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Geriatric Screeners 2.0: Time for a Paradigm Shift in Emergency Department Vulnerability Research

This editorial comments on the article by Milisen et al. in this issue.

The scientific growth of geriatric emergency care is accelerating.¹ While North American clinical leaders seeking American College of Emergency Physician's Geriatric Emergency Department Accreditation adapt infrastructure, continuing medical education foci, and operational protocols to optimize the outcomes of care for aging populations,^{2,3} researchers seek markers of short-term post-emergency department (ED) vulnerability for preventable undesirable outcomes.⁴ A clinically useful prognostic instrument to identify high-risk or low-risk populations would have a positive likelihood ratio of 10 or higher or a negative likelihood ratio of .1 or lower, respectively.⁵

Heeren et al add to our understanding of vulnerability accuracy by comparing the Identification of Seniors at Risk (ISAR), Flemish version of Triage Risk Screening Tool (fTRST), and the interRAI Emergency Department Screener.⁶ Their findings are consistent with decades of research quantifying the prognostic accuracy of numerous instruments (Table 1): ISAR, fTRST, and interRAI identify neither high risk nor low risk for vulnerability to prolonged ED length of stay, hospitalization, or unplanned readmissions.⁴ Despite these imperfections, geriatric ED vulnerability screeners are widely used because they promote the awareness of geriatric syndrome among patients and professionals and trigger safe interventions that demand low resources, such as delirium prevention.⁷

If after decades of research we cannot accurately predict outcomes associated with vulnerability in older ED patients, should we halt attempts to develop better screening instruments? Will it ever be possible to target those older patients effectively during an ED visit who are likely to benefit from intensive geriatric interventions and advanced care planning? Or is geriatric ED vulnerability research futile because aging in essence is chaotic and unpredictable? These questions address the core of geriatric emergency medicine. Figure 1 depicts two paths forward.

Vulnerability screening instruments ideally would identify older ED patients most likely to benefit from additional evaluation with Comprehensive Geriatric Assessment, which is effective for a range of patient-centered outcomes¹¹ but not feasible for all patients in most EDs. Pragmatically, we therefore envision a three-step ED approach. Step 1: Use

an accurate vulnerability assessment instrument to identify patients who may benefit from more holistic geriatric care. Step 2: Target assessment of geriatric impairments and presentations (such as cognitive impairment and falls) on the most vulnerable subset identified before initiating preventive interventions in a manner that is feasible and adaptable for different EDs. Step 3: Ensure adequate follow-up for a more thorough assessment either in the inpatient or outpatient setting.¹²

Ideally, this approach is associated with both better patient outcomes *and* better ED flow, but this theoretical construct unfortunately awaits conclusive validation. Until then, the real-world tension constraining geriatric syndrome screening is that the contemporary ED confronts at-capacity hospital volumes every day. Lacking proof of benefit or cost effectiveness, comprehensive serial assessments in the ED are not palatable when waiting rooms are filled with anxiously waiting patients of all ages. Some healthcare systems are adapting to this tension by creating geriatric-focused observation or frailty units that provide time for specialists' consultations,³ but many organizations lack this flexibility.

Why has predicting geriatric vulnerability been such a challenge? Heeren et al offer several explanations intended to guide future researchers.⁶ First, identifying the complexities underlying aging-related vulnerabilities such as cognitive dysfunction, mobility issues, polypharmacy, frailty, and social isolation may be unrealistic without more objective geriatric assessments beyond self-reported checklists. Diagnostic and prognostic ED accuracy research is emerging and evolving for dementia,¹³ delirium,¹⁴ falls,¹⁵ frailty,¹⁶ and other geriatric syndromes. Incorporation of these more objective validated measures into future vulnerability studies might improve instrument accuracy. Alternatively, these objective assessments of dementia, delirium, falls, or frailty could be used as serial geriatric assessment measures for those identified by the rapid screener as "vulnerable."

Second, Heeren et al suggest that one screening tool to predict multiple outcomes may be unrealistic because the intrinsic and extrinsic precipitants and risk factors for ED returns, hospitalization, functional decline, or institutionalization probably differ between patients and healthcare systems. ED return visits are often unpredictable with information routinely available in the ED.¹⁷ Alternatively, predictors of

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Table 1. Current State of Geriatric Emergency Department “Vulnerability” Instruments

Instrument	Year derived	Languages evaluated	Published ED accuracy studies, n	Outcomes predicted	Positive LR range	Negative LR range
APOP	2018	Dutch	1	90 d functional decline or mortality	3.3	.71
interRAI	2017	English French Flemish German Icelandic Portuguese	1	30 d Readmission 90 d Readmission	1.1 1.1	.63 .68
ISAR	1999	English, Spanish, Flemish	20	30 d ED returns Decline Readmission 90 d ED returns Decline Readmission	.67-1.52 1.09-1.45 0.86-1.18 0.84-1.34 1.15-1.30 1.04-1.30	.13-1.47 0.45-0.62 0.38-1.32 0.49-1.47 0.41-0.73 0.24-0.92
Rowland ⁸	1990	English	1	6 mo ED returns Readmission	1.28 1.35	0.94 0.93
Runciman ⁹	1996	English	1	6 mo ED returns Readmission	0.97 0.96	1.19 1.28
Silver Code ¹⁰	2010	English	1	6 mo ED returns Readmission	1.15 1.19	0.73 0.65
TRST	2003	English	14	30 d ED returns Decline Readmission 90 d ED returns Decline Readmission	1.25-1.51 1.11-1.58 0.94-1.57 1.01-1.23 0.94-1.58 1.16-1.22	0.43-0.72 0.46-0.74 0.48-1.13 0.75-0.98 0.42-1.10 0.51-0.73
Variables indicative of placement	2008	English	4	30-d Decline Readmission	1.11-3.55 0.93-1.12	0.58-0.65 0.77-1.48

Abbreviations: APOP, Acutely Presenting Older Patient; ED, emergency department; ISAR, Identification of Seniors at Risk; LR, likelihood ratio; TRST, Triage Risk Screening Tool.

hospital returns likely depend more on factors outside the ED, such as fragile caregiver support or inaccessible outpatient care.

Third, Heeren et al hypothesize that prognostic research in high activity/short time frame environments like the ED may suffer a “treatment paradox” in that clinicians consciously or subconsciously incorporate elements of the screening instrument into disposition or management decision making, thereby altering the natural course of events were no incorporation of these risks to occur. For cross-sectional accuracy studies, myriad forms of bias (incorporation, spectrum, differential verification, partial verification) skew observed sensitivity and specificity upward or downward.¹⁸ The bias subtypes and corresponding skew in accuracy are rarely contemplated or reported in vulnerability prediction instrument research.

Based on these historical challenges, Heeren et al propose a moratorium on additional prognostic accuracy

research. However, aborting additional vulnerability prediction research in its entirety may be premature. Older research consists almost entirely of patient-reported measures of physical and cognitive capacity. Potentially important and yet untested predictors of poor outcome in older people exist. Stratifying prognostic accuracy analyses across these predictors may improve the accuracy of existing vulnerability prediction models.

For example, readily available *International Classification of Diseases-10* codes in medical records may serve as a marker of the level of comorbidity and frailty.¹⁹ In addition, patients’ access to post-ED healthcare teams, nutrition, public transportation, and personal living situation may be unmeasured predictors of vulnerability, albeit more challenging and labor intensive to identify real time during an ED visit. In addition, the impact of acute illness severity is also neglected. Combining ED triage category with

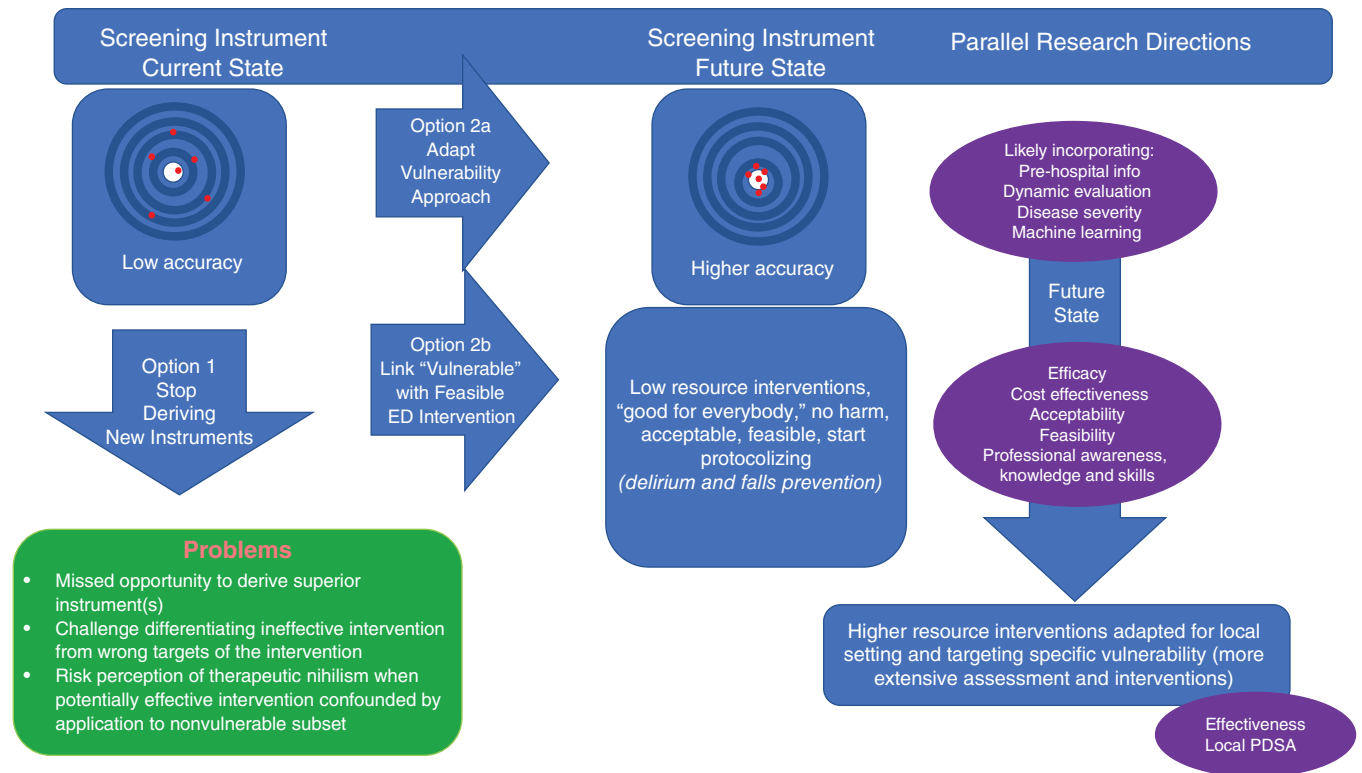


Figure 1. Approaches to advancing geriatric emergency department “vulnerability” screening research. Option 1, proposed by Heeren et al,⁶ would cease efforts to derive more accurate instruments than currently exist to focus on hybrid-effectiveness research. Alternatively, option 2a would adapt prior methods to derive “vulnerability” instruments that incorporate pre-emergency department data, dynamic reevaluations throughout emergency department episode of care, social and system factors, and current disease severity, perhaps using disruptive innovation such as machine learning. Option 2b could occur simultaneously with 2a while responding to risk identified by current imperfect instruments with widely available and generally acceptable interventions. More labor-intensive interventions like Comprehensive Geriatric Assessment would be reserved for high-resource settings or clinical research like Plan-Do-Study-Act (PDSA) cycles.

vulnerability screening may help prioritize geriatric follow-up and contribute to delivering appropriate care.²⁰

Vulnerability screening research also assesses risk at a fixed time point as if risk is static, yet even during short ED care episodes, factors like response to resuscitation or progression of confusion can occur. Integrating dynamic predictors into vulnerability algorithms requires incorporating challenging to obtain data in more complex models. Machine learning and artificial intelligence may prove invaluable assets to unlock this potential data evolution. Finally, the ED is a source of unmeasured variability in vulnerability research because most studies occur at a single site. If you have seen one ED, you have essentially seen one ED because the expectations and resources vary significantly between hospitals, regions, and nations. Lack of resources inside and outside the hospital could be considered system-level vulnerability that remains unmeasured in ED research.

Feasible and cost-effective geriatric ED care will depend on timely and accurate identification of vulnerable subsets most likely to benefit from extra time and screening, so how should future clinical researchers proceed? Heeren et al favor type 1 effectiveness-implementation hybrid research designed to measure clinical intervention effectiveness and the components of delivery simultaneously including fidelity, cultural capacity for change, and adaptability.²¹ Geriatric ED

vulnerability research has hardly explored these interwoven complexities including acceptability and usability of the diagnostic tool or the effectiveness of staff education. Feasibility of screening is also paramount to successful implementation of the entire concept of geriatric care but was only recently evaluated.²²

In addition to the hybrid research Heeren et al propose, concurrent efforts to improve geriatric vulnerability instrument accuracy are equally important but require innovative approaches that learn from prior research. The alternative of settling for the status quo of imperfect prediction instruments to proceed directly to interventional studies presents numerous pragmatic and ethical challenges. For example, differentiating ineffective interventions from vulnerability instruments that have targeted patients less likely to benefit becomes significantly more challenging with two moving pieces.

Furthermore, many potentially important predictors just discussed have never been evaluated in ED vulnerability studies, so investigators cannot adjust analyses for unmeasured confounders. In addition, without a clearly superior instrument, within-study and between-study interpretation of those adjusted analyses will be difficult because investigators will use different vulnerability instruments. Therefore, if moving directly to geriatric ED interventional research in an era of imperfect vulnerability instruments, researchers, journal editors, and study sections

must consider, measure, and adjust for these confounders if effective and pragmatic interventions are to be identified.


In the end, a catch-22 threatens the progression of geriatric emergency care. For the methodologic purist, awaiting conclusive vulnerability-focused intervention efficacy and cost-effectiveness research before starting implementation studies is the textbook approach. Prematurely moving imperfect vulnerability screeners to complex implementation science could squander opportunities to derive more accurate instruments and focus the wrong interventions at the wrong subset of patients while clinicians develop perceptions of therapeutic nihilism when the outcomes are suboptimal.

However, what is the value of vulnerability screening-intervention if the science cannot be widely implemented in clinical practice? Ultimately, the most logical path forward is twofold: continue efforts to derive more accurate vulnerability prediction instruments incorporating improvements in objective geriatric syndrome ED assessments and machine learning while simultaneously moving forward with implementation and effectiveness research on interventions generally accepted to reduce poor outcomes for problems such as delirium and falls.

In the absence of high-accuracy vulnerability screening instruments and effective interventions, funders must provide room for disruptive innovation by supporting the implementation and evaluation of rational interventions that have not yet been proven effective. The future of geriatric emergency medicine depends on accurate, thorough, and reproducible risk assessment interwoven with pragmatic interventions that align patient values with system resources, so our next steps require choosing wisely.

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