


# Analysis of lawsuits related to diagnostic errors from point-of-care ultrasound in internal medicine, paediatrics, family medicine and critical care in the USA

Michael Reaume,<sup>1</sup> Mehdi Farishta,<sup>2</sup> Joseph A Costello,<sup>3</sup> Tyler Gibb,<sup>4</sup> Thomas A Melgar <sup>5</sup>

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/postgradmedj-2020-137832>).

<sup>1</sup>Pulmonary and Critical Care Medicine, Henry Ford Hospital, Detroit, Michigan, USA

<sup>2</sup>Internal Medicine, Western Michigan University Homer Stryker MD School of Medicine, Kalamazoo, Michigan, USA

<sup>3</sup>Research, Uniformed Services University of the Health Sciences, Bethesda, Maryland, USA

<sup>4</sup>Department of Medical Ethics-Humanities and Law, Western Michigan University Homer Stryker MD School of Medicine, Kalamazoo, Michigan, USA

<sup>5</sup>Pediatrics, Adolescent and Internal Medicine, Western Michigan University Homer Stryker MD School of Medicine, Kalamazoo, Michigan, USA

## Correspondence to

Dr Thomas A Melgar, Pediatrics, Adolescent and Internal Medicine, Western Michigan University Homer Stryker MD School of Medicine, Kalamazoo, MI 49008, USA; [thomas.melgar@med.wmich.edu](mailto:thomas.melgar@med.wmich.edu)

Received 7 April 2020

Revised 4 May 2020

Accepted 5 May 2020



© Author(s) (or their employer(s)) 2020. No commercial re-use. See rights and permissions. Published by BMJ.

**To cite:** Reaume M, Farishta M, Costello JA, *et al.* *Postgrad Med J* Epub ahead of print: [please include Day Month Year]. doi:10.1136/postgradmedj-2020-137832

## ABSTRACT

**Purpose** The purpose of this study is to identify the extent of diagnostic error lawsuits related to point-of-care ultrasound (POCUS) in internal medicine, paediatrics, family medicine and critical care, of which little is known.

**Methods** We conducted a retrospective review of the Westlaw legal database for indexed state and federal lawsuits involving the diagnostic use of POCUS in internal medicine, paediatrics, family medicine and critical care. Retrieved cases were reviewed independently by three physicians to identify cases relevant to our study objective. A lawyer secondarily reviewed any cases with discrepancies between the three reviewers.

**Results** Our search criteria returned 131 total cases. Ultrasound was mentioned in relation to the lawsuit claim in 70 of the cases returned. In these cases, the majority were formal ultrasounds performed and reviewed by the radiology department, echocardiography studies performed by cardiologists or obstetrical ultrasounds. There were no cases of internal medicine, paediatrics, family medicine or critical care physicians being subjected to adverse legal action for their diagnostic use of POCUS.

**Conclusion** Our results suggest that concerns regarding the potential for lawsuits related to POCUS in the fields of internal medicine, paediatrics, family medicine and critical care are not substantiated by indexed state and federal filed lawsuits.

## INTRODUCTION

Point-of-care ultrasound (POCUS) is a powerful adjunct to the traditional physical examination that has been shown to enhance diagnostic capabilities at the bedside.<sup>1–3</sup> This technology provides the clinician with a real-time, dynamic look at the patients' vital organ systems and can be used to evaluate a plethora of physiologic parameters.<sup>1–3</sup> The utility of POCUS has been demonstrated even in the hands of novice users and trainees, where the use of this tool can reliably enhance the physical examination and diagnose some of the most life-threatening conditions.<sup>4–8</sup> In addition to these diagnostic benefits, POCUS is minimally invasive, lacks harmful ionising radiation, and may improve patient satisfaction and engagement in shared decision making.<sup>9–12</sup> With the value of POCUS becoming more evident, there is emerging implementation in many areas of

medicine. As adoption of this technology continues to increase, there are some concerns regarding the potential for lawsuits related to its use in clinical practice.

The implementation of POCUS into the broad range of medical specialties has varied greatly. Emergency medicine (EM) is a leading specialty in POCUS integration, with the introduction into the specialty in the 1980s and guidelines for POCUS use in the field dating back to 2001.<sup>13–14</sup> With the increase in POCUS use by EM physicians over time, concerns for litigation related to potential misdiagnoses and inappropriate treatments were raised.<sup>15</sup> Despite these concerns, according to multiple studies, POCUS use is an unlikely source of litigation against EM physicians.<sup>15–16</sup> Further, EM literature on POCUS suggests that liability may be more likely from the failure to perform POCUS in indicated situations, rather than misinterpretation or misdiagnoses as a result of its use.<sup>15–16</sup> Similar research has found these results to also be true in the fields of neonatology and paediatric subspecialties.<sup>17</sup> Consequently, concerns regarding the potential for lawsuits related to POCUS in these specialties appear to be unsubstantiated in the literature.

As other specialties continue to adopt POCUS use, similar concerns regarding litigation are likely to arise. Practising primary care physicians and directors of primary care training programmes reported legal concerns as a barrier to the implementation of POCUS into their practice and training programmes.<sup>18–20</sup> Legal concerns were also cited as a barrier to the implementation of POCUS into critical care medicine (CCM) fellowship training.<sup>21</sup> This study aims to identify the extent and prevalence of diagnostic error lawsuits related to POCUS use in internal medicine (IM), paediatrics, family medicine (FM) and CCM, of which little is known.

## MATERIALS AND METHODS

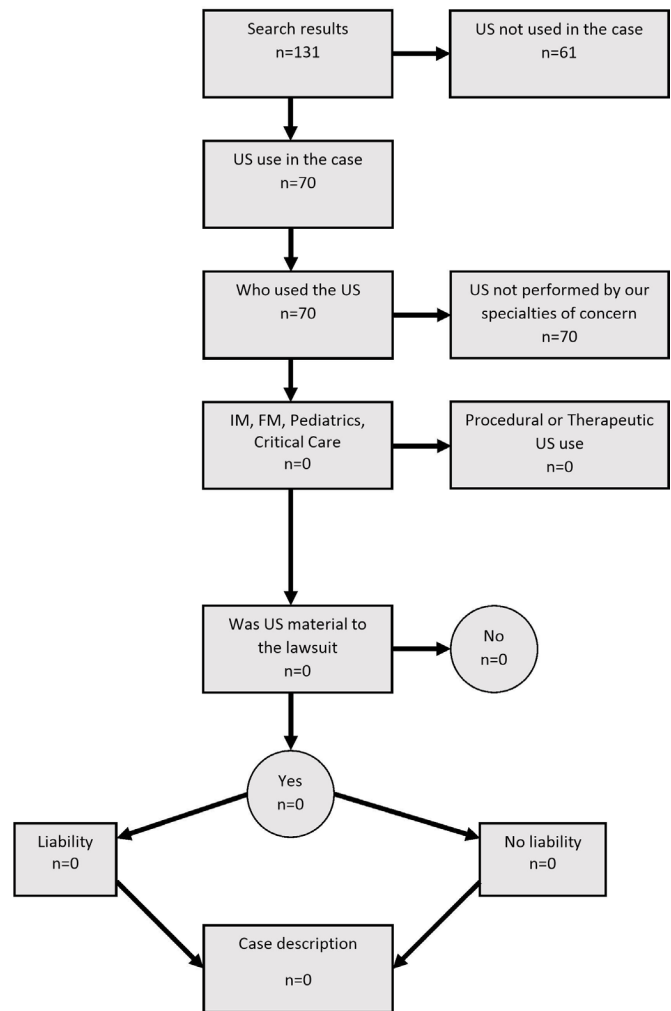
We conducted a retrospective review of the Westlaw<sup>22</sup> legal database for indexed state and federal lawsuits related to diagnostic errors in use of POCUS within IM, paediatrics, FM and CCM. The Westlaw database is a restricted, online legal resource that includes state and federal lawsuits dating back to 1939. It links to greater than 40 000 databases of state and federal case law, statutes and

other legal records. The Westlaw database is a well-validated legal resource, though is not a fully comprehensive repository of all cases in the USA largely due to the inability to account for cases that are dismissed, settled out-of-court, unreported or unpublished. The database queries were conducted by a medical librarian (JAC). First, we attempted to replicate search strategies used in prior published studies on POCUS litigation<sup>15–17</sup>; however, this was not possible given incomplete search terms descriptions in the literature. Nonetheless, using the available search terms from prior studies,<sup>15–17</sup> attempts to reconstruct the prior review search strings were made. Search dates and the number of cases returned were used as measures of successful replication. Successful replication did occur, giving us a reasonable indication that our search strategy was precise. This strategy was then augmented to account for variability in medical terminology to target our specific population. We chose to limit our search string to specific terms such as, ‘diagnostic error’ or ‘misdiagnosis’. This decision was reached after determining the use of broader terms (eg, clinical errors) was not specific and, did not replicate prior study approaches. The complete search terms are available in the online supplementary appendix. With the updated search parameters, we queried Westlaw for all state and federal cases on 1 October 2019.

The search revealed 131 cases that were then reviewed for applicability to the research question at hand. To determine relevance to our study objective and whether or not the use of POCUS was material to the substance of the lawsuit, cases were reviewed using the algorithm presented in figure 1. Cases relevant to our study objective would include POCUS for diagnostic use by clinicians in IM, paediatrics, FM or CCM where the use of POCUS was material to the lawsuit. Obstetrical ultrasounds were excluded although these may be performed by FM practitioners. All retrieved cases were reviewed independently by three physicians, and all were reviewed in their entirety regardless of their exclusion point in the algorithm. Any cases in which there were discrepancies between the physician-reviewers were re-examined by the three physicians and additionally reviewed by a lawyer to resolve the discrepancies.

## RESULTS

Of the 131 cases retrieved by our search strategy, 61 cases did not involve the use of ultrasound in relation to the lawsuit claim. In these cases, ultrasound was generally either mentioned in a reference case, suggested as an imaging modality that could have been used by the clinicians (and they failed to do so), or mentions ultrasound use in the patient case that was not temporally related to the lawsuit. Of the remaining 70 that were noted to have ultrasound use cited in the lawsuit, nearly all of them were performed and reviewed by the radiology department, or echocardiography studies performed by the cardiology department. Cases involving US use at the bedside were primarily in the area of obstetrics, which were excluded in our study. There was one case (2016 WL 4480690) that we determined to be potentially relevant to our study objective as the lawsuit was related to the use of POCUS; however, the physician was not in one of our disciplines of interest, and the liability was related to inappropriate billing and procedural use. That case involved a physical medicine and rehabilitation physician who was sued for knowingly and falsely billing for the use of bedside ultrasound guidance for procedures where ultrasound is not necessary. These included botox injections, trigger point injections and blood draws. There were no cases of physicians in IM, paediatrics, FM or CCM being sued for the diagnostic use of POCUS.



**Figure 1** Algorithm used to determine if a lawsuit was relevant to our study objective and whether or not the use of point-of-care ultrasound (US) was material to the lawsuit. FM, family medicine; IM, internal medicine.

## DISCUSSION

Our results suggest that POCUS use in the fields of IM, paediatrics, FM and CCM has been an unlikely source of lawsuits. Our findings fill an important gap in the current literature, supplementing previous studies on this topic in EM, neonatology and paediatric subspecialties.<sup>15–17</sup> Nearly 100% of physicians in high-risk specialties and at least 75% in low-risk specialties will face a legal claim during their career.<sup>23</sup> From 1 January 1992 to 31 December 2014, there were 280368 paid malpractice claims reported to the National Practitioner Data Bank as paid on behalf of physicians, with a mean payment of US\$329 565.<sup>24</sup> Physicians’ perceptions of their risk of liability impacts clinical practice,<sup>25 26</sup> and uncovering the potential for litigation due to the implementation of POCUS in our specialties of interest is an important issue. Concerns about facing a lawsuit as a result of POCUS use has the potential to negatively affect the implementation of POCUS by clinicians, which could limit its overall benefits on a population level. This is even more apparent in the concerns voiced by educational leadership, citing the potential for litigation as a barrier to implementing POCUS training in their programmes.<sup>18 19 21</sup> The results of this study provide clinicians with reliable data to make this determination based

on evidence as opposed to perception and unsupported fear of legal liability.

Our study has several limitations. First, our review of the Westlaw database may have missed lawsuits related to POCUS use in IM, paediatrics, FM and CCM due to limitations inherent to the database or to our search strategy. While the Westlaw database is a well-validated resource commonly used by legal professionals and legal scholars,<sup>22</sup> and reliably used for evaluating medical malpractice litigation in numerous studies,<sup>15–17 27–35</sup> it is not a comprehensive repository of all legal cases in the USA. We were unable to account for cases that were either dismissed, settled out-of-court or were unreported or unpublished. Furthermore, the database includes cases in the USA only, and may not reflect trends in POCUS litigation globally. In addition, while we made every attempt to maximise the precision of our search strategy, there may be cases in the database that we did not capture. Nonetheless, if POCUS use was a significant source of litigation in IM, paediatrics, FM or CCM, we would anticipate that there would be at a minimum, an identifiable precedent-setting case that would have been captured in our query. Another limitation is the exclusion of obstetrical ultrasounds, which would be of relevance to FM clinicians who perform obstetrical POCUS in their practice. Obstetrical ultrasounds are the leading field affected by ultrasound-related liability and these examinations have specific practice parameters that establish the standard of care for both routine and specialised examinations.<sup>36</sup> Evaluating litigation surrounding obstetrical ultrasounds was not an objective of our study. Lastly, it must be considered that while our current review did not identify POCUS use to be a significant source of lawsuits, this data may not be predictive of future trends in POCUS use and the potential for litigation surrounding it. For example, programme leadership in IM, FM and CCM report that formal POCUS training is available or in the process of being established in approximately 40% of these programmes, while only 12.4% of paediatrics programmes report established curricula.<sup>19 37 38</sup> This suggests that there is significant opportunity for increasing POCUS usage and the potential for subsequent related lawsuits. As usage increases over the next decade additional studies of POCUS litigation will need to be done.

## CONCLUSION

The potential for lawsuits related to POCUS use has been cited as a barrier to implementing this diagnostic tool into practice<sup>20</sup> as well as formal medical training.<sup>18 19 21</sup> Our study findings evaluating the Westlaw database suggests that these concerns are not substantiated by material lawsuits in the fields of IM, paediatrics, FM or CCM.

**Contributors** MR planned the study, reviewed all retrieved cases and drafted portions of the manuscript and is responsible for the overall content as guarantor. MF planned the study, drafted the protocol and submitted it for IRB waiver, reviewed all retrieved cases and drafted portions of the manuscript. JAC planned the study, drafted the methods section of the protocol, searched and retrieved the cases from the Westlaw database. TG planned the study, reviewed cases with discrepancies between the physician reviewers and edited the manuscript. TAM conceived of the study, planned the study, reviewed all retrieved cases and edited the manuscript and is responsible for the overall content as guarantor.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** The protocol was reviewed and waived by the IRB at Western Michigan University Homer Stryker MD School of Medicine.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** The core data are in the manuscript. We completed the review of each case regardless of where they dropped out in the algorithm. Complete data are available upon request.

## ORCID iD

Thomas A Melgar <http://orcid.org/0000-0001-5155-4060>

## REFERENCES

- Morrow D, Cupp J, Schrift D, *et al.* Point-Of-Care ultrasound in established settings. *South Med J* 2018;111:373–81.
- Smallwood N, Dachsel M. Point-Of-Care ultrasound (POCUS): unnecessary gadgetry or evidence-based medicine? *Clin Med* 2018;18:219–24.
- Moore CL, Copel JA. Point-Of-Care ultrasonography. *N Engl J Med* 2011;364:749–57.
- Jacoby J, Cesta M, Axelband J, *et al.* Can emergency medicine residents detect acute deep venous thrombosis with a limited, two-site ultrasound examination? *J Emerg Med* 2007;32:197–200.
- Bonnafy T, Lacroix P, Desormais I, *et al.* Reliability of the measurement of the abdominal aortic diameter by novice operators using a pocket-sized ultrasound system. *Arch Cardiovasc Dis* 2013;106:644–50.
- Kobal SL, Trento L, Baharami S, *et al.* Comparison of effectiveness of hand-carried ultrasound to bedside cardiovascular physical examination. *Am J Cardiol* 2005;96:1002–6.
- Andersen GN, Graven T, Skjetne K, *et al.* Diagnostic influence of routine point-of-care pocket-size ultrasound examinations performed by medical residents. *J Ultrasound Med* 2015;34:627–36.
- Maw A, Jalali C, Jannat-Khah D, *et al.* Faculty development in point of care ultrasound for internists. *Med Educ Online* 2016;21:33287.
- Cohen JS, Teach SJ, Chapman JL. Bedside ultrasound education in pediatric emergency medicine fellowship programs in the United States. *Pediatr Emerg Care* 2012;28:845–50.
- McLario DJ, Sivitz AB. Point-Of-Care ultrasound in pediatric clinical care. *JAMA Pediatr* 2015;169:594–600.
- Howard ZD, Noble VE, Marill KA, *et al.* Bedside ultrasound maximizes patient satisfaction. *J Emerg Med* 2014;46:46–53.
- Mathews BK, Miller PE, Olson APJ. Point-Of-Care ultrasound improves shared diagnostic understanding between patients and providers. *South Med J* 2018;111:395–400.
- Jehle D, Davis E, Evans T, *et al.* Emergency department sonography by emergency physicians. *Am J Emerg Med* 1989;7:605–11.
- American College of Emergency Physicians. American College of emergency physicians. ACEP emergency ultrasound guidelines-2001. *Ann Emerg Med* 2001;38:470–81.
- Blaivas M, Pawl R. Analysis of lawsuits filed against emergency physicians for point-of-care emergency ultrasound examination performance and interpretation over a 20-year period. *Am J Emerg Med* 2012;30:338–41.
- Stolz L, O'Brien KM, Miller ML, *et al.* A review of lawsuits related to point-of-care emergency ultrasound applications. *West J Emerg Med* 2015;16:1–4.
- Nguyen J, Cascione M, Noori S. Analysis of lawsuits related to point-of-care ultrasonography in neonatology and pediatric subspecialties. *J Perinatol* 2016;36:784–6.
- Schnobrich DJ, Gladding S, Olson APJ, *et al.* Point-Of-Care ultrasound in internal medicine: a national survey of educational leadership. *J Grad Med Educ* 2013;5:498–502.
- Reaume M, Siuba M, Wagner M, *et al.* Prevalence and scope of point-of-care ultrasound education in internal medicine, pediatric, and Medicine-Pediatric residency programs in the United States. *J Ultrasound Med* 2019;38:1433–9.
- Dubuque J. Barriers to Implementation of Point-of-Care Ultrasound in Primary Care [presentation]. In: *University of Vermont Larner College of Medicine - Family Medicine Clerkship Student Projects*, 2019: 464. <https://scholarworks.uvm.edu/fmclerk/464>
- Eisen LA, Leung S, Gallagher AE, *et al.* Barriers to ultrasound training in critical care medicine fellowships: a survey of program directors. *Crit Care Med* 2010;38:1978–83.
- Reuters T. Westlaw. Available: <https://legal.thomsonreuters.com/en/products/westlaw> [Accessed 1 Oct 2019].
- Jena AB, Seabury S, Lakdawalla D, *et al.* Malpractice risk according to physician specialty. *N Engl J Med* 2011;365:629–36.
- 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;177:710–8.
- Studdert DM, Mello MM, Sage WM, *et al.* Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. *JAMA* 2005;293:2609–17.
- Hermer LD, Brody H. Defensive medicine, cost containment, and reform. *J Gen Intern Med* 2010;25:470–3.
- Kandinov A, Mutchnick S, Nangia V, *et al.* Analysis of factors associated with rhytidectomy malpractice litigation cases. *JAMA Facial Plast Surg* 2017;19:255–9.
- Gupta R, Griessenauer CJ, Moore JM, *et al.* An analysis of malpractice litigation related to the management of brain aneurysms. *J Neurosurg* 2017;127:1077–83.

- 29 Engelhard SB, Shah CT, Sim AJ, *et al.* Malpractice litigation in cornea and refractive surgery: a review of the WestLaw database. *Cornea* 2018;37:537–41.
- 30 Svider PF, Sunaryo PL, Keeley BR, *et al.* Characterizing liability for cranial nerve injuries: a detailed analysis of 209 malpractice trials. *Laryngoscope* 2013;123:1156–62.
- 31 Jalian HR, Jalian CA, Avram MM. Common causes of injury and legal action in laser surgery. *JAMA Dermatol* 2013;149:188–93.
- 32 Colaco M, Sandberg J, Badlani G. Influencing factors leading to malpractice litigation in radical prostatectomy. *J Urol* 2014;191:1770–6.
- 33 Paik AM, Mady LJ, Sood A, *et al.* A look inside the courtroom: an analysis of 292 cosmetic breast surgery medical malpractice cases. *Aesthet Surg J* 2014;34:79–86.
- 34 Choudhry AJ, Haddad NN, Rivera M, *et al.* Medical malpractice in the management of small bowel obstruction: A 33-year review of case law. *Surgery* 2016;160:1017–27.
- 35 Choudhry AJ, Haddad NN, Khasawneh MA, *et al.* Surgical fires and operative burns: lessons learned from a 33-year review of medical litigation. *Am J Surg* 2017;213:558–64.
- 36 Shwayder JM, Copel JA, Stohl H. Coding and legal issues in obstetric and gynecologic ultrasound. *Obstet Gynecol Clin North Am* 2019;46:853–62.
- 37 Mosier JM, Malo J, Stolz LA, *et al.* Critical care ultrasound training: a survey of US fellowship directors. *J Crit Care* 2014;29:645–9.
- 38 Hall JWW, Holman H, Bornemann P, *et al.* Point of care ultrasound in family medicine residency programs: a CERA study. *Fam Med* 2015;47:706–11.