
Article:
Stanton, A.E. orcid.org/0000-0001-6758-7051, Juniper, M., Bedawi, E. orcid.org/0000-0001-9196-3934 et al. (5 more authors) (2025) Pleural procedural safety in the UK: is everyone's house in order? Reflections from the BTS National Pleural Service Organisational Audit and a national review of patient safety incidents. BMJ Open Respiratory Research, 12 (1). e002840. ISSN 2052-4439

https://doi.org/10.1136/bmjresp-2024-002840

BMJ Open Respiratory Research

Pleural procedural safety in the UK: is everyone's house in order? Reflections from the BTS National Pleural Service Organisational Audit and a national review of patient safety incidents

Andrew Ewing Stanton ,[1] Mark Juniper,[2] Eihab Bedawi,[3] Laura McNaughton,[4] Amelia O Clive,[5] Duneesha De Fonseka,[3] Avinash Aujayeb,[6] Matthew Evison [7,8]

To cite: Stanton AE, Juniper M, Bedawi E, *et al*. Pleural procedural safety in the UK: is everyone's house in order? Reflections from the BTS National Pleural Service Organisational Audit and a national review of patient safety incidents. *BMJ Open Respir Res* 2025;**12**:e002840. doi:10.1136/bmjresp-2024-002840

Received 23 August 2024
Accepted 18 December 2024

For numbered affiliations see end of article.

Correspondence to
Dr Andrew Ewing Stanton; andrew.stanton@nhs.net

ABSTRACT

Introduction The 2022 British Thoracic Society Pleural Services Organisational Audit highlighted evidence of ongoing risk of harm from pleural procedures. To better understand the underlying causes of these safety concerns we undertook a review of patient safety incidents from the National Reporting and Learning System (NRLS).

Methods Incident-level patient safety data from NRLS were requested from any level 3, 4 and 5 incidents describing harm resulting from pleural intervention, specifically chest drain insertion or pleural aspiration for pleural effusions (fluid), submitted between 1 April 2018 and 30 March 2022.

Results 256 incidents were identified. Most of these did not directly relate to a pleural procedure or its concerns and so were excluded. Ultimately, 21 incidents (including 2 deaths) were relevant. 17 involved direct organ puncture, predominantly liver (n= 13). 11 incidents involved seldinger drains, 5 blunt dissection drains and 1 involved both (not specified in 4). In only four incidents was it clearly detailed that an ultrasound-assisted approach had been used. In the remainder, the use of ultrasound was largely not detailed at all, or the approach used was not clear or inappropriate. Most (19/21) events occurred out with respiratory environments.

Discussion These data raise concerns about pleural intervention for fluid occurring where lack of appropriate ultrasound use may have contributed in a variety of clinical areas. This should be highlighted at a national level by specialty groups and societies. We welcome an upcoming National Confidential Enquiry into Patient Outcome and Death study to help cement our understanding of factors underlying this ongoing risk of harm and to enable definitive action to be taken to reduce this risk.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There is worrying evidence that since the National Patient Safety Agency (NPSA) alert from 2008 and widespread changes in UK respiratory practice to use ultrasound to guide pleural fluid intervention, there remains an ongoing risk of serious harm and death from pleural intervention.

WHAT THIS STUDY ADDS

⇒ This review of patient safety incidents from the National Reporting and Learning System over a 4-year period suggests the lack of ultrasound use or its incorrect interpretation was likely to be a contributory factor in episodes of organ puncture and death from seldinger chest drain insertion.

⇒ We do not think the National Health Service can be assured that the risks to patients from pleural procedures have been minimised in the 15 years since the NPSA alert.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Highlighting these data to all clinicians who deliver pleural intervention should facilitate conversations locally and nationally to ensure a clear recognition of need for ultrasound before any pleural intervention for fluid and that protocols in all clinical areas must facilitate that.

INTRODUCTION

In 2008, the National Patient Safety Agency (NPSA) rapid response report (RRR) on the risks of chest drain insertion marked a watershed moment for respiratory physicians in the UK. 12 deaths and 15 cases of severe harm from chest drain insertion were reported over a 3-year period and risks from non-ultrasound-guided procedures for pleural effusion were identified.[1] This drove nationwide changes in respiratory practice. Publications including the Getting It Right First Time National Specialty Report for Respiratory medicine[2 3] have built on the foundations of this report to improve the safety of pleural procedures and services. The 2021 British Thoracic Society (BTS) National Pleural Services Organisational Audit highlighted evidence of ongoing risk of harm from pleural procedures.[4] 62%

(69/111) of sites reported incidents related to thoracic ultrasound (TUS) and/or pleural procedures over the precedent 3 years with 21% (23/111) reporting a level 4 (severe harm) incident and 13% (14/111) reporting a level 5 (catastrophic harm or death) incident. Inadequate out-of-hours provision of appropriately trained TUS and pleural operators, along with other reported infrastructure concerns supporting pleural services, were identified as potential reasons for this finding.

To better understand underlying causes of these safety concerns, we have undertaken a further review of patient safety incidents from the National Reporting and Learning System. We reflect on this, the results of the audit and whether the National Health Service (NHS) can be assured that the risks to patients from pleural procedures have been minimised in the 15 years since the NPSA RRR.

METHODS

An application was made to NHS Improvement for incident-level patient safety data held on the NRLS. We requested data from any incidents describing harm resulting from pleural intervention, specifically chest drain insertion or aspiration for pleural effusions but excluding any general anaesthetic procedures. We included data from levels 3, 4 and 5 incidents submitted between 1 April 2018 and 30 March 2022. Specific search terms (including misspellings and variations) were "chest_drain" OR "pleural_drain" OR "intercostal_drain" AND "liver" OR "spleen" OR "splenic" OR "diaphragm" OR "heart" OR "blood" OR "bleed" or "haemorra" OR "perforat". Incidents were reviewed to determine their location and time, evidence of TUS use (immediately prior to procedure/direct guidance), equipment used and specific type of harm reported.

Patient and public involvement

There was no patient or public involvement in the design and conduct of this work.

RESULTS

256 incidents were identified and reviewed. 192 events resulted in level 3 (moderate) harm, 30 level 4 (severe) harm and 34 resulted in death. Most of these events did not directly relate to a pleural procedure so were excluded (including eg, re-expansion pulmonary oedema). Ultimately, 21 incidents (including 2 deaths) were relevant for review. Table 1 details data from these. Direct organ puncture occurred in 17, predominantly liver (n=13). Four involved other tissue/organ damage, specifically lung (n=2), diaphragm (n=1) and SVC (n=1). 11 incidents involved seldinger drains, 5 involved blunt dissection drains and 1 involved both (drain types not specified in 4). There were only four incidents where it was clearly detailed that a TUS-assisted approach was used. In the remainder of incidents, the use of TUS was not specified, with the potential that it may not have happened. In one case, data demonstrated inappropriate TUS use, whereby patient repositioning occurred before intervention (table 1). The majority (19/21) of events occurred outside respiratory environments. Reported timing of these events was mixed with 7 detailed as within working hours, 6 out of hours and 8 not specified.

DISCUSSION

This NRLS data has identified 21 cases of at least moderate harm from pleural procedures over a 4-year period mainly related to misplaced intercostal drains for pleural effusion resulting in extrathoracic organ damage. It implies that TUS was either not used or incorrectly interpreted in many of these incidents. The 2023 BTS pleural disease guidelines mandate TUS assessment prior to any pleural intervention for fluid.[5] These concerns apply to a variety of clinical areas, including respiratory areas. 27 reports led to the 2008 NPSA alert and while there are fewer deaths we have still identified 21 and so harm is still occurring. We reviewed level 3 incidents and above and so there will be harm missed. There is also likely to be under-reporting of incidents and so the true the amount of harm in the system is likely to be greater than identified and so more detailed investigation is needed. There is also no denominator possible with this methodology, which is another limitation. The NRLS data are also dependent on hospital trusts reporting instances of harm. We also excluded re-expansion pulmonary oedema as our focus was on direct trauma-related complications which had been assumed to account for level 4/5 incidents in the BTS pleural organisational audit.[4] A more systematic evaluation of complications via a larger study should include this. This will also allow for more detailed review of incidents via case notes review to establish if indeed ultrasound is not being used or done so inappropriately as our data raises concerns about, or for other potentially contributory factors such as lack of knowledge/experience of pleural procedures or lack of equipment. Although we were also unable to clarify timing of all events its clear harm is occurring both in and out-of-hours periods. A national improvement objective from the BTS audit is that 'Hospitals should have an agreed out-of-hours protocol to access appropriately trained TUS and pleural procedural operators'. Providing reliable access to appropriately trained TUS operators 24 hours a day and 7 days a week is a challenge, but recent BTS training standards[6] should help facilitate this. These provide the scope for wider 'emergency' operators (eg, from emergency, acute and critical care) to provide TUS for safe intervention in large effusions.

Despite TUS use, there will always be a risk of harm from pleural procedures but more needs to be done to mitigate against this risk. These data, coupled with BTS audit findings of lack of on-site out-of-hours cover, provide a clear message of ongoing concern.

Table 1 Summary of individual patient safety incidents from NLRS classified as level 3 (moderate), level 4 (severe harm) or level 5 (catastrophic harm) relating to pleural procedures—all for pleural effusion

Incident	Location of incident	Incident timing	TUS used?	Direct TUS/TUS assisted?	Drain type	Type of harm	Reported degree of harm
1	General surgery	In hours	Not specified	Not specified	Blunt dissection	Organ puncture (liver)	Level 3 Moderate
2	ED	Out of ours	Yes	Not appropriately	Seldinger	Organ puncture (liver)	Level 3 Moderate
3	Thoracic surgery	Out of hours	Not specified	Not specified	Blunt dissection	Organ puncture (liver)	Level 3 Moderate
4	ITU	In hours	Yes	TUS assisted	Blunt dissection	Organ puncture (lung)	Level 3 Moderate
5	Cardiac surgery	Out of hours	No	No	Seldinger	Drain in Superior Vena Cava	Level 3 Moderate
6	ED	Out of hours	Not specified	Not specified	Not specified	Organ puncture (liver)	Level 3 Moderate
7	ED	In hours	Yes	TUS assisted	Seldinger	Organ puncture (liver)	Level 3 Moderate
8	Respiratory medicine	In hours	Yes	TUS assisted	Seldinger	Organ puncture (stomach)	Level 3 Moderate
9	ITU	Not clear	Not specified	Not specified	Seldinger	Organ puncture (liver)	Level 3 Moderate
10	General Medicine	Not clear	Not specified	Not specified	Seldinger	Organ puncture (liver)	Level 3 Moderate
11	ITU	Not clear	Not clear	Not specified	Seldinger	Organ damage (diaphragm)	Level 3 Moderate
12	General Medicine	Not clear	Not specified	Not specified	Seldinger	Organ puncture (liver)	Level 3 Moderate
13	ED	Not clear	No	No	Blunt dissection	Organ puncture (liver)	Level 3 Moderate
14	Respiratory medicine	Not clear	Not specified	Not specified	Seldinger	Organ puncture (spleen)	Level 3 Moderate
15	ED	In hours	Not specified	Not specified	Not specified	Organ puncture (liver)	Level 4 Severe
16	ITU	In hours	Not specified	Not specified	Seldinger	Organ puncture (liver)	Level 4 Severe
17	Respiratory medicine	Out of hours	Not clear	Not specified	Not specified	Organ puncture (heart)	Level 4 Severe
18	Medical ward (not specified)	Not specified	Not specified	Not specified	Seldinger	Organ puncture (spleen)	Level 4 Severe
19	Not specified	Not specified	Not specified	Not specified	Blunt dissection	Organ puncture (liver)	Level 4 Severe
20	Cardiothoracic surgery	In hours	Yes	TUS assisted	Seldinger+blunt dissection	Organ damage (lung)	Level 5 Death
21	ITU	Out of hours	Not specified	Not specified	Not specified	Organ puncture (liver)	Level 5 Death

ED, emergency department; ITU, intensive care unit; NRLS, National Reporting and Learning System.

We would advocate review of local practices to ensure there is close working between all providers of pleural intervention to ensure a clear recognition of need for TUS before any pleural intervention for fluid. These data should be highlighted at a national level by specialty groups and societies, whose clinicians deliver pleural intervention.

In conclusion, while significant progress has been made since the 2008 NPSA RRR, this review suggests that we might not have our houses fully in order with more work to be done. We welcome plans for a National Confidential Enquiry into Patient Outcome and Death study into harm from pleural interventions. This more systematic investigation will help cement our understanding of

factors underlying this ongoing risk of harm and enable definitive action to be taken to reduce it.

Author affiliations
[1]Department of Respiratory Medicine, Newcastle Upon Tyne Hospitals NHS Foundation Trust, Newcastle Upon Tyne, UK
[2]Great Western Hospital Foundation NHS Trust, Swindon, UK
[3]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK
[4]Respiratory Medicine, Queen Elizabeth University Hospital, Glasgow, UK
[5]Academic Respiratory Unit, University of Bristol, Bristol, UK
[6]Northumbria Healthcare NHS Foundation Trust, North Shields, UK
[7]North West Lung Centre, University Hospital South Manchester, Manchester, UK
[8]Institute of Inflammation and Repair, University of Manchester, Manchester, UK

Acknowledgements We would like to thank Julie Windsor from NHS Improvement team for undertaking the NLRS searches. We would like to thank Sally Welham and BTS Head Office for BTS support of this and other BTS initiatives in pleural disease.

Contributors AES: conception of work, liaison with and submission of request to NRLS for incident-level data, review and analysis of data. Drafting of manuscript. MJ: conception of work, liaison with NRLS, review and analysis of data and review and comment on manuscript. EB: planning of work, review and comment on summary data and manuscript. LM: planning of work, review and comment on summary data and manuscript. AOC: planning of work, review and comment on summary data and manuscript. DDF: planning of work, review and comment on summary data and manuscript. AA: planning of work, review and comment on summary data and manuscript. ME: conception of work, liaison with and submission of request to NRLS for incident-level data, review and analysis of data and review and comment on manuscript. AES is the 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 and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

ORCID iDs
Andrew Ewing Stanton http://orcid.org/0000-0001-6758-7051
Matthew Evison http://orcid.org/0000-0003-4066-5253

REFERENCES

1 NPSA. Chest drains: risks associated with the insertion of chest drains. NPSA/2008/RRR003.
2 Respiratory medicine – girft programme national speciality report. NHS England and NHS Improvement; 2021.
3 Evison M, Blyth KG, Bhatnagar R, *et al*. Providing safe and effective pleural medicine services in the UK: an aspirational statement from UK pleural physicians. *BMJ Open Respir Res* 2018;5:e000307.
4 Stanton A, Evison M. British thoracic society national pleural services organisational audit report 2021. British Thoracic Society Reports, ISSN 2040-2023, Vol 13; 2022.
5 Roberts ME, Rahman NM, Maskell NA, *et al*. British Thoracic Society Guideline for pleural disease. *Thorax* 2023;78:s1–42.
6 Stanton AE, Edey A, Evison M, *et al*. British Thoracic Society Training Standards for Thoracic Ultrasound (TUS). *BMJ Open Respir Res* 2020;7:e000552.