

The AHRQ Report on Diagnostic Errors in the Emergency Department: The Wrong Answer to the Wrong Question

Gabor D. Kelen, MD*; Amy H. Kaji, MD, PhD; and the Consortium of Societies of Emergency Medicine[†]

*Corresponding Author. E-mail: gkelen1@jh.edu.

0196-0644/\$-see front matter

Copyright © 2023 by the American College of Emergency Physicians.

<https://doi.org/10.1016/j.annemergmed.2023.03.031>

Mitigating patient harm is paramount for all engaged in medical practice. Accurate identification of root causes of medical errors is critical but requires appropriate methodology and sound analysis. Recently, the Agency for Healthcare Research and Quality (AHRQ) released a 744-page systematic review of diagnostic errors in the emergency department (ED).¹ This report received significant national mainstream and social media attention. Although seemingly concerned with only emergency medicine (EM), there are broad implications for all medical specialties and patient safety studies. This report exemplifies how unsound scientific methods lead to unreportable findings and can thus cast aspersions on any medical discipline.

Unchallenged, the AHRQ report may stand as an accepted reference standard for years. Although there are multiple deficiencies (Table), we proffer a constructive critique of key flaws that, in our opinion, largely nullifies the AHRQ report's findings. Our commentary focuses on 2 major shortcomings. The first is the failure to formulate a meaningful set of questions that apply to emergency practice. The second is the use of a highly suspect analysis of limited and inappropriate sources to arrive at an improbable set of conclusions. Thus, the report represents a type IV error—getting the wrong answer to the wrong question. Dramatic inferences, however flawed, once in the public domain may potentiate greater harms than it seeks to prevent and mislead future research direction and mitigation strategies. We hope this brief commentary helps guide patient safety researchers in honing research questions appropriate for a specific field of study, concentrate on systems effects rather than individual failings, and eschew the use of weak data/sources to arrive at conclusions.

THE WRONG QUESTION

The very premise of the report, that EDs represent a particular high risk of diagnostic errors, is attributed to 6

malpractice/incident report studies that do not support the contention.²⁻⁷ Some do not even address the issue. Others show the same or a better diagnostic error profile for EM than outpatient and inpatient settings.⁴ The data set for another is more than 50 years old.⁷ Indeed, EM ranks about average or in the lower half of specialties for any legal claims, including those with payments.^{8,9}

The AHRQ report focuses on diagnostic errors made at the individual level. This is contrary to the standard model of medical errors, which stresses systemic causes of error (see below).¹⁰ Indeed, the “greatest threat to patient safety in the ED is crowding due to excessive inpatient boarding.”¹¹ No one in EM would place diagnostic errors ahead of crowding as a greater threat. Although improving diagnostic accuracy in the ED is laudable, it pales in relation to the harms imposed from crowding.

Harms related to crowding are well referenced elsewhere,^{11,12} but include the following aspects: morbidity and mortality related to consequential delays of treatment for both high- and low-acuity patients, consequential ambulance diversion, increased adverse events, and preventable errors from human distractions, increased consequential left without being seen, worse outcomes, longer and more costly inpatient stays, increased violence to staff, clinician and staff burn out and high turnover, and increased legal actions.

The AHRQ report also fails to understand the fundamentals of emergency practice. Establishing “diagnoses” is often of secondary concern and is sometimes impractical or irrelevant in the ED. EM concerns itself with the evaluation and management approach to symptom-complex presentations of acute and decompensated conditions. The concept of diagnostic error as used in the report is not the appropriate paradigm to understand associated harms. The key issue is whether the approach to emergency patients was appropriate for the presentation. Not establishing a specific diagnosis in the ED is not

Table. Significant issues with the AHRQ report on diagnostic errors in the emergency department.

Wrong Question	
Wrong priority for EM practice	Patient harm related to ED crowding is well documented and may be the greatest risk to patient safety, but is largely ignored by the patient safety community.
The premise of the report is not supported	The premise that EDs are particularly at high risk for DEs is based on 6 malpractice/incident report studies that either do not address or do not support the assertion. ²⁻⁷ One of these is from 1977-1981. In fact, EM ranks about average or in the lower half of specialties for any claim and claims with payments. ^{8,9}
EM practice is not “diagnosis” oriented	EM concerns itself with management of acute decompensated conditions presenting as symptom complexes. Establishing a definitive diagnosis is secondary and often impractical. Example: an admitting diagnosis of a GI bleed by the emergency physician should not be considered a missed diagnosis by the emergency physician if the final diagnosis is a peptic ulcer. Patient harm was minimized by admitting the patient for a definitive diagnostic and therapeutic endoscopy.
Inappropriate Methodology	
Analysis did not use the revised accepted definition of diagnostic errors	The National Academy of Medicine (NAM) revised the definition of diagnostic errors as follows: the failure to (a) “establish an accurate and timely explanation of the patient’s health problem(s)” or (b) “communicate that explanation to the patient.” ²⁷ The NAM report acknowledges that a working diagnosis may lack precision, can be incomplete, and is an iterative process that “involves both the passage of time and the collaboration of health care professionals, patients, and their families to reach an explanation.” ²⁸ The AHRQ authors improvised an expansive convenience set of definitions, including accepting the definitions as presented in the cited studies. None of the 3 key studies cited ¹⁴⁻¹⁶ considered diagnostic errors from the 2015 NAM perspective.
International studies cited are not generalizable to the United States	EM is not recognized as a specialty in the Canary Islands or Switzerland, and Canada’s system is also different. It is unclear whether a board-certified emergency physician ever saw the single patient who died in the Canadian study ED. ¹⁶
The authors paid little heed to public comment	The AHRQ process allows for public comment, and each comment needs a public response. The authors were made aware of the significant methodological flaws yet persisted in perpetuating the errors. ¹⁸
Relying on retrospective adjudication of errors	There is no evidence that retrospective judgments (regarding diagnostic errors) reviewing medical records can be made reliably. ²⁹
Lack of clarity if inpatient teams perpetuated the claimed diagnostic error	In virtually all studies, it is unclear at what point the ED impression was later realized as discrepant and whether the final diagnosis was made with the benefit of further information. The “first impression” of the intake admission team is unknown.
Final diagnosis is not necessarily the gold standard	Inpatient and outpatient diagnoses used for comparisons may be wrong.
Wrong Answer	
Derivation of US estimates of diagnostic errors from weak studies was inappropriate	Of the 19,127 citations reviewed, 279 were reviewed for the report. Of these, only 3 small (1%) international studies based on study designs that were retrospective or on chart review were considered “high quality” and “prospective.”
Attribution of the cause of ED diagnostic errors from malpractice data	There are no denominator data, and numerators focus on payout potential because legal actions often “must” claim cognitive diagnostic errors to establish the reason for the harm.
Influence	
Sensationalization of the data	Despite the weak underpinnings and many acknowledged caveats, the inappropriately derived data were made the focus of mainstream and social media attention. According to the AHRQ lead author’s work, ⁴ and other sources, ^{8,9} diagnostic errors in EDs align with or are better than those in outpatient and inpatient settings.
The report may increase patient harm	To avoid diagnostics, emergency physicians may practice defensive medicine ordering unnecessary tests, imaging, and consultations—all worsening ED crowding—a situation well documented to be associated with patient harm.
All diagnostic errors are implicated as due to emergency physicians	Much goes into EM diagnostic impressions, including consult opinion, referring physician information, imaging impression, and discussion with the admitting team.
Influence on medical students	Medical students may be dissuaded by mentors from considering EM, giving the implication that EM training is wanting.

DE, diagnostic errors; GI, gastroenterology.

synonymous with a “missed” diagnosis. Indeed, recent work shows that even in the best of circumstances, decreasing missing consequential diagnoses has its limits.¹³

Practicing frequently at volumes equivalent to acute disasters, EDs must function under a utilitarian ethical approach (greatest good for the greatest number) as opposed to the egalitarian approach (best outcome for each patient).¹¹ That emergency practice must orient to decrease aggregate harm risks for everyone in the ED is not widely appreciated outside of EM.

WRONG ANSWERS DERIVED FOR THE QUESTIONS POSED

Inappropriate derivation of diagnostic error estimates

Using only 3 small international nongeneralizable studies,¹⁴⁻¹⁶ the report erroneously estimates that 5.7% of US ED visits experience a diagnostic error, 2% result in harm, and 0.2% of visits result in preventable deaths. One of these, a 2004 Canary Islands study, used an unmatched case-control technique comparing patients who returned to the ED within 72 hours versus consecutive controls who did not.¹⁴ The other, from Switzerland, evaluated an unrepresentative ultraselect group of 755 (5.4%) ED patients admitted to a specific internal medicine service.¹⁵

The study most egregiously misappropriated is from Ottawa, Canada, also from 2004.¹⁶ In an unrepresentative sample of 503 “high-acuity ED patients,” one (0.2%) died from an aortic dissection. Extrapolating to the annual undifferentiated US ED population, the report prominently claims that EDs cause 250,000 preventable deaths annually from diagnostic errors alone. Perhaps the authors did not consider the absurd implication that this would be the third leading cause of death in the United States, behind cardiac and cancer-related conditions (coronavirus disease 2019 temporarily occupied the third spot in 2021). With this reasoning, given the multiple sources of medical errors in all settings, engaging with US health care would be the leading cause of death by a wide margin.

These 3 international studies are offered uncritically and without acknowledgment of potential overestimation, even though these methodological failings were noted during review by at least one prominent advisor.¹⁷ In contrast, other studies in both the United States and elsewhere that show diagnostic errors and harms are orders of magnitude less. These are dismissed as underestimates and retrospective, although methods of error adjudication are similar to those of the AHRQ report’s selected studies. A study from the same Canadian center in 2010 found a significantly lower diagnostic error rate of 0.11% among 13,495 “undifferentiated” (admitted or discharged) ED patients,

with only one (0.0074%) related death.¹⁸ Examining ED discharges from 2012 to 2015, Aaronson et al¹⁹ noted adverse events of only 0.012% of 413,167 patients and only 3 (0.00073%) diagnostic error-related deaths. Sklar et al,²⁰ omitted from the AHRQ report, reviewed unexpected deaths related to “any” error type among ED-discharged patients in their university center in 2005. The finding of 9 (0.009%) deaths per 100,000 visits potentially related to an error, consistent with Calder et al,¹⁸ would imply about 11,000 annualized deaths—substantial, but orders of magnitude less than 250,000.

Inappropriate use of malpractice data to establish cognitive failings as the primary cause of ED diagnostic errors

Although the AHRQ report acknowledges biases inherent in malpractice claims reports, the heavy reliance on malpractice data are evident as “malpractice” is referred to more than 100 times in just the main text of the report.

Although much can be learned from analyses of legal actions, such databases cannot be used to determine causation rates or even hierarchies. There are no denominator data, and numerator conditions are highly biased to focus on payouts. Several authorities note that there is no real relationship between malpractice claims and medical error.²¹⁻²³

Legal actions often “must” claim cognitive diagnostic errors as a winning strategy to establish a predicate for harm. Unfortunately, based on these flawed sources, the report emphasizes throughout that “[most]...serious harms are attributable to ... cognitive error...,” usually related to “inadequate clinical knowledge, skills, or reasoning.”¹ These assertions imply that emergency physicians receive inadequate training and that EM board certification is substandard. There are anecdotal reports from EM match applicants that their medical schools have made such a reference to dissuade them from choosing EM as a career.

Using malpractice reports, the AHRQ authors assert that cognitive deficits were responsible for nearly 90% of diagnostic errors. Interestingly, this figure comes from a study of the AHRQ lead author.⁴ The analyses include missed cancers owing to poor clinical judgment in the ED, an absurd concept. Several other cited works do not attribute such a high proportion to cognitive errors and include other specialties. That diagnostic errors in any specialty are largely cognitive is contrary to the standard model of medical errors, which asserts that the vast majority originate from system failures and not from individual lapses alone.¹⁰ Furthermore, the concept of “cognitive” error does not apply well to EM. There is no other specialty that frequently functions beyond peak stimulus saturation.

Emergency physicians contend with simultaneous complex interactions, layers of distractions, multitasking requirements, and rapid decisionmaking with incomplete data. These environmental factors strongly influence emergency physicians' situational awareness.²⁴ Thus, what appears to be “cognitive” is largely systemic. Implying a high degree of “cognitive” diagnostic errors places blame on individuals and betrays a fundamental misunderstanding of EM practice.

CONSEQUENCES OF A FLAWED REPORT

The consequence of addressing specific patient safety concerns in any medical discipline could paradoxically compromise overall patient safety. The AHRQ report may lead to efforts to improve ED diagnostic errors without consideration of interdependent safety issues and influence on clinicians. For example, each time a newly designated “high-risk” condition is added to receive special attention (ST-elevation myocardial infarction, stroke, sepsis, pulmonary embolism, trauma mechanism, suicidality, and vulnerable patients), finite resources are diverted from other seriously ill ED patients who carry no designation. Addressing diagnostic errors in isolation from other patient safety issues almost certainly leads to pressures elsewhere in the system that may increase overall harms.²⁵

A worrisome consequence of the AHRQ report is that to avoid diagnostic errors and criticism, emergency physicians may admit more patients, order more tests and diagnostic imaging attendants with radiation and dye risks, request more consults, do even lengthier workups, and observe more patients for longer durations. These actions will exacerbate ED crowding and lead to more associated adverse outcomes—including paradoxically more diagnostic errors from incremental task demands.

LESSONS LEARNED

What are the lessons to be considered from the flawed AHRQ report? It appears that standard methods and a systematic approach to studying medical errors are wanting.²⁶ Value of chart review adjudication and malpractice/incident reports are limited at best and may be misleading. Research should be directed at developing reliable approaches to measurement and causation attribution. Patient safety researchers should consult those in the field of study to ensure targeting the highest priorities and avoiding creating worse harms.²⁵ After an exhaustive literature search, if only weak data remain, the analysis should neither proceed nor be published. Investigations should involve the end-user clinician, and particular care should be taken that the question is relevant

and the premise is properly established. Arriving at the wrong answer to the wrong question is a type IV error that can result in many levels of subsequent profound harm.

We end with the following appeal. When considering patient safety in the ED, the focus must be on boarding and resultant crowding. All specialties and hospital services affect ED crowding and boarding. The entire house of medicine must conjointly commit to addressing this most important and pernicious source of patient harm.

Supervising editor: David L. Schriger, MD, MPH. Specific detailed information about possible conflict of interest for individual editors is available at <https://www.annemergmed.com/editors>.

Author affiliations: From the Department of Emergency Medicine (Kelen), Johns Hopkins University, Baltimore, MD; American College of Emergency Physicians (Kelen), Irving, TX; the Department of Emergency Medicine (Kaji), Harbor-UCLA Medical Center, David Geffen School of Medicine at UCLA, Los Angeles, CA; and Society for Academic Emergency Medicine (Kaji), Des Plaines, IL.

Authorship: All authors attest to meeting the four [ICMJE.org](http://www.icmje.org) authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist. The authors report this article did not receive any outside funding or support.

REFERENCES

1. Newman-Toker DE, Peterson SM, Badhian S, et al. *Diagnostic Errors in the Emergency Department: A Systematic Review. Comparative Effectiveness Review No. 258.* Agency for Healthcare Research and Quality; 2022.
2. Selbst SM, Friedman MJ, Singh SB. Epidemiology and etiology of malpractice lawsuits involving children in US emergency departments and urgent care centers. *Pediatr Emerg Care.* 2005;21:165-169.
3. Hussain F, Cooper A, Carson-Stevens A, et al. Diagnostic error in the emergency department: learning from national patient safety incident report analysis. *BMC Emerg Med.* 2019;19:77.
4. Newman-Toker DE, Schaffer AC, Yu-Moe CW, et al. Serious misdiagnosis-related harms in malpractice claims: the “Big Three”—vascular events, infections, and cancers. *Diagnosis (Berl).* 2019;6:227-240; Erratum appears in *Diagnosis (Berl).* 2020;8:127-128.
5. Kachalia A, Gandhi TK, Puopolo AL, et al. Missed and delayed diagnoses in the emergency department: a study of closed malpractice claims from 4 liability insurers. *Ann Emerg Med.* 2007;49:196-205.
6. Brown TW, McCarthy ML, Kelen GD, et al. An epidemiologic study of closed emergency department malpractice claims in a national database of physician malpractice insurers. *Acad Emerg Med.* 2010;17:553-560.

7. Trautlein JJ, Lambert RL, Miller J. Malpractice in the emergency department—review of 200 cases. *Ann Emerg Med.* 1984;13:709-711.
8. Jena AB, Seabury S, Lakdawalla D, et al. Malpractice risk according to physician specialty. *N Engl J Med.* 2011;365:629-636.
9. Schaffer AC, Jena AB, Seabury SA, et al. Rates and characteristics of paid malpractice claims among US physicians by specialty, 1992-2014. *JAMA Intern Med.* 2017;177:710-718.
10. Kohn LT, Corrigan JM, Donaldson MS, eds. *To Err is Human: Building a Safer Health System.* National Academy Press; 2000.
11. Kelen GD, Wolfe R, D'Onofrio G, et al. Emergency department crowding: the canary in the health care system. *NEJM Catalyst.* Published online September 28, 2021. <https://catalyst.nejm.org/doi/full/10.1056/CAT.21.0217>
12. Morley C, Unwin M, Peterson GM, et al. Emergency department crowding: a systematic review of causes, consequences, and solutions. *PLoS One.* 2018;13:e0203316.
13. Waxman DA, Kanzaria HK, Schriger DL. Unrecognized cardiovascular emergencies among medicare patients. *JAMA Intern Med.* 2018;178:477-484.
14. Nuñez S, Hexdall A, Aguirre-Jaime A. Unscheduled returns to the emergency department: an outcome of medical errors? *Qual Saf Health Care.* 2006;15:102-108.
15. Hautz WE, Kämmer JE, Hautz SC, et al. Diagnostic error increases mortality and length of hospital stay in patients presenting through the emergency room. *Scand J Trauma Resusc Emerg Med.* 2019;27:54.
16. Calder LA, Forster A, Nelson M, et al. Adverse events among patients registered in high-acuity areas of the emergency department: a prospective cohort study. *CJEM.* 2010;12:421-430.
17. Pines JM. The AHRQ diagnostic errors study: a peer reviewer's reaction. *ACEP NOW.* Published online December 29, 2022. https://www.acepnow.com/article/ahrqs-diagnostic-error-study/?elq_mid=67243&elq_cid=30282689&utm_campaign=41479&utm_source=eloquaEmail&utm_medium=email&utm_content=Email-Research-IssueAlert-ACEPeNOW_2023-1-1v2.html
18. Calder L, Pozgay A, Riff S, et al. Adverse events in patients with return emergency department visits. *BMJ Qual Saf.* 2015;24:142-148.
19. Aaronson E, Borczuk P, Benzer T, et al. 72h returns: a trigger tool for diagnostic error. *Am J Emerg Med.* 2018;36:359-361.
20. Sklar DP, Crandall CS, Loeliger E, et al. Unanticipated death after discharge home from the emergency department. *Ann Emerg Med.* 2007;49:735-745.
21. Localio AR, Lawthers AG, Brennan TA, et al. Relation between malpractice claims and adverse events due to negligence: results of the Harvard Medical Practice Study III. *N Engl J Med.* 1991;325:245-251.
22. Kachalia AB, Mello MM, Brennan TA, et al. Beyond negligence: avoidability and medical injury compensation. *Soc Sci Med.* 2008;66:387-402.
23. Studdert DM, Mello MM, Gawande AA, et al. Claims, errors, and compensation payments in medical malpractice litigation. *N Engl J Med.* 2006;354:2024-2033.
24. Levin S, Sauer L, Kelen G, et al. Situation awareness in emergency medicine. *IJSE Trans Healthc Syst Eng.* 2012;2:172-180.
25. Benishek LE, Kachalia A, Biddison LD. Improving clinician well-being and patient safety through human-centered design. *JAMA.* 2023; <https://doi.org/10.1001/jama.2023.2157>; Epub ahead of print.
26. Edlow JA, Pronovost PJ. Misdiagnosis in the emergency department: time for a system solution. *JAMA.* 2023;329:631-632.
27. National Academies of Sciences, Engineering, and Medicine. *Improving Diagnosis in Health Care.* The National Academies Press; 2015.
28. Committee on Diagnostic Error in Health Care; Board on Health Care Services; Institute of Medicine; The National Academies of Sciences, Engineering, and Medicine. Overview of diagnostic error in health care. In: Balogh EP, Miller BT, Ball JR, eds. *Improving Diagnosis in Health Care.* National Academies Press; 2015. <https://www.ncbi.nlm.nih.gov/books/NBK338594/>
29. Brennan TA. The Institute of Medicine report on medical errors—could it do harm? *N Engl J Med.* 2000;342:1123-1125.

APPENDIX

[†]The Consortium of Societies of Emergency Medicine contributing authors include: Leah B. Colucci, MD (American Academy of Emergency Medicine Residents and Students Association); Arlene S. Chung, MD (Council of Residency Directors in Emergency Medicine); Monisha Dilip, MD (Emergency Medicine Residents' Association); David Foster, MD (Council of Residency Directors in Emergency Medicine); Richard J. Hamilton, MD (Association of Academic Chairs of Emergency Medicine); Hamza Ijaz MD, (Society for Academic Emergency Medicine - Residents and Medical Students); Samuel M. Keim, MD, MS (American Board of Emergency Medicine); Thuy Nguyen, MD, (Emergency Medicine Residents' Association); Ali S. Raja MD, MPH, (Society for Academic Emergency Medicine); Sandra M. Schneider, MD (American College of Emergency Physicians); Kraftin E. Schreyer, MD (American Academy of Emergency Medicine); Robert E. Suter, DO (American College of Osteopathic Emergency Physicians); Wendy W. Sun, MD (Society for Academic Emergency Medicine - Residents and Medical Students).