doing so in person, and there were no significant differences in when adolescents disclosed STBs (before, during, or after the experience). SGM adolescents were half as likely as non-SGM adolescents to disclose to parents or caregivers, and SGM adolescents disclosed more often during the STB than non-SGM youth. These findings can inform future interventions targeted at reducing STBs in youth or increasing help-seeking behaviors for psychiatrically hospitalized adolescents.

KEYWORDS: suicide; disclosure; adolescent; sexual and gender minority

INTRODUCTION

Suicide is a leading cause of death in adolescents, and close to 12% of adolescents report lifetime suicidal ideation (SI).[1] Assessment of suicidal thoughts and behaviors (STBs) is central to suicide prevention, and disclosure of STBs is a critical pathway for youth to seek and receive support. A 2024 scoping review of rates of STB disclosure found that among both adolescents who endorsed SI and general samples, rates of disclosure have ranged widely from 23% to 70%.[2] This review also found that adolescents disclosed most frequently to parents, friends, and mental health professionals. Disclosure may be especially consequential for psychiatrically hospitalized adolescents at elevated risk for hospital readmission and suicide attempts after discharge.[3] A 2018 study found that 53.1% of adolescents admitted to a psychiatric hospital were admitted due to STBs.[4] Further, in a sample of psychiatrically hospitalized adolescents, lower rates of disclosure were associated with more intense reports of SI.[5] This suggests that STB disclosure can serve as a protective factor for youth experiencing SI. A better understanding of rates of STB disclosure, recipients of disclosure, and outcomes of disclosure could inform interventions and treatment.

Understanding STB disclosures is especially important for youth at higher risk for suicide, including sexual and gender minority (SGM) adolescents. SGM youth report higher rates of suicidal thoughts and non-suicidal self-injury, as well as greater risk for attempting suicide during their lifetime compared to non-SGM youth.[6,7] Reported STB disclosure rates among SGM adolescents who died by suicide range from 28–40%.[8] Research has demonstrated differences in disclosure among SGM youth and non-SGM youth, with some studies finding more frequent disclosure among SGM youth, but others reporting greater reluctance to disclose to parents among SGM teens.[9] Higher levels of minority stress are also associated with greater reluctance among SGM to disclose STBs.[10]

The current study examined psychiatrically hospitalized adolescents' history of disclosure, using descriptive analyses to explore factors such as the recipient of disclosure, the means of communication, the timing of the disclosure, and the adolescents' feelings after the disclosure. A secondary aim of this study was to explore the differences in STB disclosure among SGM adolescents versus non-SGM adolescents.

MATERIALS AND METHODS

The study was part of an IRB-approved retrospective chart review of adolescents (N=322, M_{age}=14.98 (1.66) years old, range=11–18) admitted to Bradley Hospital's adolescent inpatient psychiatric unit between September 2024 and May 2025 who endorsed either a lifetime history of SI or suicide attempt(s).

Measures

At intake to the psychiatric unit, adolescents completed self-report measures, including items capturing age, sex, race, sexual orientation, and gender identity. STBs were measured using the *Self-Injurious Thoughts and Behaviors Interview-SITBI*.[11] The SITBI is a semi-structured interview that gathers information about SI, suicide plans, suicide attempts, and non-suicidal self-injury. The SITBI measure demonstrated strong inter-rater and test-retest reliability and concurrent validity in adolescents and young adults. Because there are no validated measures surrounding STB disclosure in adolescents, disclosure was assessed through five self-report questions created by the research team: 1) has the youth disclosed a STB to someone, 2) the relationship of the disclosure recipient, 3) the method of disclosure, 4) the timing of disclosure (participants could select any combination of "before the STB", "during the STB", or "after the STB"), and 5) the emotional response following disclosure (feeling better, the same, or worse). Items were not specific to one STB event but rather to any incident of STB prior to admission. Therefore, adolescents could select multiple recipients, methods, and timings of disclosure.

Data Analysis

Participants who did not endorse prior STBs were excluded from the dataset. SGM teens were defined as those who responded "no" to either cisgender gender identity or heterosexual sexual identity. Logistic regression models were used to examine the association between SGM (vs. non-SGM) identity and disclosure behaviors, controlling for prior suicide attempts.

RESULTS

Of the 322 adolescents psychiatrically hospitalized during the study period, 282 (87.6%) reported STBs. Seven adolescents selected either "prefer not to answer" or "other" for both gender and sexual orientation questions and were excluded from the analyses, yielding an analytical cohort of 275 adolescents who reported any STB. Of those who reported STBs, 52% (N=143) were SGM adolescents, and 48% (N=132) were non-SGM adolescents. **Table 1** provides details on participant demographics, including gender identity, sexual orientation, and race.

Of the 275 adolescents who reported STBs, 169 (61.4%) reported disclosing an STB before admission. Of the youth who reported disclosing their STBs, the majority disclosed to a parent or caregiver (45%), to a doctor or mental health worker (42%), or to an in-person (rather than online) friend (42.6%) [**Table 2**]; 80.5% of adolescents disclosed by telling the recipient verbally. The timing of disclosure was evenly split: 47% of all participants reported at least one instance of disclosure before suicidal behaviors; 46% of all participants reported at least one instance of disclosure during STBs; and 44% of all participants reported at least one instance of disclosure after STBs. Most participants felt better (39.6%) or the same (40%) after their STB disclosure, but 20.4% of participants endorsed feeling worse after STB disclosure.

Contrary to the secondary hypothesis, STB disclosure did not differ significantly by SGM status: 67.8% of SGM youth disclosed STBs (97 of 143), compared to 55.3% of non-SGM youth (73 of 132). Of those who made a disclosure, SGM adolescents disclosed 1.89 times more often during the behavior than non-SGM adolescents, but 0.48 times as often to parents or primary caregivers than their non-SGM adolescent peers [**Table 3**]. There were no significant differences in the method of disclosure or emotional responses after disclosure between SGM and non-SGM youth. The differences in disclosure during the STB and to primary caregivers remained statistically significant when controlling for lifetime instances of suicide attempts.

Table 1. Participant Demographics (N=169)

	N (%)
Sexual Orientation (select all that apply)	
Heterosexual	71 (42%)
Asexual	12 (7.1%)
Bisexual or Pansexual	56 (33.1%)
Gay or Lesbian	13 (7.7%)
Questioning or Unsure	17 (10.1%)
Sex Assigned at Birth	
Male	51 (30.2%)
Female	118 (69.8%)
Gender Orientation (select all that apply)	
Cisgender Male	51 (30.2%)
Cisgender Female	103 (60.1%)
Transgender Female	1 (0.01%)
Transgender Male	3 (1.7%)
Nonbinary	3 (1.7%)
Gender Fluid	11 (6.5%)
Unsure	7 (4.1%)
Racial Identity (select all that apply)	
American Indian or Alaskan	10 (5.9%)
Asian	8 (4.7%)
Black or African American	33 (19.5%)
Hispanic, Latino, or Spanish Origin	54 (31.9%)
Native Hawaiian or other Pacific Islander	3 (1.8%)
White	105 (62.1%)
Middle Eastern	2 (1.2%)
Other	8 (4.7%)

Table 2. Descriptives of psychiatrically hospitalized adolescents endorsing disclosure behaviors (N=169)

	N (%)
Who the adolescent disclosed to	
Primary caregiver	76 (45%)
Adult family member	27 (16%)
Sibling	22 (13%)
Doctor or Mental Health Worker	71 (42%)
Teacher or adult at school	38 (22.5%)
In-person friend	72 (42.6%)
Online friend	31 (18%)
Somebody else	21 (12%)
How the adolescent disclosed	
By telling them directly	136 (80.5%)
Through social media	23 (13.6%)
Through text or email	58 (34%)
Through a note	14 (8%)
Another way	18 (10.7%)
When the adolescent disclosed	
Before STB	80 (47%)
During STB	78 (46%)
After STB	75 (44%)
How the adolescent felt after disclosure	
Better	67 (39.6%)
The same as before	68 (40%)
Worse	34 (20.4%)

Note: For questions asking about the recipient of disclosure, the method of disclosure, and the timing of disclosure, participants were able to select multiple options.

DISCUSSION

This study contributes to the literature examining STB disclosure in a sample of psychiatrically hospitalized adolescents by exploring the recipients, method, timing, and emotional response to disclosure. Adolescents disclosed most often to their parents or caregivers, a mental health professional, or an in-person friend. This aligns with previous research that found hospitalized adolescents often disclose STBs to parents or friends.[9] Previous research supports parent-child connection and parental support as a protective factor against suicide in adolescents.[14] Understanding common recipients of disclosure may inform future interventions for adolescents in a psychiatric hospital, improve relationships, and enhance skills in responding to STBs among individuals to whom youth frequently disclose STBs. This could include facilitating conversations about STBs in family therapy and providing guidance to parents and peers to support youth safety in the context of STBs. Given the balanced distribution in the timing of disclosure, which included before, during, and after the behavior, clinicians may want to consider ways to proactively facilitate disclosure in patients at risk for STBs.

The study also provided insight into the timing of disclosure and found unexpected differences in disclosure behaviors between SGM and non-SGM adolescents. Whereas there was no difference in disclosure frequency before or after the STB, SGM adolescents were approximately twice as likely to disclose during the STB as non-SGM adolescents. Previous literature has not examined the timing of disclosure among SGM adolescents, nor has it examined it in comparison to non-SGM adolescents. Future work should examine the underlying motivation for SGM adolescents in disclosing during an STB.

Most participants reported that they felt the same or better than before the disclosure, suggesting that disclosure may have a buffering effect for youth exhibiting STBs. This finding is consistent with prior research which found that adolescents who disclosed non-suicidal self-injury or STBs reported higher self-esteem and future optimism than those who did not disclose.[12] While prior research has not thoroughly explored how previous disclosure experiences impact future disclosure experiences; one study showed that adolescents who disclosed a suicide attempt were more likely to seek professional help after disclosing, and that disclosures were regarded as helpful.[13] This suggests that disclosures may promote safety and encourage help- and treatment-seeking behaviors. While most adolescents reported feeling the same or better after disclosure, a minority of participants reported feeling worse. Due to the limitations of the chart review format of the present study, the exact reasons for the worsening of mood cannot be determined. Potential factors include an invalidating response to the disclosure, or that the disclosure led to the present hospitalization that the adolescent may find distressing at this stage of their treatment and recovery. This finding reinforces the need for close monitoring and follow-up after disclosures.

There were no significant differences between SGM and non-SGM adolescents in the frequency of disclosure of STBs. Although this study did not find differences in the likelihood of disclosure between SGM and non-SGM youth, it found that SGM teens were about half as likely as their non-SGM peers to disclose to primary caregivers. SGM youth reported disclosing to a caregiver about 37% of the time, less than previously reported for psychiatrically hospitalized SGM youth who endorsed STBs (>50%).[9] It remains unclear which factors, including the strength of the relationship between SGM adolescents and their primary caregivers, influence the likelihood of disclosure, highlighting the need for future research on this topic.

When analyzing differences between SGM and non-SGM adolescents, it was hypothesized that if rates of disclosure were analyzed without considering severity of STBs, there may be more STB disclosures due to more frequencies of STB, and therefore more opportunities to disclose, rather

Table 3. Descriptives and logistic regressions estimating odds of SGM adolescents endorsing disclosure behaviors (relative to non-SGM), including controlling for frequency of prior suicide attempts

	SGM N=143; N=97 for disclosure details N(%)	Non-SGM N=132; N=73 for disclosure details N(%)	Odds–ratio (OR) of disclosure behavior (95% CI)	OR controlling for lifetime instances of suicide attempts (95% CI)
Disclosed STB	97 (68%)	73 (55%)	1.62 (0.99–2.67)	1.54 (.93–2.56)
Who the adolescent disclosed to				
Primary caregiver	36 (37%)	41 (56%)	**0.48 (0.26–0.89)***	**0.43 (0.23–0.82)***
Adult family member	14 (14%)	13 (18%)	0.80 (0.35–1.82)	0.81 (0.35–1.87)
Sibling	12 (12%)	10 (14%)	0.91 (0.37–2.24)	0.86 (0.34–2.15)
Doctor or Mental Health Worker	46 (47%)	26 (36%)	1.56 (0.83–2.91)	1.61 (0.86–3.06)
Teacher or adult at school	24 (25%)	15 (21%)	1.31 (0.63–2.72)	1.33 (0.63–2.80)
In-person friend	48 (49%)	26 (36%)	1.70 (0.91–3.17)	1.86 (0.98–3.53)
Online friend	20 (21%)	11 (15%)	1.41 (0.62–3.18)	1.50 (0.65–3.45)
Somebody else	12 (12%)	9 (12%)	1.03 (0.41–2.59)	1.03 (0.40–2.62)
How the adolescent disclosed				
By telling them directly	78 (80%)	60 (82%)	0.87 (0.40–1.90)	0.95 (0.43–2.12)
Through social media	17 (18%)	6 (8%)	2.43 (0.91–6.53)	2.54 (0.93–6.95)
Through text or email	38 (39%)	20 (27%)	1.69 (0.87–3.27)	1.70 (0.87–3.33)
Through a note	10 (10%)	4 (5%)	2.03 (0.61–6.75)	2.08 (0.61–7.02)
Another way	13 (13%)	6 (8%)	1.77 (0.64–4.91)	1.68 (0.60–4.71)
When the adolescent disclosed				
Before STB	45 (46%)	36 (49%)	0.89 (0.48–1.63)	0.90 (0.48–1.67)
During STB	51 (53%)	27 (37%)	**1.89 (1.02–3.53)***	**2.07 (1.09–3.92)***
After STB	44 (45%)	32 (44%)	1.11 (0.60–2.04)	1.05 (0.56–1.96)
How the adolescent felt after disclosure				
Better compared to the same	33 (34%) compared to 41 (42%)	34 (47%) compared to 28 (39%)	1.51 (0.77–2.97)	0.73 (0.48–1.09)
Better compared to worse	33 (34%) compared to 23 (23%)	34 (47%) compared to 11 (15%)	2.15 (0.91–5.11)	0.71 (0.43–1.19)
The same compared to worse	41 (42%) compared to 23 (23%)	28 (39%) compared to 11 (15%)	1.43 (0.60–3.39)	0.98 (0.59–1.64)

Note: * p<0.05. SGM= Sexual and/or Gender Minority identity. OR=odds ratios from logistic regressions predicting disclosure behavior from SGM identity (vs non-SGM), without covariates and covarying, lifetime, suicide-attempt frequency, as assessed with the SITBI.11 After removing those who did not disclose STBs, a sample size of 170 adolescents remained for further analysis. The last question, which assessed how adolescents felt after disclosure, was analyzed using a multinomial logistic regression, instead of a logistic regression.

than differences in SGM status. Therefore, in analyses, lifetime instances of suicide attempts were controlled in order to control for the severity of STBs. However, as seen in **Table 3**, the odds ratios were similar between analyses without controlling for lifetime instances of suicidal thoughts, and analyses controlling for those with lifetime instances of suicidal thoughts.

Limitations

Findings should be considered in the context of the study's limitations. First, the sample consisted of adolescents hospitalized at a psychiatric hospital in the Northeast United States. The adolescents in the study may present with more severe psychopathology and STBs than a community-based sample, thus impacting the generalizability of the findings. Additionally, the sample was predominantly White, so the

results may not be generalizable to other cultures and races. Culture can influence help-seeking and STB disclosure, with some cultural groups showing fewer help-seeking behaviors for STBs than others, so future research should address how different cultures engage in help-seeking behaviors, such as disclosure of STBs.[15] The cross-sectional nature of this study is also a limitation. Due to the nature of data collection, no longitudinal data were collected. Therefore, it was not possible to track participants' disclosure behavior over time, to assess how emotional response to disclosure trends over time, or to assess how others' response to disclosure impacts future disclosure behavior or treatment-seeking behavior. Finally, due to limited power, gender and sexual minority status could not be analyzed separately; future studies with larger samples should examine them independently.

CONCLUSIONS

Future work should examine the effect of responses to STB disclosure on the likelihood of disclosing in the future, and how the severity of STBs impacts disclosure behavior. Clinicians may also explore how to increase adolescents' access to and comfort with help-seeking behaviors, including disclosure. This is particularly important for youth at higher risk for suicide, such as those psychiatrically hospitalized or marginalized based on sexual or gender identity. This may include creating future opportunities for disclosure of STBs to family members or treatment providers following discharge from the psychiatric hospital.

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Triple Vulnerability: Suicidal Ideation, Elevated Anxiety, and Alcohol Consumption and Treatment Engagement in a Partial Hospital Setting

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ABSTRACT

OBJECTIVE: Partial hospitalization programs (PHP) are acute psychiatric settings that commonly treat patients with active suicidal ideation (SI), anxiety, and alcohol use. Alcohol use is common among patients with SI and anxiety, and this triple vulnerability may negatively impact treatment engagement and outcomes in PHP. This study examined whether patients presenting with SI, elevated anxiety, and alcohol use ("triple vulnerability") demonstrated differences in PHP treatment outcomes (completing treatment, number of days attended, number of absences) compared to patients without the vulnerability.

METHODS: Participants were 493 patients admitted to an Acceptance and Commitment Therapy-based PHP program in the United States between 2014-2020. Triple vulnerability was defined as reporting (1) active SI, (2) clinically elevated anxiety (CUXOS-D ≥ 20), and (3) consuming ≥ 1 alcoholic drink on a typical drinking day within the past year. Binary and linear regressions were used to assess differences in treatment completion status, number of days attended, and number of absences.

RESULTS: The triple vulnerability was not significantly associated with treatment completion status or with the number of absences; it was, however, positively associated with the number of days attended at PHP.

CONCLUSION: People who experience SI, clinically elevated anxiety, and who consume at least one alcoholic beverage on a typical drinking day are more likely to attend PHP for a longer duration of time, but are not any more susceptible to not finishing treatment, relative to people who do not have the triple vulnerability. Future work can benefit from exploring additional treatment outcomes that may be impacted by patients with the triple vulnerability.

KEYWORDS: partial hospitalization program; treatment outcomes; suicidal ideation; anxiety; alcohol use

INTRODUCTION

Suicide was the 12th leading cause of death in 2023,[1] with approximately 49,300 suicide deaths. These rates represent a 35% increase over the past two decades.[2] In addition, about 12.8 million people seriously thought about suicide in 2023.[1] Partial hospitalization programs (PHP) are acute psychiatric settings that commonly treat patients with active suicidal ideation, offering daily intensive group therapy, individual psychotherapy, and psychiatry visits with medication management, while allowing patients to return home each evening. Nearly half of PHP patients report active suicidal ideation on intake.[3] The integration of intensive and multimodal therapy distinguishes PHPs as a valuable and common treatment setting for patients with suicidal ideation. Yet, PHPs and their treatment outcomes remain relatively understudied.[4,5]

Anxiety is prevalent among patients in PHPs and is associated with increased suicidal ideation[6] and suicide attempts[7] even when controlling for other mood disorders.[6] In population-based studies, the presence of anxiety disorders increased the odds of experiencing suicidal ideation and suicide attempts by 2.29 and by 2.48.[6]

Alcohol use is common in patients with suicidal ideation and anxiety. Comorbid alcohol use and anxiety symptoms have been associated with poorer treatment outcomes, less engagement in alcohol use-reduction behaviors, and overall less willingness to participate in treatment.[8-11] These intersecting symptoms may elevate the risk of incomplete treatment within the PHP setting, which relies heavily on daily attendance, group engagement, and participation. Therefore, patients with this triple vulnerability may struggle with less willingness to participate in PHP treatment, putting them at greater risk for early drop-out, missed absences, and increased risk for suicide and rehospitalization. Given that patients with this triple vulnerability do not necessarily have to meet diagnostic criteria for depression, alcohol use disorder, or another anxiety disorder, they may be clinically overlooked due to their lack of comorbid conditions. Despite the fact that they may not meet diagnostic criteria for all three disorders, when all their symptoms are taken together, these three factors may result in a clinical picture that is more difficult to treat than any in isolation. Patients with the triple vulnerability are a vulnerable group, and this exploration is a worthy endeavor given that it might help build awareness into how the triple vulnerability impacts treatment.

The Current Study

The current study aimed to examine whether patients presenting with the co-occurrence of suicidal ideation, clinically elevated anxiety, and recent alcohol use ("triple vulnerability") differed in treatment engagement outcomes in a PHP compared to those without this triple vulnerability. Specifically, we evaluated treatment-completion status, number of days attended, and number of absences. We hypothesized that patients meeting criteria for the triple vulnerability would demonstrate lower rates of treatment completion and reduced program attendance compared to patients without the full triple vulnerability.

METHODS

Treatment Setting/Procedure

Data were collected from consented patients presenting to an Acceptance and Mindfulness-based PHP between April 2014 and March 2020. Treatment was primarily based on Acceptance and Commitment Therapy (ACT) with elements of Cognitive Behavior Therapy and Dialectical Behavior Therapy incorporated as clinically indicated. Patients attended four to five group therapy sessions daily, as well as individual sessions with their therapist and psychiatrist. All patients completed standardized intake measures on their first day of treatment. Patients met daily with their individual therapist, psychiatrist, and attended 3-5 groups. Further treatment schedule details can be found in Terrill, Hubert, Yun, Ingram, Dalrymple.[12]

Participants

Participants were 493 adults admitted to the PHP for treatment who had complete data for all of the study variables. Participants' mean age was 34.76 years (*SD* = 12.88), and 70.8% identified their biological sex as female, 26.4% as male, and 2.8% as "other". Participants reported their race/ethnicity as 74.6% White, 11% Hispanic, 5.1% Black, 1.6% Asian, 1.8% Portuguese, and 5.9% Other. In terms of education, 7.7% did not graduate high school, 18.3% graduated from high school or received a GED, 35.3% completed some college, 23.3% graduated from a 2- or 4-year college program, 5.7% completed some graduate or professional school, and 9.7% completed graduate or professional school. Patients with missing alcohol use, anxiety, or suicidal ideation data were excluded from analyses.

Measures

Suicidal Ideation: Suicidal ideation was measured using a single item from the Remission from Depression Questionnaire (RDQ).[13] The item asked, "I had thoughts about killing myself" and was rated on a three-point scale (0 = "not at all or rarely true", 1 = "sometimes true", 2 = "often or almost always true") during the past week. Any non-zero endorsement (1 or 2) was coded as "active suicidal ideation."

Anxiety: Anxiety was measured using the Clinically Useful Anxiety Outcome Scale - Daily (CUXOS-D),[14] a 20-item self-reported measure of daily psychic and somatic symptoms of anxiety. Daily symptoms varied from 0 ("not at all") to 4 ("extremely"), with total scores ≥20 indicating at least mild anxiety. Scores of 20 or higher on intake or on day 1 of treatment (whichever was available) were coded as "clinically elevated anxiety." The daily version of the CUXOS has strong internal consistency (Cronbach's alpha = .93 at intake), test-retest reliability (r = .95 at intake), and high correlation with another measure assessing symptoms of anxiety.[14]

Alcohol Use: A single item from the Alcohol Use Disorders Identification Test - Consumption (AUDIT-C)[15] was used to establish the frequency of alcohol use. The item asked, "How many drinks do you have on a typical day when you were drinking in the past year?" and is rated on a Likert scale of "0" = 0 drinks to "5" = 10 or more drinks. This item was only used to identify people with regular alcohol exposure.

Triple Vulnerability: A dichotomous variable was created to represent the presence or absence of the triple vulnerability. Participants were coded as meeting triple vulnerability if they endorsed (1) active suicidal ideation, (2) criteria for clinically elevated anxiety (CUXOS-D >= 20), and (3) having 1+ drinks during a typical day of drinking during the past year (AUDIT-C ≥1). A total of 143 participants (29%) met triple vulnerability criteria, and 350 did not.

Number of days attended: A continuous variable was created to represent the total number of days of PHP attendance.

Completion status: Patients' completion status was determined by their primary provider (PhD, PsyD or MD), and included the following categories: (1) treatment complete, (2) treatment nearly complete, (3) insurance no longer covering, (4) nonattendance, (5) referred to another program, (6) transferred to inpatient care, (7) withdrew due to external limitations, (8) reported dissatisfaction and withdrew against medical advice, and (9) other. For interpretability, the treatment complete category was renamed to 'completed, ' and all other 8 categories (treatment nearly complete, insurance no longer covering, nonattendance, referred to another program, transferred to inpatient care, withdrew due to external limitation, reported dissatisfaction, and other) were collapsed into 'not completed.'

Number of absences: A continuous variable was created representing the total number of days patients were absent from PHP.

Data Analysis Plan

All analyses were conducted using IBM SPSS (Version 31.0). A binary logistic regression was conducted, with triple-vulnerability status as the predictor and treatment completion status (yes/no) as the dependent variable. Additionally, two linear regressions were conducted with triple-vulnerability

status as the predictor and number of days attended at PHP and number of absences as the respective dependent variables. Age and sex were entered as covariates. Descriptive statistics for all study variables among the triple-vulnerability groups vs. people without the triple vulnerability are presented in **Table 1**.

RESULTS

First, a binary logistic regression with treatment-completion status as the dependent variable showed that the model significantly predicted the outcome, (3) = 9.24, p = .026, explaining 3% of the variance (Nagelkerke R^2= .03) and correctly classifying 67% of cases. In the adjusted logistic regression model, only age was associated with higher odds of treatment completion (OR = 1.02, 95% CI [1.01, 1.04], p = .009). Triple vulnerability and sex were not significantly associated with treatment completion. Second, the linear regression with the number of days attended at PHP as the dependent variable showed the model was significant, F(3,492) = 4.13, p = .007. The results showed that the triple-vulnerability status was a significant predictor of the number of days attended (β=0.11, t= 2.40, 95% CI [0.21, 2.20], p = .017). Third, the linear regression with number of absences as the dependent variable showed the model was significant, F(3,492) = 7.13, p <.001. The results showed that the triple-vulnerability status was not a significant predictor of the number of absences (β=0.03, t= 0.68, 95% CI [–0.21, 0.44], p = .499). Only sex was a significant negative predictor in this model, p <.001. Sex was coded as 0 = female and 1 =male, indicating that males are less likely to have absences.

DISCUSSION

To our knowledge, this is the first study to examine treatment outcomes (i.e., treatment completion, number of days attended at PHP, number of absences) among patients engaging in a PHP in the Northern United States who reported suicidal ideation, clinically elevated anxiety, and consumed at least 1+ drink on a typical drinking day in the last year. Findings showed that patients who experience the triple vulnerability are more likely to remain longer in treatment relative to patients without the triple vulnerability. Patients did not differ based on treatment completion or number of absences. This study is an important step towards understanding how to improve treatment engagement and outcomes among patients who are at risk for suicidal ideation, elevated anxiety, and alcohol use.

The goal of PHPs is to help stabilize symptoms and improve functioning to help patients transition to a lower level of care. Prior research has indicated that comorbid alcohol use and anxiety symptoms are associated with less willingness to participate in treatment.[8-11] By identifying patients who have these characteristics that may put them at risk for premature discharge from PHP or worse treatment outcomes, additional support can be provided to reduce suicidal ideation, anxiety, and alcohol consumption to increase engagement in treatment, and therefore increase the likelihood of positive treatment outcomes. Among patients who did not have the triple vulnerability, approximately 78% did not report active suicidal ideation, which may speak to why those patients attended PHP treatment for a shorter duration. Additionally, it may be worthwhile to explore in more depth why men with the triple vulnerability, in particular, were less likely to have absences from PHP treatment compared to women.

Surprisingly, the triple vulnerability did not impact treatment completion and instead only resulted in patients with the triple vulnerability being more likely to attend for more days relative to those without the vulnerability. The clinical relevance of identifying the triple vulnerability is highlighted by the fact that the patients required a longer PHP course of treatment, even when not meeting full diagnostic criteria for any single disorder. Although the difference between an average of 8.13 versus 7.24 days [**Table 1**] may be modest, and cannot alone establish clinical significance in terms of symptom stabilization, it is important to note that each additional day in an intensive treatment environment, such as PHP, may carry clinical relevance as it relates to readiness for step-down to outpatient care. Specifically,

Table 1. Descriptive Statistics for all Study Variables

	Triple Vulnerability N = 143	Control Group N = 350
	N (%)	N (%)
Suicidality		
Not at all or rarely true	0 (0%)	273 (78%)
Sometimes true	64 (44.8%)	43 (12.3%)
Often or almost always true	79 (55.2%)	34 (9.7%)
Alcohol Use		
0 drinks	0 (0%)	143 (40.9%)
1 to 2 drinks	71 (49.7%)	123 (35.1%)
3 to 4 drinks	44 (30.8%)	46 (13.1%)
5 to 6 drinks	17 (11.9%)	21 (1.1%)
7 to 9 drinks	6 (4.2%)	9 (2.6%)
10 or more drinks	5 (3.5%)	8 (2.3%)
Treatment Completion		
Completed	89 (62.2%)	240 (68.6%)
Not completed	54 (37.8%)	110 (31.4%)
	M (SD)	**M (SD)**
Anxiety	60.31 (19.72)	51.40 (22.84)
Number of Days Attended	8.13 (6.46)	7.24 (4.29)
Number of Absences	1.44 (1.67)	1.41 (1.67)

a longer stay in PHP can indicate that a patient has not yet reached the clinical stability that affords a safe step-down to outpatient care, as this threshold is examined on a daily basis by clinicians in order to help patients return to a lower level of care as soon as possible. This also has practical implications for discharge planning, in terms of identifying an outpatient care team, which can take time, communicating with an existing care team, and ensuring appropriate outpatient supports. Patients with the triple vulnerability may benefit from initiating discharge-planning discussions earlier in their admissions to ensure timeliness before discharge. PHP and its treatment outcomes remain relatively understudied,[4,5] and future research in this treatment setting is indicated to determine what each additional treatment day confers in terms of post-discharge functioning.

There may be several other reasons why patients with the triple vulnerability had a longer treatment duration (by an average of about one day), and these reasons are speculative as they were not directly tested in this study. Possible explanations could be that they needed it due to increased severity, that their clinicians recommended a longer duration of treatment, that the PHP did not specifically address their alcohol use, or that they were more willing to remain in treatment until they completed their treatment. It is also possible that due to the triple vulnerability, day-to-day engagement was less, resulting in the need for more total days to complete the treatment. Clinicians may benefit from awareness that patients with the triple vulnerability may stay longer in PHP treatment. They may also encourage patients to make efforts to increase their engagement, which could make their treatment stay more efficient (i.e., resulting in a shorter length of stay that is optimized by having fewer absences during the length of stay). Clinicians may also consider discussing treatment engagement generally with patients and making adjustments to the patient's treatment plan based on the patient's needs. For example, if a patient with the triple vulnerability is reporting that they are having a difficult time engaging in group therapy, the clinician can work with them to approach engagement using emotion regulation, self-compassion, and distress-tolerance skills, instead of disengaging and avoiding others and the group leader. Clinicians may also benefit from revisiting the patients' values and goals in seeking treatment, and aim to increase their motivation to commit to action and change.

Future work may benefit from conducting PHP exit interviews with patients to examine their perspectives on treatment duration, and whether they may benefit from changes to help increase engagement. Although not directly assessed in the study, it would be worthwhile to explore why their treatment duration was statistically significantly longer. Interviews could also examine what motivated patients with the triple vulnerability to remain in treatment until completion. Findings could have important implications for policy. For example, if findings suggest that patients are engaged with treatment and they are still having longer PHP stays, this would support that people who carry this vulnerability may require a longer treatment duration (and this work can be cited in support of the need to request longer treatment to insurance companies if they are declining extended time at PHPs). Additionally, future work can also examine whether patients who have the triple vulnerability will have improved treatment outcomes if they participate in a PHP 'co-occurring track' that is specific to people who are also consuming substances, vs the general PHP track, which is not specific to substance use. Co-occurring mental health and substance use tracks at PHP specifically aim to address issues specific to substance use and may be better suited for patients with the triple vulnerability.

The current study highlights a higher-risk population that may benefit from additional targeted psychoeducation related to the manner in which symptoms maintain one another. Because patients with the triple vulnerability do not necessarily meet full diagnostic criteria for a DSM-5 disorder, they are more likely to fall through the cracks clinically, and may not be flagged as higher risk with traditional screening tools. The current study findings suggest that this combination, even when sub-diagnostic threshold, warrants clinical attention, given that it is associated with a longer treatment course. If PHP patients are screened for the triple vulnerability, clinicians may monitor their treatment adherence closely. They can also assess treatment engagement as well as their tendency to practice acquired ACT-based skills after program hours. A potential lower-cost method for accomplishing this could be through the use of digital interventions to assess these variables in a non-obtrusive and private manner, and provide additional skills' practice outside of program hours.

Limitations

The treatment setting of this study is a major strength. However, this study is not without limitations. First, alcohol-use measures were not collected from the entire sample (since PHP started), and as such, our sample size was significantly reduced due to a lack of AUDIT-C information for many PHP patients. Relatedly, we did not explicitly assess for daily alcohol use or for alcohol-related consequences, which would provide rich data for understanding alcohol use frequency and risk for serious consequences. Second, the study was conducted among patients in a PHP setting and thus may not generalize to less acute patient populations, such as outpatient treatment settings. Third, many of the independent variables, such as suicidality, anxiety, and alcohol use, are based on self-report and thus are subject to social desirability (e.g., underreporting or overreporting). It is possible that patients did not fully report their symptom severity due to social desirability. Lastly, suicidal ideation was assessed using a single self-report item, which may limit the ability to capture variability in ideation severity over time.

CONCLUSIONS AND FUTURE DIRECTIONS

Study findings indicate that patients who report active suicidal ideation, elevated symptoms of anxiety, and consume 1–10+ drinks on a typical drinking day in the last year are more likely to remain in treatment longer relative to patients who do not have this vulnerability. Future research may benefit from continuing to examine this triple vulnerability longitudinally, to further understand how PHP treatment duration impacts patients' symptoms after discharge (longer term). Whereas the triple vulnerability did not have an impact on two treatment outcomes observed in this study (treatment completion, number of days absent), it is possible that it can have an impact on other treatment outcomes, such as engagement in outpatient therapy, changes in suicidal-ideation severity, and inpatient hospitalization or PHP readmission. Longitudinal work would be an ideal methodology to track patients who discharge from PHP care, and assess their symptom trajectory following the completion/termination of their care.

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Firearm Violence, Digital Amplification, and the Case for Mental Health Literacy

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KEYWORDS: firearm violence; resilience; mental health; education; health policy; community

THE ALARM ENDS BUT THE EXPOSURE DOES NOT

The emergency alert eventually stopped buzzing. Classes resumed. Emails reassured everyone that resources were available. Yet for many at Brown University and the surrounding communities, the danger did not end when the shooter was neutralized. Fear does not follow institutional timelines. It lingers in the body: in hypervigilance, disrupted sleep, irritability, withdrawal, and a recalibration of feeling safe.

The December 2025 Brown shooting was not only a campus crisis; it was a community-level exposure event. Individuals and communities who were never physically near the scene nonetheless absorbed the shock. In this way, firearm violence functions less like a discrete incident and more like a public health exposure—diffused, cumulative, and unequally distributed.

PRACTICING THE DRILL, NEGLECTING THE AFTERMATH

Schools and universities have become increasingly adept at preparing for the *moment* of violence. Lockdown drills, shelter-in-place protocols, and trauma-informed language are now routine.[1,2] These measures are not misguided; they save lives. What remains largely unaddressed is the mental health crisis fueling and following these events.

In 1963, Rhode Island (RI) established a vision for school health centered on education, services, and a healthy environment. For decades, "school safety" was synonymous with fire drills and Cold War-era simulations. Today, the landscape has shifted fundamentally; firearm violence is now the leading cause of death for American youth.[3,4] RI law mandates that students in grades 1–12 receive about 20 minutes per day of health and physical education, including mental health and emotional well-being.[5] This mandate has been operationalized primarily through standardized physical education and emergency preparedness, while relegating mental health education to episodic, reactive, and inconsistent instruction.[2,6] As early as grade school, we are drilling the body for survival and leaving the mind to recover on its own. This imbalance reflects a broader systems failure: preparedness without recovery, protection without processing.

FIREARM VIOLENCE AS AMBIENT EXPOSURE

Firearm violence is not a rare experience of RI residents. Nearly one in four young adults reports exposure to firearm violence during childhood or adolescence.[4,7] Exposure to firearm violence, a form of adversity associated with increased risk of mental health problems later in life, is not limited to direct victimization.[4,7] Witnessing violence, knowing someone who was harmed, or repeatedly experiencing lockdowns and alerts all contribute to cumulative psychological load.

The Brown shooting fits squarely within this pattern. Even for those not in immediate danger, the event added to an existing archive of exposure—one that many Brown students and community members have been building for years. Unlike traditional adverse childhood experiences, exposure to firearm violence often extends into young adulthood and higher education yet remains largely absent from prevention frameworks that focus narrowly on K–12 populations.

THE AMPLIFICATION ENVIRONMENT: COVID-19, SOCIAL MEDIA, AND ARTIFICIAL INTELLIGENCE (AI)

The psychological impact of firearm violence unfolds within an amplifying environment shaped by the COVID-19 pandemic, ubiquitous social media, and rapidly expanding AI technologies. This environment does not create violence, but it intensifies its reach and prolongs its effects.

Adults and youth experienced profound social isolation during the pandemic, alongside disrupted routines, loss, and uncertainty. Although the lockdown eventually ended, life never fully returned to the way it was, and youth development never quite caught up. Simultaneously, distress is no longer episodic, and the learning environment is no longer just the classroom; both are available 24/7, in virtual landscapes designed to hijack dopamine and amygdala pathways. We inhabit a digital ecosystem of algorithms and a never-ending stream of distressing media, such that platforms

constantly deliver streams of alerts, videos, speculation, and graphic content, often before context or support is provided. Violent events are replayed, analyzed, and algorithmically resurfaced, transforming acute incidents into chronic psychological exposure. Moreover, emerging reliance on AI-based companionship and mental health tools reflects systemic gaps in care.[8,9] Technologies are increasingly used not as supplements to traditional psychological services, but as substitutes—filling voids created by insurance barriers, provider shortages, and persistent stigma.[7,10] Like students, faculty, teachers, healthcare workers, parents, and community members are embedded in this digital and social ecosystem. Exposure is collective, even when risk is uneven.

THE RESILIENCE TRAP

In the aftermath of gunfire violence, resilience is praised. Youth and young adults are commended for returning to their academic settings. Communities are applauded for "bouncing back." While well-intentioned, this framing quietly shifts responsibility from systems to individuals.

Repeated exposure to violence without corresponding investment in skills, language, and access to care is not resilience; it is endurance. Expecting individuals to continually adapt to environments characterized by fear and instability—without structural support—risks normalizing psychological injury as a personal failing rather than a predictable response to chronic stress.

Public health research increasingly emphasizes that recovery depends not only on individual coping, but on protective factors embedded at the community and policy levels.[4,11] This includes education that equips individuals to recognize stress responses, seek help early, and understand when distress is a rational reaction to an unsafe environment.[11,12]

MENTAL HEALTH LITERACY

Mental health literacy is not built with a one-time assembly or a worksheet distributed after a tragedy. However, it comes from a standardized, developmentally appropriate curriculum that is taught longitudinally and reinforced. Mental health literacy includes understanding how stress and trauma affect the brain and body, recognizing early distress signs, navigating coping behaviors, and knowing how to access care.

Evidence suggests that improving mental health literacy increases help-seeking, reduces stigma, and strengthens early intervention—outcomes that are critical in environments marked by exposure to violence.[12] Mental health literacy facilitates skill-building that is as routine as physical health. If K–12 schools can mandate standardized health screenings and physical health, they can also require formalized mental health literacy to promote mental health and wellbeing.

WHEN FEAR DISRUPTS MENTAL HEALTH EDUCATION

During Fall 2025, our team delivered a series of mental health workshops at a RI high school. Following the Brown shooting, the final workshop was canceled because our team was too overwhelmed. That cancellation was instructive. It demonstrated that fear disrupts learning. Sleep education cannot land when individuals are hypervigilant. Nutrition lessons falter when cortisol remains elevated. Mental health is not an adjunct to physical health education; it is the foundation that enables individuals to function at their best.

STEWARDSHIP AND THE PATH FORWARD

Stewardship is a core obligation of public institutions: the responsibility to create conditions for healthy populations. In the context of firearm violence, stewardship must extend beyond drills and security measures to include literacy, prevention, and recovery. We call for the RI Department of Education to rebalance the implementation of the 20-minute daily health mandate to explicitly require recurring, standardized mental health education to facilitate mental health literacy. Mental health should be treated as a core priority introduced early and reinforced across developmental stages.

We cannot predict every act of violence, but we can decide whether individuals are left alone with its psychological aftermath. Preparing bodies to survive without teaching minds how to recover is an incomplete form of safety. Moving beyond the drill requires acknowledging exposure, adapting to changing environments, and committing to mental health literacy as essential education for students, especially K–12.

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Every Step Counts: Honoring Recovery in All Its Forms

LAURA CARDENAS RAMOS, MD; JUSTIN BERK, MD

For a child, reaching a milestone is a sign of their development. For a student, receiving a diploma marks the culmination of a significant stage in their life. Parents and educators are acquainted with these pivotal moments. They witness them, celebrate them, and preserve them. Many of life's milestones are remembered through tangible items: a child's first tooth, a marathon medal, a photo, a certificate, a small keepsake. Each item tells a story. These objects anchor us to our growth and remind us of what we've endured and achieved, treasured reminders of progress and resilience.

In the field of addiction recovery, sobriety coins have long served a similar purpose. They are a small but powerful recognition of the challenges faced and overcome, symbols that quietly honor the courage required to begin again and continue forward.

As an addiction medicine provider (LCR), I have been privileged to be part of many patients' recovery journeys. I witness the courage it takes to return each week, despite trauma, stigma, and instability. I've had patients say, "Can I come every week? Showing up helps," and they keep on showing up, again and again. Their persistence, vulnerability, and openness are a testament to how deeply personal and nonlinear their recovery is. This has allowed me to better appreciate each patient's unique path—a path defined not only by setbacks but by small victories, moments of clarity, and acts of self-compassion that are often invisible to the outside world.

Mutual help organizations provide a regular structure to daily living, along with a supportive community.[1] The coins distributed at meetings become personal badges of honor. While many patients benefit from the solidarity, accountability, and encouragement provided in this setting, not all feel safe or ready to participate. Some share sentiments like: "Socializing is stressful right now," "Groups are emotionally triggering," "I'm an introvert and feel drained after the meetings," or, "I'm not ready to share my story with others." These reflections revealed an important truth: the traditional group-based approach, while transformative for many, is not a one-size-fits-all solution. Recovery looks different for everyone. For some individuals, the sense of community offered in these spaces is not accessible or helpful at certain stages of their healing, and honoring that difference is essential.

That realization sparked a question: How can we honor the milestones of those pursuing recovery outside of mutual help groups and 12-step programs? How do we make sure their progress is seen, validated, and celebrated, even if their path does not include the structure of group meetings?

This question led to a simple yet meaningful initiative: the introduction of wooden recovery coins into the outpatient practice. Wood is a symbol of strength and represents growth, grounding, and connection to the earth. Each wooden coin marks a specific month in the patient's recovery journey, whether it's one week or one year. In the clinic, when a patient achieves a milestone, we dig through our cloth bag of coins to find the right one. We hand them the coin, accompanied by words of encouragement and supported by objective evidence of their progress. We don't imply that one setback erases the journey; instead, we emphasize that progress is cumulative. Many ultimately "fall off the wagon," but we choose to celebrate what's going right and take pride in those steps together.

From the beginning, patients responded to this unexpected gesture with deep appreciation. It strengthened the bond between them and the recovery team while boosting their motivation and morale. The coins, though simple, seem to say: *we see you, and we care*. They become a tangible reminder that someone believes in them—even on the days they struggle to believe in themselves.

Research consistently supports the combination of behavioral and pharmacological interventions as the most effective approach for treating substance use disorders. A 2020 Cochrane review found that 12-step interventions can be as effective and more cost-effective than professionally delivered behavioral therapies.[2,3] As healthcare providers, advocating for accessible and individualized resources may be one of the most meaningful ways we can support recovery. The best treatment is always the one that meets a patient where they are.[1] That might be pharmacological management. It might be trauma-focused therapy. It might be harm reduction. And sometimes, it is a small, unassuming wooden coin placed in the right hands at the right moment.

The coins became part of a combined approach in our clinic, serving as a tangible recognition of progress, tailored to each patient's path and pace. Whether a patient has years of sobriety or is trying again for the first time in months, we want them to know: we're still here, still rooting for them as members of their fan club. Because no matter how recovery unfolds, every step forward deserves to be seen, honored, and remembered.

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The Storm After the Calm: A Case of Medetomidine Withdrawal

GUSTAVO D. PORTO, MD; KIRA GALEANO, MD; WILLIAM BINDER, MD

ABSTRACT

We report a case of a 30-year-old woman with a history of intravenous drug use, who presented to the emergency department with nausea, vomiting, agitation, and delirium. In order to protect her airway and to facilitate further evaluation, she received endotracheal intubation, but despite maximum pharmacologic sedation, she became increasingly tachycardic and hypertensive. A comprehensive blood toxicology panel revealed medetomidine, a sedative used in veterinary medicine and a known adulterant used in illicit fentanyl. While medetomidine has permeated the fentanyl supply in the middle Atlantic states, to our knowledge this is the first case reported in Rhode Island.

KEYWORDS: medetomidine; withdrawal; intoxication; contaminant; narcotics

PRESENTATION AND HOSPITAL COURSE

The patient is a 30-year-old female who presented with complaints of abdominal pain and persistent vomiting for 24 hours. Her history was otherwise limited due to agitation and confusion. Medical history obtained through the electronic medical record was significant for intravenous (IV) drug use, including fentanyl, as well as cannabis use, for which she has had multiple prior ED visits for presumed cannabis hyperemesis syndrome, which typically improved with IV medications.

Vital signs were notable for a heart rate (HR) of 125, blood pressure (BP) 159/108 mm Hg, temperature of 97.8 Fahrenheit, and SpO2 of 99%. Her physical exam revealed confusion and agitation, mild diaphoresis, with pupils at 3 mm and equal. Cardiac exam revealed tachycardia, with a normal S1S2. The patient's lung sounds were clear, and her abdomen was soft without distention or guarding. As noted, her neurologic exam was significant for confusion and agitation, and she was unable to attend to commands. She spontaneously moved all extremities.

An initial EKG was performed and was notable for sinus tachycardia with a rate of 139, but otherwise normal intervals. Lab work revealed a white blood cell count of 23.6k, K of 2.4, and lactate of 4.3. The patient's initial urine toxicology report was positive for cannabis, benzodiazepines, and fentanyl. Her volatile alcohol levels were undetected and her acetaminophen/salicylate levels were negative. Imaging of her brain and abdomen/pelvis were unremarkable.

While in the emergency department the patient's mental status continued to worsen, causing her to become increasingly agitated, swinging at staff and herself, and she required physical and chemical restraints for patient and staff safety. The patient received multiple rounds of medications for chemical sedation, including droperidol, midazolam, fentanyl, and a dexmedetomidine drip, with no success in controlling her agitation. She continued to fight against the physical restraints and became more tachycardic to the 170s. Her diaphoresis worsened, and her pupils became more dilated. She had no hyperreflexia or ankle clonus on exam, no urinary retention, and remained normothermic. She was intubated in order to control her agitation for her safety and to facilitate work-up.

The patient was transferred to the intensive care unit for ventilator management and further evaluation and care. She was maintained on a propofol and dexmedetomidine infusion, and on day two of her hospital admission her vital signs improved and she was extubated. A comprehensive blood toxicology panel was notable for medetomidine, in addition to the drugs detected in her urine panel. She endorsed using IV opiates but left the hospital against medical advice and prior to completing her repeat laboratory studies.

DISCUSSION

Our patient suffered from medetomidine toxicity and withdrawal. Medetomidine was first brought to market in Europe in 1987 and received FDA approval for sedation in dogs in 1996.[1] It is a selective alpha-2 adrenergic receptor agonist and is widely used in veterinary medicine as a sedative and analgesic. Medetomidine is a racemic mixture of dexmedetomidine, the more pharmacologically active enantiomer which is approved for human use, and levo-medetomidine. Alpha-2 agonists are sympatholytic and inhibit norepinephrine and dopamine release, with the primary result being central nervous system (CNS) depression given the higher concentration of alpha-2 receptors centrally as opposed to peripherally.[2,3] Along with sedation, medetomidine can cause bradycardia and produce biphasic effects on blood

pressure due to the initial peripheral alpha-2 receptor activation on vascular smooth muscle, leading to vasoconstriction. This is followed by the more dominant central alpha-2 receptor activation causing the reduction in circulating catecholamines and hypotension.[3]

Medetomidine was first identified as an adulterant in the non-medical opioid supply in Maryland in July 2022. Since then, it has been found in illicit fentanyl in multiple locations in the United States, as well as in Canada, and has been linked to adverse outcomes in Philadelphia, Chicago, and Pittsburgh.[3,4] Use of medetomidine has mushroomed over the last several years. In a 2024 study in Philadelphia, medetomidine was detected in 29% of samples taken of illicit fentanyl with prevalence increasing to 87% six months later.[2,5] It has been routinely detected in wastewater in numerous states and is distributed throughout the U.S., with the greatest concentration in the Northeast and Midwest.[5]

Use of medetomidine has surpassed xylazine, which was formerly the most common adulterant in fentanyl samples.[2,4,6,7] Xylazine, a non-opioid sedative and alpha 2 adrenergic agonist medication most commonly associated with necrotic skin wounds, is sometimes combined with medetomidine and fentanyl in the non-medical opioid supply.[8] It can also cause bradycardia and hypotension, but these cardioactive effects are more predominantly noted in medetomidine toxicity as medetomidine has a 10-times greater alpha 2:alpha 1 selectivity.[9]

The combination of fentanyl and medetomidine, sometimes referred to as "demon," attenuates the respiratory drive.[3,4] In a study on Wistar rats, the combination of fentanyl and medetomidine worked synergistically, leading to earlier onset of toxicity, including respiratory depression and bradycardia compared to either drug alone.[2] While naloxone administration may reverse the impact on the fentanyl dosing, it does not countermand medetomidine toxicity.[3] At present, no reversal agents for medetomidine are currently approved for human use. Atipamezole, an imidazoline alpha-2 receptor antagonist, is a veterinary reversal agent for medetomidine and is used in dogs, but it may precipitate acute, life-threatening withdrawal symptoms in humans.[3]

Consequently, management of acute medetomidine toxicity—hypotension, bradycardia, and CNS depression—is primarily supportive. Airway protection can be achieved either through head of bed elevation or through endotracheal intubation and mechanical ventilation. Bradycardia and associated hypotension can initially be managed with fluids and vasopressors.[3,9] In patients with heavy, chronic use of medetomidine, it is paramount to closely monitor symptom progression as patients may start to display signs of withdrawal, which requires differing management.

Acute medetomidine withdrawal can lead to life-threatening hyperadrenergic symptoms, including severe hypertension, tachycardia, and agitation. Anxiety, tremor, flushing and diaphoresis can occur within hours of last drug use. Hyperthermia, a predictor of an increased risk of mortality, has been noted as well.[5] Laboratory findings are numerous. Hypokalemia, elevated lactic acid levels, and high troponin can occur. QTc prolongation, acute cardiomyopathy, and posterior resolving encephalopathy syndrome have been reported.[3,4]

Management of acute withdrawal continues to develop. In the early stages of medetomidine withdrawal (usually 4–6 hours after last use), oral and transdermal alpha-2 agonists and antiemetic therapy can be considered. Alpha-2 agonists such as clonidine, tizanidine, guanfacine, and dexmedetomidine can be utilized to directly treat the underlying pathophysiology of medetomidine withdrawal. Additionally, droperidol and benzodiazepines can be used for both agitation and as an antiemetic.[3] Progression, however, is not uncommon, and rapid escalation from agitation to autonomic dysregulation can occur during the course of an emergency department evaluation.[9] In one study, approximately two-thirds of patients required ICU admission and 16% required intubation.[4]

In our case, the patient's progressive agitation and inability to follow commands made enteral treatment untenable. The patient eventually required endotracheal intubation, ICU admission, and a dexmedetomidine infusion along with benzodiazepines. Intravenous dexmedetomidine is the mainstay of severe withdrawal symptoms, and patients may require higher than usual infusion rates.[9] Patients in severe withdrawal can continue to receive transdermal or oral clonidine (even through an orogastric tube) if there is persistent hyperadrenergic symptoms. Phenobarbital has limited effect in these patients unless there is suspicion for accompanying benzodiazepine withdrawal, and ketamine may also have limited impact in medetomidine withdrawal.[3] Patients may also require management of opioid withdrawal with antiemetics, antidiarrheals, and additional supportive medications. It is interesting to note that weaning of prolonged dexmedetomidine in the ICU setting can cause similar withdrawal symptoms to medetomidine withdrawal, given their shared mechanism of action. Signs of medetomidine withdrawal may abate after 24–48 hours.[9]

Due to the increasing prevalence of medetomidine in Rhode Island's fentanyl supply, early recognition of medetomidine toxicity and withdrawal is critically important. Management of medetomidine withdrawal is notoriously difficult, and may require intensive levels of intervention as these patients may develop life-threatening derangements with untoward consequences if not appropriately addressed.

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Association Between Perceived Interpersonal Support and Quality of Life Among Adult Patients Undergoing Chemotherapy at an Integrated Academic Cancer Institute

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ABSTRACT

PURPOSE: Increased interpersonal support may improve the quality of life of patients with a cancer diagnosis. We seek to determine the relationship between perceived interpersonal support (PIS) and quality of life (QOL) among adult patients receiving chemotherapy infusions at an academic cancer institute.

METHODS: We surveyed patients with cancer receiving chemotherapy infusions at The Miriam Hospital (TMH) of Brown University Health from February 2024 to April 2024. We administered two established surveys in-person to patients: (1) a 12-item Interpersonal Support Evaluation List (ISEL), and (2) a 16-item Quality of Life Scale (QOLS). Linear regressions were run to understand any association between performance on the ISEL and the QOLS, and between demographic characteristics and ISEL or QOLS performance.

RESULTS: Of 432 eligible chemotherapy patients during the study period, 93 (22%) completed the prospective surveys. The mean (SD) ISEL total score was 31.2 (6.0) out of a maximum of 36, and the mean QOLS total score was 93.5 (11.8) out of a maximum of 112. Higher PIS was significantly associated with greater QOL satisfaction (β = 0.86; 95% CI, 0.28 to 1.43; P = 0.004), indicating a 0.86-unit QOLS increase per unit rise in ISEL score. Patients who identified as "Black or African American" (β = –5.36; 95% CI, –9.39 to –1.32; P = 0.010) or "Other" (β = –4.91; 95% CI, –8.95 to –0.88; P = 0.018) had a significantly lower ISEL total score compared to those who identified as "White or Caucasian."

CONCLUSION: PIS is positively associated with QOL among patients undergoing chemotherapy. Cancer institutes should proactively make workforce, programmatic, and resource investments to better address gaps in support to improve QOL.

KEYWORDS: Interpersonal support; quality of life; cancer support; cancer survivorship

INTRODUCTION

The diagnosis of cancer has a profound impact on a patient's quality of life (QOL). Measuring QOL involves a diverse set of criteria related to physical, functional, psychological, social, behavioral, and spiritual well-being.[1] Similarly, a cancer diagnosis can heavily test a patient's interpersonal support system, defined as the perceived availability of interpersonal resources.[2] This definition broadly captures the diversity of social support systems, including structural (i.e., number of contacts in social network) and functional (i.e., the perceived availability of support such as financial aid or emotional support).[3,4] Reliance on interpersonal support points to a growing need to promote empathetic, inclusive, and accessible support systems for all patients with cancer, with a focus on integrating social support systems as a social determinant of health in oncology care. This is particularly critical considering patients' changing support needs when diagnosed with cancer and throughout the cancer continuum. For patients, their priority during illness may take the form of "spiritual struggle, the search for forgiveness, and the search for purpose and meaning in life."[5] Therefore, the goal of cancer treatment should not simply be to increase survival time but also to improve QOL.[6]

Social support systems have been determined to be highly important for maintaining optimal physical health, supporting mental health, and improving longevity, all of which can affect quality of life. A positive support system can enhance resilience to stress, protect against trauma-related experiences, and reduce clinical morbidity and specific/all-cause mortality.[7-9] Support from social networks has also been shown to buffer periods of unpredictability and/or adversity, such as during the COVID-19 pandemic and at the time of initial cancer diagnosis.[10-12] Experimental research has demonstrated the role three neurobiological pathways (autonomic nervous, neuroendocrine, and immune systems) play in linking social support with health and longevity. This includes inhibition of defense responses, promotion of homeostasis, social bond formation through parasympathetic system, hypothalamic pituitary axis (HPA) stress regulation, and oxytocin production, which can ultimately lead to higher perceived quality of life.[13]

Chemotherapy is one of the most common treatments for patients with cancer.[14] Its mechanism of action leads to killing of not only cancer cells but also healthy cells, causing side effects such as fatigue. Due to its many potential adverse side effects on the body, patients undergoing chemotherapy need strong emotional support and may require

interventions that promote mental health to deal with anxiety or depression.[15] As such, it is crucial to study how the interpersonal support structure can affect these specific patients with cancer.

This proof of concept study focuses on exploring the relationship between PIS and QOL for patients receiving chemotherapy at an academic medical center in Rhode Island. Given that greater support reduces the burden of navigating cancer on one's own, it is expected that increased PIS is associated with higher QOL in this patient population. By analyzing patient social support systems on quality of life in the largest cancer institute in Rhode Island, this study aims to identify specific areas of support that can impact resilience in patients with cancer and elucidate areas for investment at the cancer center level.

METHODS

Study Population

This study enrolled patients from the Brown University Health Cancer Institute at The Miriam Hospital (TMH) who met inclusion criteria of: (1) an adult 18+, and (2) receiving chemotherapy infusion treatment with an active cancer diagnosis. Brown University Health is a comprehensive, integrated, academic health system affiliated with The Warren Alpert Medical School of Brown University.

The cross-sectional study received approval from the Lifespan/ Brown University Health Institutional Review Board under expedited review 45 CFR 46.110(b)(1), Category 7(a) from the Human Research Protection Program. Patients were selected for an in-person interview during scheduled chemotherapy infusion appointments based on the normal course of care conducted by the oncologists, nurses, and the social worker team. Sampled patients were representative of the overall patient population. The study period was from February 9, 2024 to April 26, 2024.

Survey Methods

After confirming eligibility and obtaining consent from patients during interviews, trained research staff administered two surveys, including (1) a 12-item Interpersonal Support Evaluation List (ISEL), and (2) a 16-item Quality of Life Scale (QOLS). Trained study staff provided each potential participant with a consent form that included the name and contact information of the principal investigator and IRB. Study staff were available to answer any questions about the surveys should they arise.

The ISEL-12 is a modified 12-item measure of patient perception of social support.[16] The ISEL-12 is derived from the long original version of the ISEL and contains 12 items which assess the perceived availability of social support on a four-point scale ranging from "definitely false" to "definitely true." There are three subscales measuring appraisal, belonging, and tangible support scores consisting of four items each. Appraisal support measures perceived availability of someone to talk to about one's problem; belonging: people one can do things with; and tangible: availability of material aid. All items are summed to yield a total score (scores range 0–36).

The Quality of Life Scale (QOLS) is a 16-item measure of five conceptual domains of QOL which have strong correlation to social support: (1) material and physical well-being; (2) relationships with other people; (3) social, community and civic activities; (4) personal development and fulfillment; and (5) recreation.[17] A seven-point scale ranging from "delighted" (7), "pleased" (6), "mostly satisfied" (5), "mixed" (4), "mostly dissatisfied" (3), "unhappy" (2), "terrible" (1) is used. All items are scored to yield a total score (scores can range from 16 to 112).

Data Extraction

Key demographic characteristics of patients were collected from the EPIC Electronic Health Record (EPIC Systems, Verona, WI), including: gender, age, race, ethnicity, marital status, insurance type, prior consult history with a social worker, and advanced directive status. Additional clinical data collected include: cancer diagnosis category,[18] year of cancer diagnosis, and intent of current chemotherapy treatment.

Statistical Analysis

All descriptive results (as % of responses) using non-missing responses were reported across each of the ISEL and QOLS domains. Univariable linear regression analyses were conducted to identify any associations between collected demographic characteristics extracted from EPIC and performance on either the ISEL or QOLS. We finally ran a simple, unadjusted linear regression model to understand any association between performance on the ISEL and performance on the QOLS. Analyses were conducted using Stata version 18.0 (StataCorp LLC), with significance defined as $p < 0.05$.

RESULTS

Of 432 eligible chemotherapy patients being treated in the infusion rooms at the Norman & Rosalie Fain Health Center at TMH during the study period, 93 (22%) completed the prospective surveys and had an up-to-date and complete medical record for the purposes of our study [**Table 1**]. The average (SD) age was 68.4 years old (10.3). The majority of patients were male (50.5%), White or Caucasian (79.6%), not Hispanic or Latino (94.6%), married (64.5%), on Medicare (62.4%), diagnosed in 2023 or 2024 (59.1%), and the most common cancers were gastrointestinal (30.1%), genitourinary (23.7%), and breast (17.2%).

Cumulative ISEL Ratings

With the exception of question 5, over 70% of patients reported the highest level of PIS (either responding "definitely

Table 1. Demographic Characteristics of Interviewed Patients Undergoing Chemotherapy

Characteristic	N (%) N = 93
Gender	
Female	46 (49.5%)
Male	47 (50.5%)
Age	
Mean (standard deviation)	68.4 (10.3)
Race	
Black/African American	10 (10.8%)
White or Caucasian	74 (79.6%)
Other	9 (9.7%)
Ethnicity	
Hispanic or Latino	3 (3.2%)
Not Hispanic or Latino	88 (94.6%)
Prior Consult with Social Worker	
Yes	31 (33.3%)
No	62 (66.7%)
Year of Diagnosis	
2024	12 (12.9%)
2023	43 (46.2%)
2022	10 (10.8%)
2021	7 (7.5%)
Before 2021	21 (22.6%)

true" for normal scored or "definitely false" for reverse scored) [**Table 2**]. Questions as defined in the ISEL survey were categorized into one of the three types of PIS, either appraisal, belonging, or tangible. On average, patients expressed the highest level of PIS for appraisal support (80.1%), followed by tangible support (75.5%), and belonging support (71.8%). Across the interpersonal support scores, participants had the lowest PIS in belonging support, such as finding someone to go to a movie with on short notice.

Cumulative QOL Ratings

Overall, patients demonstrated high satisfaction in their QOL [**Table 3**]. Over 80% of patients were "delighted" or "pleased" with their material comforts; their relationships with parents, siblings, children, spouse/significant others, and close friends; reading, listening to music, and consuming other entertainment; and their independence. Of all QOL domains, patients reported the lowest average levels of satisfaction with their health (4.69), participation in organizations/public affairs (4.99), and participation in active recreation (4.89) on the 7-point scale.

Linear Regression Analysis

Among participants who fully completed the ISEL (n=92) and QOLS (n=55) surveys, the mean (SD) ISEL total score was 31.2 (6.0) out of a maximum of 36, and the mean QOLS total score was 93.5 (11.8) out of a maximum of 112 [**Table 4**].

Table 2. Interpersonal Support Evaluation List (ISEL) Results by Question

Question	1. definitely false	2. probably false	3. probably true	4. definitely true
I would have a hard time finding someone to go with me on a day trip.	73.4%	10.6%	7.5%	8.5%
There is no one I can share my most private worries and fears with.	90.4%	1.1%	5.3%	3.2%
If I were sick, I could easily find someone to help with my daily chores.	6.4%	2.1%	20.2%	71.3%
There is someone I can turn to for advice about handling family issues.	6.5%	3.3%	18.5%	71.7%
I could easily find someone to go with me to the movies that evening.	5.3%	6.4%	26.6%	61.7%
When I need suggestions on a personal problem, I know someone I can ask.	2.1%	2.1%	16.0%	80.0%
I don't often get invited to do things with others.	74.5%	11.7%	11.7%	2.1%
If I had to go out of town, it would be difficult to find someone who would look after my home.	73.4%	8.5%	9.6%	8.5%
If I wanted to have lunch, I could easily find someone to join me.	6.4%	2.1%	13.8%	77.7%
If I was stranded 10 miles from home, there is someone I could call who could come and get me.	3.2%	1.1%	9.6%	86.2%
If a family crisis arose, it would be difficult to find someone to give me advice.	78.5%	11.8%	4.3%	5.4%
If I needed some help moving to a new home, I would have a hard time finding someone to help.	71.3%	17.0%	6.4%	5.3%

Items 2, 4, 6, 11 make up the Appraisal Support subscale; Items 1, 5, 7, 9 the Belonging Support subscale; Items 3, 8, 10, 12 the Tangible Support subscale. Some items are reverse scored.

Table 3. Quality of Life Scale (QOLS) Results by Domain

Domain	1. Terrible	2. Unhappy	3. Mostly dissatisfied	4. Mixed	5. Mostly Satisfied	6. Pleased	7. Delighted
Material comforts	0.0%	0.0%	1.1%	5.4%	11.8%	28.0%	53.8%
Health, physically fit	0.0%	5.4%	12.9%	30.1%	20.4%	20.4%	10.8%
Relationships with parents, siblings & other relatives	0.0%	1.1%	0.0%	4.4%	10.9%	20.7%	63.0%
Having and rearing children	0.0%	0.0%	0.0%	7.8%	7.8%	11.7%	72.7%
Close relationships with significant other	1.3%	0.0%	1.3%	4.0%	4.0%	9.3%	80.0%
Close friends	0.0%	1.1%	0.0%	4.3%	10.8%	17.2%	66.7%
Helping others,volunteering, advising	0.0%	1.1%	3.2%	16.1%	17.2%	23.7%	38.7%
Organizations and public affairs	2.4%	7.1%	8.2%	22.4%	15.3%	21.2%	23.5%
Learning or school	1.2%	1.2%	8.1%	12.8%	24.4%	20.9%	31.4%
Knowing yourself, asset, limitations	0.0%	0.0%	0.0%	8.7%	17.4%	29.4%	44.6%
Work (job or home)	1.2%	1.2%	4.6%	10.3%	19.5%	26.4%	36.8%
Expressing yourself creatively	0.0%	2.1%	4.3%	14.9%	21.3%	28.7%	28.7%
Socializing-meeting other people, etc.	0.0%	4.3%	6.5%	10.8%	16.1%	29.0%	33.3%
Reading, music, and entertainment	0.0%	0.0%	2.2%	5.4%	12.0%	21.7%	58.7%
Active recreation	2.3%	5.7%	9.1%	22.7%	26.1%	11.4%	22.7%
One's independence	0.0%	1.1%	2.2%	9.7%	8.6%	25.8%	52.7%

Table 4. Regression Analysis of Associations with ISEL and QOLS scales

	ISEL (n=92)		QOLS (n=55)	
Mean (SD, Minimum, Maximum)	31.2 (6.0, 7, 36)		93.5 (11.8, 67, 112)	
Median	33.5		96.0	
Linear Regression	Coefficient (95% CI)	P-value	Coefficient (95% CI)	**P-value**
ISEL	—	—	**0.86 (0.28, 1.43)**	**0.004**
QOLS	**0.86 (0.28, 1.43)**	**0.004**	—	—
Male	0.72 (–1.81, 3.25)	0.57	–0.58 (7.08, 5.93)	0.86
Age	–0.01 (–0.13, 0.11)	0.88	0.11 (–0.20, 0.42)	0.47
Black or African-American	**–5.36 (–9.39, –1.32)**	**0.010**	–0.58 (–11.12, 9.95)	0.91
Other Ethnicity	**–4.91 (–8.95, –0.88)**	**0.018**	–0.08 (–10.62, 10.45)	0.99
Hispanic or Latino	–3.83 (–10.93, 3.27)	0.29	8.81 (–8.26, 25.88)	0.31
Prior Consult with Social work	–2.17 (–4.82, 0.49)	0.11	–2.99 (–9.82, 3.84)	0.38
Year of Diagnosis: 2021	4.55 (–1.03, 10.13)	0.11	2.21 (–9.70, 14.12)	0.71
Year of Diagnosis: 2022	0.41 (–4.22, 5.05)	0.86	0.56 (–12.43, 13.56)	0.93
Year of Diagnosis: 2023	1.21 (–2.01, 4.44)	0.46	**–7.64 (–15.28, –0.01)**	**0.05**
Year of Diagnosis: 2024	–0.54 (–4.90, 3.83)	0.81	–5.94 (–16.00, 4.13)	0.24

The association between ISEL total score and QOLS total score was evaluated using unadjusted, univariable linear regression. The coefficient for ISEL total score was 0.86 (95% CI, 0.28 to 1.43; P = 0.004), indicating that for each unit increase in the ISEL score, the QOLS score increased by 0.86 units. The model explained 14.5% of the variance in the QOLS total score (R-squared = 0.1446).

The association between demographic and clinical characteristics of patients and their performance on the ISEL and QOLS surveys were tested independently using univariable linear regressions. The coefficients for gender, age, ethnicity, marital status, insurance type, prior consult history with a social worker or psychologist, advanced directive status, cancer diagnosis category, year of cancer diagnosis, and intent of current chemotherapy were not significant for either survey with the exception of the year of 2023 for the QOLS.

Linear regression on the relationship between race and ISEL total score showed a significant effect of race on ISEL

total score (F(2, 88) = 5.78; P = 0.0044). The model explained approximately 11.6% of the variance in ISEL total score (R-squared = 0.1161). Patients who identified as Black or African American had a significantly lower ISEL total score, with a coefficient of –5.36 (95% CI, –9.39 to –1.32; P = 0.010) compared to those who identified as White or Caucasian. Similarly, those categorized as "Other" also had a lower ISEL total score, with a coefficient of –4.91 (95% CI, –8.95 to –0.88; P = 0.018). The average ISEL total score for the White or Caucasian reference group was 32.14 (95% CI, 30.80 to 33.47).

Similarly, the relationship between year of diagnosis and QOLS total score was examined using linear regression, with patients who were diagnosed in 2023 having a nearly significant lower QOLS total score, with a coefficient of –7.64 (95% CI, –15.28 to –0.01; P = 0.05) compared to those diagnosed before 2021, with a similar pattern observed in 2024 (although insignificant).

DISCUSSION

In approximately a quarter of adults receiving chemotherapy at TMH, our study found a positive association between PIS and QOL. With every unit increase in PIS, QOL increased by 0.86 units. This supports findings in other research contexts that have concluded the role of increased PIS in reducing anxiety and depression and improving physical health and response to negative life events.[19-22] Another study among patients with lung cancer undergoing chemotherapy demonstrated the important role of PIS as a mediator for the relationship between depression and QOL.[23]

Additionally, from the subset of patients identifying as Black or African American or Other, there is an indication of significant racial disparities in PIS and disparities in QOL that should be further tested. Although not shown to be statistically significant, there may be additional disparities for those more recently diagnosed with cancer among a broader cohort of patients undergoing chemotherapy.

Across ISEL domains, a majority of patients reported strong PIS. Lowest areas of satisfaction in belonging and tangible categories suggest strong potential for interventions and support from social workers and patient navigators to (1) build support groups among chemotherapy patients to promote engagement in social activities, and (2) build more comprehensive support resources for tangible tasks like moving, assisting with chores, or physical activities. Prior research has also demonstrated the role of strong PIS in reducing potentially unnecessary aggressive end-of-life care, emphasizing the need for this type of assessment in clinical care.[24-29]

Across QOL domains, our results indicate a strong focus among patients on their own lives and close networks rather than external affairs or activities. Mixed levels of satisfaction with health among chemotherapy patients could be addressed through programs related to chemotherapy-specific wellness and health maintenance education during the course of treatment. Interestingly, building community through recreational activities and civic engagement among these patients during chemotherapy can simultaneously improve QOL satisfaction and belonging support.

Our current support system, Brown University Health's Community Health Institute (CHI), has various programs in place to address social determinants of health, including social support needs such as screening for incarcerated and low-income patients. However, there is still limited programming for addressing social support systems among patients with cancer.[30-33] This type of limited support is evident across hospital systems throughout the country. From the perceived ratings of PIS and QOL, TMH and other cancer institutes across the country can undertake specific interventions to improve tangible supports and opportunities to improve belonging and community-building, along with specific health and recreation-focused efforts to improve QOL of patients undergoing chemotherapy.

Limitations

Our study does have some key limitations. Firstly, our smaller study showed a low survey response rate (22%) of eligible patients, which may be subject to non-response bias. Notably, characteristics of respondents to our survey were representative of non-respondents. From survey respondents, we were unable to collect an equal number of valid data for QOL as ISEL due to unanswered satisfaction ratings by patients during survey administration out of respect for patients' willingness to forgo answering certain questions. This study represents an exploratory analysis of patient-reported ratings within a defined study duration, and reflects survey response within routine clinical care rather than a longitudinal data collection effort. Due to the potential for high-patient attrition, variability in patient care plans, and difficulty contacting patients, a longitudinal collection was not conducted. We encourage future researchers to assess all criteria and coordinate with patient treatment teams to ensure collection of data. Secondly, although our sample was representative of the population at TMH, another issue was the lack of generalizable representation across racial and ethnic groups in the U.S., particularly minority groups. Future studies should include a broader and diverse sample to determine if the pattern found in our study holds for these populations. Finally, our linear regression model testing ISEL and QOLS was unadjusted. Given the limited sample size, multivariable adjustment for potential confounders in **Table 4** was not performed.

CONCLUSION

In conclusion, this proof of concept study revealed the positive association between PIS and QOL in patients receiving chemotherapy. The relatively lower ratings of belonging and tangible support compared to appraisal support highlight a need for support groups and services for tangible tasks, with a particular focus on African American and other racial/ethnic populations. Low satisfaction with health, participation in organizations/public affairs, and participation in active recreation calls for a way to bring together patients in programs that benefit wellness and health maintenance and encourage them to contribute toward positive change on issues. Our findings suggest that cancer institutes should find targeted interventions (i.e., social work, patient navigation, screening, etc.) to meaningfully address PIS and ultimately improve the QOL of the patients they serve.[34,35] This study's findings align with efforts of the American Cancer Society and the Centers for Medicare & Medicaid Services (CMS) calendar year (CY) 2025 Medicare Physician Fee Schedule (PFS) final rule, which provides reimbursement for principal illness navigation services.[36,37] We provide insights to better inform health systems in evolving to address the unique social support needs of patients with cancer to ultimately improve quality of life.

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Assessing Public Health and Preventative Health Needs of Underserved Communities in Rhode Island

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ABSTRACT

BACKGROUND: In the United States, significant disparities exist in preventative health among underserved communities, including African American/Black (AA/B), Hispanic/Latino (H/L) and lesbian/gay/bisexual/transgender/queer (LGBTQ+) individuals. We explored the influence of social determinants of health (SDOH) on preventative health outcomes in these groups.

METHODS: We conducted a comprehensive cross-sectional needs assessment at safety-net health clinics in Providence, Rhode Island, from June to September 2022.

RESULTS: Of N=1,017 individuals, 67% identified as H/L, 16% identified as AA/B, and 19% identified as LGBTQ+. The most common diagnosed health conditions were anxiety (26%), depression (23%), hypertension (20%), and diabetes (15%). People reported most commonly needing help with food (31%), housing (25%), and utilities (22%). More social needs were associated with reductions in COVID-19 booster vaccination (p<.01) and higher mental health diagnoses (p<.01). AA/B individuals with higher health literacy were also less likely to be diagnosed with a mental health condition (p=.02). LGBTQ+ individuals were more likely to report a history of mental health illness, tobacco use, hazardous alcohol use, other substance use, and more sexual partners (p<.05).

CONCLUSIONS: Addressing health literacy and other social determinants of health is important to address disparities and achieve health equity among marginalized communities.

KEYWORDS: Social determinants of health; health disparities; mental health; sexual health; health literacy

INTRODUCTION

In the United States (US), significant health disparities exist among underserved communities, including African American/Black (AA/B), Hispanic/Latino (H/L), and lesbian, gay, bisexual, transgender, and queer (LGBTQ+) individuals.[1] The COVID-19 pandemic highlighted and exacerbated the numerous disparities experienced by these underserved populations,[2] including those related to infectious diseases prevention (i.e., vaccination), substance use, mental health, and sexual health. The peak of the pandemic saw an almost 30% reduction in primary care visits.[1] Post-pandemic, the extent of these disparities is largely unknown. Approaches to address these disparities have included focusing on addressing structural inequalities.[3] In addition, disparities among underserved communities are affected by social determinants of health (SDOH).[4] SDOH are defined as conditions and environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health outcomes.[4] Understanding and addressing SDOH is critical to improving health disparities among undeserved communities in the US.

SDOH include a diverse set of factors that affect health outcomes, including income and socioeconomic status, education opportunities, access to healthcare, occupation and employment status, workplace safety, access to housing, gender inequity, racial segregation, social support, policy and laws, availability of transportation, neighborhoods, and many others.[5] These determinants can have a significant impact on population health which disproportionately impacts underserved communities. SDOH factors, such as health behaviors, clinical care, social and economic status, and physical environment, may account for up to half of health outcomes.[6,7] This also includes mortality.[8,9] Studies have found that addressing SDOH can improve population-level health outcomes. As an example, states that dedicate more funding for social services compared to medical services have seen improved health outcomes compared to states that do not.[10]

Health literacy is also considered a SDOH,[11,12] and is defined as the degree to which individuals can find, understand, and use information and services for health-related decisions and actions for themselves and others. National assessments of health literacy demonstrate that approximately 36% of US adults have basic or below-basic health literacy,[13] with individuals of color and non-native English speakers more likely to have lower health literacy than White individuals and English speakers, respectively.[14-16] Lower socioeconomic status, including lower educational attainment, is the most important determinant of health literacy.[17] However, less is known about how health literacy as a SDOH affects preventative health outcomes among underserved communities.

The goal of this study was to assess the strength of relationships between SDOH, including health literacy, and preventative health outcomes at safety-net clinics in a major urban area in the US, with a focus on AA/B, H/L and LGBTQ+ communities.

METHODS

We conducted a cross-sectional needs assessment on preventative health among patients presenting to safety-net health clinics in Providence, Rhode Island (RI) from June 2022 to September 2022. Sites included four community-based clinics providing most major safety-net healthcare in the city serving AA/B, H/L and LGBTQ+ individuals. All patients attending clinics during the study period were asked to participate. If interested, a needs assessment was conducted and included questions on demographics, SDOH, infectious diseases' vaccination, substance use, mental health, sexual health, health communications, and media use habits. Vaccination outcomes included: 1) Initial vaccination against COVID-19 (yes/no); 2) Booster dose for COVID-19 (yes/no); 3) Children vaccinated against COVID-19 (yes all/no or only some children).

Substance use was assessed across three dimensions: alcohol, tobacco, other substance use. Alcohol use outcomes were based on the first two questions of the AUDIT-C, a questionnaire utilized to determine alcohol dependance.[18] The questions of "How often do you have a drink containing alcohol?" and "How many standard drinks containing alcohol do you have on a typical day?" were summed to produce a total score (0-8), with higher scores representing hazardous alcohol use. A cut-off score of 3+ to dichotomize individuals into two groups was used: hazardous drinking (3+) and not engaging in hazardous drinking (two or fewer). Tobacco outcomes were based on: "Do you currently use tobacco products including cigarettes, cigars, chewing tobacco, hookah, vaping tobacco, etc.?" (No versus any use). Other substance use was based on: "In the past six months, have you used any of the following substances?" with a list of multiple substances based on National Institute of Drug Abuse screening tools (Any use compared to none).

Mental health was assessed using the CDC's Healthy Days core question: "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 was your mental health not good?"[19] Given the non-normal distribution of count data, data were recoded into quintiles with 0 days representing no days of poor mental health, 1–5 representing minimal poor mental health, 6–10 representing moderately poor mental health, 11–20 representing frequently poor mental health, and 21–30 representing severely poor mental health. Participants were asked to endorse conditions that a health professional had ever stated they had. Anxiety, depression, or other mood disorders were classified as "Yes" to having a history of a mental health condition, while those who did not select these conditions were classified as "No".

Sexual health was assessed with: "How many partners have you had sex with in the past three months? Including oral, vaginal, or anal sex." (0 or 1 partner compared to 2+). Participants were asked: "Not including blood donations, when was your last HIV test?" Participants were coded as never (0), within the past year (1), more than one year ago (2).

SDOH were evaluated including income, education, employment, housing, public assistance, preferred language, insurance, health literacy, and social needs. Social needs were determined by: "What do you need help with?" Options included: food, housing, clothing, utilities, education/tuition, employment/job training, transportation, immigration, substance use treatment, legal assistance, childcare, smoking cessation, mental health, other, or no assistance needed. Social needs scores were categorized as 0 needs, 1 need, 2 needs, 3 or more needs. Health literacy as a SDOH was assessed using previously validated screening questions[20,21]: "How often do you need help reading materials from your healthcare provider?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "How often do you have problems learning due to difficulty understanding written information?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "How often do you have problems understanding what is told to you about your medical condition?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "What is your level of confidence filling out medical forms alone?" (Extremely=1, Quite a bit=2, Somewhat=3, A little bit=4, Not at all=5). Total scores were produced on a scale of 4–20. Participants were categorized into three groupings of health literacy: limited (4–12), marginal (13–16), adequate (17–20), in accordance with previous validation.

Baseline characteristics and associations with all health outcomes (COVID-19 vaccination, substance use, mental health, and sexual health) were examined using chi-square and Fisher's exact tests. Multinomial and binary logistic regression models evaluated relationships between SDOH and each preventative health outcome. Interaction terms were included for binary regressions to explore the moderating role of race and ethnicity on the relationship between health literacy and outcomes. Given prior research documenting disparities in health literacy particularly among Black/AA and Hispanic/Latino communities, we chose to incorporate an interaction term in the regression models to specifically examine relationships between race (non-Black/AA vs. Black/AA individuals) and the three levels of health literacy (limited vs. marginal, limited vs. adequate), and then ethnicity (non-Hispanic/Latino vs. Hispanic/Latino individuals) and the three levels of health literacy (limited vs. marginal, limited vs. adequate). Analyses were conducted in Stata 17.0 and SPSS 29.0. De-identified data collected for the needs assessment was approved by the Brown University Institutional Review Board for publication.

RESULTS

A total of N=1,223 individuals were offered enrollment and N=1,017 individuals completed the survey (86%). Average age was 42 years, 67% identified as H/L, 16% as AA/B, 60% were born outside the US, and 25% reported household incomes of <$10,000 annually [**Table 1**]. A total of 6% identified as transgender or gender diverse, 12% as bisexual+ (we use bisexual+ as an umbrella term for people who feel sexual and emotional attraction to more than one gender (bisexual, pansexual, fluid, queer, asexual, and other free identifiers)), and 7% as gay or lesbian. People reported needing the most help with food (31%), housing (25%), and utilities (22%). Common health conditions people reported included anxiety (26%), depression (23%), hypertension (20%), diabetes (15%), obesity (14%), and asthma (14%). Common sources of health information included trusted healthcare providers (56%), the internet (36%), family (19%), friends (13%), and social media (10%). Roughly half reported limited or marginal proficiency reading, understanding written, and understanding verbal medical information, and confidence completing medical forms alone. Associations between SDOH and preventative health outcomes appear in **Tables 2–4**.

In terms of COVID-19 vaccination, SDOH including socioeconomic status and education were significantly associated with receiving vaccination. A household income >$25k was associated with approximately 3x greater odds of having received at least one dose of the vaccine (p=.004) compared to individuals with household incomes <$10k. Compared to those with less than a high school degree, having some college or greater was associated with an approximately 2-4x greater odds of having received a COVID-19 booster (p=.003). Compared to reporting no social needs to having 1+ social needs was associated with reduced odds of receiving a COVID-19 booster (ORs 0.3–0.5; p=.003). There were no differences in age, gender, race, ethnicity, sexual orientation, education, or preferred language and receiving at least one dose of the vaccine. Limited or marginal degrees of health literacy was not associated with receiving any vaccination including a COVID-19 booster, compared to those with adequate health literacy. Compared to those with incomes <$10k/year, having incomes between $25,001–$75k was associated with 4x greater odds of having all children vaccinated (95% CI 1.76–8.98). Interestingly, compared to those with less than a high school degree, receiving at least some college was associated with reduced odds of having all children vaccinated against COVID-19 (OR 0.37, 95% CI 0.16–0.86).

Gender and sexual orientation were associated with tobacco and alcohol use [**Table 3**]. Identifying as bisexual+ was associated with approximately 3x increased odds of tobacco use (95% CI 1.30–5.23) and 7x increased odds of hazardous drinking (95% CI 3.33–14.66) compared to identifying as straight. There was no difference in race, ethnicity, or degree of health literacy and tobacco use or hazardous

Table 1. Social Determinants in a Sample of 1017 Patients Across Rhode Island

Characteristics		N	%
Age	18–29	237	23
	30–39	239	24
	40–49	174	17
	50–59	158	16
	60+	135	13
	Missing	74	7
Gender	Cisgender Man	292	29
	Cisgender Woman	663	65
	Transgender/Gender Diverse	58	6
	Missing	4	0.4
Race	White	330	32
	Black or African American	163	16
	American Indian/Alaska Native	28	3
	Asian	20	2
	Native Hawaiian/Pacific Islander	10	1
	Not Listed	293	29
	Decline to Answer	200	20
Ethnicity	Hispanic/Latino	683	67
	Non-Hispanic/Latino	318	31
	Decline to Answer	15	2
	Missing	1	0.1
Sexual Orientation	Heterosexual	742	73
	Bisexual+	119	12
	Lesbian/Gay	70	7
	Missing	86	9
Income	<$10,000	256	25
	$10,000–$25,000	270	27
	$25,001–$75,000	276	27
	>$75,000	78	8
	Missing	137	14
Education	< High School Degree	238	23
	High School Graduate	262	26
	Some College	235	23
	College Graduate+	270	27
	Missing	12	1
Preferred Language	Other Language	501	49
	English	516	51
Health Literacy	Limited	245	24
	Marginal	234	23
	Adequate	506	50
	Missing	32	3
Social Needs	0 Needs	393	39
	1 Need	243	24
	2 Needs	153	15
	3+ Needs	228	22

Table 2. Logistic Regression Results of Factors Associated with Covid-19 Outcomes

Characteristics		Received One Vaccine Dose	Received Covid Booster	Children Received Vaccine
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	ref	**ref***	**ref***
	30–39	0.84 (.46–1.53)	1.13 (.63–2.03)	2.33 (.96–5.67)
	40–49	1.29 (.61–2.77)	1.71 (.84–3.50)	**7.32 (2.76–19.38)***
	50–59	1.09 (.52–2.26)	**2.75 (1.22–6.22)***	**5.13 (1.64–16.08)***
	60+	2.26 (.95–5.42)	**3.65 (1.50–8.86)***	**15.50 (1.39–172.61)***
Gender	Cisgender Men	ref	ref	ref
	Cisgender Women	0.98 (.59–1.64)	0.67 (.40–1.14)	0.86 (.45–1.66)
	Trans/Gender Diverse	4.84 (.93–25.30)	2.63 (.62–11.17)	0.16 (.01–3.99)
Race	non-Black/AA	ref	ref	ref
	Black/AA	1.40 (.25–7.85)	0.33 (.07–1.58)	0.49 (.04–6.86)
Ethnicity	non-Hispanic/Latino	ref	ref	ref
	Hispanic/Latino	0.89 (.24–3.34)	1.02 (.24–4.30)	0.16 (.02–1.68)
Sex Orientation	Heterosexual	ref	**ref***	ref
	Bisexual+	0.83 (.39–1.78)	**2.62 (1.14–6.04)***	1.39 (.41–4.69)
	Lesbian/Gay	3.82 (.83–17.62)	**3.11 (1.10–8.81)***	1.66 (.10–26.49)
Income	<$10,000	**ref***	ref	**ref***
	$10,000–$25,000	1.64 (.98–2.77)	0.98 (.53–1.80)	1.57 (.73–3.37)
	$25,001–$75,000	**3.11 (1.65–5.89)***	0.64 (.34–1.20)	**3.98 (1.76–8.98)***
	>$75,000	**3.23 (1.02–10.23)***	0.89 (.31–2.54)	2.31 (.57–9.47)
Education	<High School Degree	ref	**ref***	**ref***
	High School Graduate	0.85 (.46–1.54)	1.28 (.65–2.51)	0.45 (.20–1.01)
	Some College	1.68 (.83–3.40)	**2.35 (1.13–4.87)***	**0.37 (.16–.86)***
	College Graduate+	1.75 (.83–3.69)	**3.76 (1.71–8.29)***	0.88 (.38–2.07)
Language	Other Language	ref	ref	ref
	English	0.58 (.31–1.08)	**0.35 (.18–.66)***	0.55 (.26–1.17)
Health Literacy	Limited	ref	ref	ref
	Marginal	0.9 (.19–4.15)	0.38 (.08–1.93)	0.14 (.01–1.98)
	Adequate	0.8 (.21–3.14)	0.34 (.08–1.47)	0.62 (.05–7.06)
Social Needs	0 Needs	ref	**ref***	ref
	1 Need	0.79 (.43–1.45)	**0.45 (.24–.82)***	1.06 (.51–2.20)
	2 Needs	0.47 (.24–.91)	**0.29 (.14–.61)***	0.88 (.37–2.09)
	3+ Needs	0.87 (.46–1.65)	**0.38 (.20–.71)***	1 (.44–2.25)
Literacy x Race [a]	Limited x non-Black/AA	ref	ref	ref
	Marginal x Black/AA	2.88 (.18–45.83)	4.77 (.64–35.59)	3.79 (.13–114.04)
	Adequate x Black/AA	0.62 (.09–4.08)	1.83 (.32–10.36)	0.61 (.03–10.79)
Literacy x Ethnicity [a]	Limited x non-H/L	ref	ref	ref
	Marginal x H/L	1.37 (.26–7.26)	1.57 (.28–8.79)	10.83 (.70–167.46)
	Adequate x H/L	1.29 (.31–5.45)	2.43 (.52–11.45)	2.24 (.18–27.22)

AA= African American; H/L= Hispanic/Latino; *=significant at p<.05; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

drinking. Regarding other substance use, identifying as bisexual+ was associated with a 5x greater odds (95% CI 2.60–9.76) and gay/lesbian with 3x greater odds of use (95% CI 1.46–6.47), compared to those identifying as straight. Preference for English was associated with an approximately 7x increased odds, compared to preferring other languages (95% CI 3.51–13.15). Endorsing social needs was associated with substance use. Compared to those with no needs, those with one need had 2.5x greater odds of substance use (95% CI 1.46–4.44), and those with 3+ needs had 2.3x greater odds (95% CI 1.28–4.30). There was no difference in race, ethnicity, or degree of health literacy and substance use.

Gender was significantly associated with ever being diagnosed with a mental health condition. Compared to men, women had 1.6x greater odds of ever being diagnosed (95% CI 1.04–2.50), and transgender/gender diverse individuals had 6x greater odds (95% CI 2.11–16.89). Compared to straight individuals, those identifying as bisexual+ had

Table 3. Logistic Regression Results of Factors Associated with Substance Use Outcomes

Characteristics		Tobacco Use	Hazardous Drinking	Other Substance Use Past 6mo
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	ref	ref	ref
	30–39	1.08 (.57–2.02)	0.65 (.33–1.30)	0.79 (.45–1.37)
	40–49	1.75 (.88–3.49)	0.71 (.33–1.55)	0.76 (.40–1.45)
	50–59	2.19 (1.08–4.42)	0.83 (.37–1.90)	1.18 (.59–2.38)
	60+	1.05 (.45–2.46)	0.59 (.21–1.61)	0.65 (.29–1.46)
Gender	Cisgender Men	ref*	ref*	ref*
	Cisgender Women	0.56 (.34–.90)*	0.23 (.13–.41)*	0.5 (.31–.79)*
	Trans/Gender Diverse	0.35 (.11–1.05)	**0.04 (.01–.14)***	0.47 (.18–1.23)
Race	non-Black/AA	ref	ref	ref
	Black/AA	0.7 (.16–3.13)	0	1.06 (.25–4.39)
Ethnicity	non-Hispanic/Latino	ref	ref	ref
	Hispanic/Latino	0.83 (.26–2.63)	0.48 (.10–2.43)	1.47 (.45–4.80)
Sex Orientation	Heterosexual	ref*	ref*	ref*
	Bisexual+	2.61 (1.30–5.23)*	6.99 (3.33–14.66)*	5.04 (2.60–9.76)*
	Lesbian/Gay	1.05 (.42–2.61)	**3.07 (1.40–6.75)***	**3.07 (1.46–6.47)***
Income	<$10,000	ref	ref	ref
	$10,000–$25,000	0.96 (.56–1.63)	1.33 (.61–2.92)	1.02 (.57–1.82)
	$25,001–$75,000	0.53 (.29–.99)	1.74 (.80–3.81)	0.75 (.41–1.37)
	>$75,000	0.37 (.13–1.06)	3.78 (1.42–10.08)	0.74 (.32–1.72)
Education	<High School Degree	ref	ref	ref
	High School Graduate	1.54 (.82–2.92)	0.8 (.34–1.92)	1.13 (.56–2.27)
	Some College	1.24 (.62–2.48)	0.77 (.31–1.95)	1.06 (.52–2.19)
	College Graduate+	0.6 (.28–1.30)	1 (.41–2.44)	1.09 (.52–2.31)
Language	Other Language	ref	ref	ref
	English	**2.98 (1.56–5.71)***	1.56 (.74–3.30)	**6.79 (3.51–13.15)***
Health Literacy	Limited	ref	ref	ref
	Marginal	0.82 (.23–2.86)	0.65 (.13–3.30)	2.48 (.73–8.44)
	Adequate	0.76 (.25–2.33)	0.92 (.22–3.85)	2.67 (.88–8.08)
Social Needs	0 Needs	ref	ref	**ref***
	1 Need	0.99 (.54–1.79)	1.32 (.69–2.51)	**2.54 (1.46–4.44)***
	2 Needs	1.11 (.57–2.16)	0.99 (.44–2.22)	1.6 (.83–3.10)
	3+ Needs	1.35 (.75–2.43)	0.87 (.41–1.86)	**2.34 (1.28–4.30)***
Literacy x Race [a]	Limited x non-Black/AA	ref	ref	ref
	Marginal x Black/AA	0.83 (.11–6.54)	0	0.49 (.08–3.19)
	Adequate x Black/AA	1.99 (.37–10.57)	0	0.92 (.19–4.45)
Literacy x Ethnicity [a]	Limited x non-H/L	ref	ref	ref
	Marginal x H/L	0.8 (.19–3.36)	3.09 (.47–20.46)	0.27 (.06–1.17)
	Adequate x H/L	0.93 (.27–3.27)	2.15 (.39–11.72)	0.37 (.11–1.32)

AA= African American; H/L= Hispanic/Latino; *=significant at p<.05; [a]= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

4.5x greater odds (95% CI 2.37–8.52). Regarding household income, individuals earning $10k–$25k had reduced odds, compared to those making <$10k (OR 0.45, 95% CI 0.28–0.74). Social needs were significantly associated with mental health. Compared to those without social needs, those with 1+ needs had 2.3–3.7x greater odds of ever being diagnosed (p<.001). There was no difference in race and ethnicity and having a mental health condition. However, there was an interaction effect between race and health literacy. Black/AA individuals with marginal or adequate health literacy had reduced odds of ever being diagnosed with a mental health condition compared to non-Black/AA individuals with limited health literacy (ORs 0.07–0.18; p=.013). [See **Table 5**.]

Several social identity variables were associated with sexual health. Identifying as a cisgender woman or as transgender/gender diverse was associated with reduced odds of having 2+ sexual partners (ORs 0.08–0.20; p<.001).

Table 4. Logistic Regression Results of Factors Associated with Sexual Health Outcomes

Characteristics		HIV Test Within the Past Year	HIV Test More Than A Year Ago	Number of Sexual Partners
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	**4.64 (2.03–10.59)***	1.42 (.63–3.19)	ref
	30–39	**10.35 (4.64–23.11)***	**2.89 (1.35–6.19)***	0.91 (.41–1.99)
	40–49	**9.76 (4.08–23.34)***	**4.9 (2.17–11.05)***	0.9 (.36–2.28)
	50–59	**4.37 (1.90–10.04)***	**3.4 (1.60–7.19)***	0.2 (.05–.77)
	60+	**ref***	**ref***	0.18 (.03–1.05)
Gender	Cisgender Men	2.22 (.68–7.27)	1.82 (.47–7.12)	**ref***
	Cisgender Women	3.17 (1.00–10.04)	**3.84 (1.02–14.40)***	0.2 (.10–.44)*
	Trans/Gender Diverse	ref	**ref***	**0.08 (.02–.27)***
Race	non-Black/African American	0.66 (.32–1.34)	0.59 (.28–1.25)	ref
	Black/African American	ref	ref	1.42 (.11–19.26)
Ethnicity	non-Hispanic/Latino	0.88 (.46–1.70)	**0.47 (.23–.96)***	ref
	Hispanic/Latino	ref	**ref***	1 (.13–7.77)
Sex Orientation	Heterosexual	**0.12 (.04–.40)***	0.36 (.09–1.35)	**ref***
	Bisexual+	0.64 (.15–2.66)	1.46 (.30–7.00)	**10.3 (4.26–24.91)***
	Lesbian/Gay	**ref***	ref	**11.01 (4.44–27.29)***
Income	<$10,000	2.64 (.95–7.31)	1 (.34–2.97)	ref
	$10,000–$25,000	**2.94 (1.07–8.03)***	2 (.69–5.77)	0.85 (.33–2.20)
	$25,001–$75,000	1.72 (.67–4.40)	1.83 (.67–4.95)	0.92 (.26–2.39)
	>$75,000	**ref***	ref	1.0 (.30–3.37)
Education	<High School Degree	0.6 (.28–1.30)	0.41 (.19–.87)	ref
	High School Graduate	0.7 (.34–1.42)	0.65 (.32–1.33)	0.61 (.18–2.08)
	Some College	0.81 (.39–1.68)	0.49 (.23–1.04)	0.52 (.15–1.86)
	College Graduate+	ref	ref	1 (.29–3.45)
Language	Other Language	0.66 (.34–1.26)	1.17 (.59–2.31)	ref
	English	ref	ref	**4.09 (1.18–14.15)***
Health Literacy	Limited	1.25 (.65–2.40)	0.85 (.44–1.65)	ref
	Marginal	0.75 (.42–1.34)	0.84 (.46–1.54)	3.6 (.59–21.88)
	Adequate	ref	ref	2.11 (.41- 10.94)
Social Needs	0 Needs	1.94 (1.01–3.71)	1.10 (.57–2.11)	ref
	1 Need	1.56 (.80–3.05)	1.21 (.63–2.34)	1.32 (.54–3.24)
	2 Needs	1.78 (.83–3.85)	1.08 (.49–2.36)	1.07 (.38–2.99)
	3+ Needs	ref	ref	3.18 (1.28–7.94)
Literacy x Race [a]	Limited x non-Black/AA			ref
	Marginal x Black/AA			0.20 (.01–5.94)
	Adequate x Black/AA			0.55 (.03–9.16)
Literacy x Ethnicity [a]	Limited x non-H/L			ref
	Marginal x H/L			0.63 (.06–6.33)
	Adequate x H/L			0.61 (.06–5.02)

AA= African American; H/L= Hispanic/Latino; *=significant at p<.05; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

Compared to straight individuals, those identifying as bisexual+ had 10.3x increased odds of having multiple sexual partners (95% CI 4.26–24.91), and gay/lesbian individuals had 11x increased odds (95% CI 4.44–27.29). Preference for English was associated with 4.1x increased odds of sex with multiple partners (95% CI 1.18–14.15). Compared to those with incomes >$75k, household incomes of $10k-25k was associated with 3x increased odds of testing for HIV within the past year compared to never testing (95% CI 1.07–8.12). Compared to H/L individuals, being non-H/L was associated with reduced odds of testing for HIV over a year ago, compared to never testing for HIV (OR 0.47, 95% CI 0.23–0.96).

DISCUSSION

This is among the first studies post-pandemic to evaluate preventative health among underserved populations. Major strengths were the systematic sampling and high response

Table 5. Logistic Regression Results of Factors Associated with Mental Health History

Characteristics		History of Mental Health Condition
		OR (95% CI)
Age	18–29	ref
	30–39	1.05 (.63–1.76)
	40–49	0.92 (.50–1.67)
	50–59	0.77 (.41–1.44)
	60+	0.49 (.24–.99)
Gender	Cisgender Men	ref*
	Cisgender Women	1.61 (1.04–2.50)*
	Trans/Gender Diverse	5.97 (2.11–16.80)*
Race	non-Black/African American	ref
	Black/African American	2.05 (.59–7.12)
Ethnicity	non-Hispanic/Latino	ref
	Hispanic/Latino	0.93 (.32–2.69)
Sex Orientation	Heterosexual	ref*
	Bisexual+	4.49 (2.37–8.52)*
	Lesbian/Gay	1.30 (.64–2.65)
Income	<$10,000	ref*
	$10,000–$25,000	0.45 (.28–.74)*
	$25,001–$75,000	0.90 (.54–1.49)
	>$75,000	0.65 (.29–1.47)
Education	<High School Degree	ref
	High School Graduate	0.62 (.36–1.09)
	Some College	0.64 (.36–1.16)
	College Graduate+	0.75 (.41–1.36)
Language	Other Language	ref
	English	1.54 (.90–2.64)
Health Literacy	Limited	ref
	Marginal	2.34 (.69–7.93)
	Adequate	1.78 (.61–5.23)
Social Needs	0 Needs	ref*
	1 Need	2.29 (1.38–3.79)*
	2 Needs	2.09 (1.15–3.80)*
	3+ Needs	3.68 (2.16–6.25)*
Literacy x Race [a]	Limited x non-Black/AA	ref*
	Marginal x Black/AA	0.07 (.01–.45)*
	Adequate x Black/AA	0.18 (.04–.77)*
Literacy x Ethnicity [a]	Limited x non-H/L	ref
	Marginal x H/L	0.28 (.07–1.06)
	Adequate x H/L	0.45 (.14–1.43)

AA= African American; H/L= Hispanic/Latino; *=significant at p<.05; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

rate (i.e., 86%). The results of the study demonstrate and quantify the complex nature and needs of diverse communities. We found that individuals reported high rates of mental health problems (i.e., anxiety and/or depression), and other chronic medical conditions (i.e., hypertension, diabetes, and/or obesity). Mental health needs were higher than national estimates[21] and may reflect the underserved communities surveyed. Gender was significantly associated with ever being diagnosed with mental health conditions. Transgender/gender diverse individuals had almost 6x greater odds being diagnosed compared to cisgender men. Those identifying as bisexual+ had almost 5x greater odds of ever being diagnosed. There was no difference in race and ethnicity and having a mental health condition. Results highlight significant disparities that the LGBTQ+ community faces with mental health.[22] Efforts to expand access to mental health care are urgently needed.

In addition to the aforementioned social identities, this assessment identified several other important SDOH reported by individuals that may influence health. The most common SDOH reported was needing help with food (31%) and housing (25%). These trends are higher than national averages that find 13.5% of American households report food insecurity.[24] Food insecurity increased 50% during the pandemic in our state, partly because of economic crises and inflationary prices on food. There is significant need for housing in this population, an important SDOH.[25] Recent studies have highlighted that our state ranks last nationally in new housing production.[26] Efforts should focus on food and housing to address health disparities in underserved communities.

Health literacy is important for optimal health outcomes. Roughly half of patients reported limited or marginal proficiency understanding medical information and confidence completing medical forms. AA/B individuals with marginal or adequate health literacy had reduced odds of ever being diagnosed with mental health conditions compared to non-AA/B individuals with limited health literacy, suggesting that the protective effect of higher health literacy against having mental health conditions appears to be more pronounced among AA/B individuals. Adequate health literacy may be more beneficial in reducing likelihood of mental health conditions. This highlights the need for improvement with health literacy among individuals, and especially those who may identify as AA/B to mitigate mental health challenges.

This study offers insights into which SDOH are strongly associated with COVID-19 vaccination outcomes. Higher income and education were associated with 2–3x greater odds of receiving at least one dose of the vaccine or a booster. Having limited or marginal degrees of health literacy was also not associated with receiving initial vaccination, which likely reflects comprehensive statewide efforts to reach underserved communities. Compared to those with no

social needs, having 1+ social needs was associated with a reduced odds of receiving a booster. Having at least some college education was also associated with a reduced odds of having all children vaccinated. There was no difference in race, ethnicity, or degree of health literacy and likelihood of vaccinating children, suggesting that enhancing campaign efforts among lower socioeconomic communities may improve vaccination rates, regardless of race or ethnicity.

The study highlights significant disparities that LGBTQ+ individuals experience related to tobacco, alcohol, substance use, and sexual health. Sexual minorities and transgender/gender diverse individuals reported higher levels of substance use and sexual partners compared to straight individuals and cisgender men. Prior literature demonstrates high rates of substance use and sexual partners within LGBTQ+ populations.[27,28] Importantly, having increased sexual partners is not inherently problematic and can be an important aspect of sexual health.[29] Nor is occasional substance use always problematic if use does not create dysfunction within someone's life.[30] Promoting condoms and frequent testing to ensure low transmission rates of HIV and other STIs is important. As substance use has been shown to increase condomless sex,[31] interventions should continue education on how to use substances safely within sexual contexts, while promoting harm reduction to ensure individuals do not experience negative sequalae associated with substance use.

Limitations of the study included potential generalizability and self-reported data. The assessment also asked limited questions about broader topics that could be nuanced in nature (i.e., sexual health). The analysis determined associations and not causality. However, systematic sampling and high response rate were a major strength. Although the study was conducted in one geographic location which may not be representative of the state or country, demographics of the study reflect diverse populations constituting major groups in other major urban settings across the United States. Although self-reported data can be a limitation of surveys, high rates of mental health conditions, substance use, and sexual partners suggest that patients felt comfortable reporting behaviors to staff conducting the needs assessment. We also note that this study examined social identities (e.g., race, sexual orientation, gender, etc.) as proxies for experiences of social health determinants such as racism, sexism, and genderism. Future studies might utilize survey instruments that measure inequity as opposed to proxies for inequity.

In conclusion, this study highlights the significant and diverse needs of specific undeserved communities in the US. In this urban population, food and housing continue to be significant SDOH that warrant further intervention. AA/B, H/L, and LGBTQ+ individuals face significant disparities with mental and sexual health, substance use, hazardous drinking, and tobacco use. Health literacy continues to be a challenge and may impact health outcomes. Future programming should prioritize reducing stigma in communities regarding sexual health, substance use and mental health conditions more commonly experienced among LGBTQ+ individuals; improving access to housing and food sources among those exhibiting these needs; and increasing screening, referrals, and treatment retention specifically for mental health and substance use. To achieve equity, focusing on these SDOH and underserved communities are warranted to improve public health outcomes across the United States.

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Synthesis Across Disciplines: Creating Integrated Clinical Vignettes for Pre-clerkship Medical Training

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ABSTRACT

INTRODUCTION: Case-based learning strategies have been shown to enhance student engagement, promote active learning, and improve problem-solving ability by simulating clinical scenarios. However, few interventions focus specifically on integration within basic science domains, and even fewer have been student-led and implemented longitudinally throughout a pre-clerkship curriculum. This study evaluates the impact of a student-led initiative that incorporated interdisciplinary clinical vignettes into first-year medical coursework at a large allopathic medical school in the United States.

METHODS: Vignettes were designed to align with curricular themes across anatomy, histology, and pathology for each of the 13 curricular blocks. First-year medical students completed post-intervention surveys measuring confidence in applying course material, integration between concepts, and perceived relevance of the vignettes.

RESULTS: Across all blocks of vignettes, the majority of respondents agreed that the vignettes allowed them to think about lecture material in a new way (98%; 57% strongly agree, 41% somewhat agree), felt relevant to current material (95%; 73% strongly agree, 22% somewhat agree), and related the concepts from their anatomy, pathology, and histology courses (94%; 69% strongly agree, 25% somewhat agree). The analysis of our survey data confirms that students' confidence in exam material increased after the use of the clinical vignettes. This was statistically significant for every discipline and across the vast majority of blocks.

CONCLUSIONS: Integrated vignettes fostered interdisciplinary learning and improved confidence in applying pre-clerkship knowledge across disciplines. This low-resource, peer-led model may serve as an adaptable tool to support early clinical reasoning and integrative learning across foundational science curricula.

KEYWORDS: Medical education; clinical vignettes; interdisciplinary learning; curriculum integration; pre-clerkship training

INTRODUCTION

The pre-clerkship curriculum is the foundation of the medical student's career as a future physician. It introduces them to the basic sciences such that, as students transition into the clinical sciences during their third and fourth years, they are well-equipped with the knowledge that will be applied to their future patients. The medical profession necessitates that this foundation be simultaneously wide and deep. It must extend to include a variety of topics across several specialties, from histology to anatomy to microbiology. While this compartmentalization supports subject-specific depth, it frequently lacks the contextual integration that mirrors the complexity of clinical practice. As a result, students may struggle to synthesize across disciplines, a skill crucial for transitioning into the clinical years and beyond.

The ability to connect structure with function and textbook learning with clinical decision-making is not inherently intuitive and must be deliberately cultivated. Yet, current pedagogical strategies often emphasize knowledge acquisition over integration, leaving a critical educational gap in helping students bridge theory to practice during pre-clerkship training.[1] This gap can contribute to lower confidence, diminished retention, and difficulty applying basic science knowledge in clinical reasoning tasks.[2,3]

Case-based and vignette-driven learning strategies have been shown to enhance student engagement, promote active learning, and improve problem-solving ability by simulating real-world scenarios.[4,5] A meta-analysis of eight studies indicates that case-based approaches lead to greater physician competency years after graduation.[6,7] Furthermore, curricular models that intentionally integrate content across disciplines lead to stronger learner satisfaction, improved diagnostic accuracy, and greater preparedness for medical content encountered in the clerkship phase.[8,9] However, few interventions focus specifically on integration within basic science domains, and even fewer have been student-led and implemented longitudinally throughout a pre-clerkship curriculum.

In this study, we sought to address this unmet need by developing and distributing a series of integrated clinical vignette sets designed to promote cross-disciplinary synthesis between anatomy, histology, and pathology. These vignettes were crafted by both upperclassmen and first-year medical students for eight blocks of a first-year medical

school curriculum and provided in advance of each block's summative exam. Each vignette combined radiologic and gross anatomical images, microscopic pathology, and clinical narratives to encourage students to apply knowledge in a cohesive and contextualized format.

We hypothesized that this intervention would improve students' perceived confidence across disciplines and enhance their ability to view pre-clerkship content in novel, clinically relevant ways. Specifically, we investigated whether integrated vignettes (1) increased students' confidence in their understanding of core disciplines; (2) encouraged novel approaches to the material; and (3) supported perceived relevance to the curriculum. This paper presents a quantitative and qualitative evaluation of that initiative, with the goal of informing future strategies for meaningful integration in medical education.

METHODS

A set of clinical vignette scenarios (3–4 per block) was designed for each of the 13 blocks of the first-year curriculum at a large allopathic medical school in the United States. Content integrated content and images (slides, radiology images, cadaver images) to synthesize content across key themes in anatomy, histology, and pathology. For example, a case pertaining to a child with lung disease may incorporate chest X-rays (anatomy), microscope slides of alveoli (histology), and gross images of the diseased lung (pathology). The student must then incorporate the relevant information from each visual modality as it relates to the clinical picture and questions asked in the vignettes.

Vignettes were reviewed by professors of the relevant specialty to ensure accuracy. Each block of the curriculum lasted approximately three weeks and culminated in a non-cumulative multiple-choice exam. Every block, the new slide deck was distributed to the 144 first-year students via the class email listserv one week before their exam. Students completed 13 blocks of their curriculum by the end of their first year. Vignettes were provided for 8 of their 13 blocks (Scientific Foundations of Medicine [SFM] Exams 1–4, Brain Sciences Exams 1–3, and Supporting Structures). These exams comprised the portions of the curriculum which included at least two of the three core courses (anatomy, pathology, histology) the vignettes sought to integrate. Similarly, the 8 blocks spanned both the students' SFM and Organ Systems (Brain Sciences and Supporting Structures) phase of the pre-clerkship medical school curriculum. Individual feedback from respondents was taken into consideration to make each block resource more applicable to the lecture or anatomy lab material. After each open-ended question posed to learners, there was an in-depth explanation of the correct answer and link to the relevant lecture for their reference.

At the end of the deck, there was a link to an anonymous Qualtrics survey for students to complete. This post-intervention survey asked students to retrospectively rank their confidence pre-intervention and then post-intervention. The survey was approved by our institution's IRB prior to dissemination. Student participation in the survey was voluntary and asked students to rank their confidence on a Likert scale (0–100) in material before and after the practice set, as well as evaluate their attitudes toward the practice material. There was one open-response question for students to provide additional thoughts or bring errors in the resource to the attention of the researchers.

After each block, statistics regarding students' attitudes toward the resource were compiled and compared to the previous blocks. Statistical analyses, including one-way T tests and ANOVA tests, were performed to determine if there was a difference in students' survey responses pre- and post-intervention. After the last block, aggregated data was analyzed to determine the overall efficacy of the intervention.

RESULTS

In total, the survey received 188 responses, of which 161 responses (85%) evaluated our key study objectives: presentation of material in a new way, relevance to current material, and concept integration. Across all categories, the majority of respondents agreed that the vignettes allowed them to think about lecture material in a new way (98%; 57% strongly agree, 41% somewhat agree), felt relevant to current material (95%; 73% strongly agree, 22% somewhat agree), and related the concepts from their anatomy, pathology, and histology courses (94%; 69% strongly agree, 25% somewhat agree) [**Figure 1**]. When comparing the three study objectives between the SFM and Organ Systems Portion, differences were noted in terms of thinking about material in a new way. While respondents agreed the vignettes made them think about material in a new way (98% and 97%, respectively), 63% of respondents during SFM strongly agreed the resource allowed them to encounter the material in a

Figure 1. Student responses regarding the extent to which the clinical vignettes: (1) presented material in a new way, (2) were relevant to current coursework, and (3) facilitated integration of concepts across disciplines.

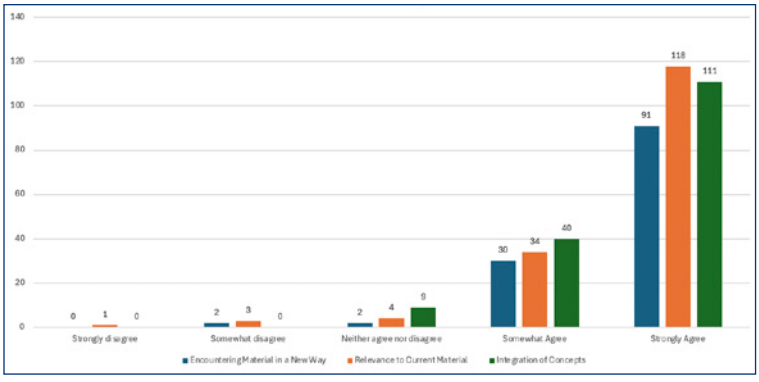


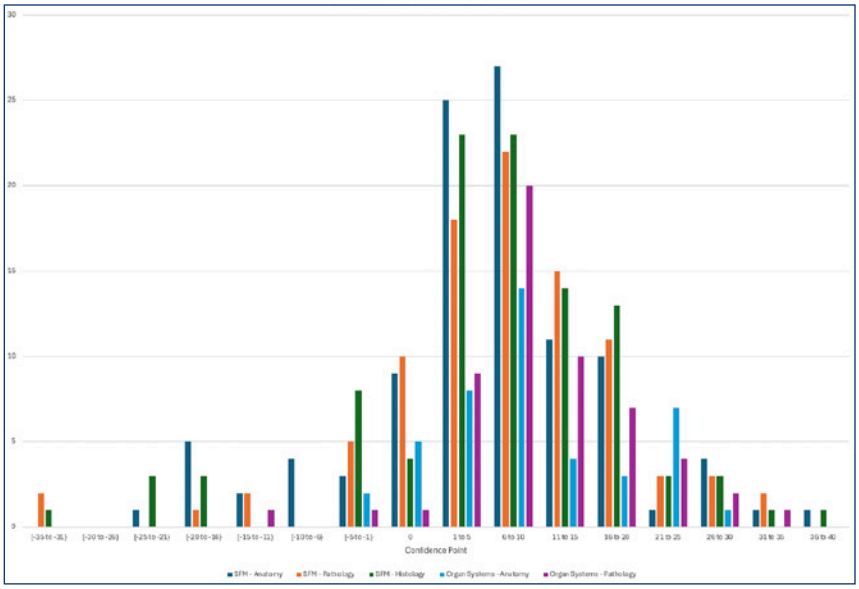
Table 1. Mean change in confidence scores with corresponding 95% confidence intervals, stratified by course (Anatomy, Pathology, and Histology) and curricular phase (Scientific Foundations of Medicine [SFM], Organ Systems, Brain Sciences, and Supporting Structures).

Exam	Responses	Anatomy	Pathology/Physiology	Histology
Total	176	7.43 (95% CI 5.78–9.07)*	8.05 (95% CI 6.27–9.83)*	6.26 (95% CI 3.78–8.74)*
SFM	105	6.21 (95% CI 4.19–8.35)*	6.56 (95% CI 4.40–8.84)*	6.26 (95% CI 3.78–8.74)*
Organ Systems	71	10.20 (95% CI 8.07–12.73)*	11.70 (95% CI 9.62–13.77)*	N/A
Brain Sciences	60	10.03 (95% CI 7.42–12.63)*	11.27 (95% CI 9.21–13.32)*	N/A
Supporting Structures	11	11.57 (95% CI 5.95–17.20)*	14.71 (95% CI 6.84–22.59)*	N/A

new way compared to 47% of respondents during Organ Systems. This finding was reversed when rating relevance of material, with 67% of respondents strongly agreeing that the material was relevant during SFM; whereas during Organ Systems, 87% of respondents strongly agreed the material was relevant. Interestingly, respondents noted the integration of concepts remained similar between the two phases of the curriculum.

Respondents were asked to rank their confidence from 1–100 in their ability to perform well on the exam for the three courses integrated into the clinical vignettes (Anatomy, Pathology/Physiology, And Histology). Overall, confidence increased significantly across all three domains: Anatomy (mean increase = 7.43; 95% CI: 5.78–9.07), Pathology/Physiology (mean increase = 8.05; 95% CI: 6.27–9.83), and Histology (mean increase = 6.26; 95% CI: 3.78–8.74) [**Table 1**]

Figure 2. Distribution of respondents grouped by 5-point intervals of change in confidence, presented across all combinations of exam domains (SFM and Organ Systems) and individual courses (Anatomy and Pathology). Histology is excluded because it is only taught during SFM. *Denotes statistical significance at P < .0001.



When stratified by curriculum phase, significant increases in confidence were observed in Anatomy and Pathology across all phases. Within the SFM phase, confidence increased in Anatomy by 6.21 points (95% CI: 4.19–8.35), in Pathology by 6.56 points (95% CI: 4.40–8.84), and in Histology by 6.26 points (95% CI: 3.78–8.74). In the Organ Systems phase, confidence increased in Anatomy by 10.20 points (95% CI: 8.07–12.73) and in Pathology by 11.70 points (95% CI: 9.62–13.77). Within the Brain Sciences subunit, increases were similarly observed in Anatomy (10.03; 95% CI: 7.42–12.63) and Pathology (11.27; 95% CI: 9.21–13.32). Finally, in the Supporting Structures subunit, the greatest increases were noted: 11.57 points in Anatomy (95% CI: 5.95–17.20) and 14.71 points in Pathology (95% CI: 6.84–22.59). All reported changes were statistically significant when comparing pre- to post-vignette confidence (P <0.0001).

To assess the distribution of confidence changes and compare vignette efficacy across curriculum phases, we stratified responses from the SFM and Organ Systems blocks and binned confidence change scores into 5-point intervals (ranging from –35 to 40). Among the 104 SFM Anatomy respondents, 76.9% reported an increase in confidence, with 50.0% noting a gain of 1–10 points. Similarly, of the 94 SFM Pathology respondents, 78.7% reported increased confidence, with 42.5% falling within the 1–10 point range.

In the Organ Systems phase, 84.1% of the 44 Anatomy respondents experienced a confidence increase, with 50.0% reporting gains of 1–10 points. Confidence improvements were even more pronounced in Organ Systems Pathology: among 56 respondents, 94.6% reported increased confidence, and 51.8% reported a gain of 1–10 points [**Figure 2**].

Student confidence prior to resource use impacts the degree of confidence change respondents report. To further investigate how baseline confidence influenced the effectiveness of the vignettes, we stratified respondents based on their pre-vignette confidence levels (<60, 60–80, and >80). Furthermore, we categorized the degree of confidence level change into 5 groups—substantial decrease, modest decrease, no change, modest increase, and substantial increase. These are defined as follows: substantial is a gain or loss of 10 or

more confidence points, modest is a gain or loss of 1 to 10 points, and no change is 0 confidence point change. The majority of respondents with low initial confidence in both Anatomy and Pathology experienced either a modest or substantial increase in confidence, with 62.1% and 54.5%, respectively, reporting a modest increase and an additional 25.0% and 30.3% reporting a substantial increase [**Figure 3**]. In contrast, respondents with high baseline confidence were more likely to report no change or only a modest improvement. For example, 45.2% of students with high confidence in Anatomy and 41.4% in Pathology reported only a modest increase, while 34.3% and 37.9%, respectively, experienced no change [**Figure 3**].

To investigate how baseline confidence influenced the effectiveness of the vignettes, we stratified respondents across both total and course-specific domains. Respondents with lower initial confidence (<60) demonstrated the greatest mean increase in total confidence (13.71; 95% CI: 11.24–16.18), followed by those in the 60–80 range (8.24; 95% CI: 6.85–9.63). Respondents who began with high confidence (>80) reported minimal changes (0.99; 95% CI: –0.79 to 2.77). The differences between all groups was significant (>60 v. 60-80, p<0.0001; >60 v. 80+, p<<0.0001, (60–80 v. 80+, p<0.0001).

This trend held across both Anatomy, Pathology, and Histology. In Anatomy, students with initial confidence <60 showed a mean increase of 15.16 points (95% CI: 11.28–19.04), compared to 7.06 (95% CI: 4.26–9.86) and 2.70 (95% CI: 0.96–4.44) for those in the 60–80 and >80 groups, respectively. Similarly, in Pathology/Physiology, students with confidence <60 experienced a mean increase of 11.03 (95% CI: 7.16–14.90), while those with confidence between 60–80 improved by 9.52 points (95% CI: 7.62–11.42), and those above 80 saw a smaller gain of 2.17 points (95% CI: 0.37–3.97). In Histology, students with confidence <60 experienced an average increase of 14 (95% CI: 8.79–19.21), while those with confidence between 60–80 improved by 8 points (95% CI: 4.95–11.05), and those above 80 saw a decrease of 1.59 points (95% CI: –5.88–2.7) [**Table 2**]. When comparing confidence changes between pre-exam confidence groups within the same curriculum segment (e.g., Anatomy <60 vs. Anatomy 60–80), the only comparison that did not reach statistical significance was between the Pathology groups with baseline confidence >60 and 60–80 (p = 0.23). Additionally, one-way ANOVA's revealed that there was not a statistically significant difference in confidence interval change between each course at each initial confidence interval (Anatomy: F(2, 86) = 0.51, p = 0.60; Pathology: F(2, 190) = 1.13, p = 0.32; Histology: F(2, 113) = 0.1.87, p = 0.16).

Figure 3. Distribution of students within each pre-vignette confidence group who experienced a substantial decrease, modest decrease, no change, modest increase, or substantial increase in confidence following vignette exposure, stratified by course.

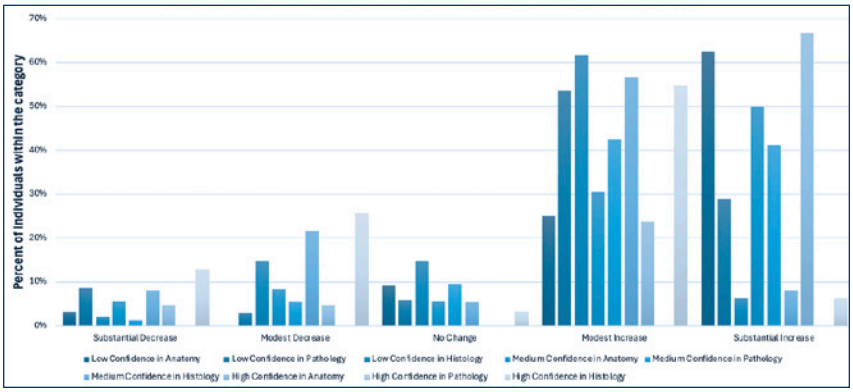


Table 2. Mean change in confidence with 95% confidence intervals, stratified by pre-vignette confidence levels (low, moderate, high) for each course (Anatomy, Pathology, and Histology), with sub-analyses conducted within each course.

Category	Number of Survey Responses	Mean Confidence Change
Total Confidence: <60	89	13.71 (95% CI 11.24–16.18)
Total Confidence: 60–80	193	8.24 (95% CI 6.85–9.63)
Total Confidence: >80	116	0.99 (95% CI –0.79–2.77)
Anatomy Confidence: <60	32	15.16 (95% CI 11.28–19.04)
Anatomy Confidence: 60–80	69	7.06 (95% CI 4.26–9.86)
Anatomy Confidence: >80	47	2.7 (95% CI 0.96–4.44)
Pathology/Physiology Confidence: <60	36	11.03 (95% CI 7.16–14.90)
Pathology/Physiology Confidence: –80	73	9.52 (95% CI 7.62–11.42)
Pathology/Physiology Confidence: >80	37	1.05 (95% CI -2.48–4.58)
Histology Confidence: <60	21	14 (95% CI 8.79–19.21)
Histology Confidence: 60–80	51	8 (95% CI 4.95–11.05)
Histology Confidence: >80	31	–1.59 (95% CI -5.88–2.7)

DISCUSSION

The analysis of our survey data confirms that students' confidence in exam material increased after the use of the clinical vignettes. This was statistically significant for every discipline and across the vast majority of blocks. They were most helpful in aiding students in view material in a new way when covering topics from the SFM course. We postulate that this is due to the granular, memorization-heavy

nature of SFM content, which can be difficult to contextualize through traditional study methods. Previous literature has shown that clinical vignettes improve student engagement,[10-12] confidence,[13] and knowledge retention by promoting contextualized learning and clinical reasoning.[6,8] Presenting basic science material in a narrative or patient-based format may make abstract or foundational content more digestible and memorable.

Conversely, material felt more relevant for students during the organ systems blocks. This may reflect improved vignette writing skills over time as the authors gained experience, but also aligns with the observation that clinical relevance becomes more salient as students transition to more advanced systems-based content.[7] The authors intend to perform additional analysis after the next academic year to evaluate if the revisions that were made to the vignettes impact this metric. The utility of the vignettes in integrating topics remained stable across the blocks. This may be due to the intentional focus on horizontal and vertical integration during vignette design, a strategy supported by educational research as key to improving curricular coherence and clinical application of knowledge.[14,15]

Importantly, students who rated their baseline confidence as low showed greater improvement in confidence after completing the vignettes. This could be partially explained by a statistical ceiling effect (i.e., students who began with high confidence had less room to improve), but it may also suggest that the vignettes serve as an especially valuable learning tool for students struggling to master the material. Given the pass/fail nature of the pre-clerkship curriculum, this is particularly significant. Supporting students with lower confidence in the material helps ensure the entire cohort's success and promotes equity in academic performance.

There are several other limitations that should be considered. The main limitation being that there is only one survey that students fill out retrospectively. This asks them to estimate their confidence level before they did the vignettes and after, which can lead to recall bias and prevent accurate results. The authors intentionally designed the study in this way to prevent excessive burden on students as they use these materials to prepare for their exams—a common consideration in educational research where time constraints can reduce participation.[16] The authors aimed to remove the barrier of a pre-test so that students would be more inclined to use the vignettes without the burden of excessive evaluation. It should also be noted that responding to the survey was encouraged but not required or incentivized, which may have led to response bias in those who felt strongly enough to take the survey. With that being said, the response rate included a large proportion of students in the cohort, and thus leads the authors to believe that this was not a source of significant bias.

A future initiative of this project will be to track individual student responses across blocks and disciplines. This was omitted from the initial study for ease of completion by students (e.g., not having to remember and input a unique identifying code to ensure anonymity). Another extension of this project will be to see how students' responses correlated with their actual exam performance. Other medical education studies have successfully used anonymized tracking tools to correlate student perceptions with academic outcomes.[16,17] Since the majority of the authors are current students, the team decided that this would not be appropriate, in order to respect the privacy of their fellow students.

Despite these limitations, this project offers evidence that integration across disciplines encourages students to interact with pre-clerkship curriculum material in a way that increases confidence and allows students to think critically about material in a new way. This project will continue to support students in their pre-clerkship phase and provide a roadmap for curricular innovation at other institutions.

CONCLUSION

The findings of this study add to the growing body of evidence that clinical vignettes are a powerful tool for promoting integration across disciplines and enhancing student confidence. This intervention encourages students to engage with pre-clerkship material in a more active and applied way, fostering the development of critical thinking skills. Our approach serves as a model for curricular innovation both within our institution and beyond.

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Healthcare Professionals' Confidence in Promoting Secure Storage Strategies in Practice: Evaluation of Counseling on Access to Lethal Means (CALM) Training in Rhode Island

ERICA ROMERO, MPH; KELSEA TUCKER, MS; TARA COOPER, MPH

INTRODUCTION

According to the Rhode Island Violent Death Reporting System (RVDRS), from 2020 to 2024, 38.9% of suicide deaths listed hanging, strangulation, and suffocation as the primary injury mechanism, followed by firearms at 30.1%.[1] RVDRS data also reveal that 89.9% of deaths by suicide with the injury mechanism of firearms were by Rhode Islanders who identified as male. Additionally, 27.3% of these deaths were by male Veterans/Service Members.

Based on these data and due to an absence of evidence-based interventions for hanging, strangulation, and suffocation in suicide prevention research and literature, the Rhode Island Department of Health's Violence and Injury Prevention Program (RIDOH VIPP) has prioritized firearms-related prevention strategies under their Centers for Disease Control and Prevention Comprehensive Suicide Prevention (CDC CSP) grant. Strategies include promotion of secure, offsite, firearms storage facilities, distribution of cable style gun locks and safes, and implementation of Counseling on Access to Lethal Means (CALM) training for healthcare and behavioral healthcare professionals.

Since May 2025, RIDOH VIPP has partnered with Care New England Health System to host eight CALM trainings for clinicians at Butler Behavioral Health, Kent Hospital, Women & Infants, The Providence Center, and other ambulatory clinics within their system. CALM is an intervention that aims to equip clinicians and others who work with individuals at risk of suicide with the tools to encourage patients to implement strategies to increase time and distance between themselves and the most common and lethal items in their environment, including firearms.[2] Research indicates that when individuals at risk of suicide are unable to access their preferred means, the likelihood of substitution of means is low. Additionally, many suicidal crises are temporary, meaning that when presented with a barrier that increases the time before the person at risk can access potentially lethal items, the crisis may pass.[3]

Given the burden of suicide deaths in Rhode Island and the evidence that exists in support of lethal means counseling as a prevention strategy, this article aims to further explore the impact of CALM on both the Rhode Island clinicians who have completed training and their patients at risk for suicide.

METHODS

Pre- and post-test surveys were administered via Microsoft Forms for participants of the 2025 and 2026 CALM trainings. Healthcare professionals were invited via email to participate in the trainings by Care New England. Responses were collected anonymously before and after the training. Although the populations of participants are the same, they will be treated as independent groups for the analysis. The pre-test survey participants are categorized as the not trained group, and the post-test participants are categorized as the trained group.

In both the pre- and post-surveys, responses on confidence about lethal means safety were collected to assess the difference between healthcare professionals trained in CALM versus healthcare professionals not trained in CALM [**Table 1**]. Participants were asked to rank their agreement on a 5-point Likert scale from Strongly agree (5) to Strongly disagree (1) for the following statements to assess their confidence: "I can explain why 'means matter' when it comes to preventing suicide"; "I have confidence in listing storage options to reduce at-risk patients' access to household firearms"; "I have confidence in outlining strategy to reduce at-risk patients' access to high-risk medications (including over-the-counter medication)"; and "I have confidence talking more comfortably and collaboratively with patients about reducing their access to lethal means". Questions were derived from CALM America, Inc.'s evaluation on the components of the training and modified to assess confidence for the Comprehensive Suicide Prevention grant evaluation tiered approach activity tailored towards healthcare professionals. A Mann-Whitney U test was conducted [**Table 1**] to compare groups. Data coding and all analyses were completed using SAS (version 9.4).

To evaluate impact from the CALM training, healthcare professionals were asked in the CALM training post-survey if they would be interested in participating in a key informant interview in a six-month follow-up period from the date of the training. Key informants were asked to describe a conversation they had surrounding listing storage options to reduce at-risk patients' access to household firearms and what happened during that conversation.

Table 1. Median CALM Evaluation Metrics Responses by Training Group

CALM Evaluation Metrics	Not Trained (Pre) N=113	Trained (Post) N=101	U	p-value[1]	r
	Median (IQR)	Median (IQR)			
I can explain why "means matter" when it comes to preventing suicide	4.0 (3.0–5.0)	5.0 (5.0–5.0)	9223.0	<.0001	0.62
I have confidence in listing storage options to reduce at-risk patients' access to household firearms	4.0 (2.0–4.0)	5.0 (5.0–5.0)	9907.5	<.0001	0.70
I have confidence in outlining strategies to reduce at-risk patients' access to high-risk medications (including over-the-counter medication)	4.0 (3.0–5.0)	5.0 (5.0–5.0)	9347.0	<.0001	0.62
I have confidence talking more comfortably and collaboratively with patients about reducing their access to lethal means	4.0 (3.0–5.0)	5.0 (5.0–5.0)	9167.0	<.0001	0.59

[1]Mann-Whitney U Test

Data Notes: Participants were asked to rank their agreement on a 5-point Likert scale from Strongly agree (5) to Strongly disagree (1).

IQR = interquartile range; U = Mann–Whitney U statistic; r = effect size calculated

RESULTS

In the 2025 and 2026 CALM trainings, 113 participants are in the not trained group (pre-test), and 101 are in the trained group (post-test). Healthcare professionals who participated in the training predominantly worked in an Outpatient setting, followed by Emergency setting (hospital intake/triage, emergency departments, etc.), and Inpatient setting (data not shown). When assessing the difference between groups, responses to lethal means safety statements were different between groups of healthcare professionals trained in CALM and healthcare professionals not trained in CALM, with a statistically significant increase in confidence for all CALM evaluation metrics and a large effect size, indicating a substantial difference between training groups (p-value <.0001, r=0.62, 0.70, 0.62, 0.59). The greatest effect size is seen for the metric question, "I have confidence in listing storage options to reduce at-risk patients' access to household firearms" (r=0.70).

Qualitative Results

Following the 2025 and 2026 CALM trainings, there were six key informant interviews conducted in six-month follow-up. Thematically across all interviews, informants felt that their ability to discuss lethal means safety pertaining to firearms and storage mechanisms was the highlight of the CALM training. When asked to describe a conversation they had surrounding listing storage options to reduce at-risk patients' access to household firearms and what happened during that conversation. One key informant shared a situation in their mobile crisis work where they responded to a suicidal male Veteran in his home. The patient was hesitant to share information, but when potential lethal means were discussed, he was more open to talking about the ideation and shared that he had a firearm. While there were many barriers to lethal means options presented to the patient, it would never have been discussed if not for the recent training. The informant was able to get the patient to put a photo of him and his sister next to the firearm so he would think of her to help de-escalate potential crises. Our informant learned this strategy from the CALM training.

Another key informant shared a conversation in their therapeutic practice where they were seeing an 18-year-old male client for his anxiety, and the informant brought up firearms during their regular treatment plan review. The informant approached the conversation about firearms without stigma or judgment to encourage their client to open up about his firearm ownership, where the firearms were stored in his home, and who has access to them. The client disclosed that they are in a safe with a passcode and the ammunition is stored separately. This lethal means safety strategy on asking questions about firearms was learned at the CALM training and will now be a regular part of their conversations as a suicide prevention tool during their sessions.

DISCUSSION/RECOMMENDATIONS

The quantitative and qualitative findings of this evaluation highlight the strength CALM training has in teaching secure storage strategies to healthcare professionals. The statistically significant difference in all evaluation metrics for healthcare professionals trained in CALM and the largest effect size on confidence listing storage options to reduce at-risk patients' access to household firearms emphasize the practical significance of the training. The use of secure storage strategies in a six-month follow-up period by participants interviewed further points to the effectiveness of CALM and how it can be used in practice in both crisis and pre-crisis situations.

Based on these findings, it is recommended that healthcare system leadership consider prioritizing CALM training for all clinical staff, with an emphasis on behavioral healthcare professionals. While best practice indicates in-person training should be utilized as the first option, in cases where financial limitations exist, online, self-paced training can be accessed at no cost through the Zero Suicide website: https://zerosuicidetraining.edc.org/enrol/index.php?id=20.

Additionally, to support implementation of CALM training, organizations are encouraged to consider allocating funds to the purchase of secure storage materials such as gun locks and lockboxes that have been vetted by industry professionals, such as those at CALM America, Inc., the organization responsible for the development, implementation, and dissemination of CALM.

While the data analyzed demonstrates a statistically significant difference in confidence amongst healthcare professionals trained in CALM versus healthcare professionals not trained in CALM, anonymous surveys prevented linkage of participant responses together to assess pre- and post-test results holistically as one group. When examining the successful use of CALM strategies in a six-month follow-up interview, informants were selected based on willingness to volunteer for interviews. This only represents a segment of all healthcare professionals who completed the CALM training during the 2025 and 2026 sessions. Despite these limitations, this study was able to utilize both qualitative and quantitative data collection and analysis to identify positive outcomes.

Based on these findings, RIDOH continues to work towards identification of further funding to expand CALM training and related interventions. For more information on RIDOH's CALM efforts or guidance on implementing CALM in your organization, please reach out to: RIDOH.suicideprevention@health.ri.gov.

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

VITAL EVENTS	REPORTING PERIOD		
	JANUARY 2026	12 MONTHS ENDING WITH JANUARY 2026	
	Number	Number	Rates
Live Births	850	10,752	10.1*
Deaths	1079	10,677	10.1*
Infant Deaths	2	42	3.9#
Neonatal Deaths	1	29	2.7#
Marriages	260	6,650	6.3*
Divorces	191	2,525	2.4*

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

Underlying Cause of Death Category	REPORTING PERIOD			
	JULY 2025	12 MONTHS ENDING WITH JULY 2025		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	191	2,325	211.9	2,560.0
Malignant Neoplasms	164	2,163	197.1	4,322.5
Cerebrovascular Disease	34	464	42.3	510.0
Injuries (Accident/Suicide/Homicide)	61	802	73.1	9184.0
COPD	43	480	43.7	479.5

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

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

Why join RIMS?

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

In 2025, RIMS members helped

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

We're not stopping here

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

Click to join

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

Wins for providers

RIMS worked to secure and support key budget investments.

Medicaid primary care rate increase

Up to 100% of medicare rates
Starting October 2025

Medicaid prior authorization pilot

Eliminates prior authorization for Medicaid for three years
Starting October 2025

Physician loan repayment funding

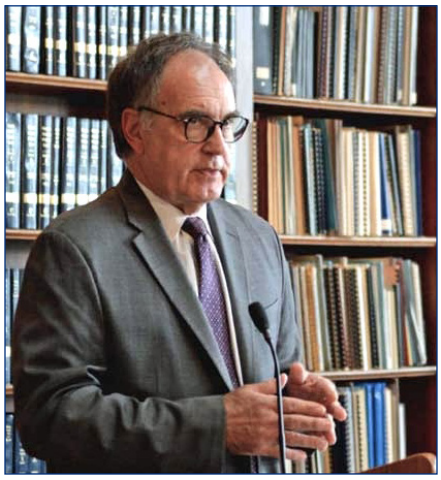
Includes $200,000 in funding to recruit and retain clinicians

Health center funding

Sustained investments in FQHCs and community health

Health services funding assessment

$30Mannually for primary care and other critical programs



Our priorities

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

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

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

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

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

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

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

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CMS strengthens prior authorization transparency, addressing AMA concerns

CHICAGO, ILL. — The American Medical Association (AMA) welcomed updated guidance from the Centers for Medicare & Medicaid Services (CMS) that strengthens enforcement of federal prior authorization transparency requirements, addressing concerns the AMA raised about how health plans were making required information available to patients and physicians.

The AMA alerted CMS to widespread problems with health plans' public disclosures of prior authorization requirements and outcomes. Rather than making information readily accessible, many plans posted disclosures that were difficult to find, hard to comprehend or incomplete. CMS' updated guidance addresses several of these concerns and provides greater clarity for patients seeking information about health plans' prior authorization policies.

"Patients should not need a portal password, a billing manual or medical training to find and understand a health plan's prior authorization practices," said AMA President **WILLIE UNDERWOOD III, MD, MSc, MPH**.

"Yet that is what we found when we examined how plans were implementing these transparency requirements. One plan posted an 832-page list of billing codes without a word of plain English. Others buried required information behind portals. Another published numbers that didn't add up — and acknowledged that its data should 'not be relied upon.' In other words, thank you for reading this. The information may or may not be true."

The AMA documented these practices, brought them to CMS, and the agency acted. The AMA is grateful for the updated guidance.

Earlier this year, the AMA examined how 15 Medicare Advantage contracts were implementing the transparency provisions of CMS's 2024 Interoperability and Prior Authorization final rule, which requires payers to publicly post prior authorization requirements and outcomes.

The AMA's review revealed a consistent pattern: On the surface, many plans appeared to comply with the rule while presenting disclosures in places and formats that made them difficult or impossible to find or use. Plans posted hundreds of pages of billing codes without plain-language descriptions, buried required disclosures behind physician or member portals and deep within plan websites, reported mathematically impossible statistics and turnaround times without units, and omitted entire categories of care—including behavioral health and post-acute services—from public reporting.

The AMA documented these problems and recommended specific corrective actions in a May 22 letter to CMS, followed by additional comments.

CMS has now incorporated several of the AMA's recommendations into its guidance.

Specifically, the guidance:

Defines what it means for prior authorization information to be publicly accessible. CMS makes clear that disclosures are not publicly accessible if they are available only through password-protected portals or cannot be reached through ordinary navigation from a payer's public-facing website.

Clarifies disclosure of all medical items and services subject to prior authorization. CMS specifies that plans must publicly identify all medical items and services requiring prior authorization, addressing the omission of entire categories of care from plan disclosures.

Clarifies that prior authorization disclosures must be understandable. CMS explicitly says lists of procedure codes without plain-language descriptions do not satisfy the requirement and recommends a single, comprehensive list organized by uniform service categories, with CPT codes, plain-language descriptions and a machine-readable format.

Improves accuracy and reliability of reported data. CMS clarifies that every turnaround-time metric must include a unit of time and requires median turnaround times of less than one day to be reported in hours rather than rounded to "0 days." The agency also recommended that payers explain any data quality issues in their reporting.

The AMA is urging CMS to build on the new guidance by addressing several remaining gaps in the federal transparency framework:

Define prior authorization broadly enough to capture rebranded practices. CMS should define prior authorization based on how the process functions, regardless of whether a payer calls it "prior authorization," "precertification," or "advance notice," or delegates the process to a third-party utilization management vendor.

Make prior authorization information available at the point of enrollment. CMS should link directly from plan pages on Medicare Plan Finder and HealthCare.gov to their prior authorization requirements and performance metrics, and should require states to include the same links in Medicaid and CHIP plan-comparison and enrollment tools.This would give consumers the information they need to compare plans before choosing coverage.

Standardize prior authorization reporting. CMS should require standardized templates for prior authorization service lists and performance metrics, rather than merely recommending standardized reporting. Consistent formats would make information easier for patients and physicians to understand and compare across plans.

Patients and physicians can share their experiences with care delays and denials at FixPriorAuth.org. ❖

AMA Honors: A new national awards program recognizing individuals shaping the future of healthcare

CHICAGO, ILL. — The American Medical Association (AMA) has announced the launch of AMA Honors, a new national awards program recognizing individuals whose work is helping shape the future of healthcare.

Beginning in 2027, AMA Honors will present three marquee awards celebrating transformative innovation, public health leadership, and trusted communication. Each award includes a $25,000 prize that may be directed to the recipient or a charitable organization of their choice.

"Medicine is evolving at an extraordinary pace, driven by advances in technology, bold public health leadership, and trusted communication that helps patients make informed decisions," said AMA President **WILLIE UNDERWOOD III, MD, MSc, MPH**. "The AMA created these awards to recognize the individuals whose work is driving that progress and making a meaningful difference in the lives of patients and communities. By celebrating extraordinary achievement, these awards will shine a national spotlight on the leaders and ideas shaping the future of healthcare."

The awards include:

Tech Innovator Award: Recognizing an individual whose innovation has advanced healthcare through transformative impact, real-world application, and a commitment to safety, trust, and transparency.

Public Health Champion Award: Honoring impactful leadership that advances population health and improves health outcomes.

Excellence in Communication Award: Recognizing an individual whose work has advanced public understanding, engagement, or perception of health and medicine through accurate, responsible communication that reaches broad audiences.

Award recipients will be selected by a six-person committee composed of AMA leaders and external members, who will evaluate nominations through a rigorous, independent review process using the published evaluation criteria.

The inaugural awards ceremony will be held Feb. 23, 2027, at the National Portrait Gallery in Washington, D.C., during the AMA National Advocacy Conference. The event will bring together award recipients and leaders from across medicine, public health, technology, and healthcare.

Nominations for the inaugural awards are now open and will be accepted through Nov. 2, 2026. To learn more about eligibility requirements and the nomination process, visit the AMA Honors web page. ❖

Brown University Health launches unique intestinal ultrasound program

PROVIDENCE — Brown University Health is expanding access to Intestinal Ultrasound (IUS), a simple, non-invasive way to evaluate for inflammation in the bowel in real time for both children and adults with inflammatory bowel disease (IBD) —which includes conditions such as Crohn's disease and ulcerative colitis.

Unlike traditional tests such as colonoscopy or CT scans, IUS can be done right in a clinic setting, without radiation, sedation, or bowel prep. It allows clinical teams to quickly assess how active the disease is, whether treatment is working, and make immediate decisions—often during the same visit.

"Our goal is to provide patients with the most effective and least burdensome tools available. Intestinal Ultrasound gives us the ability to assess disease activity in real time, avoid unnecessary procedures and make treatment decisions more quickly, all while improving the patient experience. Instead of waiting weeks for results, patients can leave their appointment with a clearer understanding of their condition and a plan moving forward," said Brown University Health Inflammatory Bowel Disease Center Director **SEAN FINE, MD**, who has already begun performing IUS for adult patients with IBD. He is the only adult gastroenterologist in Rhode Island offering the procedure.

Brown University Health also leads the way in pediatric IUS. Pediatric Inflammatory Bowel Disease Center Associate Director **SHOVA SUBEDI, MD**, has led establishment of the pediatric IUS program at Hasbro Children's, the first of its kind in New England. She is among a small number of pediatric gastroenterologists nationally utilizing the technology and serves on the Pediatric Committee of the Intestinal Ultrasound Group of the United States and Canada (IUSCAN), helping advance the use of IUS across North America.

"Intestinal Ultrasound has changed how we care for children with inflammatory bowel disease. Because it is noninvasive and can be performed during a routine clinic visit, it helps families better understand their child's condition and allows us to monitor response to treatment more closely, allowing Brown University Health to provide more comprehensive patient-centered IBD care," said **DR. SUBEDI**.

Intestinal Ultrasound can be performed at the bedside, providing real-time visualization of the intestines and allowing patients and clinicians to review findings together. Unlike colonoscopy, MRI enterography (MRE) or CT imaging, IUS requires no bowel preparation, sedation or radiation exposure, making it a more convenient and patient-friendly option. The technology enables providers to evaluate bowel wall thickness, blood flow, strictures, fistulas and abscesses, and monitor intestinal inflammation frequently and noninvasively. This allows clinicians to adjust treatment earlier and help prevent disease progression and complications. ❖

Brown University Health, Arcamyra Therapeutics to launch Phase 1 trial of ACM-CpG for peritoneal carcinomatosis

PROVIDENCE — Brown University Health and Arcamyra Therapeutics Inc., a clinical-stage oncology company advancing nanoparticle-based immunotherapies for solid tumors with high unmet needs announced that the U.S. Food and Drug Administration has cleared Investigational New Drug application 180703 for ACM-CpG, enabling the therapy to move into clinical evaluation for patients with peritoneal carcinomatosis.

BrUOG 452 is an investigator-initiated Phase 1 trial coordinated by the Brown University Oncology Research Group to evaluate ACM-CpG in patients with peritoneal carcinomatosis. The study, listed on ClinicalTrials.gov as NCT07658196, will be led by **KHALDOUN ALMHANNA, MD**, as principal investigator and represents the first clinical evaluation of ACM-CpG in this disease setting.

Peritoneal carcinomatosis occurs when cancer spreads to the peritoneum, the membrane lining the abdominal cavity, and can cause symptoms such as abdominal swelling, pain and digestive complications that significantly affect daily life. Because the disease often develops in advanced gastrointestinal or gynecologic cancers and can be difficult for medicines to reach effectively, patients have limited treatment options and a significant need for new approaches.

ACM-CpG is a polymersome-encapsulated TLR9 agonist developed on Arcamyra's proprietary block-copolymer nanoparticle platform. In BrUOG 452, it will be administered intraperitoneally to deliver innate immune activation directly within the peritoneal cavity, an approach designed to help address drug-delivery barriers in this difficult-to-treat disease setting.

Potentially eligible patients will have documented peritoneal carcinomatosis from colorectal or appendiceal cancer. Patients may have an intact primary colorectal or appendiceal tumor, and limited liver or lung disease is permitted.

The trial builds on early clinical evaluation of ACM-CpG in other indications, where the investigational therapy has been well tolerated and has shown evidence of innate immune activation.

"This FDA clearance marks an important step for Arcamyra and for patients with peritoneal carcinomatosis, a disease with few effective treatment options," said **MADHAVAN NALLANI, PhD**, chief executive officer and co-founder of Arcamyra Therapeutics. "We are pleased to advance ACM-CpG into this Phase 1 trial with Dr. Almhanna and the teams at Brown University Health and The Warren Alpert Medical School of Brown University, whose experience in gastrointestinal oncology and peritoneal disease will be essential to this work."

"Peritoneal carcinomatosis remains one of the most challenging disease settings we treat, and patients need new options," said Dr. Almhanna. "ACM-CpG's early tolerability and immune-activation profile provide a strong rationale for studying this regional immunotherapy approach in patients with peritoneal disease. Brown University Health brings an experienced immunotherapy team and a surgical oncology program that cares for a high volume of patients with carcinomatosis."

The study is expected to further evaluate ACM-CpG's safety, tolerability and early biological activity in this patient population, helping inform future clinical development of the investigational therapy.

Forward-Looking Statements

This press release contains forward-looking statements, including statements regarding the initiation, timing, conduct, and potential of Arcamyra's clinical program for ACM-CpG. These statements are based on current expectations and are subject to risks and uncertainties, including those related to clinical development, regulatory review, patient enrollment, and the inherent uncertainty of the drug development process. Clearance of an IND does not guarantee that a clinical trial will be initiated, completed, or successful, or that any product candidate will receive marketing approval. Actual results may differ materially from those expressed or implied. Arcamyra undertakes no obligation to update any forward-looking statement except as required by law. ❖

American Lung Association applications now open for 2027–2028 research awards and grants cycle

PROVIDENCE — The American Lung Association Research Institute has announced the start of its 2027–2028 Research Awards and Grants cycle. The program supports high-impact basic, translational and clinical research. Applications are carefully evaluated and selected through rigorous scientific peer review. Awardees investigate a wide range of complex issues with the goal of reducing the burden of lung disease. Researchers across disciplines and career levels are encouraged to apply.

"The American Lung Association in Rhode Island is committed to investing in lifesaving research—it is core to our mission of creating a world free of lung disease. Amid federal changes in research and funding, it is more important than ever for nonprofit organizations to help sustain scientific discovery and innovation," said **DANIEL MIRAMONTES**, Executive Director for the American Lung Association in Rhode Island. "By investing in the best and brightest scientists, we hope to accelerate lifesaving discoveries that revolutionize the way we prevent, detect and treat lung disease."

Funding opportunities include:

Indoor Air Research Award: Up to $100,000/year (independent) or $50,000/year (mentored), for up to three years. This award supports research on how indoor environments impact lung health, with the goal of informing policy and improving public health outcomes. A letter of intent is required.

Lung Cancer Discovery Award: $100,000/year for up to two years. Funds groundbreaking research in lung cancer across disciplines, from lab studies to clinical investigations. A letter of intent is required.

Emerging Respiratory Pathogen Award: $100,000/year for up to two years. Supports studies into the pathobiology and long-term consequences of new and evolving respiratory pathogens. A letter of intent is required.

Innovation Award: $75,000/year for up to two years. Supports independent investigators with recent NIH K- or R-type awards for novel studies in lung health or disease. A letter of intent is required.

Hastings Innovation Award for Interstitial Lung Disease: $75,000/year for up to two years. Designed for independent investigators focused on ILD research with prior NIH award experience.

Allergic Respiratory Diseases Research Award: $75,000/year for up to two years. Jointly funded with the American Academy of Allergy, Asthma & Immunology (AAAAI), this award supports research in allergic respiratory diseases.

Catalyst Award: $50,000/year for up to two years. Mentored award for early-career scientists on the path to research independence. A letter of intent is required.

Dalsemer Interstitial Lung Disease Award: $50,000/year for up to two years. Provides seed funding for mentored junior researchers studying ILD.

Public Health and Public Policy Research Award: $50,000/year for up to two years. Supports public health research and evaluation of policies affecting air quality and lung health.

For the 2027–2028 Lung Association Research Institute grant cycle, qualified researchers must be conducting research in the U.S. and meet individual grant qualifications and other terms and conditions. Application materials are available through ProposalCentral. The entire process takes 6 to 8 months. Research grant awardees will be notified in June 2027.

To learn more or begin the application process, visit Lung.org/research. ❖

Miriam awarded $11.1M NIH grant to advance research on stress, trauma and resilience

PROVIDENCE — The Miriam Hospital has received an $11.1 million federal grant from the National Institute of General Medical Sciences, part of the National Institutes of Health, to support Phase 2 of its Center of Biomedical Research Excellence for Stress, Trauma and Resilience.

The competitive renewal will expand the STAR COBRE's work to advance research on how early-life stress and trauma affect long-term health, support emerging investigators, and strengthen community partnerships aimed at developing practical interventions that promote resilience and improve outcomes for children, families and communities. The Phase 2 grant will build on the center's significant accomplishments during its first five years and further strengthen Rhode Island's only research center dedicated to stress, trauma and resilience.

"Support for Phase 2 will allow us to accelerate STAR COBRE's impact on a regional and national level, catalyzing transformative science and the next generation of transdisciplinary scientists, strengthening ties with our amazing community partners and improving health across the lifespan," said **LAURA R. STROUD, PhD**, principal investigator of the STAR COBRE, director of The Miriam Hospital's Center for Behavioral and Preventive Medicine, and professor of psychiatry and human behavior at the Warren Alpert Medical School of Brown University. "Decades of research have shown that childhood stress and trauma can profoundly affect health across the lifespan, yet many questions remain about how these experiences shape physical and mental health and, importantly, how and when to intervene. This investment will help us develop new solutions, advance scientific understanding, and train the next generation of investigators working to improve health and resilience."

The Phase 2 award will support three new research initiatives led by early-stage investigators and clinician-scientists focused on developing innovative interventions to improve health outcomes associated with stress and trauma.

Researcher initiatives include:

- **LG WARD, PhD**, will develop a novel trauma-informed care toolkit for inpatient obstetrics designed to reduce traumatic childbirth, improve communication between providers and patients, and improve postpartum mental health.
- **LINDSAY HUFFHINES, PhD**, will develop a brief, community-informed intervention to help parents who experienced childhood adversity and their young children, with the goal of building resilience and improving family mental health.
- **KAYLONI OLSON, PHD**, will examine how momentary stress contributes to chronic pain, stress biology and weight-related behaviors to pave the way for a novel intervention to improve weight- and pain-related health in real time.

A new focus during Phase 2 will include intervention development, wearable technologies, implementation science, and expanded community engagement to help translate scientific discoveries into real-world improvements in resilience and health. ❖

Novel radiation strategy redefines a new treatment paradigm for glioblastoma

PROVIDENCE — New data from a multi-institutional feasibility clinical trial across 15 institutions nationwide presented by **CLARK CHEN, MD, PhD**, professor and director of the Brain Tumor Program at Brown University Health, suggest that a novel radiation therapy device may help improve outcomes for patients newly diagnosed with glioblastoma, one of the deadliest forms of brain cancer.

The findings were presented as a podium presentation at the 2026 American Society of Clinical Oncology (ASCO) Annual Meeting and provide the foundation for a planned Phase III randomized clinical trial.[1]

Glioblastoma is an aggressive brain cancer that is difficult to treat. Standard treatment includes surgery to remove as much of the tumor as possible, followed by radiation and chemotherapy. However, to allow the brain and surgical incision time to heal following tumor removal, radiation and chemotherapy are typically delayed for three to six weeks after surgery. During this time, cancer cells left behind after surgery can continue to grow and multiply.

"Even after a successful surgery, microscopic glioblastoma cells remain in the brain," said Dr. Chen. "In 50 to 70 percent of patients, these cells grow quickly enough to become visible on MRI scans before standard radiation treatment can begin. In some cases, the tumor grows back to a size that requires a second surgery. This early regrowth is associated with poorer survival, creating an urgent need for treatments that can target cancer cells without affecting wound healing."

To address this challenge, investigators evaluated GammaTile® (GT Medical Technologies, Tempe, Arizona), a cesium-131-based radiation therapy implanted directly into the surgical cavity at the time of tumor removal. Unlike conventional external beam radiation therapy (EBRT) that requires waiting until the patient has healed from surgery, GammaTile® begins delivering radiation immediately after surgery. Because the radiation travels only a short distance, it remains concentrated around the area where the tumor was removed and does not interfere with wound healing. The treatment also delivers radiation doses that are two to four times higher than can be safely achieved with conventional external beam radiation therapy.

Dr. Chen led the Phase I GESTALT clinical trial (NCT05342883) involving 15 hospitals across the United States to determine whether GammaTile® could be safely incorporated into standard glioblastoma treatment. The study included 67 patients and found that the combined treatment, which comprised surgery and concurrent GammaTile® placement followed by a shortened course of EBRT and standard chemotherapy, was safe and practical to deliver. Patients who received GammaTile® did not experience more serious side effects than those typically seen with standard treatment alone.

Most notably, only 6 percent of patients experienced rapid early tumor regrowth after surgery, compared with the 50 to 70 percent rates commonly reported when patients must wait three to six weeks before starting radiation and chemotherapy.[2-3] The findings suggest that delivering radiation at the time of surgery may help prevent cancer growth during this critical period.

"These results suggest that immediate radiation treatment at the time of surgery may address one of the most significant challenges in glioblastoma care," said Dr. Chen. "By treating residual cancer cells during the recovery period, we may be able to reduce early tumor regrowth while maintaining the safety of standard treatment."

"GammaTile was built to close the gap in glioblastoma care created by the wait for traditional external beam radiation to begin after surgery," said **MICHAEL GARCIA, MD, MS**, Chief Medical Officer of GT Medical Technologies. "These results show what's possible when we stop giving residual cancer cells time to regrow between surgery and radiation. We're grateful to Dr. Chen and the entire GESTALT investigator team for the rigor they brought to this trial, and we're energized to support the Phase III study that will build on it. Based on these findings, a Phase III randomized clinical trial, BRIDGES (NCT07195591), has been launched to further evaluate the potential benefits of incorporating GammaTile® into the frontline treatment of newly diagnosed glioblastoma."

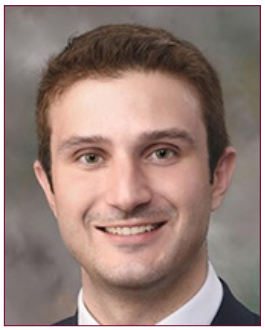
"GT Medical Technologies was founded by brain tumor specialists who believed that innovative radiation therapy approaches were critical for improving patient outcomes," said **PER LANGOE**, Chief Executive Officer of GT Medical Technologies. "These trial results suggest that we are realizing their vision for patients with glioblastoma, and the ongoing Phase III BRIDGES trial will further inform our understanding of how GammaTile may improve patient outcomes."

This study was sponsored by GT Medical Technologies, Inc. Dr. Chen is a consultant for GT Medical and a participating investigator in the NCT05342883 trial. ❖

References

1. Chen C, et al. Presented at: American Society of Clinical Oncology; May 31, 2026; Chicago, IL.
2. Waqar M, et al. *Neuro-oncology Adv.* 4 (2022).
3. Guzzino J, et al. *J Neurooncol.* 176:5 (2025).

Joseph A. Gil, MD, performs thumb joint replacement with newly available TOUCH® CMC 1 implant



EAST PROVIDENCE — University Orthopedics hand and upper extremity surgeon **JOSEPH A. GIL, MD**, has become the first surgeon in Rhode Island to perform a thumb joint replacement using the TOUCH® CMC 1 prosthesis, a newly FDA-approved implant designed to relieve pain and restore function for patients with arthritis at the base of the thumb.

The procedure, performed at Rhode Island Hospital, is known as carpometacarpal (CMC) total joint arthroplasty. It replaces the arthritic joint at the base of the thumb with a small ball-and-socket implant. Similar in concept to a hip replacement—but designed specifically for the thumb—the prosthesis is designed to reduce pain and restore the strength and mobility patients need for everyday activities such as gripping, pinching, and opening jars.

"Thumb arthritis can make even the simplest daily activities like buttoning a shirt, turning a key, or gripping a coffee cup extremely painful," said Dr. Gil. "With the goal of restoring function and reducing pain, this implant provides another treatment option for people living with thumb arthritis who want to get back to the activities they enjoy."

The thumb CMC joint is one of the most common joints affected by osteoarthritis. As cartilage wears away, patients often experience pain, weakness, and loss of grip and pinch strength that can interfere with work, hobbies, and everyday tasks.

Until recently, surgical treatment for advanced thumb arthritis typically involved removing the arthritic trapezium bone and reconstructing the joint using nearby tendon tissue. The TOUCH® CMC 1 prosthesis offers an alternative by replacing the joint with a dual-mobility implant designed to provide stability while maintaining natural thumb movement.

Developed by KeriMedical and distributed in the United States by Medartis Inc., the TOUCH® CMC 1 prosthesis received FDA approval in 2025 after more than a decade of successful use in Europe. With that approval, patients in the Rhode Island area now have access to an innovative treatment option that, until recently, was available only overseas.

"Every patient is different, and there is no one-size-fits-all treatment for thumb arthritis," Dr. Gil said. "Having access to this technology allows us to offer another evidence-based option for patients whose symptoms have not improved with conservative treatment."

The Hand & Wrist Center at University Orthopedics offers comprehensive care for thumb arthritis, including splinting, medications, corticosteroid injections, hand therapy, and advanced surgical treatments when appropriate. ❖

Appointments

Providence Community Health Centers names Mary Benvenuto as President, CEO

PROVIDENCE — **MARY BENVENUTO**, a seasoned healthcare executive with more than 20 years of leadership experience, has been named President and CEO of Providence Community Health Centers (PCHC). Benvenuto, who will join PCHC on October 13, 2026, was a unanimous selection of the Board of Directors following an extensive national search. She replaces **MERRILL THOMAS**, who will be retiring later this year after 25 years.

Benvenuto brings a proven track record of operational excellence, strategic growth, financial stewardship, and mission-driven leadership to Rhode Island's largest federally qualified health center. She currently serves as Executive Vice President and Chief Financial and Operating Officer at Open Sky Community Services, a $140 million behavioral health and human services organization serving communities throughout Central Massachusetts. In this role, she oversees operations, including finance, information technology, human resources, facilities, data strategy, real estate, and organizational growth initiatives.

Prior to joining Open Sky, Benvenuto served as Chief Financial Officer of Manet Community Health Center, a federally qualified health center in Massachusetts, where she partnered with executive leadership to expand access to care, strengthen operational performance, and support organizational growth during the COVID-19 pandemic. Her experience also includes executive leadership roles with Last Mile Health and the United Way of Rhode Island. Benvenuto received her Master of Science in accounting from Nichols College and Bachelor of Science in accounting from Bryant University.

As CEO, Benvenuto will lead a team of 500 employees as she guides strategic initiatives that support patient access, workforce development, operational excellence, financial sustainability, and continued investment in community health. Her leadership comes at a pivotal time as PCHC continues to expand services and strengthen its role as a trusted provider of comprehensive primary care, behavioral health, dental care, specialty services, and community-based healthcare programs. ❖

Brown graduate John Gaitanis, MD, to lead NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development

BETHESDA, MD — National Institutes of Health (NIH) Director **JAY BHATTACHARYA, MD, PhD**, announced the selection of **JOHN GAITANIS, MD**, as director of NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). Dr. Gaitanis began his role on August 23rd.

As NICHD director, Dr. Gaitanis will shepherd the investment of NICHD's approximately $1.7 billion annual budget, facilitating research to advance maternal, gynecologic, and child health, as well as the health of people with intellectual and developmental disabilities. He will lead a staff of about 1,100 who either conduct research at NICHD or support some of the institute's approximately 2,300 research grants and projects at organizations throughout the United States and internationally.

"With the burden of chronic disease on the rise, Dr. Gaitanis's forward-thinking approaches for NICHD research will help us adapt to the realities of today," Dr. Bhattacharya said. "We're eager for research advances in prevention, precision, and systems-level understanding to pinpoint root causes of these conditions and yield transformative advances in clinical care to improve health for women, children, and people with disabilities."

Dr. Gaitanis, a nationally respected expert in complex neurodevelopmental disorders, epilepsy, and autism, brings nearly three decades of clinical, academic, and leadership experience to the position. He previously served as Chief of Child Neurology at Tufts Medical Center in Boston, and Director of Child Neurology at Brown Medical School in Providence, Rhode Island.

Throughout his distinguished career, Dr. Gaitanis has advanced research and clinical care for individuals with complex neurological and neurodevelopmental conditions, expanded access to specialized services, and trained physicians to deliver comprehensive, individualized care. His work has also advanced clinician education and evidence-informed approaches that support the health, communication needs, autonomy, and dignity of nonspeaking individuals with autism.

Dr. Gaitanis received his MD from Brown Medical School and completed his pediatrics residency at the University of Rochester. He subsequently completed his neurology training at Boston Children's Hospital/Harvard Medical School, where he served as chief resident, followed by fellowship training in epilepsy and clinical neurophysiology at Beth Israel Deaconess Medical Center/Harvard Medical School.

Dr. Gaitanis previously served on the board of the Epilepsy Foundation of New England and currently serves on the board of the Medical Academy of Pediatrics and Special Needs (MAPS), a national leader in translating emerging science into clinical care for children with severe, chronic, and complex medical conditions. MAPS is home to the only U.S. fellowship program of its kind, providing physicians with advanced training in the application of translational medicine across this highly complex and historically underserved pediatric population. In recognition of his leadership and contributions to the field, Dr. Gaitanis received the MAPS Trailblazer Award in 2025. ❖

Appointments

George Hanna, MD, joins University Gastroenterology's Liver Center

PROVIDENCE — University Gastroenterology (UGI) announced that it's expanding access to comprehensive gastrointestinal and liver care for patients throughout Rhode Island and Southern New England with the addition of fellowship-trained gastroenterologist **GEORGE HANNA, MD**.

A Rhode Island native, Dr. Hanna is a general gastroenterologist with a particular clinical interest in diseases and conditions affecting the liver. He treats a broad range of gastrointestinal conditions, including gastroesophageal reflux disease (GERD), abdominal pain, constipation, diarrhea, diverticulitis, difficulty swallowing, and Barrett's esophagus. His areas of special interest include abnormal liver tests, fatty liver disease, drug-induced liver injury, autoimmune and viral hepatitis, and cirrhosis.

Dr. Hanna earned his medical degree from Jefferson University in Philadelphia before returning to Rhode Island to complete his internal medicine residency at the Warren Alpert Medical School of Brown University. He subsequently completed a three-year gastroenterology fellowship at Yale Bridgeport Hospital, serving as chief gastroenterology fellow during his final year. He is board-certified in internal medicine by the American Board of Internal Medicine.

Joining University Gastroenterology also represents a homecoming for Dr. Hanna. Born and raised in Rhode Island, he grew up in Lincoln, spent summers in Narragansett, and attended Mount Saint Charles Academy, where he played hockey. Growing up in a family of physicians, he saw firsthand the value of building meaningful relationships with patients—an experience that continues to shape his approach to care. After nearly a decade of medical education and training, returning to Rhode Island to practice medicine fulfills an important personal and professional goal.

"My parents, aunt, and grandfather all practiced medicine in Rhode Island, so I grew up seeing the relationships they built with their patients and the importance of knowing each patient as an individual," Dr. Hanna said. "That human connection has always stayed with me. I've spent the last decade working toward the opportunity to come home, and I'm grateful to now be caring for patients in the community where I grew up and joining a practice that shares those same values."

Dr. Hanna sees patients at University Gastroenterology's Staniford Street office in Providence. He performs procedures at the Staniford Street and West River locations, as well as The Miriam Hospital.

CharterCARE names Ciaran J. McNamee, MD, chief of thoracic surgery

PROVIDENCE — CharterCARE Health of RI has announced that **CIARAN J. MCNAMEE, MD**, has been named Chief of Thoracic Surgery and Thoracic Diseases for the system. An active staff member of Massachusetts General Hospital and Dana-Farber Cancer Institute, and Assistant Professor of Surgery at Harvard Medical School, he most recently led the thoracic program at Care New England through its affiliation with Brigham and Women's Hospital.

Dr. McNamee will provide Rhode Islanders with access to world-class thoracic surgery, especially in the treatment of related cancers. He will immediately add a depth of knowledge and experience to the nationally recognized surgical oncology program at Roger Williams Cancer Center, and will lead thoracic care at both Roger Williams Medical Center and Our Lady of Fatima Hospital. CharterCARE has invested heavily in advanced robotic surgery technology, which match Dr. McNamee's clinical interests in robotic surgery and incorporating innovations at the frontiers of medical care to provide autonomy and well- being to those in need.

A recognized leader in the field with more than 20 years of academic practice, surgery, and research experience, Dr. McNamee joins CharterCARE to enhance the thoracic surgery program and to establish a thoracic oncology service across the system. His clinical interests include benign and malignant esophageal disease, COPD, lung cancer, thymoma and thymic cancer, minimally invasive and robotic surgery.

Board-certified in surgery and thoracic surgery, he received his medical degree from McGill University, Faculty of Medicine in Canada, and performed his residencies in surgery at Alberta Hospital, and in cardiothoracic surgery at Broadgreen Hospital and Royal Devon and Exeter Hospital. He completed a fellowship in clinical thoracic surgery at the University of Manitoba and a Master's in experimental surgery at the University of Alberta.

In making the announcement, CharterCARE CEO **JEFFREY LIEBMAN** stated, "Access to world-class cancer and surgical care is an important thread in Rhode Island's quality of life. I'm proud that CharterCARE has attracted a national talent to take a leadership role in the development of our thoracic surgery program. His special interests in thoracic oncology and research background in lung cancer will advance patient care and treatment options and complement the work of the Roger Williams Cancer Center." ❖

Recognition

Brown University Health hospitals named among nation's best in *U.S. News & World Report's* 2026–2027 rankings

PROVIDENCE — *U.S. News & World Report* released its 2026–2027 Best Hospitals ratings recently; The Miriam Hospital, Rhode Island Hospital, Newport Hospital and Saint Anne's Hospital were recognized in the annual rankings. The Miriam Hospital and Vanderbilt Rehabilitation Center at Newport Hospital are ranked number one in Rhode Island and in the Providence metro area. All four Brown University Health hospitals received "high performing" scores in specialty care.

"Across Brown University Health, our clinicians and staff are dedicated to delivering exceptional, world-class care to patients throughout Rhode Island and Southeastern Massachusetts every day," said **SARAH FROST**, chief of hospital operations at Brown University Health and president of Rhode Island Hospital. "We are proud to see several of our hospitals recognized by *U.S. News & World Report*, this recognition reflects the skill, compassion and commitment of our teams and the trust of the communities we serve."

The Miriam Hospital has earned the honor of top hospital in Rhode Island for 15 straight years, starting with *U.S. News & World Report's* first state rankings in 2012–2013.

"To be recognized once again as the No. 1 hospital in Rhode Island is a tremendous honor and a reflection of the exceptional care our teams provide every day," said **MARIA DUCHARME, DNP, RN**, president of The Miriam Hospital and chief quality executive at Brown University Health. "For 15 consecutive years, The Miriam Hospital has earned this distinction, underscoring our team's unwavering commitment to quality, safety and compassionate care. I am deeply proud of our physicians, nurses, clinical teams and staff whose dedication continues to make this recognition possible."

U.S. News also gave the hospital "high performing" rankings for its excellence in care and treatment in the following eight conditions and adult specialty areas:

- Hip Replacements
- Hip Fracture
- Knee Replacements
- Back Surgery Spinal Fusion
- Colon Cancer Surgery
- Heart Attack
- Stroke
- Pneumonia

Vanderbilt Rehabilitation Center at Newport Hospital has earned the honor of top rehabilitation center in Rhode Island and the Providence metro area for the 2026-2027 rankings. Newport Hospital also earned a "high performing" ranking for its excellence in specialty care and treatment for the following condition:

- Diabetes

Rhode Island Hospital received "high performing" rankings for its excellence in care and treatment in the following three conditions:

- Abdominal Aortic Aneurysm Repair
- Lung Cancer Surgery
- Transcatheter Aortic Valve Replacement

In addition, Saint Anne's Hospital received a "high performing" ranking for excellence in:

- Hip Replacement

For the 2026–2027 rankings and ratings, U.S. News evaluated nearly 4,500 hospitals across 14 adult specialties and 23 procedures and conditions; only 16% of evaluated hospitals earned a Best Hospitals designation. ❖

Brown University Health's LifePACT earns prestigious national accreditation for critical care transport

PROVIDENCE — Brown University Health's Critical Care Transport Team, LifePACT, has earned accreditation from the Commission on Accreditation of Medical Transport Systems (CAMTS), becoming the third ground-only medical transport program in the United States to receive this prestigious recognition.

CAMTS accreditation is considered the gold standard for medical transport programs, recognizing organizations that meet rigorous national standards for patient care, safety, clinical excellence, education, and operational performance. This designation reflects LifePACT's commitment to delivering the highest level of critical care during patient transport.

LifePACT specializes in the emergency transport of critically ill and injured adult and pediatric patients, providing advanced critical care while safely transferring patients to the most appropriate medical facility. Like the lifesaving care often associated with helicopter medical evacuation services, LifePACT delivers that same level of expertise through specialized ground transport.

Operating from Providence, the LifePACT team staffs two advanced life support ambulances 24 hours a day, seven days a week, 365 days a year. Each year, the team transports approximately 1,500 critically ill or injured patients throughout Rhode Island and the surrounding region.

During every transport, LifePACT's highly trained team have access to advanced medical technology to stabilize patients and continue intensive care before they reach the hospital. The team's capabilities include mechanical ventilation, advanced cardiac monitoring, oxygen therapy, and the transport of patients requiring highly specialized cardiac support devices, including intra-aortic balloon pumps and Impella heart pumps.

"We have monitors, ventilators, oxygen equipment, and the ability to transport patients on balloon pumps and Impella devices that support patients experiencing severe cardiac emergencies," said **NELSON PEDRO**, a critical care paramedic and operations manager for Life Pact. "Our team brings the intensive care unit directly to the patient, ensuring they receive expert critical care every step of the journey."

"This accreditation is a testament to the dedication, expertise, and professionalism of our entire LifePACT team," said **SARAH FROST**, chief of hospital operations at Brown University Health and president of Rhode Island Hospital and Hasbro Children's. "Achieving CAMTS accreditation demonstrates our commitment to providing the highest quality care for patients during some of the most critical moments of their lives." ❖

Westerly Hospital honored with the 2026 Emergency Nurses Association (ENA) Lantern Award

WESTERLY — Westerly Hospital is proud to announce that its Emergency Department has been honored with the 2026 Emergency Nurses Association (ENA) Lantern Award, a national recognition of excellence in emergency nursing.

This is the first time Westerly Hospital has been selected for the award. Lawrence + Memorial Hospital in New London, and Pequot Health Center in Groton, CT also received the honor last year. All three emergency departments are part of Yale New Haven Health.

The ENA Lantern Award showcases an Emergency Department's accomplishments in incorporating evidence-based practice and innovation into emergency care. It encourages departments to share stories that reflect a commitment to both exceptional patient care and the well-being of nursing staff.

"This prestigious recognition encourages Emergency Departments (ED) to share stories that highlight their commitment not only to exceptional patient care but also to the well-being of their nursing staff," said **SHANNON CHRISTIAN**, chief nursing officer at Westerly Hospital. "It stands as a visible symbol of Westerly's dedication to quality, safety and fostering a healthy work environment."

The ED was selected for outstanding performance in leadership, practice, education, advocacy and research. The award reflects ongoing efforts to create a supportive and resilient environment for staff while delivering the highest standard of care to patients and families.

"We are incredibly proud of our Emergency Department teams for earning this national recognition," said **OLIVER MAYORGA, MD**, interim president, Westerly Hospital. "Their hard work, compassion and unwavering commitment to the patient and family experience are what make this honor so well deserved. This award reflects the excellence they bring to our emergency departments every day."

The Lantern Award is valid for three years and serves as a beacon for other emergency departments striving for excellence. ❖

The Miriam Hospital Emergency Department recognized as an Emergency Nurses Association (ENA) Lantern Award recipient

PROVIDENCE — The Miriam Hospital Emergency Department has been selected as a recipient of the 2026 ENA Lantern Award, which recognizes exceptional innovation and evidence-based practice improvements that result in improved patient care and staff well-being.

"Receiving the ENA Lantern Award is a testament to the extraordinary commitment, compassion and expertise of our emergency department team," said **MARIA DUCHARME, DNP, RN**, president of The Miriam Hospital and chief quality executive for Brown University Health. "At The Miriam Hospital, our nurses and front-line clinicians are empowered to lead innovation and drive meaningful change. This recognition reflects their unwavering dedication to delivering exceptional care while creating a safer, more supportive environment for patients, families and staff."

The Miriam Hospital earned the Lantern Award for exceeding the criteria for Lantern Award designation in the areas of quality, safety, healthy work environment, and innovation in nursing practice and emergency care. In addition, ENA notes that Lantern-recognized departments demonstrate exemplary performance across the core domains of leadership, practice, education, advocacy, and research initiatives that improved patient access and strengthened workforce safety in its emergency department. Guided by a culture of shared governance and nurse-led innovation, the department achieved a 40 percent reduction in patients who left without being seen, helping ensure more timely access to emergency care.

The department also implemented several safety enhancements to better protect patients and staff, including a weapons detection system, a reinforced triage area and wearable panic

badges for employees. These investments reflect The Miriam Hospital's commitment to creating a safe environment where caregivers can deliver the highest-quality emergency care.

"This recognition reflects the extraordinary commitment of our emergency department team to deliver exceptional care every day," said **DENISE BRENNAN, DNP, RN, CNL**, director of Emergency Services, Radiology Nursing and the Stroke Program for The Miriam Hospital. "I am deeply grateful to our nurses, physicians, support staff and clinical leaders, whose dedication to quality, safety, innovation and continuous improvement made this achievement possible. The Lantern Award reflects the culture they have built together and their unwavering commitment to patients, families and colleagues."

The Miriam Hospital is among 126 recipients nationwide recognized this year and one of only two hospitals in the state of Rhode Island to ever receive this award. This designation is granted through a rigorous national peer review process and is valid for three years. ❖

South County Hospital earns 17th consecutive Outstanding Patient Experience Award

WAKEFIELD — South County Hospital is proud to announce it has once again been recognized with the Outstanding Patient Experience Award from Healthgrades—marking 17 consecutive years (2010–2026) of this prestigious honor. This recognition places South County Hospital among the top 5% of hospitals nationwide for Outstanding Patient Experience and an even more elite group of only 27 hospitals nationwide to earn the award for 17 straight years, and the only hospital in Rhode Island to do so.

"This recognition reflects the commitment of our entire team—from our providers and nurses to our support staff and volunteers—to creating an exceptional experience for every patient who walks through our doors," said **AARON ROBINSON,** President and CEO of South County Health. "Outstanding patient care is about more than just delivering excellent clinical outcomes; it's also about making every patient feel heard, respected, informed, and cared for throughout their healthcare journey. We are honored that our patients continue to recognize the compassion, personalized attention, and high-quality care that define the South County Health experience."

The Healthgrades Outstanding Patient Experience Award recognizes hospitals that consistently deliver exceptional care while placing patients at the center of every interaction. Based on patient survey data, the award reflects excellence in communication, responsiveness, cleanliness, and the overall quality of the patient experience. Healthgrades distinctions are widely recognized by patients seeking trusted information when choosing where to receive care, particularly for elective procedures.

In addition to this milestone, South County Hospital has recently earned several other top Healthgrades distinctions, including:

- 5-Star Rating for Treatment of Heart Failure (2025–2026)
- 5-Star Rating for Treatment of Chronic Obstructive Pulmonary Disease (2025–2026)
- 5-Star Rating for Treatment of Pneumonia (2025–2026)
- Pulmonary Care Excellence Award (2025–2026)
- 5-Star for Treatment of Diabetic Hospitalizations (2026)
- 5-Star for Outpatient Total Knee Replacement (2026)
- 5-Star Rating in Vaginal Delivery (2024–2025), Top 10% in the Nation
- 5-Star Rating in C-Section Delivery (2024–2025)

These recognitions reflect South County Hospital's continued commitment to delivering exceptional clinical outcomes while providing every patient with a compassionate, personalized, and high-quality healthcare experience. ❖

Obituaries

SALVATORE GUIDO AZZOLI, MD, FACS, born May 23, 1941 in Providence, RI, died peacefully on July 29, 2026 in Orleans, MA.

He leaves behind his wife of 61 years, Geraldine Alma Palmieri, his three children Lora Ann (late husband James Feltham), Lynn Marie (husband Roland Desrochers), Christopher Gerard (wife Lisa Bienvenu), and ten beloved grandchildren.

A talented youth baseball player and student raised on, "the Hill" (Federal), he graduated from Mount Pleasant High School in 1959, earned his Bachelor of Arts from Providence College in 1963, and his MD from Loyola Stritch School of Medicine in Chicago, IL, in 1967.

Dr. Azzoli completed an internship in internal medicine at Saint Vincent's Hospital in Brooklyn, NY, residency in general surgery at Rhode Island Hospital, then served in the US Army (Major), 82nd Airborne, Womack Army Medical Center, Fort Bragg, NC, from 1973-75.

Following Army service, he returned to his home state to begin private practice in general surgery, which he continued from 1975-2007. Before retirement, he served as medical director of the Wound Care Center at Our Lady of Fatima from 2007-2010. During practice, he served on the surgical staff at Saint Joseph's, Fatima, Roger Williams, and Rhode Island hospitals, with office hours in Cranston, and Bristol Medical Center.

A renowned surgeon and teacher, he is remembered by colleagues for his steady and gifted hands, and trusted capabilities during challenging vascular and gastrointestinal cases. He is remembered by patients and their families for his kindness, dedication, and meticulous peri-operative medical care. During his career, he served on the faculty at Brown Medical School, won numerous teaching awards, and trained a generation of young surgeons.

For full obituary visit, www.boyleandsonfunerals.com. Memorial donations may be made to St. Jude Children's Research Hospita www.stjude.org/donate. ❖

PATRICIA I. CARELLA, MD, 85, of Norton, Mass., passed away on July 18, 2026. Dr. Carella's journey was marked by exceptional intellect, generosity, and lifelong learning. After graduating from Attleboro High School and the University of Rhode Island, her ambition to pursue medicine led her to Italy, where she earned her medical degree from the University of Bologna in 1972. She completed her internship at Brigham & Women's Hospital in Boston, followed by an anesthesiology residency at The Miriam Hospital in Providence. She spent the entirety of her medical career as a cherished member of the Department of Anesthesiology at The Miriam until her retirement in 2006.

Over her decades of service, she touched the lives of countless physicians, nurses, staff, and patients with her clinical skill, calm presence, and dedication. She was a lifetime member of the American Medical Association (AMA).

Her faith was central to her life and she was a devout communicant of St. Mary's Church in Mansfield, Massachusetts. She is survived by her nephew, James Nowak, and his wife, Tracy of Sedona, Arizona, along with many cousins, colleagues, and dear friends, who will miss her quick wit, sharp mind, and generous heart.

Donations in her memory may be made to St. Mary's Church, 330 Pratt Street, Mansfield, Massachusetts 02048 or IN-SIGHT Vision Rehabilitation, 43 Jefferson Blvd #1, Warwick, RI 02888 or at https://in-sight.org/

LEIGH ANNE HOHLSTEIN, PhD, 64, of Rumford, passed away on July 23, 2026 of ALS.

She was the daughter of the late Col. Robert P. Hohlstein, USAF (Ret) and Jeanette (Cave) Hohlstein.

She was born in Alabama and grew up in several parts of the US and Europe, but she lived in Rhode Island since 1989 and happily considered Rhode Island her home.

She received her BS from St. Lawrence University and her PhD in Clinical Psychology from Wayne State University.

She completed her internship at Brown University and was a Clinical Assistant Professor in the Department of Psychiatry at the Warren Alpert Medical School of Brown University. For over 30 years, she was a clinical psychologist with a private practice on the East side of Providence specializing in the treatment of eating disorders.

She had many ways of finding joy. First and foremost was in her friends and family. She adored her children and parents, and the deep and lasting relationships she made with friends who she considered family.

She is survived by her mother Jeanette Hohlstein, and by her loving children Alyssa Stanio and her husband Stephen Stanio of College Park, MD, and Matthew Borden and his partner Ashley Sapiente of Woburn, MA. She is also survived by many other loving family members, and friends who were her chosen family.

Her family and friends would like to thank the ALS clinics at Massachusetts General Hospital and Rhode Island Hospital, HopeHealth Hospice, and the loving and wonderful medical providers in Vermont.

A memorial celebration of her remarkable life will be held at a later date. Donations in her memory can be made to a charity of your choice, HopeHealth Hospice (hopehealthco.org), or Compassion and Choices (compassionandchoices.org). ❖