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PRACTICE CHANGERS

High Dose Nitroglycerin in Acute Heart Failure

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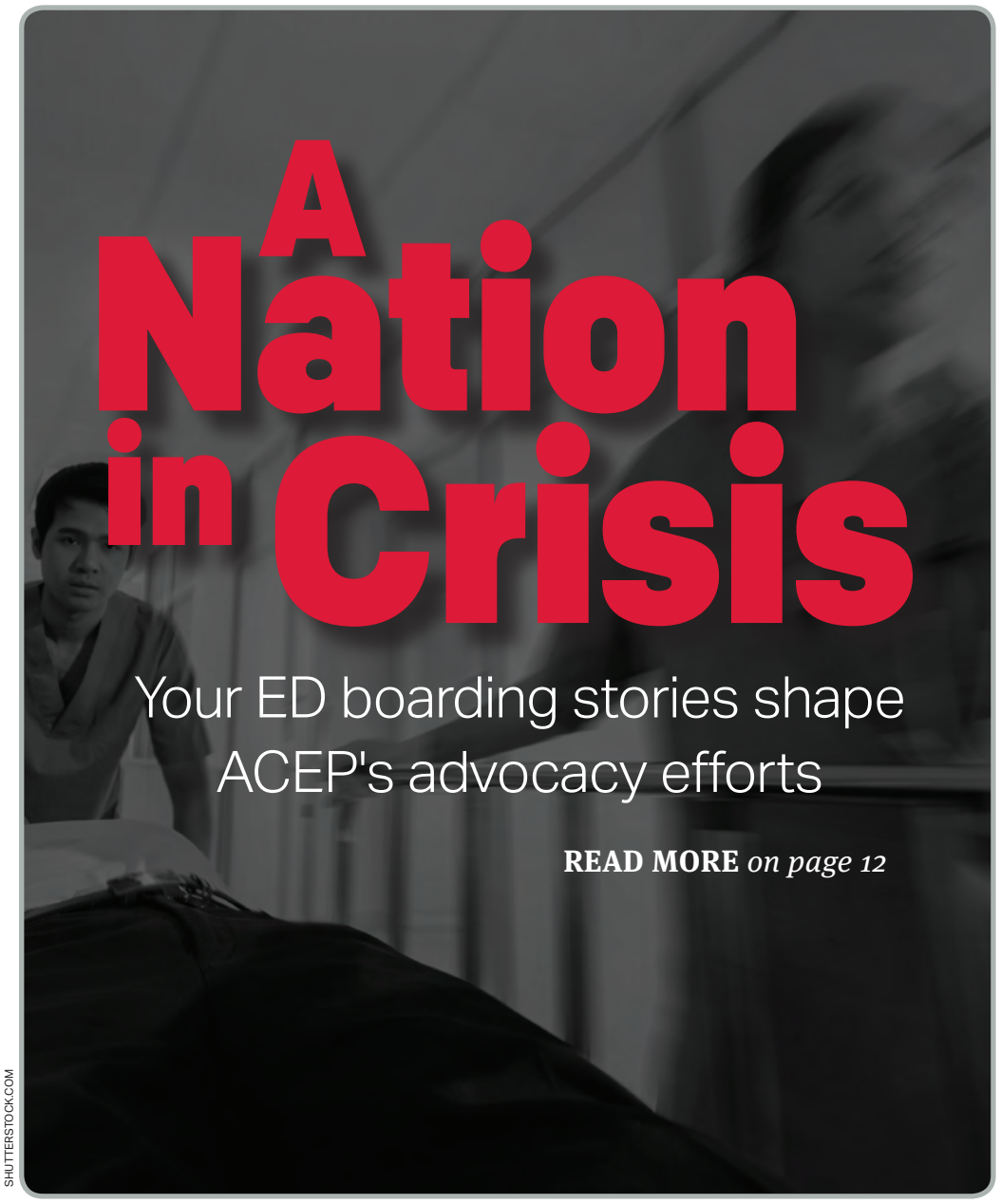

A Nation in Crisis

Your ED boarding stories shape ACEP's advocacy efforts

READ MORE *on page 12*

SHUTTERSTOCK.COM

Ping Ping Ping Goes the Bullet—or Should It?

by HEATHER V. ROZZI, MD, FACEP AND RALPH J. RIVIELLO, MD, MS, FACEP

Case

A young male is brought to the emergency department (ED) via EMS after sustaining a gunshot wound. The trauma team is activated. The patient is hemodynamically stable and has an intact primary survey. On secondary survey, there is a perforating wound. Across from the wound is a bulge in the skin with a palpable foreign body, presumably a bullet. Radiographic imaging shows no serious vascular or bony injury, and confirms the presence of a superficial, bullet-shaped radiopaque foreign body as noted on exam. Given its position, the trauma team decides to remove the bullet at the bedside. You then hear the surgical resident tell the nurse, "Get me a scalpel, tray, and a metal basin. I love hearing the bullet drop into the basin." How do you respond to this request?

FORENSIC FACTS

Discussion

Firearm injuries are increasingly common in the United States. In 2020, there were 45,222 firearm-related deaths. Many more Americans were injured by firearms, with more than 70 percent of those being firearm-related assaults.[1] Firearm-related fatalities usually play out a few different ways: the patient dies at the scene, the patient is transported to the hospital and dies either in the ED, operating room, or at some point after hospital admission or they live. For patients who do not survive, their forensic needs are met by the coroner, or medical examiner. Other patients following a gunshot would arrive to the ED and undergo treat-

CONTINUED *on page 18*

PERIODICAL

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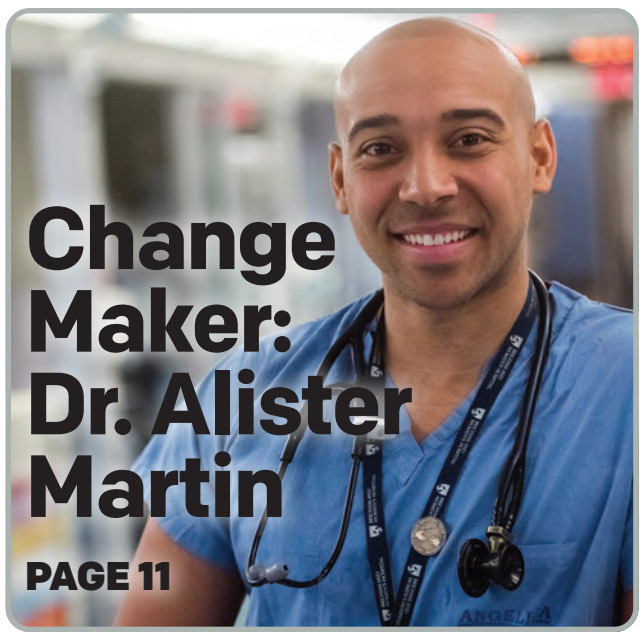

Change Maker: Dr. Alister Martin
PAGE 11

For adults with schizophrenia
or bipolar I or II disorder,

There's a different way to treat agitation

IGALMI is the **first and only** sublingual film
for the acute treatment of agitation[1]

INDICATION

IGALMI is indicated for the acute treatment of agitation associated with schizophrenia or bipolar I or II disorder in adults.
Limitations of Use: The safety and effectiveness of IGALMI have not been established beyond 24 hours from the first dose.

IMPORTANT SAFETY INFORMATION

WARNINGS AND PRECAUTIONS

Hypotension, Orthostatic Hypotension, and Bradycardia: IGALMI causes dose-dependent hypotension, orthostatic hypotension, and bradycardia. In clinical studies with IGALMI, patients were excluded if they had treatment with alpha-1 noradrenergic blockers, benzodiazepines, other hypnotics or antipsychotic drugs four hours prior to study drug administration; had a history of syncope or syncopal attacks; SBP < 110 mmHg; DBP < 70 mmHg; HR < 55 beats per minute; or had evidence of hypovolemia or orthostatic hypotension. Because IGALMI decreases sympathetic nervous system activity, hypotension and/or bradycardia may be more pronounced in patients with hypovolemia, diabetes mellitus, or chronic hypertension, and in geriatric patients. Avoid use of IGALMI in patients with hypotension, orthostatic hypotension, advanced heart block, severe ventricular dysfunction, or history of syncope. After IGALMI administration, patients should be adequately hydrated and should sit or lie down until vital signs are within normal range. If a patient is unable to remain seated or lying down, precautions should be taken to reduce the risk of falls. Ensure that a patient is alert and not experiencing orthostatic hypotension or symptomatic hypotension prior to allowing them to resume ambulation.

QT Interval Prolongation: IGALMI prolongs the QT interval. Avoid use of IGALMI in patients at risk of torsades de pointes or sudden death, including those with known QT prolongation, a history of other arrhythmias, symptomatic bradycardia, hypokalemia, or hypomagnesemia, and in patients receiving other drugs known to prolong the QT interval.

Somnolence: IGALMI can cause somnolence. Patients should not perform activities requiring mental alertness, such as operating a motor vehicle or operating hazardous machinery, for at least eight hours after taking IGALMI.

Risk of Withdrawal Reactions, Tolerance, and Tachyphylaxis: IGALMI was not studied for longer than 24 hours after the first dose. There may be a risk of physical dependence, a withdrawal syndrome, tolerance, and/or tachyphylaxis if IGALMI is used in a manner other than indicated.

ADVERSE REACTIONS

The most common adverse reactions (incidence ≥5% and at least twice the rate of placebo) were somnolence, oral paresthesia or oral hypoesthesia, dizziness, dry mouth, hypotension, and orthostatic hypotension.

Igalmi™
(dexmedetomidine)
sublingual film · 120 mcg, 180 mcg

Discover the difference with IGALMI, a sublingual film formulation of dexmedetomidine[1]

TARGETS a key mediator of agitation[1-3]*

MUCOADHESIVE, so it cannot be spit out[1,3,4]

NONINVASIVE sublingual film[1]

ABSORPTION of dexmedetomidine into the bloodstream via the oral mucosa[1,3]

PATIENT-ADMINISTERED under the supervision of a healthcare provider[1]

NOT A CONTROLLED SUBSTANCE[1]

Learn more about the proven reductions in agitation at IGALMIhcp.com

*IGALMI reduces the release of norepinephrine, a key mediator among other neurotransmitters thought to be involved in agitation.[1-3]

IMPORTANT SAFETY INFORMATION (continued)

DRUG INTERACTIONS

Drugs That Prolong the QT Interval: Avoid use. Concomitant use of drugs that prolong the QT interval may add to the QT-prolonging effects of IGALMI and increase the risk of cardiac arrhythmia.

Anesthetics, Sedatives, Hypnotics, and Opioids: Concomitant use may cause enhanced CNS-depressant effects. Reduction in dosage of IGALMI or the concomitant medication should be considered.

USE IN SPECIFIC POPULATIONS

Hepatic Impairment and Geriatric Patients (≥65 years old): A lower dose is recommended in patients with hepatic impairment and geriatric patients. See the full Prescribing Information for the recommended dosage depending on the agitation severity.

Please see the Brief Summary of the full Prescribing Information on the following pages.

To report SUSPECTED ADVERSE REACTIONS, contact BioXcel Therapeutics, Inc. at 1-833-201-1088 or medinfo@bioxceltherapeutics.com, or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

bioxcel therapeutics®

References: 1. IGALMI. Package insert. BioXcel Therapeutics, Inc.; 2022. **2.** Miller CWT, Hodzic V, Weintraub E. Current understanding of the neurobiology of agitation. *West J Emerg Med*. 2020;21(4):841-848. doi:10.5811/westjem.2020.4.45779 **3.** Data on file. BXCL501-301 CSR (SERENITY I). BioXcel Therapeutics, Inc.; January 2021. **4.** Data on file. BXCL501-302 CSR (SERENITY II). BioXcel Therapeutics, Inc.; January 2021.

Igalmi™
(dexmedetomidine)
sublingual film · 120 mcg, 180 mcg

IGALMI™ (dexmedetomidine) sublingual film, for sublingual or buccal use. Rx Only. Brief Summary of Prescribing Information (PI) for IGALMI. See full PI.

Indication: IGALMI is indicated for the acute treatment of agitation associated with schizophrenia or bipolar I or II disorder in adults. Limitations of Use: The safety and effectiveness of IGALMI have not been established beyond 24 hours from the first dose.

Important Recommendations Prior to Initiating IGALMI and During Therapy: IGALMI should be administered under the supervision of a healthcare provider. A healthcare provider should monitor vital signs and alertness after IGALMI administration to prevent falls and syncope.

IGALMI is for sublingual or buccal administration. Do not chew or swallow IGALMI. Do not eat or drink for at least 15 minutes after sublingual administration, or at least one hour after buccal administration.

Recommended Dosage: The initial dose of IGALMI is based on agitation severity, with lower doses recommended in patients with hepatic impairment and geriatric patients. If agitation persists after the initial dose, up to two additional doses may be administered at least two hours apart, depending upon the patient population and agitation severity. Assess vital signs including orthostatic measurements prior to the administration of any subsequent doses. Due to risk of hypotension, additional half-doses are not recommended in patients with systolic blood pressure (SBP) less than 90 mmHg, diastolic blood pressure (DBP) less than 60 mmHg, heart rate (HR) less than 60 beats per minute, or postural decrease in SBP ≥ 20 mmHg or in DBP ≥ 10 mmHg.

The recommended dose in adults is 120 mcg for mild or moderate agitation and 180 mcg for severe agitation. Patients with mild or moderate hepatic impairment and mild to moderate agitation should receive 90 mcg. Patients with mild or moderate hepatic impairment and severe agitation should receive 120 mcg. Patients with severe hepatic impairment and mild to moderate agitation should receive 60 mcg. Patients with severe hepatic impairment and severe agitation should receive 90 mcg. Geriatric patients (patients ≥65 years old) with mild, moderate or severe agitation should receive 120 mcg. See Full Prescribing Information for recommendations on administering up to two additional doses and maximum recommended dosages.

CONTRAINDICATIONS: None.

WARNINGS AND PRECAUTIONS

Hypotension, Orthostatic Hypotension, and Bradycardia: IGALMI causes dose-dependent hypotension, orthostatic hypotension, and bradycardia. In clinical studies, 18%, 16%, and 9% of patients treated with 180 mcg of IGALMI, 120 mcg of IGALMI, and placebo, respectively, experienced orthostatic hypotension (defined as SBP decrease ≥ 20 mmHg or DBP decrease ≥ 10 mmHg after 1, 3, or 5 minutes of standing) at 2 hours post-dose. In those studies, 7%, 6%, and 1% of patients treated with 180 mcg of IGALMI, 120 mcg of IGALMI, and placebo, respectively, experienced HR ≤ 50 beats per minute within 2 hours of dosing. In clinical studies with IGALMI, patients were excluded if they had treatment with alpha-1 noradrenergic blockers, benzodiazepines, other hypnotics or antipsychotic drugs four hours prior to study drug administration; had a history of syncope or syncopal attacks; SBP < 110 mmHg; DBP < 70 mmHg; HR < 55 beats per minute; or had evidence of hypovolemia or orthostatic hypotension.

Reports of hypotension and bradycardia, including some resulting in fatalities, have been associated with the use of another dexmedetomidine product given intravenously (IGALMI is for sublingual or buccal use and is not approved for intravenous use). Clinically significant episodes of bradycardia and sinus arrest have been reported after administration of this other dexmedetomidine product to young, healthy adult volunteers with high vagal tone and when this product was given by rapid intravenous or bolus administration.

Because IGALMI decreases sympathetic nervous system activity, hypotension and/or bradycardia may be more pronounced in patients with hypovolemia, diabetes mellitus, or chronic hypertension, and in geriatric patients. Avoid use of IGALMI in patients with hypotension, orthostatic hypotension, advanced heart block, severe ventricular dysfunction, or history of syncope. After IGALMI administration, patients should be adequately hydrated and should sit or lie down until vital signs are within normal range. If a patient is unable to remain seated or lying down, precautions should be taken to reduce the risk of falls. Ensure that a patient is alert and not experiencing orthostatic hypotension or symptomatic hypotension prior to allowing them to resume ambulation.

QT Interval Prolongation: IGALMI prolongs the QT interval. Avoid use of IGALMI in patients at risk of torsades de pointes or sudden death including those with known QT prolongation, a history of other arrhythmias, symptomatic bradycardia, hypokalemia or hypomagnesemia, and in patients receiving other drugs known to prolong the QT interval.

Somnolence: IGALMI can cause somnolence. In placebo-controlled clinical studies in adults with agitation associated with schizophrenia or bipolar I or II disorder, somnolence (including fatigue and sluggishness) was reported in 23% and 22% of patients treated with IGALMI 180 mcg and 120 mcg, respectively, compared to 6% of placebo-treated patients. Patients should not perform activities requiring mental alertness, such as operating a motor vehicle or operating hazardous machinery, for at least eight hours after taking IGALMI.

Risk of Withdrawal Reactions: Symptoms of withdrawal have been observed after procedural sedation with another dexmedetomidine product administered intravenously. In this study, 12 (5%) adult patients who received intravenous dexmedetomidine up to 7 days (regardless of dose) experienced at least 1 event related to withdrawal within the first 24 hours after discontinuing dexmedetomidine and 7 (3%) adult patients who received intravenous dexmedetomidine experienced at least 1 event related with withdrawal 24 to 48 hours after discontinuing dexmedetomidine. The most common withdrawal reactions were nausea, vomiting, and agitation. In these subjects, tachycardia and hypertension requiring intervention occurred at a frequency of <5% in the 48 hours following intravenous dexmedetomidine discontinuation. IGALMI was not studied for longer than 24 hours after the first dose. There may be a risk of physical dependence and a withdrawal syndrome if IGALMI is used in a manner other than indicated.

Tolerance and Tachyphylaxis: Use of another dexmedetomidine product administered intravenously beyond 24 hours has been associated with tolerance and tachyphylaxis and a dose-related increase in adverse reactions. IGALMI was not studied for longer than 24 hours after the first dose. There may be a risk of tolerance and tachyphylaxis if IGALMI is used in a manner other than indicated.

ADVERSE REACTIONS, Clinical Studies Experience: Because clinical trials are conducted under widely varying conditions, adverse reactions rates observed in the clinical trials of a drug cannot be directly compared to rates in clinical trials of another drug and may not reflect the rates observed in practice.

The safety of IGALMI was evaluated in 507 adult patients with agitation associated with schizophrenia (N=255) or bipolar I or II disorder (N=252) in two randomized, placebo-controlled studies (Studies 1 and 2). In both studies, patients were admitted to a clinical research unit or a hospital and remained under medical supervision for at least 24 hours following treatment. Patients were 18 to 71 years of age (mean age was 46 years old); 45% were female and 55% were male; 66% were Black, 31% were White, 2% were multiracial, and 1% were other.

In these studies, patients received an initial dose of IGALMI 180 mcg (N=252), IGALMI 120 mcg (N=255), or placebo (N=252). Patients who were hemodynamically stable (i.e., those with systolic blood pressure (SBP) > 90 mmHg, diastolic blood pressure (DBP) > 60 mmHg, and heart rate (HR) > 60 beats per minute) and without orthostatic hypotension (i.e., reduction in SBP < 20 mmHg or DBP < 10 mmHg upon standing) were eligible for an additional dose after 2 hours. An additional half dose (90 mcg, 60 mcg, or placebo) was given to 7.1% (18/252), 22.7% (58/255) and 44.0% (111/252) of patients in the IGALMI 180 mcg, IGALMI 120 mcg or placebo arms, respectively. After at least an additional 2 hours, an additional second half dose (total IGALMI dose of 360 mcg, total IGALMI dose of 240 mcg, or placebo, respectively) was given to 3.2% (8/252), 9.4% (24/255), and 21.0% (53/252) of patients in the IGALMI 180 mcg, IGALMI 120 mcg or placebo arms, respectively.

In these studies, one patient discontinued treatment due to an adverse reaction of oropharyngeal pain.

The most common adverse reactions (incidence ≥ 5% and at least twice the rate of placebo) were: somnolence, oral paresthesia or oral hypoesthesia, dizziness, dry mouth, hypotension, and orthostatic hypotension.

Adverse reactions that occurred in IGALMI-treated patients at a rate of at least 2% and at a higher rate than in placebo-treated patients in Studies 1 and 2 were as follows (adverse reaction is followed by percentage of patients treated with IGALMI 180 mcg (n = 252), IGALMI 120 mcg (n = 255) and placebo (n = 252): Somnolence, includes the terms fatigue and sluggishness, (23%, 22%, 6%); Oral paresthesia or oral hypoesthesia (7%, 6%, 1%); Dizziness (6%, 4%, 1%); Hypotension (5%, 5%, 0%); Orthostatic hypotension (5%, 3%, <1%); Dry Mouth (4%, 7%, 1%); Nausea (3%, 2%, 2%); Bradycardia (2%, 2%, 0%); Abdominal discomfort, including dyspepsia, gastroesophageal reflux disease (2%, 0%, 1%).

Hypotension, Orthostatic Hypotension, and Bradycardia in Two Placebo-Controlled Studies: In clinical studies, patients were excluded if they were treated with alpha-1 noradrenergic blockers, benzodiazepines, antipsychotic drugs, or other hypnotics four hours prior to study drug administration; had a history of syncope or syncopal attacks; their SBP was less than 110 mmHg; their DBP was less than 70 mmHg; their HR was less than 55 beats per minute; or they had evidence of hypovolemia or orthostatic hypotension. In these studies, vital signs were monitored (at 30 minutes, 1-, 2-, 4-, 6-, and 8- hours post-dose), including orthostatic vital signs at 2-, 4-, and 8-hours post-dose. Maximum positional decreases in SBP and DBP after standing were observed at two hours post-dose. Maximal reductions on BP and HR were observed two hours post-dose.

The mean BP (in mmHg) and HR decrease (in bpm) across all patients from both studies at 2 hours post-dose were as follows for patients treated with IGALMI 180 mcg (n = 252), IGALMI 120 mcg (n = 255) and placebo (n = 252): Mean SBP Decrease (15, 13, 1), Mean DBP Decrease (mmHg) (8, 7, <1), Mean Heart Rate Decrease (9, 7, 3). In the clinical studies: 13%, 8%, and <1% of patients in the single dose 180 mcg IGALMI, 120 mcg IGALMI, and placebo groups, respectively, experienced SBP ≤ 90 mmHg and a decrease ≥ 20 mmHg of SBP within 24 hours of dosing; 19%, 17%, and 2% of the patients in the 180 mcg IGALMI, 120 mcg IGALMI, and placebo groups, respectively, had a DBP ≤ 60 mmHg and a DBP decrease ≥ 10 mmHg within 24 hours of dosing; 4%, 3%, and 0% of patients in the 180 mcg IGALMI, 120 mcg IGALMI, and placebo groups, respectively, had a HR ≤ 50 beats per minute and a HR decrease ≥ 20 beats per minute within 24 hours of dosing.

At 8 hours post-dose, 2% of patients in the IGALMI 180 mcg group experienced a SBP ≤ 90 mmHg and decrease ≥ 20 mmHg compared with one patient (<1%) in the IGALMI 120 mcg group and none in the placebo group. At 24 hours, none of the patients in the IGALMI 180 mcg group experienced a SBP ≤90 mmHg and decrease ≥ 20 mmHg compared with one patient (<1%) in the IGALMI 120 mcg group and none in the placebo group. At 8 hours post-dose, none of the patients in the IGALMI 180 mcg group had a HR ≤ 50 beats per minute and a HR decrease ≥ 20 beats per minute compared with one patient in the 120 mcg group (<1%) and none in the placebo group.

Postmarketing Experience

The following adverse reactions have been identified during post approval use of another dexmedetomidine product given intravenously (IGALMI is not approved for intravenous use). Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

Blood and Lymphatic System Disorders: Anemia; *Cardiac Disorders:* Arrhythmia, atrial fibrillation, atrioventricular block, bradycardia, cardiac arrest, cardiac disorder, extrasystoles, myocardial infarction, supraventricular tachycardia, tachycardia, ventricular arrhythmia, ventricular tachycardia; *Eye Disorders:* Photopsia, visual impairment; *Gastrointestinal Disorders:* Abdominal pain, diarrhea, nausea, vomiting; *General Disorders and Administration Site Conditions:* Chills, hyperpyrexia, pain, pyrexia, thirst; Hepatobiliary Disorders: Hepatic function abnormal, hyperbilirubinemia; Investigations: Alanine aminotransferase increased, aspartate aminotransferase increased, blood alkaline phosphatase increased, blood urea increased, electrocardiogram T wave inversion, gammaglutamyltransferase increased, electrocardiogram QT prolonged; *Metabolism and Nutrition Disorders:* Acidosis, hyperkalemia, hypoglycemia, hypovolemia, hypernatremia; *Nervous System Disorders:* Convulsion, dizziness, headache, neuralgia, neuritis, speech disorder; *Psychiatric Disorders:* Agitation, confusional state, delirium, hallucination, illusion; *Renal and Urinary Disorders:* Oliguria, polyuria; *Respiratory, Thoracic and Mediastinal Disorders:* Apnea, bronchospasm, dyspnea, hypercapnia, hypoventilation, hypoxia, pulmonary congestion, respiratory acidosis; *Skin and Subcutaneous Tissue Disorders:* Hyperhidrosis, pruritus, rash, urticaria; *Surgical and Medical Procedures:* Light anesthesia; *Vascular Disorders:* Blood pressure fluctuation, hemorrhage, hypertension, hypotension

DRUG INTERACTIONS

Drugs that Prolong the QT Interval: Concomitant use of drugs that prolong the QT interval may add to the QT-prolonging effects of IGALMI and increase the risk of cardiac arrhythmia. Avoid the use of IGALMI in combination with other drugs known to prolong the QT interval.

Anesthetics, Sedatives, Hypnotics, and Opioids: Concomitant use of IGALMI with anesthetics, sedatives, hypnotics, or opioids is likely to lead to enhanced CNS depressant effects. Specific studies with another dexmedetomidine product given intravenously have confirmed these effects with sevoflurane, isoflurane, propofol, alfentanil, and midazolam. Due to possible enhanced CNS effects when given concomitantly with IGALMI, consider a reduction in dosage of IGALMI or the concomitant anesthetic, sedative, hypnotic, or opioid.

USE IN SPECIFIC POPULATIONS

Pregnancy, Risk Summary: There are no available data on IGALMI use in pregnant women to evaluate for a drug-associated risk of major birth defects, miscarriage or other adverse maternal or fetal effects. Available data from published randomized controlled trials and case reports over several decades of use with intravenously administered dexmedetomidine during pregnancy have not identified a drug-associated risk of major birth defects or miscarriage; however, the reported exposures occurred after the first trimester. Most of the available data are based on studies with exposures that occurred at the time of cesarean-section delivery, and these studies have not identified an adverse effect on maternal outcomes or infant Apgar scores. Available data indicate that dexmedetomidine crosses the placenta.

In animal reproductive studies fetal toxicity occurred in the presence of maternal toxicity with subcutaneous administration of dexmedetomidine to pregnant rats during organogenesis at doses 5 times the maximum recommended human dose [MRHD] of 360 mcg/day based on mg/m^2 body surface area. Adverse developmental effects, including early implantation loss and decreased viability of second generation offspring, occurred when pregnant rats were subcutaneously administered doses less than or equal to the MRHD based on mg/m^2 from late pregnancy through lactation and weaning *(see Data)*.

The estimated background risk of major birth defects and miscarriage for the indicated population is unknown. All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2 to 4% and 15 to 20%, respectively.

Data: *Animal Data*: Increased post-implantation losses and reduced live pups in the presence of maternal toxicity (decreased body weight) occurred in a rat embryo-fetal development study in which pregnant dams were administered subcutaneous doses of dexmedetomidine of 200 mcg/kg/day (equivalent to 5 times the MRHD of 360 mcg/day based on mg/m^2) during the period of organogenesis (Gestation Day (GD) 5 to 16). No embryo-fetal toxicity was observed at 20 mcg/kg/day (less than the MRHD of 360 mcg/day based on mg/m^2). No malformations were reported at any dose level.

No malformation or embryo-fetal toxicity were observed in a rabbit embryo-fetal developmental study in which pregnant dams were administered dexmedetomidine intravenously at doses up to 96 mcg/kg/day (equivalent to 5 times the MRHD of 360 mcg/day based on mg/m^2) during the period of organogenesis (GD 6 to 18).

Reduced pup and adult offspring weights and grip strength were reported in a rat developmental toxicology study in which pregnant females were administered dexmedetomidine subcutaneously at 8 mcg/kg/day (less than the MRHD of 360 mcg/day based on mg/m^2) during late pregnancy through lactation and weaning (GD 16 to postnatal day [PND] 25). Decreased viability of second generation offspring and an increase in early implantation loss along with delayed motor development occurred at 32 mcg/kg/day (equivalent to the MRHD of 360 mcg/day based on mg/m^2) when first generation offspring were mated. This study limited dosing to hard palate closure (GD 15-18) through weaning instead of standard dosing from implantation (GD 6-7) to weaning (PND 21).

Lactation, *Risk Summary*: Available published literature report the presence of dexmedetomidine in human milk following intravenous administration. There is no information regarding the effects of dexmedetomidine on the breastfed child or the effects on milk production. Advise women to monitor the breastfed infant for irritability. The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need for IGALMI and any potential adverse effects on the breastfed child from IGALMI or from the underlying maternal condition.

Pediatric Use: The safety and effectiveness of IGALMI have not been established in pediatric patients.

Geriatric Use: Fifteen geriatric patients (≥ 65 years of age) were enrolled (no patients were 75 years of age and older) in the clinical studies for acute treatment of agitation associated with schizophrenia or bipolar I or II disorder. Of the total number of IGALMI-treated patients in these clinical studies, 11/507 (2.2%) were 65 years of age and older. Dosage reduction of IGALMI is recommended in geriatric patients. A higher incidence of bradycardia and hypotension was observed in geriatric patients compared to younger adult patients after intravenous administration of another dexmedetomidine product. The pharmacokinetic profile of intravenous dexmedetomidine was not altered in geriatric subjects. Clinical studies of IGALMI did not include sufficient numbers of patients 65 years of age and older to determine whether there were differences in the effectiveness of IGALMI in the acute treatment of agitation associated with schizophrenia or bipolar I or II disorder compared to younger adult patients.

Hepatic Impairment: Dexmedetomidine clearance was decreased in patients with hepatic impairment (Child-Pugh Class A, B, or C). Thus, a dosage reduction of IGALMI is recommended in patients with hepatic impairment compared to patients with normal hepatic function.

DRUG ABUSE AND DEPENDENCE

Controlled Substance: IGALMI contains dexmedetomidine, which is not a controlled substance.

Dependence, Physical Dependence: Physical dependence is a state that develops as a result of physiological adaptation in response to repeated drug use, manifested by withdrawal signs and symptoms after abrupt discontinuation or a significant dose reduction of a drug. The dependence potential of dexmedetomidine has not been studied in humans. However, because studies in rodents and primates have demonstrated that intravenous dexmedetomidine exhibits pharmacologic actions similar to those of clonidine, it is possible that dexmedetomidine may produce a clonidine-like withdrawal syndrome upon abrupt discontinuation. IGALMI was not studied for longer than 24 hours after the first dose. There may be risk of physical dependence and a withdrawal syndrome if IGALMI is used in a manner other than indicated.

Tolerance: Tolerance is a physiological state characterized by a reduced response to a drug after repeated administration (i.e., a higher dose of a drug is required to produce the same effect that was once obtained at a lower dose). IGALMI has not been studied for longer than 24 hours after the first dose. There may be a risk for tolerance if IGALMI is administered in a manner other than indicated.

OVERDOSAGE: In a tolerability study of intravenous dexmedetomidine in which healthy adult subjects were administered doses at and above the recommended dose of 0.2 to 0.7 mcg/kg/hour, the maximum blood concentration was approximately 13 times the upper boundary of the therapeutic range for the intravenous dexmedetomidine (IGALMI is not approved for intravenous use). The most notable effects observed in two subjects who achieved the highest doses were first degree atrioventricular block and second-degree heart block.

Five adult patients received an overdose of intravenous dexmedetomidine in intensive care unit sedation studies. Two patients who received a 2 mcg/kg loading dose (twice the recommended loading dose) over 10 minutes, experienced bradycardia and/or hypotension. One patient who received a loading intravenous bolus dose of undiluted dexmedetomidine (19.4 mcg/kg), had cardiac arrest from which he was successfully resuscitated.

Consider contacting a Poison Center (1-800-222-1222) or a medical toxicologist for overdosage management recommendations for IGALMI.

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New Haven, CT 06511

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NEWS FROM THE COLLEGE

UPDATES AND ALERTS FROM ACEP

Have You Been Impacted by Non-Compete Clauses?

In early January, the Federal Trade Commission (FTC) proposed to ban non-compete clauses in all employment contracts. This proposed ban would also apply retroactively and affect current contracts that include non-compete clauses. ACEP fundamentally opposes non-compete clauses because they negatively impact emergency physician job security and future opportunities. The FTC is seeking comments on this proposed ban, and ACEP wants to include your firsthand stories about non-compete clauses in its formal comments. Submit your story using the QR code below.

Funding Available for PACED Accreditation

ACEP's Pain and Addiction Care in the ED (PACED) accreditation program aims to accelerate the transfer of knowledge about acute pain management and addiction treatment and secure appropriate resources for patients. PACED accreditation ensures quality, patient safety, communication, responsibility, and clarity in the management of emergency department (ED) patients suffering from pain and addiction. Through the support of the Substance Abuse and Mental Health Services Administration (SAMHSA), ACEP will accredit up to 50 emergency departments through its PACED program at no cost to the site. Rural hospitals and hospitals that experience high opioid misuse rates in the community where they are located are encouraged to apply. Learn more at acep.org/PACED50.

New Patient Education Resources Available to Encourage COVID-19 Vaccines

ACEP members can find new print and digital materials for download that can help educate patients about severe COVID-19 illness risk, treatments available, and the importance of early treatment. These resources include information from the U.S. Centers for Disease Control and Prevention and culturally tailored content from the *We Can Do This* campaign's team of multicultural experts. Spanish-language resources are also available. Find these handouts at acep.org/WeCanDoThis.

Save $100 On Upcoming Pediatric EM Conference

Join your pediatric emergency medicine peers in the Big Apple for the 2023 Advanced Pediatric Emergency Medicine Assembly, March 31–April 3. Pediatrics is a uniquely challenging patient population—take this opportunity to learn from the preeminent experts in pediatric emergency care. Save $100 with promo code NYNY23 when you register at acep.org/PEM.

Hear Our Special Podcast Episode with Dr. Pam Bensen

In honor of Women Physicians Day on Feb. 3, *ACEP Now* Resident Fellow Sophia Gorgens, MD, hosted a podcast discussion with emergency medicine pioneer Pamela Bensen, MD. Dr. Bensen is uniquely qualified to talk about the progress of women physicians in emergency medicine. She was a charter member of ACEP and the first woman resident in emergency medicine (1971). She was also the first woman elected to the national ACEP Board of Directors and served from 1982–88. Dr. Bensen pioneered innovations in ACEP's governance, developed the first emergency medicine group and the first paramedic training program in Maine, and was an early adopter of data analysis to improve clinical care in the emergency department (1980s). Subscribe to the ACEP Nowcast podcast through your preferred podcast network or listen to the archives on our website at acepnow.com/podcast.


DR. BENSEN

Member Benefit Spotlight: PEPID

PEPID empowers emergency physicians to make better, faster, decisions, at the point of care. Trusted for over 25 years, PEPID's comprehensive drug and disease reference is augmented by tools like a drug interactions checker, medical and dosing calculators, laboratory interpretation ranges, and more—providing a one-stop emergency-focused reference tool. ACEP members can save 15 percent on a one-year subscription. Learn more at acep.org/PEPID or use the QR code below.

SEND YOUR THOUGHTS AND COMMENTS TO ACEPNOW@ACEP.ORG

THE BREAK ROOM

Re: "There Are Only Four Effective Interventions in Emergency Medicine"

In 1980, a wise, old teacher noted that, "The only use of a Swann Ganz catheter in a patient with heart failure is as a tourniquet." Please add "Pain is the fifth vital sign" to the Joint Commission indictment. Not only was there no support for it, but it proved lethal to so many.

—Stephen Bohan, MD, MS, FACP, FACEP

Re: "A Novel Technique to Treat a Dental Avulsion"

Any non-dentist attempting to replace avulsed teeth will be justifiably nervous. Even in a well-equipped emergency department (ED), working in a small space and doing a novel procedure can be challenging; a remote setting is even more problematic. It behooves the clinician to use the simplest possible methods. While Dr. Dark and colleagues describe one method on interdental stabilization using sutures (previously described), it is, as they note, not the easiest and probably not the most successful technique. Using cyanoacrylate (Superglue or the equivalent) may be the easiest and best makeshift method. After drying the affected tooth and the adjacent teeth and gums, apply the adhesive to the teeth and to the gingiva below them. Apply the adhesive to both the mesial (closest to mid-line) and distal (away from midline) sides of the tooth so that it bonds to the adjacent teeth. Even better is to combine adhesive and a wire that can be the metal bridge from a surgical mask, a thin orthopedic wire, a small-gauge spinal needle with the ends clipped, a thin paperclip, or similar thin-gauge, malleable, but relatively rigid wire. Bend the wire so it conforms to the convexity of the normal tooth configuration and covers four or five teeth (more if the technique is used to stabilize a mandibular or maxillary fracture).[1] The patient should be placed on a liquid or soft diet and be seen by a dental professional as soon as possible.

—Kenneth V. Iserson, MD

1. Dental: fillings, extractions, and trauma. In: Iserson K.V. Ed. Improvised Medicine: Providing Care in Extreme Environments, 2e. McGraw Hill; 2016. Available at: https://accessmedicine. mhmedical.com/content.aspx?bookid=1728&sectionid=115697338. Accessed January 29, 2023.

Re: "The Reperfusion Guidelines Finally Catch Up"

I wanted to thank you for publishing Dr. Westafer's article on new STEMI activation criteria. About 15 months ago, I had an acute posterior myocardial infraction (MI). My EKG changes were classic, but missed by the emergency department (ED) and emergency physician reading my EKG. My troponin was elevated and due to this a cardiologist was called on a consultative basis. The cardiologist arrived 2.5 hours after I entered the ED. The cardiologist immediately recognized the acute posterior MI. I was brought to the cath lab an hour later and had a stent placed. Three and a half hours had elapsed.

I hope this article improves the recognition of posterior MIs along with the other EKG patterns noted.

—Patricia Jo Schiff, MD, MMSc, FACEP

Re: "The Reperfusion Guidelines Finally Catch Up"

I read with interest the nice article by Dr. Westafer: "The Guidelines Finally Catch Up. New STEMI activation criteria." As one of the founders of the new occlusion myocardial infarction (MI)—Non-Occlusion MI (OMI/NOMI) paradigm to replace the STEMI—non-ST elevation myocardial infarction (STEMI) paradigm, I am delighted that the American College of Cardiology/American Heart Association is de-emphasizing ST elevation in the diagnosis of occlusion. There are so many features of the ECG that are important. Among them, Dr. Westafer discusses posterior OMI; however, she propagates old dogma: that posterior OMI has a horizontal ST segment, a large R-wave, and an upright T-wave. We have proven all of this false in this paper: https://www.ahajournals.org/doi/pdf/10.1161/JAHA.121.022866).

We showed that acute posterior OMI may have a flat, upsloping, or downsloping ST segment, may have a small or large R-wave, may have inverted, biphasic, or upright T-waves. What matters is whether the ST depression is maximal in V1-V4 versus V5-6. The R-wave only enlarges after there is myocardial damage. The T-wave is more likely to be upright if there is prolonged infarction or reperfusion. The ST segment is downsloping in cases with a negative or biphasic T-wave.

—Stephen W. Smith, MD

FROM THE EDITOR

A Nation in Crisis

ACEP collects stories of boarding in EDs across the Country

by CEDRIC DARK, MD, MPH, FACEP

Honestly, I've never seen it this bad in my many years of practice. On my last shift, I walked into an emergency department where 36 of the 38 open patient rooms were occupied by inpatient borders—people who were already admitted to the hospital, some for nearly three days, but waiting for a bed upstairs. Several months ago, 20 newly renovated emergency department beds were co-opted by the inpatient services for boarders. More recently, another 20 beds went offline and have been converted into additional waiting room spaces while the main waiting room gets renovated. All in all, in an emergency department with approximately 80 beds, we were holding 75 admissions.

According to a nurse who has worked in this department long before I have, this was a record number of boarders. But this one boarding story isn't a outlier. My story is one of hundreds of boarding stories emergency physicians can tell about the dangerous, inhumane, and heartbreaking condition of emergency medicine after the pandemic.

While the emergency department functions 24/7/365, much of the rest of the hospital maintains banker's hours. Converting semiprivate to private rooms, which may improve patient satisfaction, limits hospital capacity. Shortages of nursing and other ancillary services have reduced the ability to operate at full capacity. Overcrowded hospitals, one symptom of which is emergency department boarding, result in lower quality of care for patients, staff burnout, and increased mortality.[1] The appropriate solutions are not casting blame on low acuity patients, most of whom we can see and discharge easily. Instead, administrators, regulators, and lawmakers need to focus on blockages elsewhere—the distribution of elective surgeries, nursing shortages, early discharge of patients before noon, discharge on the weekend, and providing surge capacity for hospitals. If not, the stories you will read on page 12 will continue to accrue. And while we struggle to deliver the best care possible to our patients, we will not hesitate to speak out.

Reference

1. McKenna P, Heslin SM, Viccellio P, et al. Emergency department and hospital crowding: causes, consequences, and cures. *Clin Exp Emerg Med*. 2019;6(3):189-195.

DR. DARK (@RealCedricDark) is associate professor of emergency medicine at Baylor College of Medicine and the medical editor in chief of *ACEP Now*.

HAVE AN IDEA?

Submit your article or story pitch to *ACEP Now*

If you have a story idea or drafted article, contact Editor Danielle Galian, MPS, or Medical Editor in Chief Cedric Dark, MD, MPH, FACEP. Our editorial team will review your submission and update you on next steps. Include 250 words with bullet points if you're submitting a story pitch with the following:

- Why our readers would value the story.
- Potential experts or sources for the story.
- How the story would influence the provision of emergency medicine.
- What you hope the reader would learn from your article.

The usual length of standard articles (departments, columns, one- to two-page articles) is about 600 to 800 words. The usual length of feature articles (two or more pages) is about 800 to 1,200 words. A reference list is also required for researched material.

Submit a Case Report

To be considered for publication, send an outline of your case presentation to Medical Editor in Chief Cedric Dark, MD, MPH, FACEP with the following:

- 250-word description that explains the presentation and final diagnosis.
- Three bulleted teaching points.
- 800 word maximum.
- 10 reference maximum.

Cases with clinical images preferred.

Submit a Letter to the Editor

ACEP Now welcomes letters to the editor. Letters should be 250 words or less, may be edited for length and style, and are published online and/or in print at the editorial team's discretion. Submit your letter including your name, title, organization, and contact information to Editor Danielle Galian, MPS.

Interested in Writing for *ACEP Now*?

ACEP Now welcomes guest columns by physician writers.

Creative CAREERS

Exploring unique career options for emergency physicians

TONYA WALKER, MD, MPH

Chief Medical Officer, Director of Employee Health at Netflix

Doctor Tonya Walker's first love was public health, and it's that passion that has guided her into a variety of unique jobs in emergency medicine. Now, two years into her role as the first Chief Medical Officer and Director of Employee Health at Netflix, she uses her past training in emergency medicine, public health, and occupational medicine to care for the global teams that power one of the largest streaming services in the entertainment industry.

She was hired by Netflix in November 2020 after spending almost two years as the head of medical and occupational health for Unilever North America. When Netflix contacted her about building and leading an operational pandemic response team, she thought hard about whether the opportunity had the public health component she enjoyed so much at her previous roles.

At Unilever, Dr. Walker was supporting the safety of the staffers who were producing the soap, hand sanitizer, toilet paper and other goods the public so desperately needed during the early days of the pandemic. In contrast, "Netflix was helping people mentally," she said. As an emergency physician mom in New York City who had to homeschool her children during the height of the pandemic, she understood the value of being able to emotionally escape into a new (or old) TV show or movie.

When she accepted the job at Netflix, Dr. Walker threw herself into collaborating with the teams and developing the protocols needed for staffers to work safely in a variety of countries, each with different—and constantly changing—COVID regulations. She employed her skills learned in the emergency department: prioritizing, triaging, and staying calm in chaos.

TONYA WALKER

"As we move out of the crisis phase of COVID-19, the role can focus on the more customary medical advisory, network building, and occupational-health components of a corporate medical-officer role," Dr. Walker said. She consults on employee benefit packages, medical leaves of absence, travel, and workers' compensation cases. Her team also works on workplace wellness and resilience initiatives for employees. Netflix has recently hired a physician to work on the team that oversees onsite safety for projects filmed in North America. "This person will help to implement occupational health programs for our shows," she said. Dr. Walker assists with coordinating and contracting with local medical advisors and emergency medical services for the company's international employees and projects. Her travel schedule stays busy!

She's always been a people person, which is something that initially drew her to emergency medicine. She loves that at Netflix, she still gets to meet new people all the time. One of her most translatable skills from emergency medicine is swift relationship building. To be successful as she collaborates with teams around the world, she needs to build trust and respect quickly so they can work together to implement solutions. It also helps that after years as an emergency physician in New York City, she is very comfortable translating medicine and science to diverse, non-medical audiences. Still, it has been strange to go from the like-minded camaraderie of the ED team to being the only physician in the room. "[It] can be isolating, and exciting at the same time," Dr. Walker said.

Her favorite part of working at Netflix is learning something new every day, especially about business. And not unlike working in a hospital, sometimes her suggestions don't align perfectly with business priorities. When that happens she's "found that the humility you gain from the ER and leaning on data and science is what allows for more fruitful discussions and well-informed decisions."

For her peers interested in corporate medicine, she suggests visiting the American College of Occupational and Environmental Medicine website to learn more about occupational medicine opportunities. Dr. Walker encourages emergency physicians to be open to outside-the-box career opportunities when they come along. "[We are] EM docs, after all. We can do anything!"

Read more about Dr. Walker's path to Netflix on our website, acepnow.com.

WILEY/GETTY

Report on ED Diagnostic Errors Sparks Controversy

EM community takes issue with methodology of AHRQ study's "headline-grabbing" extrapolations

by JORDAN GRANTHAM AND CEDRIC DARK, MD, MPH, FACEP

When the Agency for Healthcare Research and Quality (AHRQ) released its systematic review of diagnostic errors in the emergency department on Dec. 15, 2022, the report immediately started making waves.

The media quickly picked up the 744-page review prepared by the Johns Hopkins University Evidence-based Practice Center and presented it to the public with headlines including "ER Doctors Misdiagnose Patients with Unusual Symptoms" (New York Times, Dec. 15) and "More than 7 million incorrect diagnoses made in US emergency rooms every year, government report finds" (CNN, Dec. 16).

The emergency medicine community also responded swiftly. On Dec. 14, a joint letter from ACEP and nine other emergency medicine organizations stated: "The report makes misleading, incomplete, and erroneous conclusions from the literature reviewed and conveys a tone that inaccurately characterizes and unnecessarily disparages the practice of emergency medicine in the United States."

As the news circulated, the emergency medicine and research communities dug past the headlines and into the methodology of "Diagnostic Errors in the Emergency Department: A Systematic Review." Many took to social media to question some of its key findings. Kristen Panthagani, MD, PhD, an emergency medicine resident at Yale University and a self-described "dataviz nerd," wrote a thorough Twitter thread and a blog post examining the methodology and calling into question the "statistically terrible" extrapolation that resulted in the ensuing headlines.

Questions soon arose about the report's peer and public review process. In an article posted to *Inside Medicine* on Dec. 16 by Jeremy Faust, MD, MS, FACEP, the Johns Hopkins University author team's private responses to peer reviewer and technical expert comments suggested that several critical comments were not taken into consideration for the final report.

The Results section of the report is where the critical comments were concentrated, including those questioning the diagnostic error rate extrapolation for the U.S. emergency departments that eventually generated controversy. Technical Expert Panelist 2 wrote: "This section has a fatal flaw and should be removed, specifically, any national extrapolation. Headline grabbing, yes, but this is at best gravely misleading…"

Peer Reviewer 1 stated, "These summarized results should include the limitations of the evidence. There is not good data to make accurate estimates in the U.S. as presented in the summary." However, while AHRQ instructs authors to address all feedback from peer reviewers, technical reviewers, and the public, the authors are not obligated to incorporate all feedback into the final report, as evidenced by the writing team's response to reviewers: "We disagree that the data are insufficient to make extrapolations." In the body of the final report, the authors stated that "The overall representativeness of this estimate for U.S. ED care is uncertain, but the figure is not outside the range expected." *ACEP Now* emailed questions to the study authors about the validity of these extrapolations and received a statement in response that did not address those specific questions.

Mark Graber, an internist and nephrologist who is also Founder and President Emeritus of the Society to Improve Diagnosis in Medicine, has studied diagnostic error for more than 25 years. He served as a peer reviewer for the study. Peer reviewers and technical expert panelists are suggested by the authors and approved by AHRQ.

"It's an incredibly detailed and extensive study, and it was difficult to review because of the large body of evidence and the many questions [the authors] were trying to address," Dr. Graber said. Dr. Graber understands that people are upset about the limited number of studies used to calculate the diagnostic error rate, but he said there just aren't very many studies available, especially high-quality studies.

"I thought this study did an honest job in saying 'these are the studies we used, this is how we analyze the data, this is the number we came up with,'" Dr. Graber said. "It does point out the need for much more research in this area."

For his part, Dr. Graber was most concerned that his feedback about how to improve diagnosis in the ED wasn't incorporated into the revisions. He wished the authors expanded that to include more actionable solutions. "At this point in the game, we know that there are many other ways to improve diagnosis that weren't touched upon at all [in the report]," Dr. Graber said. "Things like getting second opinions, using resources for decision support, getting better patient engagement, these are all things that have been proposed to improve diagnosis in other settings and would very likely be very productive in the emergency department."

In addition to the reviewers and experts listed on the final report, AHRQ's process includes a period of public review for the draft version of the systematic review. The writing team is obligated to respond to all comments submitted during public review, and those comments are made public three months after the report is published. Because of the unusually strong public reaction to this report,

Craig Umscheid, MD, MS, Director of AHRQ's Evidence-based Practice Center Division, told *ACEP Now* that AHRQ is looking to make those available before its normal three-month process to increase transparency.

Hardeep Singh, MD, MPH, a Professor of Medicine at Baylor College of Medicine, is a quality and safety researcher who has studied diagnostic error rates since 2005. He understands how challenging it is to analyze the limited data and measure preventability and attribution in the emergency care setting. Dr. Singh reviewed the draft in March 2022 and submitted his concerns via the public comment process. His public comments spotlighted substantial scientific concerns and methodological flaws. "It is full of 'convenient' extrapolations and cherry picking," he wrote, and he recommended substantial revisions to ensure that future research and quality improvement efforts don't focus on potentially incorrect epidemiology and solutions based on this cherry-picked data.

Dr. Singh was disappointed when he saw the report was published without revisions to address the key objections he and other academics raised during public comment period.

"We, as researchers, have to be more responsible," Dr. Singh said. "With that comes accountability for making estimates of errors and harm using extremely rigorous science. We need to be able to protect the scientific integrity of the work we do."

Dr. Singh made clear that he does think diagnostic errors are a significant problem, both inside and outside of the emergency department. "But when numbers are estimated with flawed data, you lose trust. And making estimates from studies that didn't even measure diagnostic error and sensationalizing them is a fundamental problem that won't help our case for improvements," he said.

Another diagnostic error researcher who spoke with *ACEP Now* on the condition of anonymity also submitted public comments for the AHRQ report. The researcher explained that diagnostic error research is very difficult to quantify, especially when considering preventability and causality of patient deaths, so it's important to message the results with caution. They felt the body of the report explained its methodology and reasoning well, but that context was lost in a conclusion lacking nuance. "The main message is way too strong for the data that they have, the work that is out there," the researcher said. "A much better conclusion would be that there's a lot more research to be done because the numbers are not known."

Nuance is important, especially when drawing conclusions about U.S. emergency departments by extrapolating data from studies done in Switzerland, where emergency medicine is not recognized as a specialty, or from Spain, where residency training in emergency medicine began just over a decade ago.

Jeremiah Schuur, MD, MHS, a patient safety expert and adjunct professor of emergency medicine at the Alpert Medical School of Brown University, said that the report "doesn't pass the sniff test." He said if the report's data is true, then emergency physicians would miss one diagnosis every shift. "As someone who has overseen Mortality & Morbidity conferences at multiple facilities, that is not the experience that I've had," he said.

When discussing the headline-grabbing-numbers about potentially deadly errors, Dr. Schuur suggested it could have been framed differently. "When you have very imprecise results, it's often better to frame them in that way and talk about [mortality rate] in a range of possibilities."

"It's frustrating that the process did not get the authorship team to modify their report," Dr. Schuur said.

Dr. Panthagani, the Yale emergency medicine resident, heard about the study and its subsequent media coverage and decided to dig into the numbers herself. She echoed the same frustration as Dr. Schuur. "Bad data just really bothers me," Dr. Panthagani said. The goal of her popular Twitter thread was to explain the holes in the data and make it clear that the public shouldn't be afraid to come to the ED for emergency care. Dr. Panthagani took issue with the portion of the report in which the authors calculate the range of fatal medical errors in the ED. The report's abstract presents the fatal medical error rate at 0.2 percent, but the body of the report explains that this number is derived from one small study with only one death, and the uncertainty of that rate actually ranges from 0.005 percent to 1.1 percent, or 6,500 to 1.4 million deaths.

The authors of the report call this confidence interval "implausibly wide" and define a new one. What was presented to the public was their own, much smaller "plausible range" estimate of fatal medical errors—0.1 to 0.4 percent.

In response to questions about methodology, the authors sent *ACEP Now* a statement indicating they are working on a response to the most frequently asked questions about the report. The study authors will publish this FAQ in the coming weeks. "We have received a number of questions and concerns about the provenance, methods, or conclusions in the 744-page report. Some of these are fair critiques that deserve a thorough response; others are based on misunderstandings that can be answered through clarifying our approach and findings."

Dr. Umscheid said the AHRQ staff is closely monitoring all feedback, including social media reactions such as Dr. Panthagani's. AHRQ reviews the private and public comments submitted, along with the author response to those comments, prior to publication. But this level of post-publication controversy is unusual for AHRQ. Dr. Umscheid said he hopes is that they can "continue the discourse around this important topic."

"Nobody wants this type of feedback," Dr. Umscheid said. "We'd much rather have feedback where people are not only interested in the findings, but are engaged with the findings and want to take the findings and move forward. I'll speak for myself in saying it's important for me and important for us to listen to the feedback."

JORDAN GRANTHAM is senior content manager at ACEP.
DR. DARK is medical editor in chief of *ACEP Now.*

AHRQ Study: A Peer Reviewer's Reaction

The flawed extrapolation overshadows the study's useful clinical takeaways

by JESSE M. PINES, MD, MBA, MSCE

In December 2022, Newman-Toker et al., published a systematic review on emergency department (ED) diagnostic errors with funding from the Agency for Healthcare Research and Quality (AHRQ). CNN highlighted its findings: 7.4 million annual U.S. ED misdiagnoses, 2.6 million harms from preventable errors, and >100,000 permanent, high severity disabilities, and more than 250,000 deaths. According to the study, nearly six percent of ED visits are misdiagnosed.

In unison, the emergency medicine community recoiled.

Proposing that emergency medicine errors are a leading cause of death, behind heart disease, cancer, and COVID-19, but ahead of all accidents and strokes defies belief. Diving into the methods, it's clear why. The data supporting these extrapolations are, in a manner of speaking, anemic. Emergency medicine societies, led by American College of Emergency Physicians (ACEP), called them "misleading, incomplete, and erroneous." ACEP insisted CNN change their article to reflect these objections.

I have something to admit. I was involved. I was a technical expert and peer reviewer. I gave feedback when the authors created search strategies in 2020 via a one-hour Zoom. In 2021, I gave written feedback on a draft. My name is listed prominently on page 6, which caused me to get doxxed on EMDocs. When the report dropped, people reached out. A few examples:

"I saw the CNN news story. Did you agree with this?"

"Your name was on the AHRQ report. What was your role?"; and

"What the actual eff?"

My purpose in writing this article is twofold. First, to briefly defend the technical experts and reviewers. More importantly, how this unfolded is a tragically missed opportunity to have a discussion about errors. Useful takeaways exist within the dense 744-page tome if you can ignore its erroneous extrapolations and read beyond the abstract.

Regarding my involvement, I was critical of the report's definition of medical errors. In reference to its national estimates, I wrote it had, "...a fatal flaw and should be removed....Headline grabbing, yes, but this is at best gravely misleading." The authors disagreed with my review. Other reviewers made similar comments. The reviewers didn't write it. Having reviewed it doesn't mean that I, or other reviewers, approve.

I won't recount our criticisms here, but many were similar ACEP's. Suffice it to say, medical error research is complicated. Causes for some diagnostic errors are clear. Yet for many, there is no gold standard of diagnostic truth or smoking gun. It's sometimes impossible to reliably assign root causes for diagnostic errors even with full vetting. Therefore, my view is that combining studies across different populations from different EDs in different countries at different times that define errors in different ways is not meaningful. However, I found some of more qualitative themes useful. Below I describe my four takeaways.

1. **Know the Malpractice Hotspots**
   Certain conditions cause more malpractice claims. Yet malpractice allegations are not perfect proxies for diagnostic error rates. Malpractice cases involve an alleged standard-of-care, a large potential payout, and a poor outcome. Nevertheless, malpractice hotspots are good to know (Table 1). Malpractice allegations, even if dismissed, have negative psychological impacts on physicians and take years to resolve. Malpractice hotspots are a good starting point for developing clinical protocols. Protocols can often vaccinate against litigation and improve safety. Say you discharge a HEART score of 3 after appropriate testing. You document that the risk for short-term cardiac events is low (~1 percent). When lawyers review your "missed" acute myocardial infarction, it's clear standard of care was followed and the case is often avoided.
2. **Beware of Atypical Presentations**
   Atypical (i.e., non-classic) presentations of serious conditions surround malpractice hotspots (Table 2). No emergency physician misses obvious strokes (e.g. slurred speech/arm weakness). But it's easier to miss when the only symptom is vertigo. When evaluating vertigo, a useful bedside test called the Head Impulse-Nystagmus-Test of Skew (HINTS) exam can help differentiate central versus peripheral symptoms. Additionally, emergency physicians should have a low threshold to thoroughly work up and consult a specialist for new objective, neurologic findings. A painful abdomen is another area where serious conditions can hide, particularly in older adults. Abdominal CT findings have consistently surprised me more than any other ED test. My rule of thumb: if in any doubt, CT (or ultrasound if a child); if the patient is old, don't think. CT everyone with new abdominal pain.
3. **Root Causes of Errors are Most Often "Thinking" Problems**
   ED diagnosis is a complex cognitive process, drawing incomplete information from history, prior data from disparate sources, a physical exam, and interpreting diagnostic tests. It is quite miraculously reliable, particularly with expectations of treating more than two patients per hour and increasing emergency department crowding and boarding. Because thinking problems dominate as root causes of malpractice cases (Table 3), standardizing your approach can improve safety. This involves creating protocols for high-risk complaints for malpractice hotspots, particularly where symptoms can be atypical. For example, lower back pain: almost always non-serious but a small minority have cord compression. Hardwiring a red flag assessment and a complete lumbar plexus exam into every back pain evaluation may help reduce misdiagnosis.
4. **SPADE is a Good Way to Track Errors**
   The Symptom-disease Pair Analysis of Diagnostic Error (SPADE) methodology can track ED misdiagnosis of stroke, myocardial infarction, aortic dissection, spinal cord compression, and others. When a trigger condition is diagnosed, a look back can assess for related prior visits. For example, when stroke is diagnosed, recent visits with dizziness, vertigo, or nausea/vomiting should prompt a chart review. SPADE measures could also be developed to assess ED-level quality.

In closing, there are real concerns with parts of the report. But I sincerely hope it's not outright dismissed, especially given all the energy invested in producing it. Nevertheless, it will undoubtedly be a main course at ED residency journal clubs for years to come. A final bit of advice in this regard. You can't do justice to the entire report in a single journal club, or even read it in one sitting. Don't try. Break it into pieces for reading and discussions. Set a goal to understand a few key questions, rather than superficially scanning the whole report.

TABLE 1

THE 15 TOP EMERGENCY MEDICINE MALPRACTICE HOTSPOTS (IN RANK ORDER)
1. Stroke
2. Acute myocardial infarction
3. Aortic aneurysm/dissection
4. Spinal cord compression/injury
5. Venous thromboembolism
6. Meningitis/encephalitis
7. Sepsis
8. Lung cancer
9. Traumatic Brain Injury / traumatic intracranial hemorrhage
10. Arterial thromboembolism
11. Spinal/intracranial abscess
12. Cardiac arrhythmia
13. Pneumonia
14. Gastrointestinal perforation/rupture
15. Intestinal obstruction

Adapted from: Newman-Toker et al. Diagnostic Errors in the Emergency Department: A Systematic Review. 2022. Data were drawn from a large database of emergency medicine malpractice claims. The list is in the order of the most common conditions causing serious misdiagnosis-related harms.

TABLE 2: Common serious ED conditions that present with atypical symptoms

CONDITION	ATYPICAL PRESENTING SYMPTOMS
Stroke	Headache, vertigo/dizziness, altered mental status or confusion, nausea and/or vomiting, gait disturbances
Acute Myocardial infarction	Syncope or fall, nausea and/or vomiting, generalized weakness/fatigue/malaise, altered mental status or confusion, shortness of breath
Aortic aneurysm / dissection	Abdominal pain, fever (caused by aortitis), non-specific pain or no pain at all, syncope, shortness of breath, back pain
Sepsis	Generalized weakness/fatigue/malaise, altered mental status or confusion (older adults), fever in children

Adapted from: Newman-Toker et al. Diagnostic Errors in the Emergency Department: A Systematic Review. 2022. Data on these conditions were drawn from several studies in the systematic review.

TABLE 3

THE 10 MOST COMMON "ROOT CAUSES" IDENTIFIED IN ED MALPRACTICE LITIGATION (IN RANK ORDER)
1. Thinking problems (i.e. clinical judgment)
2. Issues with communication
3. Issues related to documentation
4. Issues related to lack of insurance
5. Clinical environment
6. Behavior-related
7. Administrative issues
8. Supervision issues
9. Technical skill
10. Electronic health records

Adapted from: Newman-Toker, et al. Diagnostic Errors in the Emergency Department: A Systematic Review. 2022. Data were drawn from a large database of emergency medicine malpractice claims.

DR. PINES is the National Director of Clinical Innovation at US Acute Care Solutions. and a Professor of Emergency Medicine at Drexel University.

Dr. Alister Martin's Medical Entrepreneurship for Equity

WHEN HUMAN POTENTIAL, ADVOCACY, AND HEALTH CARE CONVERGE

by DANIELLE GALIAN, MPS

Alister Martin, MD, MPP, encapsulates a mindset that embodies the spirit of emergency medicine: the entrepreneurial spirit. It would be easy for anyone looking through his resume to be curious about where he gets his drive. Afterall, his work in the emergency department (ED) alone is inspiring and would leave very little time for anything else. Dr. Martin graduated from Harvard Medical School, Harvard Kennedy School of Government, and the Harvard Affiliated Emergency Medicine Residency program. He most recently completed a White House Fellowship as senior advisor to Vice President Kamala Harris and is currently an assistant professor at Harvard Medical School. If that's not enough, he founded a novel organization—one of many over the years—called A Healthier Democracy in October 2022.

So, where does Dr. Martin get his drive?

"I just want to be a part of the solution," said Dr. Martin. "Logically, I think you can only do emergency medicine for so long before you start to get really upset and moved by the everyday violence of poverty our patients face, or the fact we are the only doctors some of these folks will ever have. Emotionally, I'm moved by the fact that in communities like the one I grew up in in New Jersey, the margin for error is so thin, that a slip one way or the other could result in an irreparable situation. It's my job to try and do what I can to put my thumb on the scale for the vulnerable in the types of communities like the one where I grew up to the extent that I can." Dr. Martin is doing *everything* he can to make a difference in and out of the ED while fulfilling his potential.

Ever the humble leader, he's quick to point out there have been a few failures along the way, too. "[These initiatives] are a sub segment of all the things that I've done and tried, and from the failures, and from the stumbles, and the falling on my face, I learned lessons to make these other things more successful." From addiction treatment to helping just over 5,000 clinicians get their DEA-X waiver transfers to voting rights, Dr. Martin showcases how the toughest experiences in the ED can be lessons that benefit the lives of the most vulnerable.

ALISTER MARTIN

Dr. Martin at Harvard Medical School.

Front Door for Addiction Treatment

One of the first initiative's Dr. Martin spearheaded early in his career was called Get Waivered. As fate would have it, the inspiration for it came from his first week in residency. Dr. Martin treated a young woman who had become addicted to opioid pain pills. She was a young mom who had just given birth to her second child. "She was at her son's daycare and basically fell down the stairs, broke her left ankle, and had this big surgery," Dr. Martin recalled. "She was put on a bunch of opioid pills. This was in 2015 before we were really talking about the opioid epidemic. She came to our hospital because she had been basically misuing prescription pills for seven weeks. And her husband had some left over from an accident he had had."

Dr. Martin's patient found a dealer back home in the neighborhood she grew up in and texted the dealer to obtain these drugs. When she showed Dr. Martin the text in the ED, she said, "I'm done. Delete my number, I'm getting help." And the dealer responded back, "Good luck, I hope all goes well for you." An hour later, she heard a knock at her door and it was her dealer at her apartment who said, "Look, I know what you texted me, but recovery's hard. Here's some pills for the road." Dr. Martin recounts the story as it was told to him that the dealer gave his patient oxycodone for free. That's when her husband intervened, and they brought her to Dr. Martin in the ED.

"I'm hearing this thinking I've been a doctor for all of six days, but absolutely...of course we're going to help you. You came here and you asked for help. We're going to help you. It's what we do," said Dr. Martin. "And I remember going and telling my attending, 'Hey look, we got this woman. She's asking for treatment. I think it's the perfect time. This is totally reversible for her. I want to admit her, I want to get her into treatment.' And the attending said, 'That's not what we do here.'" Dr. Martin admits his attending was kind, compassionate, and intelligent who was working in a system that just wasn't set up to help patients like that. "And as a result, I have no idea what happened to that woman. But basically, that walk back from my attending's desk to the patient's room was the longest walk of my life," said Dr. Martin.

It was during that walk that Dr. Martin made a commitment to himself to try and move the needle and make the ED into a proverbial front door for addiction treatment. In 2017, Get Waivered was established to help patients access recovery treatment in the ED. "Probably many other ER physicians were dealing with the same issue and letting patients down in that way," said Dr. Martin. "So, Get Waivered was an initiative that we started in 2017 to basically get ER physicians their DEA-X waiver so they can prescribe buprenorphine."

The X-waiver is a piece of legislation from the H.R. 2634-Drug Addiction Treatment Act of 2000 that aims to help emergency physicians prescribe buprenorphine for patients experiencing opioid withdrawal. Dr. Martin's Get Waivered initiative increases the number of emergency physicians obtaining this waiver. "When we started there were about 400 ER clinicians who had this waiver. We have helped just over 5,000 clinicians of all specialties get the training they need to get their DEA-X waiver over the course of the last six or seven years now with the majority of those being ER clinicians," said Dr. Martin. "The goal is to try and get 100 percent of ER physicians, and nurse practitioners, and APPs, etc., to get this waiver. Back in the day, you had to pay $200 for this thing, which is absolutely crazy. We made it free and tried to make the shift from common sense to common practice." Subsequently, on December

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Q&A

How do you like to spend your free time?

I like to play Super Smash Bros on Nintendo Switch. Come find me on Nintendo Switch Online.

Favorite musician or band?

Drake. The guy does not miss.

Where would you would like to visit?

Mykonos, Greece.

What book are you reading at the moment?

I just finished *The Overstory*.

Favorite early career memory?

Being so well looked after by mentors in the field of emergency medicine. I am only successful because I have a village of elders in emergency medicine behind me, guiding me, and pushing me forward. I am standing on the shoulders of giants and I think it's my responsibility to push the work they started forward and to carry the baton until my time is up before passing it on to the next generation of emergency physicians.

Advice for young physicians?

There's a Bible passage from Jesus's brother that came to mind for me when I read this question: "Now listen, you who say, 'Today or tomorrow we will go to this or that city, spend a year there, carry on business and make money.' Why, you do not even know what will happen tomorrow. What is your life? You are a mist that appears for a little while and then vanishes." (James 4:13-16). We are only here for this brief moment in time (we as emergency physicians understand this more than most people). Let's do as much good as we can while we are here. It's our time now. Go big y'all.

If you weren't a physician, what career or job would you pursue?

100 percent I would try to go to space. So, either an astronaut or Space Force Guardian. If that didn't work out perhaps a novelist (preferably in space).

A Nation in Crisis

Wait times and staffing shortages are causing bottlenecks that are overwhelming hospitals, forcing emergency care to spill into lobbies and waiting rooms and putting lives at risk. As part of its advocacy campaign to find solutions to the ED boarding crisis, ACEP collected more than 100 personal stories from emergency physicians on the front lines (acep.org/boarding-stories). While the consequences of boarding are felt in the ED, the challenges are systemic and necessitate collaboration from all stakeholders. ACEP is calling for the White House to convene a summit of health care leaders and policymakers. Stay updated at acep.org/boarding.

"Patients sit for days, unbathed, not ambulated, using urinals standing in corners in view of everyone. A patient I admitted three days ago stopped me asking, 'Why?' Hands reach out from gurneys as I pass asking for food, water, help to the bathroom, a blanket, or someone to simply talk to and show they care."

"The situation for patients, families, and care teams is untenable, and on the verge of collapsing."

"We have been asked to do more with less to the point that it feels like we are expected to do everything with nothing."

"We've had lobby nurses responsible for 15-20 patients. We've pushed diltiazem, hung amiodarone, cared for septic shock, and are now admitting patients regularly directly from the lobby."

"Saving beds for elective surgical patients while truly ill, critically ill patients waiting in hallways in the emergency department is disheartening. It's unsustainable, morally wrong, and dangerous for staff and for patients. How did we go from being healthcare heroes to an afterthought of the medical system?"

"We have many senior patients. Some are sleeping, slumped over in wheelchairs in the waiting room over 16 hours waiting for treatment. We have found emergent conditions in our waiting room including intracranial bleeding, saddle pulmonary emboli, acute stroke, complete heart block. We have had people suffer cardiac arrest in the waiting room while waiting for room in the ED."

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"We had a 12-month-old patient who presented in respiratory distress and low oxygenation who was found to have pneumonia and required a high amount of oxygen (Optiflo) to maintain his oxygen saturations. After stabilizing him for the interim, we attempted to transfer to a Pediatric ICU (PICU). We were met with not a single open PICU bed in the state, as well as no hospitals with capability to accept transfer in every major city in the surrounding states."

"I'm working in a nine-bed ED with an additional three beds dedicated to psychiatric patients. We now have a patient who has been boarding with us for over five months with no end in sight."

"Despite the overwhelming situation, I see acts of bravery by our staff as they do their best in such extreme circumstances. Each day I fear that a patient or staff member will be harmed because of the critical situation in which we are required to serve."

"We had someone in the lobby who was not being appropriately monitored and began having large bloody vomiting…He lost pulses in the waiting room in front of others including children. As the resuscitation began…this posed high risk for other patients in the lobby as we began CPR while blood ejected from his mouth with every compression."

"One ED with 15 beds which should be staffed with five nurses and two technicians was staffed by two nurses and one technician. At the same time we had eight boarders and two patients pending transfer to a higher level of care. (On ventilators and vasoactive infusions). We did not have the ability to take care of the folks in the waiting room. People were not able to be triaged. Some unfortunately died in the waiting area… The cuts in hospital bed capacity and service capabilities over recent years, in the name of efficiency, have left us with an inadequate system for such emergencies."

"It's dangerous, scary, and impossible to practice appropriate medicine. You just go by level of acuity and length of stay and try to find the needle in the haystack."

"In the last six months, we have had three people die in our waiting room."

READ MORE FIRST-HAND ACCOUNTS *at* ***acep.org/boarding-stories***

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MAT, *Not* MTF

Alcohol use disorder is a preventable and treatable medical condition

by SALLY MAHMOUD-WERTHMANN, MD

"Metabolize to freedom" or "MTF" as it is commonly known to emergency physicians is too frequently the instructions that accompany sign out to a colleague. Alcohol use disorder (AUD), a preventable and treatable medical condition, results in over 2 million annual emergency department (ED) encounters, accruing an annual cost of $15 billion.[1,2] Accounting for nearly 40 percent of all substance-use-related ED visits in 2021, data suggests that alcohol-related ED visits are steadily increasing.[3] Emergency departments faced with unprecedented boarding challenges cannot afford to ignore this persistent public health burden, particularly in light of evidence-based interventions and medications that can treat AUD.[4]

Yet, there remains a significant treatment gap for patients with AUD. Of the more than 18 million people in the United States who need treatment, fewer than 10 percent receive ap-

propriate medication.[5] Additionally, there is a significant evidence-practice gap. Even though a considerable body of literature demonstrates the benefits of using FDA-approved medications in the treatment of AUD, few emergency departments have a protocol in place to initiate these medications and help patients achieve goals of reduced alcohol consumption or abstinence.[6] Intoxicated or withdrawing patients are observed until sobriety, treated for their acute complication, and ultimately discharged without addressing their underlying AUD.

Naltrexone and Acamprosate

Three medications are FDA-approved for the treatment of AUD—naltrexone, acamprosate, and disulfiram, and several others show off label benefit.[7,8] Here I will focus on naltrexone and acamprosate, since those are both first-line treatments and have the best evidence supporting their benefits.[9] Naltrexone, an opioid antagonist, is available in two formulations: oral daily naltrexone and intra-muscular, extended-release naltrexone (Vivitrol) administered monthly.[10] Naltrexone reduces heavy drinking and is an ideal option for patients who would like to reduce their alcohol consumption rather than quit.[11] Vivitrol offers the added benefit of once-a-month dosing, which may positively impact compliance especially in patients who face socioeconomic barriers to access care.[12] A recent study found that initiating Vivitrol in the ED in collaboration with case management demonstrated significant reductions in overall alcohol consumption as well as improved quality of life. Importantly, nearly 80 percent of patients completed all follow up appointments and 69 percent of the patients continued Vivitrol after the study.[13] Another study found that in comparison to oral naltrexone, patients who received Vivitrol in the ED had higher rates of follow up within 30 days. Of note, patients in both arms were seen by a substance use navigator.[14]

Acamprosate, another FDA-approved medication for AUD, shows promise in treating AUD. Acamprosate promotes abstinence, but has not demonstrated efficacy in individuals who continue to drink alcohol.[11] Though it may be better for patients who are highly motivated to abstain, it is dosed three times a day, making it problematic for some patients. Ultimately, the treatment selection should be tailored to the individual, what medications your pharmacy has available, and any relevant medical co-morbidities which may make certain options contraindicated.

AUD, associated with considerable morbidity and mortality, is a classic example of a mismatch between a treatment offered in the outpatient setting and those with limited or no interaction with this part of the health care system. As emergency physicians, we see these patients, but often miss a critical window of opportunity by not evaluating our patients for their interests in reducing alcohol consumption or achieving sobriety. The current literature suggests that expanded access to medication assisted treatment (MAT) for opiate use disorder was associated with significant cost-saving reductions in morbidity and mortality.[15] Similarly, MAT for AUD will likely prove cost effective. Time need not be a barrier as implementing appropriate protocols and ancillary staff can ease opportunity cost of integrating these valuable discussions into our practice.

Treating the acute complications of AUD is like fixing a hole in a dam that is about to burst. Emergency physicians need to shift away from the "metabolize to freedom" culture and move towards routinely offering MAT in conjunction with counseling and psychosocial resources whenever indicated. Laying the foundation for long-term recovery of addiction may not be a role chosen by all of us when we signed up for emergency medicine, but we can choose to shoulder the responsibility thrust upon us, provide the best care for our patients, and optimize ED use for AUD.

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THE NEXT GENERATION OF EM

RESIDENT VOICE

Medicine with Heart

Incorporating humanities in the study of humans

by SOPHIA GÖRGENS, MD

"The practice of medicine is an art, not a trade; a calling, not a business; a calling in which your heart will be exercised equally with your head."
—William Osler

If you're interested in learning how to expand your skills as a physician through writing, remember that competency in writing, like any skill, takes practice. Whether it's an hour a day or five minutes a week, it is the intent and discipline that drive progress. Equally important, however, is finding a support network. Not only is writing in a vacuum boring, but it also lacks feedback and therefore limits your ability to grow. Just as we often run difficult cases and our medical reasoning by colleagues, so too should you find a friend or a writing group to run your writing by and seek constructive criticism. Not every comment need be listened to or incorporated, but feedback opens up a dialogue that can spark new ideas and improve your writing.

Read Dr. Görgens's full article by following the QR code below.

Your Overconfidence is Your Weakness

Why physicians are overconfident and how we can overcome it

by ALEX KOO, MD

Medical training oftentimes relies on pattern recognition, which is necessary to develop an excellent clinician who is both efficient and precise. There's a flip side, though. An overreliance on pattern recognition can miss outlying cases or entrench misguided practices. In addition, the knowledge base of medicine is vast, covering different specialties that are—in their own individual right—constantly evolving. The shifting landscape creates "potholes" that are not always readily apparent. It's inevitable that we'll step in these potholes, but may not even recognize them or, even if we do, we may find it difficult to acknowledge them. Overconfidence is one difficulty in seeing these potholes or acknowledging them.

Balancing confidence with self-cognizance can make us better clinicians who evolve with the medical landscape. There is a power in recognizing there are—as Donald Rumsfeld would term "unknown unknowns." It relies on being cognizant of medicine's and our own limitations, aware of our own egos, and then implementing concrete strategies, such as cognitive pauses, case reviews, and seeking feedback.

Overconfidence in Medicine

Medical knowledge evolves at a rapid pace. Peter Densen, MD, estimated that the medical knowledge "doubling" rate was 50 years in 1950, seven years in 1980, and just three and a half years in 2010.[1] It's hard to imagine a physician being masterful in every diagnostic and therapeutic technique for every patient. It is even sometimes difficult for physicians to be aware of these knowledge gaps. Studies on overconfidence are present in physician imaging interpretation and diagnosis.[2,3] In one study in the intensive care unit, clinicians who were "completely certain" of a clinical diagnosis for 126 patients' causes of death were actually incorrect 40 percent of the time, confirmed by post-mortem autopsy.[4]

Another interesting aspect of overconfidence is the Dunning-Kruger Effect, first described in 1999 in studies of participants' self-perceptions in areas of logic, humor, and grammar. Its simplified findings were that the less proficient one was, the more likely one was to overestimate their proficiency. This has been similarly demonstrated in medicine. Residents' confidence or self-perception of their knowledge in areas of diagnosis and communication were overinflated to their actual demonstration in these areas, compared to attending physicians. Furthermore, lower-performing physicians tended to rate themselves higher than their peers.[4–7]

The landscape of medicine and its physician training have natural hurdles that make one prone to overconfidence, but sometimes for good reason. Physicians are trained in areas of pattern recognition, hearing a chief complaint, and coming to a hypothesis. Cognitive load and time spent are decreased as this pattern recognition of "fast thinking" leads a physician down a familiar pathway. To prevent overtesting and overconsultation, physicians must make a quick differential to focus diagnostics and treatment. Most of the time, the hypothesis is correct. However, relying on pattern recognition with blind confidence can lead to "early diagnostic closure," the premature narrowing of diagnostic possibilities such that the patient's true diagnosis is never considered. While testing may be done to confirm a diagnosis, there may also be confirmation bias or seeking data to confirm an inaccurate hypothesis.

Lastly, there are societal and internal pressures that feed into an unrealistic visage that physicians cannot make mistakes. As a result, we may internalize and overestimate our professional competency. On top of that, it is just naturally difficult to admit or confront one's own mistakes. Sometimes it feels better to *feel* right than to *be* right. These pressures create obstacles for one to self-evaluate their performance critically and accurately.

Strategies for Combating Overconfidence

1. **Identify knowledge gaps and create a plan to fill these gaps.**

Recognize that the practice of medicine has limitations. Even with the latest evidence and training, there will always be a level of uncertainty. One established practice pattern today may be altered or completely refuted in a few

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PUTTING RESEARCH TO WORK FOR YOU

PRACTICE CHANGERS

DR. WESTAFER (@Lwestafer) is an attending physician and research fellow at Baystate Medical Center, clinical instructor at the University of Massachusetts Medical School in Worcester, and co-host of FOAMcast.

High Dose Nitroglycerin in Acute Heart Failure

This treatment, once cutting-edge, is becoming more mainstream

by LAUREN WESTAFER, DO, MPH, MS

The current acute management of patients with acute decompensated heart failure (ADHF) in florid pulmonary edema barely resembles the management I observed during medical school over a decade ago. Patients routinely roll into the emergency department (ED) with the loud whistle of prehospital non-invasive ventilation (NIV) machines. The early prehospital and ED use of NIV has made intubation of patients with pulmonary edema from ADHF uncommon. Morphine, once doled out in ADHF for vasodilatory properties and sympathetic nervous system, has been abandoned in ADHF due to observations of harm.[1,2] Bedside ultrasounds are wheeled into rooms to confirm diagnoses and initiate treatment in a matter of minutes and prior to portable chest radiographs. Physicians may order nitroglycerin to be dosed in milligrams and nurses may hang nitroglycerin drips with initial rates >200 µg/min without balking at the dose.

Recently, the American College of Emergency Physicians Clinical Policy Committee released updated guidelines on the management of acute heart failure syndromes that reflect some of these changes.[3] Three of the four recommendations in the clinical policy are probably standard in most EDs.

- Point-of care lung ultrasound is sufficiently accurate and can be used in conjunction with the history and physical exam to diagnose acute heart failure (Level B).
- Physicians may consider early administration of diuretics in patients with acute heart failure syndromes, provided the clinician is certain about the diagnosis and the patient has signs of volume overload (Level C).
- Physicians should not rely on current heart failure risk stratification tools to identify patients that can be directly discharged home from the ED. However, several tools may be used to identify high risk patients that *should not* be discharged home such as the Ottawa Heart Failure Risk Scale (OHFRS; Level B), the Emergency Heart Failure Mortality Risk Grade for 7-day mortality (EHMRG7) or the STRATIFY decision tool (Level C). These tools are neither sufficiently sensitive nor specific to be used as the sole criteria for decision-making.

The remaining recommendation, however, may be less routine, depending on local practice patterns and training. The new ACEP clinical policy includes a recommendation that we consider the use of high-dose nitroglycerin in hypertensive patients with ADHF, albeit as a consensus recommendation. This is consistent with a recommendation from the European Society of Cardiology that nitroglycerin can be given as 1–2 mg boluses in severely hypertensive patients with acute pulmonary edema.[4]

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The use of nitroglycerin in AHDF is not new—it is the most commonly used vasodilator. However, there is little consensus regarding starting dose for nitroglycerin. Infusions are often initiated at 5-10 µg/min and then titrated up for effect.[5] However, the additional benefit of afterload reduction, which is beneficial in ADHF, only comes at higher doses. As a result, there has been interest in using high-dose nitroglycerin early in the treatment of ADHF presenting with significantly elevated blood pressures.

What is "High-Dose" Nitroglycerin?

The definition of "high-dose" nitroglycerin varies. Some may consider an infusion of 200-400 µg/min "high-dose," while others consider boluses of 1-3 mg "high-dose" nitroglycerin. In the open-label, non-randomized study that forms the basis of the ACEP clinical policy recommendation, patients received a 2 mg bolus of nitroglycerin and a nitroglycerin drip was started at a low rate (0.3-0.5 µg/kg/min) with titration up to 400 µg/min. Additional 2 mg boluses of nitroglycerin could be given every 3-5 minutes.[6] A 2021 study gave patients a bolus of 0.6 to 1 mg of nitroglycerin, depending on systolic blood pressure, and initiated an infusion at 100 µg/min that could be titrated based on blood pressure.[7]

Who May Be Appropriate Patient for High-Dose Nitroglycerin?

The studies of high-dose nitroglycerin typically include patients with clinical signs of ADHF with pulmonary edema, hypoxemia and/or dyspnea, and hypertension. The inclusion criteria vary with regard to minimum blood pressure threshold, but ≥160 mmHg is commonly used.[6,8]

What is the Potential Benefit?

Studies of high-dose nitroglycerin consistently suggest a trend towards reduced need for endotracheal intubation, non-invasive ventilation, and admission to critical care units.[6,8,9] This may be particularly important given strained hospital resources and critical care beds. Additionally, a short-term high-dose infusion or bolus doses of nitroglycerin can achieve rapid improvement in hemodynamics and symptoms, obviating the need for an infusion upon admission to the hospital. Unfortunately, most of these studies are small and not randomized; thus, the certainty of evidence regarding the magnitude of benefit is low.

What is the Potential Harm?

Two primary potential harms arise in the administration of nitroglycerin—hypotension and headache. Fortunately, hypotension is uncommon and transient, occurring in approximately two to three percent of patients in studies of high-dose nitroglycerin.[6,7,10–12] Additionally, one of the benefits of nitroglycerin is the quick "on and off," the half-life is about 3 minutes. As a result, the hypotension observed in these studies resolved within minutes.

How Does One Bolus Nitroglycerin?

The delivery of nitroglycerin boluses can also vary, such that even if there is a reluctance to administer a bolus of nitroglycerin, the same dose can be effectively achieved. For example, a bolus can be administered as a slow intravenous push. Alternatively, one may encounter less resistance achieving a bolus of nitroglycerin by utilizing an infusion rate of 300-500 µg/min for a few minutes. "High-dose" or bolus dose nitroglycerin may seem like an outrageous dose compared to low-dose infusions; however, the dose may not be as high-dose as we think. We routinely administer 0.4 mg of sublingual nitroglycerin to patients with chest pain. Although the bioavailability may vary based on sublingual technique, this is approximately the same as 160 µg of intravenous nitroglycerin. Some prehospital services will administer 0.4–0.8 mg of sublingual nitroglycerin, sometimes repeated over 10–15 minutes to achieve an effective "bolus" of nearly 0.5 mg.[7,11]

Enthusiasm for high-dose nitroglycerin in severe ADHF is no longer fringe. The professional society endorsements for high-dose nitroglycerin push high-dose nitroglycerin in ADHF with pulmonary edema from cutting-edge to mainstream and may facilitate the use of this approach for select patients.

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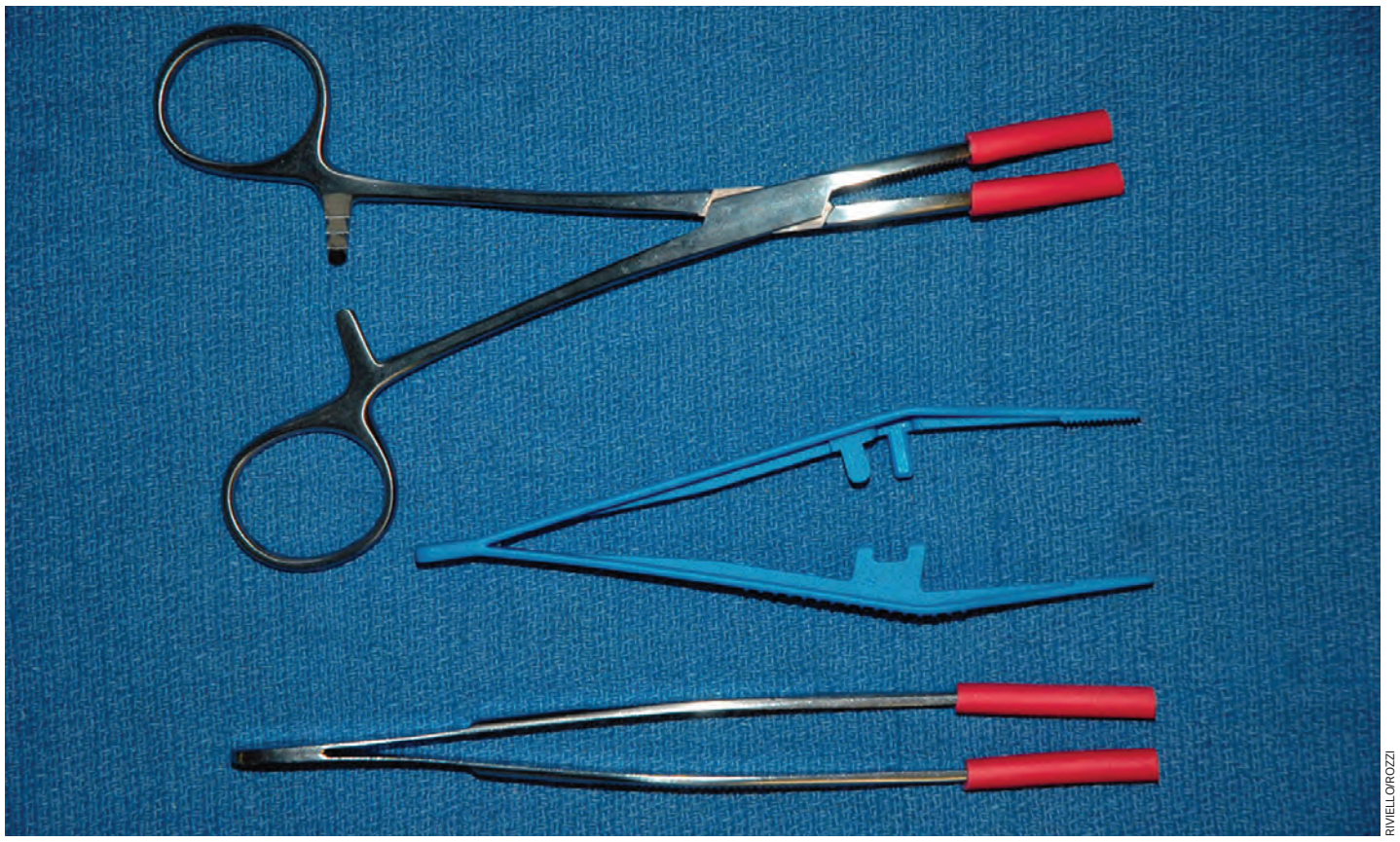
ment and evaluation, and are either admitted to the hospital or discharged. Many who survive rely on emergency physicians and ED personnel to help meet their forensic needs. Our primary goal remains resuscitation and stabilization, however, we should be cognizant of the forensic needs.

One aspect to consider is how to handle evidence. Ammunition, or a cartridge, is the object that is loaded into a firearm. It consists of a cartridge case which holds the bullet, a primer, and powder. Upon firing the weapon, the cartridge is ejected and the bullet becomes the projectile. Cartridge cases (casings) and bullets can be removed from patients in the hospital. Cartridges are commonly made of brass (copper and zinc). Bullets come in a variety of shapes, sizes, and compositions. Bullets are often made of copper, steel, and lead (though lead is becoming less common). These metals are soft and malleable so they can conform to the barrel of the weapon, which has spiral impressions called lands and grooves. Traveling along the barrel imparts ballistic markings onto the bullet that experts can use to match it to the weapon and other possible casings.[2,3]

How we handle bullets in the ED can affect the ballistic analysis. Because bullets are soft and malleable, use of metallic surgical instruments like forceps to grasp the bullet can impart marks from the instrument into the bullet (Figure A). These marks can disrupt the ballistic markings and make comparisons and weapon matching impossible. Furthermore, dropping the bullet into a metal basin can also alter these ballistic markings and have similar consequences. There have been reports of physicians using a metallic instrument to mark the bullet with their initials or a symbol so they can identify it if asked in court. This can also ruin, obscure, or alter ballistic markings and should not be used.

So, what should be done to remove and handle bullet evidence?[4] First of all, whenever possible use instruments made of plastic to retrieve and handle bullets. Often these may not be available or as useful as metallic instruments. If metallic instruments are to be used, they can be modified with rubber or silicone tubing over the tips (red-rubber catheters or Suture Booties) to prevent them from damaging the bullet (Figure B). Use minimal pressure when handling the bullet and if able, do not engage the clamping mechanism of the instrument. Next, never drop the bullet into a metal basin; use a plastic basin. If only a metal basin is available, line it with surgical towels and create a divot to gently place the bullet into until it can be packaged. And of course, do not place your own marks on the bullet and minimize any handling of it. You do not need to clean the bullet, but you can gently remove any large pieces of tissue.

The bullet then should be packaged for transfer to law enforcement. The best way to do that is to place it in a coin envelope. You can wrap it in gauze first for added protection. As an alternative, a sterile plastic specimen cup can be used. It should be lined with gauze as well in order to protect the bullet and prevent it from moving around. Whichever packaging is used, it should then be labeled with the patient's name, date and time, and the name of the person who collected and/or packaged the evidence. Next, a chain of custody form should be used or chart notation should be made detailing what was done with the evidence. At a minimum, the name of the accepting officer and their badge number, law enforcement agency, name of the person turning over the evidence, date and time, and the signatures of both persons should be documented. A copy should remain in the chart and another copy should be sent with the evidence.



RIVIELLO/ROZZI

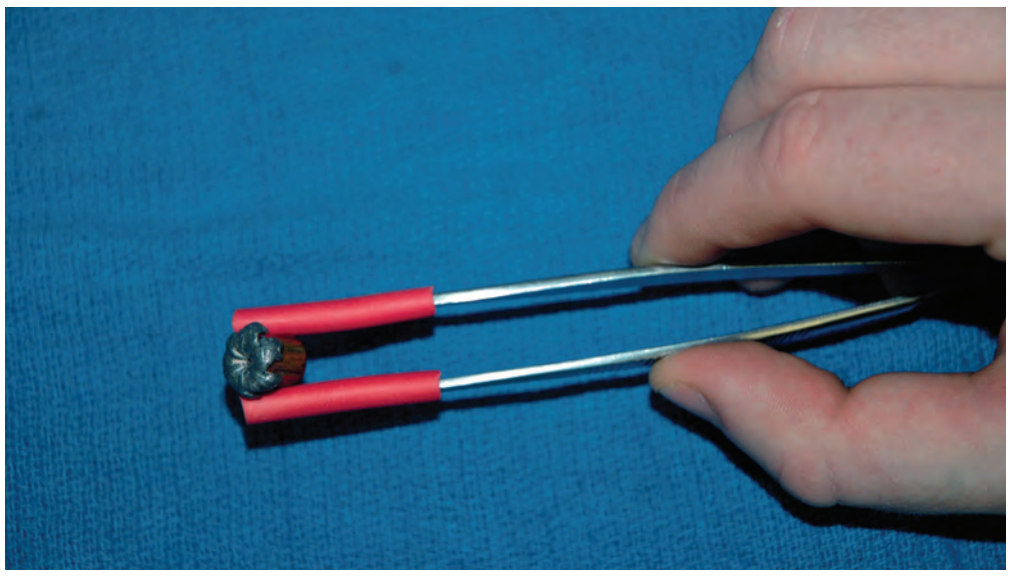


FIGURE A (ABOVE): Because bullets are soft and malleable, use of metallic surgical instruments like forceps to grasp the bullet can impart marks from the instrument into the bullet.

FIGURE B (LEFT): If metallic instruments are to be used, they can be modified with rubber or silicone tubing over the tips (red-rubber catheters or Suture Booties) to prevent them from damaging the bullet.

KEY POINTS

- Gun violence is increasing; and emergency and trauma physicians should understand the forensic needs of patients.
- Hospitals should have policies in place on how to handle forensic evidence.
- When handling ammunition-related evidence (bullets/casings), metal instruments and basins should be avoided when possible.
- Bullets should be protected and packaged in envelopes or specimen containers.
- All forensic evidence should be properly labeled with patient name, date of birth, date and time of collection, and collector's name.
- A well-documented chain of custody ensures the integrity of the evidence.

Case Resolution

You politely explain to the surgical resident the nature of bullets, and proper evidence collection procedures. They thank you for helping them out and you offer to stay and help show them how to package the evidence. The bullet is removed with a plastic forceps and placed in a plastic basin until you and the resident package it in a specimen cup, label it, and complete the chain of custody form for law enforcement.

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EM LITERATURE OF NOTE

PEARLS FROM THE MEDICAL LITERATURE

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An Incorrect Report on ED Error

"Only one of the selected studies measures error in those discharged from the ED"

by RYAN RADECKI, MD, MS

In 1999, the Institute of Medicine published a report entitled, "To Err Is Human," that estimated 44,000 to 98,000 patients die annually in hospitals due to medical error.[1] In 2016, a sensational publication claimed medical error as the third-leading cause of death in the United States.[2] Now, a new systematic review published by the Agency for Healthcare Research and Quality (AHRQ) has put the emergency department (ED) in its crosshairs.[3]

This AHRQ review claims diagnostic error occurs in nearly one in 18 ED patients, resulting in 2.6 million adverse events with 370,000 serious harms, including 250,000 deaths. The response to this article has been swift, with all the major emergency medicine professional societies signing on to a response conveying their dismay.[4] This dismay is not grounded in the harsh focus on the state of emergency medicine practice, but on the flawed analysis itself.

The core issues repeatedly raised involve the studies used to estimate the frequency of diagnostic error. The authors of the AHRQ review generate their estimate from three small studies examining the outcomes of a mere 1,758 patients in Spain, Switzerland, and Canada.

Two of these studies form the basis for their estimate of the rate of diagnostic error occurring in the ED. Only one of these studies specifically measures error in those discharged from the ED. This study was conducted over 15 years ago in Tenerife, in the Canary Islands, an archipelago off the coast of Morocco and collectively administered as an autonomous community of Spain.[5] It reviewed outcomes of 500 patients, specifically selecting half from those having an unscheduled 72-hour return to the ED. The practice environment differed substantially from the U.S., with nearly 90 percent of patients evaluated by residents and non-emergency physician staff, with these physicians averaging three patients per hour in a seasonally overcrowded department. Blood tests were performed on only approximately half of patients and CTs on a mere two percent.

Within the cohort of unscheduled 72-hour returns, 20 percent displayed discordant diagnoses between initial and subsequent ED visits, while those without unscheduled returns displayed a four percent rate of discordant diagnoses at primary health center follow-up. Even if the decades-old performance of this remote archipelago were a reasonable proxy for modern U.S. medical care, it is immediately obvious a discrepantly coded diagnosis is not a reliable surrogate for diagnostic error. A handful of core definitions of diagnostic error exist, including one from the National Academy of Medicine, and each requires full case review to determine missed or delayed opportunities to make a correct or timely diagnosis.[6] Absent any sort of structured review, no accurate estimate for the rate of diagnostic error can be ascertained.

A second study of patients admitted to the internal medicine service in Switzerland uses the same approach of looking for diagnostic discrepancies.[7] Inselspital University Hospital in Berne, Switzerland, is a university hospital of approximately 40,000 annual visits staffed by an interdisciplinary unit within the ED, intensive care, and anesthesiology. In this study, clinicians reviewed ED admitting and IM discharge diagnoses to classify them as discrepant, clearly stating, "this study investigated discrepancies in diagnoses, not error, which would require a thorough review of the diagnostic process." These authors ultimately identified discrepancies between admitting and discharge diagnoses in 12.3 percent of cases, three-quarters of which did not have the ED admitting diagnosis among the discharge diagnoses. The authors of the AHRQ review subsequently blend the diagnostic discrepancies from these two studies, from 15 years ago in the Canary Islands and seven years ago in Berne, Switzerland, to produce an overall 5.7 percent rate for diagnostic error in present-day U.S. EDs.

Attempting to Ascertain the Rate of Harm

The next portion of the AHRQ review uses these studies, and a third one from Canada, in an attempt to ascertain the rate of harm from diagnostic error.[8] In the Canadian study conducted in 2004, follow-up was performed on 503 adult patients evaluated in "high acuity" areas of the ED. Of these patients, a single death was observed. A patient with chest pain was referred to cardiology with an elevated troponin level, but was subsequently diagnosed with, and died as a result of, an aortic dissection. As the sole "high-quality" study directly addressing the question of death from diagnostic error, this 0.2 percent estimate forms the foundation of all subsequent estimates.

A true 95 percent confidence interval from this study would generate an absurdly uninformative estimate of annual deaths attributed to diagnostic error ranging from 6,500 to 1.4 million. However, rather than admit this insurmountable limitation, the authors of the AHRQ review invent a new biostatistic, the "plausible range." This made-up descriptor has no rigorous precedent, but rather represents an arbitrary ±2-fold range ultimately made up around the single death from aortic dissection observed in Canada.

To support this supposed "plausible range," the authors construct increasingly specious chains of extrapolation from the small numbers of events in these studies from nearly 20 years ago, along with other mathematical calisthenics based on population-based death statistics. These other data are inappropriately elevated above observational studies conducted in ED populations, with estimates of death due to diagnostic error ranging from merely zero percent to 0.0074 percent.[9,10,11] With up to 1,000-fold differences in estimates between data sources, the clear answer is the lack thereof: the true incidence and harms from diagnostic error across the heterogenous ED landscape in the U.S. remains unknown. It is irresponsible to publish an estimate and to assume such precision.

Diagnosis-specific estimates also suffer from similar issues, particularly with respect to the incidence of stroke in patients presenting to the ED with dizziness. The authors of the AHRQ review, in repeated and prominent calls for future research in their personal area of academic work, cite an "estimated 45,000 to 75,000" missed strokes in dizziness annually. The source for this statistic in the AHRQ review is, in fact, an editorial by these same authors, which subsequently cites their own practice seminar article regarding the HINTS (Head Impulse, Nystagmus, Test of Skew) exam, which ultimately extrapolates data from a study of patients with dizziness.[12]

This retrospective study from Neuces County, Texas, was conducted in 2000-2003, and focuses on 53 patients who were adjudicated to have had a cerebrovascular diagnosis following chart review. The AHRQ authors' analyses of this study neglect to mention a third of these patients were not diagnosed with stroke, but with transient ischemic attack, and it is the mere 46 ED cases from this cohort forming the foundation for the proposed rate of missed strokes in modern clinical evaluation. It is absolutely the case patients with dizziness can manifest underappreciated etiologies, but studies of over 40,000 patients provide estimates of subsequent stroke diagnoses of 0.18 percent within 30 days, a far cry from tens of thousands of missed strokes.[13]

Finally, the accounting of the frequency of various clinical conditions affected by diagnostic error is derived substantially from a U.S. database of closed malpractice claims. While there is certainly alluring face validity to serious harms percolating to the level of a tort claim, these data cannot realistically inform any sort of reliable estimate of relative disease-specific errors. Likewise, using these tort data to approximate estimates of the frequency of types of diagnostic error is invalid. The authors of the AHRQ admit as much in the text, but do not refrain from heavily utilizing this citation.

Unsupported and Misleading

The field of diagnostic error, patient safety, and cognitive biases in medicine is of profound importance to the specialty of emergency medicine. These issues of diagnostic accuracy must also be considered within the challenges of resource stewardship, overdiagnosis, and unintended consequences. The findings promulgated by this AHRQ review are, bluntly, unsupported by the evidence cited and misleading as to the gaps requiring further study. In light of the comprehensive issues marring this publication, I personally believe it should be retracted for further revision.

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PROTECT YOUR POT OF GOLD FROM BAD ADVICE

THE END OF THE RAINBOW

DR. DAHLE (@WCInvestor) is a blogger, best-selling author, and podcaster. He is not a licensed financial adviser, accountant, or attorney and recommends you consult with your own advisers prior to acting on any information you read here.

What is a 457 Plan and Should I Use It?

Understanding the best plan options for you

by JAMES M. DAHLE, MD, FACEP

Question

I recently changed jobs and my new job offers both a 403(b) plan and a 457(b) plan. I know the 403(b) is a lot like the 401(k) I used to have, but what is a 457(b) and should I use it?

Answer

A 457(b) plan, like a 401(k), 403(b), or traditional IRA, is a tax-deferred retirement savings account. The primary difference between a 457(b) plan and those other accounts is the owner of the account. With an IRA, 401(k), or 403(b), the account contains your money. In a 457(b), the account contains the money of your employer. This is money your employer has promised to pay you at some point in the future, but it is not technically your money yet. Think of it as deferred compensation.

Despite 457(b) money not being yours, you are still allowed to control how it is invested in the plan. Like a 401(k), a 457(b) typically allows you to choose between various mutual fund investments in the plan and change that mix of investments periodically. For this reason, most people think of it and treat it as just another 401(k). That is fine most of the time, but as with many things in finance, the devil is in the details. You need to understand the details, especially when deciding whether to use the account or not. You always have the option of not using any retirement account and simply saving for retirement in a taxable, non-qualified brokerage account where you have maximum flexibility and unlimited contribution amounts.

457(b) contribution limits are exactly the same as the employee contribution amount to a 401(k), $22,500 in 2023. Thus, a 457(b) allows many investors to double their tax-protected retirement savings annual contribution. There are catch-up contributions too, but they do not work exactly like 401(k) catch-up contributions. Some plans do not allow them at all. The IRS permits a plan to offer the same $7,500 per year catch-up contribution that 401(k)s have for individuals over age 50. However, it also allows 457(b)s to offer two other types of catch-up contributions instead, whichever is less. The first of these allows you to double your contribution in the last three years before retirement age ($45,000 per year). The second allows you to make up for any contributions you were allowed to make but did not make in the past.

A big advantage of a 457(b) over a 401(k), 403(b), or IRA is that there is no penalty for withdrawing the money before a certain age. Once you have left the employer, you can pull the money out penalty-free whether you are 40 or 70. Thus, 457(b) money is often some

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of the first money an early retiree spends. If you still have money in a 457(b) at age 72, you are required to take Required Minimum Distributions (RMDs) from it, just like a traditional IRA.

When deciding whether to use your 457(b) or not, the first question to address is whether the 457(b) plan is a governmental or a non-governmental plan. Governmental plans are pretty much better in every respect, but perhaps the greatest advantage is that when you leave the employer, you can roll a 457(b) into a traditional IRA or other retirement account. That is not the case for a non-governmental 457(b). You might be able to roll it into another non-governmental 457(b), but you should assume that the money will be in this 457(b) until it is withdrawn. In addition, the assets in a governmental 457(b) are held in trust for the employee, just like a 401(k). That is not the case with a non-governmental 457(b). Those funds are subject to the employer's creditors. For this reason a 457(b) provides excellent asset protection against your creditors, but it provides no protection at all against an employer's creditors. I have been searching for years for a doctor who actually lost 457(b) money to an employer's creditors and have not yet found one, but it is a theoretical risk. The bottom line is that if your 457(b) is a governmental 457(b) like that offered by most university hospitals, go ahead and use it just like another 401(k). If it is a non-governmental 457(b), you need to look at it more carefully before deciding to use it.

What Should You Look For? Four Things Primarily:

1. Stability of the employer
2. Distribution options
3. Investment options
4. Fees

Since this money is subject to the creditors of the employer, if the employer seems to be going bankrupt, you may want to limit how much money you put into the 457(b). While the upfront tax break is great, and tax-protected growth can really boost your after-tax investment returns, the return of your principal matters more than the return on your principal. If your employer is not paying its bills (and it cannot hide this fact long from the physicians and other staff working at a hospital), I would recommend against using the 457(b).

Next, check out what the distribution options are. Essentially, you want flexibility and the ability to spread out distributions over at least five years. Otherwise, you may end up having to take all of the money out in a single year and pay taxes on most of it at a high rate. 457(b) distribution options have tremendous variation. Make sure the options offered by the plan are acceptable to you.

Third, look at the investments. Just like with a 401(k), you want to see broadly-diversified, low-cost, index mutual funds in the plan. If all of the investments in the plan are expensive (more than one percent expense ratios) actively managed funds, you may not want to leave your money there for years, much less decades. The funds don't all have to be good, but there have to be enough good ones for the account to be useable for you in your overall investing plan.

Finally, check out the fees. Despite an increasing number of lawsuits against employers for ducking their fiduciary duty to their employees, many still offer terrible retirement plans. Terrible plans have lousy investments and high fees. Ideally, the employer is paying all of the fees associated with the plan, but as long as the fees total less than one percent per year, the plan is probably still worth using.

457(b) plans can be a great addition to your retirement account quiver. However, before you start using one, you need to understand how they work.

DOGMA FEELS RIGHT UNTIL YOU STEP IN IT

SKEPTICS' GUIDE TO EMERGENCY MEDICINE

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What's Best in Out-Of-Hospital Cardiac Arrest

Should I stay or should I go now?

by KEN MILNE, MD

Case

A 22-year-old pitcher gets struck in the chest by a baseball coming off the bat while at spring training camp. He goes down on the mound and is suspected to have commotio cordis.[1] The athletic trainers immediately start CPR for the witnessed cardiac arrest. Paramedics quickly arrive and wonder if they should stay on the scene or transport the patient with resuscitation still in progress.

Clinical Question

What is the best in out-of-hospital cardiac arrest (OHCA)? Remain and gain or load and go?

Background

It is unclear from the published medical literature which practice is superior in adult patients with refractory OHCAs.

Some countries have a physician-led model, like in Europe, and provide more care in the field. In contrast, the North American model has traditionally been *"load and go."*

In the U.S., there is a fair bit of variability. Some emergency medical service (EMS) agencies transport almost all patients regardless of return of spontaneous circulation (ROSC), while others rarely transport if ROSC is not achieved. Which approach provides the best patient-oriented outcome has not been determined.

Reference: Grunau, et al. Association of intra-arrest transport vs continued on-scene resuscitation with survival to hospital discharge among patients with out-of-hospital cardiac arrest. *JAMA*. 2020;324(11):1058–1067.

- **Population:** Adults 18 years and older with non-traumatic OHCA (defined as persons found apneic and without a pulse who underwent either external defibrillation [bystanders or EMS] or chest compressions).
  - » **Exclusions:** Aged less than 18 years, do-not-resuscitate order being discovered, transport prior to cardiac arrest, missing data to classify as intra-arrest or to classify the primary outcome, missing variables required for propensity score analysis.
- **Intervention:** Intra-arrest transport prior to any episode of ROSC defined as palpable pulse for any duration.
- **Comparison:** Continued on-scene resuscitation.
- **Outcome:**
  - » **Primary Outcome:** Survival to hospital discharge.
  - » **Secondary Outcomes:** Survival with favorable neurologic outcome (defined as a modified Rankin scale [mRS] score of less than three).
- **Type of Study:** Multi-center (192 EMS agencies) observational study.

Authors' Conclusions

Among patients experiencing out-of-hospital cardiac arrest, intra-arrest transport to hospital compared with continued on-scene resuscitation was associated with lower probability of survival to hospital discharge. Study findings are limited by potential confounding due to observational design.

Results

The included population consisted of 43,969 patients. The median age was 67 years, two-thirds were male, and half were bystander- or EMS-witnessed. Of these OHCAs, 22 percent had an initial shockable rhythm and one-quarter underwent intra-arrest transport.

TABLE 1: Secondary Outcomes

	TRANSPORT VS ON-SCENE	DIFFERENCE (95% CI)
Survival to Hospital Discharge		
Full Cohort	3.8% vs 12.6%	-8.8 (-8.3 to -9.3)
Propensity Matched	4.0% vs 8.5%	-4.6(-5.1 to -4.0)
Survive Good Neuro (mRS<3)		
Full cohort	2.6% vs 10.2%	-7.6 (-8.2 to -7.0)
Propensity Matched	2.9% vs 7.1%	-4.2 (-4.9 to -3.5)
ROSC		
Full cohort	15.8% vs 48.3%	-32.6 (-33.4 to -31.7)
Propensity Matched	16.2% vs 39.3%	-23.2 (-24.2 to -22.1)

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Key Result

In adults with OHCAs, survival was more likely with continuous, on-scene resuscitation compared to intra-arrest transport.

- **Primary Outcome:** Survival to hospital discharge 12.6 percent on-scene vs 3.8 percent with transport.
  - » Difference -8.8 percent (95 percent CI -8.3 percent to -9.3 percent).
- **Secondary Outcomes:** See Table 1.
- **EBM Commentary:**
  1. **Association is Not Causation:** This was an observational study design, which means we cannot conclude causation, but rather only associations. Propensity score matching was done to mitigate some of the biases from non-randomized trials. While these statistical methods can help balance observed baseline covariates, they cannot get to the same level as a randomized control trial.[2]
  2. **Prognosis Bias:** Bias in research can be defined as something that could systematically move the results away from the best point estimate of an observed effect size. Prognosis bias has seven major domains: study participation, attrition, selection of candidate predictors, outcome definition, confounding factors, analysis, and interpretation of results.[3] The authors felt that their study could suffer from attrition bias. Adult patients with OHCA and unfavorable phenotypes may have had resuscitation terminated. This means they would not have the opportunity to achieve ROSC. There was a large difference in the termination of resuscitation (0.2 percent of intra-arrest transport compared to 56.7 percent for the on-scene resuscitation).
  3. **Safety of First Responders:** While patient care is the primary concern, we must also be concerned about the wellbeing of the EMS paramedics. Providing CPR in the back of a moving ambulance raises concerns about safety. There are data published in *Annals of Emergency Medicine* reporting an increased odds ratio of crashing with the use of lights and sirens.[4] This could lead to increased risk to paramedics who are providing resuscitation during transportation.

SGEM Bottom Line

Low-quality evidence suggests "remain and gain" is associated with better survival to hospital discharge in adults patients with OHCAs compared to "load and go."

Case Resolution

The paramedic crew stay on scene providing high-quality CPR, identify a shockable rhythm, defibrillate the pitcher, achieve ROSC, and transport the patient to the hospital.

Remember to be skeptical of anything you learn, even if you heard it on the Skeptics' Guide to Emergency Medicine. ⊕

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Article Inspiration

This month's article was inspired by Buffalo Bills safety Damar Hamlin's cardiac arrest sustained on the football field.

years. Be open to the possibility of change.

Honestly evaluate yourself. Make a list and be specific. Look at your strengths. If electrocardiogram interpretations are a strength, why do you believe it is a strength? What strategies have you employed to create it as a strength? Are there any uncertainties to resolve? Then, look at what may be needed to make an area of improvement into a strength. If point-of-care echocardiograms are a weakness, be specific. Is it looking for right heart strain or looking for regional wall motion abnormalities? Then, create a plan of action to improve these areas—do a review of literature, watch videos, take a course, practice with simulation, and implement into your real-time practice.[8]

2. **Frame your professional identity and motivations.**

Framing a growth mindset to emphasize pride in *effort* rather than pride in skill or status can combat pitfalls of overconfidence. To say, "I value the courage to admit mistakes, continual learning, and the effort to improve" over "I value my accolades, accomplishments, and titles" can be a powerful shift.[9]

3. **Implement cognitive pauses.**

"Cognitive pauses" are deliberate interruptions in your workflow to apply critical thinking or reevaluate available data. In medicine, cognitive pauses can be used to critically assess available lab results, imaging, challenge one's own final diagnosis, and/or reaffirm the possibility of overconfidence. What results do not fit with my diagnosis? Are there alternative diagnoses I have not considered? Cognitive pauses can be applied in a nondiscriminatory or in a situation-dependent fashion. For example, a "blanket" cognitive pause can be applied prior to every patient discharge or situation-dependent one when encountering an unfamiliar or very complex case.

4. **Review patient cases.**

Whether through following patients seen on a prior shift, video review of a resuscitation, or reviewing cases on a committee, seeing your own and others' practice patterns can reveal improvements in practice that weren't apparent before.

5. **Learn from others and ask for feedback.**

Learn from those around you through observation, asking them of their cases, and asking for effective feedback. "Signout time" may be a good opportunity to learn from colleagues' thought processes for a common patient. When asking or giving feedback, use the "SMART" mnemonic: specific, measurable, attainable, relevant, and timely.[10]

6. **Foster a supportive and reflective environment.**

Mitigating overconfidence is not just an individual task but an institutional task. Without institutional support and safe feedback mechanisms, a culture of overconfidence can be perpetuated. Clinical decision aids can be used to guide clinicians in their thought process and promote cognitive pauses. Measurable standards such as goal patients/hour or 72-hour repeat ED visits should be transparent to clinicians with scheduled feedback in a safe and nonjudgmental environment.

Sometimes, it can be sobering and tiring to always be introspective and mindful of your limitations. However, the better "you" has always been there in satisfying a curiosity, whether it's learning a new technique or rethinking your approaches. Even Socrates, a symbol of wisdom, posited that his wisdom came from his recognition of his own ignorance. He wisely mused, "I know that I know nothing."

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30th, President Biden signed the omnibus bill which removed the X waiver completely. Dr. Martin was invited to the White House to give remarks marking the occasion.

Voting Rights and the ED

Vot-ER, an initiative to help people register to vote in health care settings, is his most notable. The intersection of medicine and politics became abundantly more obvious to Dr. Martin the more he saw patients in the ED. "I understood the connection between physical health and civic health. I had taken two years out of my medical school training. I went to the Kennedy School of Government. I also worked in politics for a year working for the Governor of Vermont, which was a fascinating experience," he recalled.

Dr. Martin refers to the DMV experience where residents are asked to register to vote and draws a comparison to health care. "What the hell does voting have to do with driving? Aren't voting and health more related than voting and driving? And so, we want to create that same kind of connection between health and voting," said Dr. Martin. To date, Vot-ER has partnered with the American Medical Association to recognize voting as a social determinant of health as well as with 700 hospitals, community health centers, medical schools, and registered—either with voter registration or through vote by mail—over 80,000 people in health care facilities across the country.

Working at the White House

Dr. Martin learned about the White House Fellowship during his time at the Kennedy School from two of his mentors who had completed it and, as Dr. Martin admits, they were two of the coolest people he had ever met. "And so, I decided to apply two years ago." He got the job. Initially, Dr. Martin worked on voting rights at the Vice President's office because of his background with Vot-ER. But then was assigned a second role helping to run health care outreach in the West Wing Office of Public Engagement.

The national discussion around health equity and social determinants of health were the top focus points for Dr. Martin during his time at the White House. Seeing opportunities to, "mobilize the health care community to use some of the federal programs and the initiatives that were being rolled out by [the Biden] administration," as he said. Forums were a great asset to his work. "We had health equity forums where we would identify a specific issue like homelessness. We would invite a world renowned or nationally recognized figure who is doing work in homelessness to come and basically do a White House event talking about the issue, talking about the data, and some of the background."

While at the White House, Dr. Martin noticed opportunities to better convene the health care community around the political determinants of health, which, he notes, "are the upstream drivers that create the social determinants of health." And this—not surprisingly—got him thinking about how to help. "I think that there are missed opportunities to have health care providers and health care groups advocate together to address, via legislation, issues like housing insecurity, climate change, and food insecurity on behalf of the patients," said Dr. Martin. His latest initiative, A Healthier Democracy, seeks to be a convening place to bring physicians together in an effort to create social change in the health care arena. "It's a social entrepreneurship incubator," Dr. Martin described. "For ideas and initiatives that clinicians have, we want to be a home for that which addresses the accounting, legal, fundraising, and administrative elements so the clinicians can just focus on creating that project or initiative they know will move the needle for their patients."

Onward and Forward

As is often the case with those who have worked in the White House, we couldn't help but ask Dr. Martin if he has any political aspirations for himself. Though he doesn't have any plans to run for office anytime soon, "talk to me after my hundreds of thousands of student loan debt has been addressed," Dr. Martin jokingly said, he does like to use his platform for another cause: advocating for an overall life framework that helps fellow emergency physicians learn to relax. "If your heart cannot relax, it does not matter how hard your heart is pumping, there's literally nothing in the chamber. And so, I take pride in figuring out ways to really relax and unwind, too. And that is not something that I used to do. I think I developed that, have had to learn that, and quite frankly, unlearn other ways of being after residency ended for me."

DANIELLE GALIAN, MPS, is editor of *ACEP Now*.

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