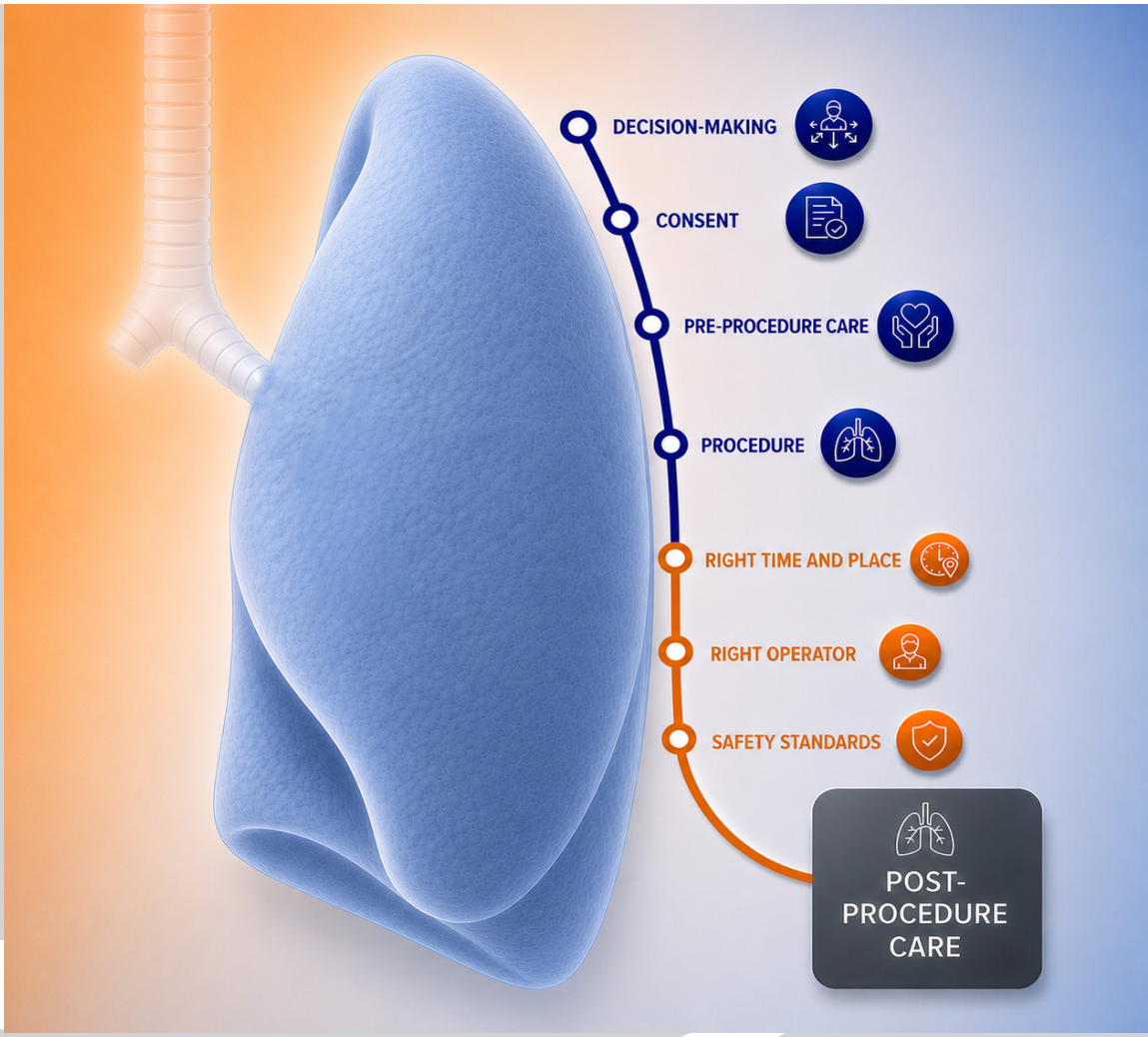
A Shared Aspiration

A review of the quality of care provided to adults who underwent a chest drain insertion or pleural aspiration



NCEPOD

Improving the quality of healthcare

A Shared Aspiration

A review of the quality of care provided to adults who underwent a chest drain insertion or pleural aspiration

A report published by the National Confidential Enquiry into Patient Outcome and Death (2026)

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Cohort: Patients aged 18 and older who were admitted to hospital between 01/01/2024 and 31/12/2024 and had a chest drain inserted or pleural aspiration undertaken.

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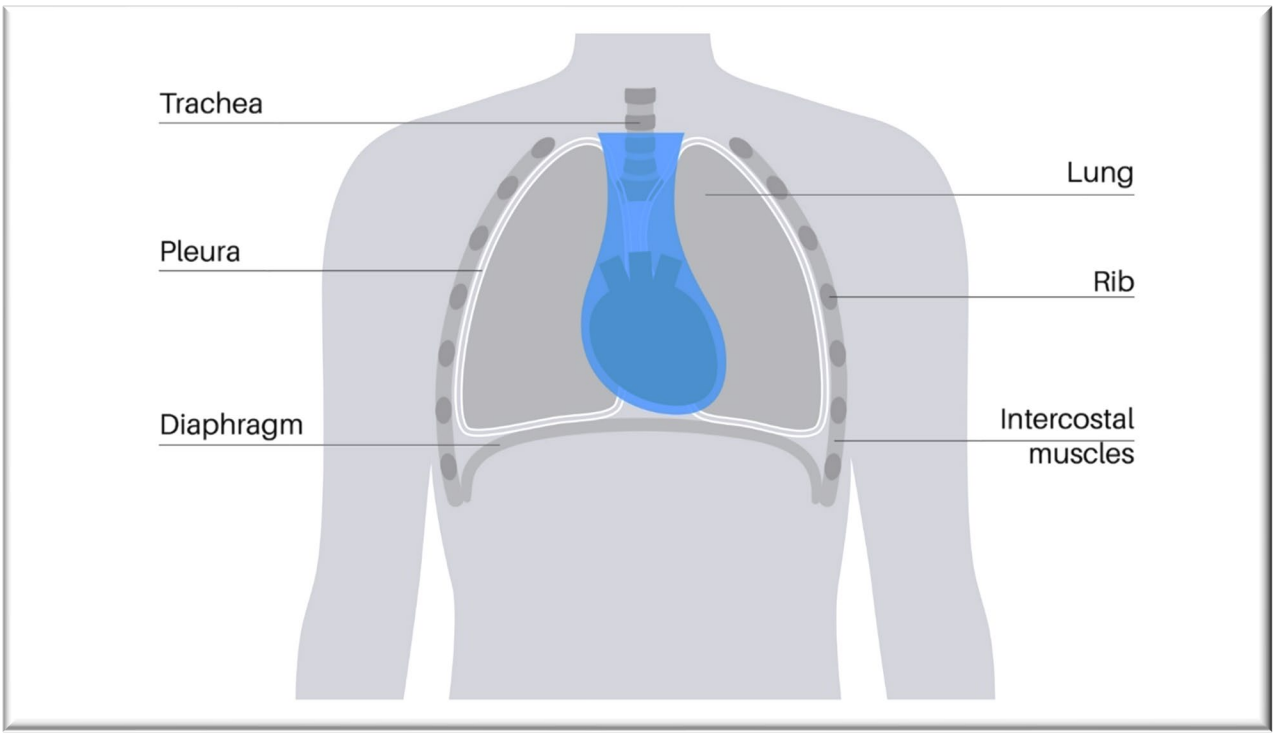
NOTES TO READERS

Definitions

For the purposes of this study, where the term 'pleural procedures' is used in the report it refers to both insertion of chest drains and pleural aspirations.

Chest drains inserted in trauma patients were not included due to the method of study sampling. However, learning from the report for 'medical' chest drains would lead naturally to a crossover to 'surgical' chest drains.

Chest drain insertion: (or chest tube thoracostomy) involves putting a flexible plastic tube into the chest cavity to drain a large volume of air or fluid continuously over hours or days.
Pleural aspiration: (thoracentesis or pleural tap) is where a needle and syringe are used to temporarily draw out a limited volume of air or fluid from the pleural space surrounding the lungs to provide immediate relief of symptoms.



Indication for the procedures

These procedures are used to diagnose unknown conditions or to provide therapeutic relief from abnormal fluid or air in the chest cavity. Common reasons include:

- An abnormal build-up of fluid between the lung and the chest wall causing severe shortness of breath, or the suspicion of an infection or malignancy – this is called **pleural effusion**
- A condition where air leaks into the pleural space causing the lung to partially or completely collapse. This trapped air pushes against the outside of the lung, preventing it from expanding normally during breathing – this is called **pneumothorax**
- Risk of a **pleural infection** within the pleural cavity, most commonly developing as a severe complication of bacterial pneumonia, though it can stem from surgery, trauma or a systemic infection.

INTRODUCTION FROM OUR CHAIR

(BACK TO CONTENTS)

Over 30,000 pleural procedures are undertaken in the UK every year; the majority of which are chest drains and pleural aspirations. This review primarily focused on procedures undertaken for pleural effusion and pneumothorax, noting that chest drains inserted in trauma patients were not included. Although the vast majority of procedures are performed safely, these are invasive procedures with the potential for serious complications. This study identified variation in all aspects of the intervention and aftercare, including access to specialist pleural teams. There are existing standards and guidelines relating to pleural disease, but these are not always followed, particularly out of hours, and not all hospitals have a formal policy for chest drain insertion. Standardisation of pleural procedures irrespective of the time or location would help ensure that all patients receive the same safe, high standard of care.

Clinicians with the most experience were more likely to report confidence in performing chest drains and pleural aspirations. Evidence shows that procedures undertaken by specialist pleural teams are safe. However, 60% of patients identified in this study were admitted outside weekday working hours. Ideally, pleural teams would be available 24 hours a day, but this is unlikely to be feasible in many hospitals. Prioritising drain insertion during the day or having a 24-hour on-call service should be considered.

The risks associated with pleural interventions do not end with the procedure. Post-procedure monitoring, imaging and drain removal are just as important as insertion but often overlooked. In 20% of patients, chest drains were removed too early or left in longer than required, resulting in reinsertion or unnecessarily prolonged hospital stays. Where a proforma was used post-procedure care was better.

Where consent was obtained and documented, only one-quarter of hospitals used a procedure-specific consent form. Reviewers believed that the consent process, including documentation, could be improved in more than half of the cases reviewed (58%).

The use of minimum standards, including a procedure-specific consent form, safety checklist and proforma for post-procedure monitoring, is associated with better consent, better pain management and better quality of care in general. Agreeing and using these standards would be relatively straightforward and inexpensive and would help address many of the variations in care identified.

With many thanks to everyone involved in the production of this report.



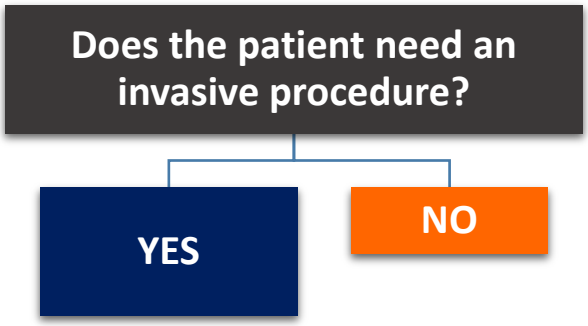
Dame Suzy Lishman DBE
NCEPOD Chair

IMPROVING THE CARE PROVIDED TO PATIENTS UNDERGOING A CHEST DRAIN INSERTION OR PLEURAL ASPIRATION

NCEPOD reviewed the care of adults admitted to hospital between 01/01/2024 and 31/12/2024 and had a chest drain inserted, or a pleural aspiration undertaken. Care was reviewed using 978 clinician questionnaires, 563 sets of case notes, 173 organisational questionnaires, 697 healthcare professional survey responses and 45 patient surveys.

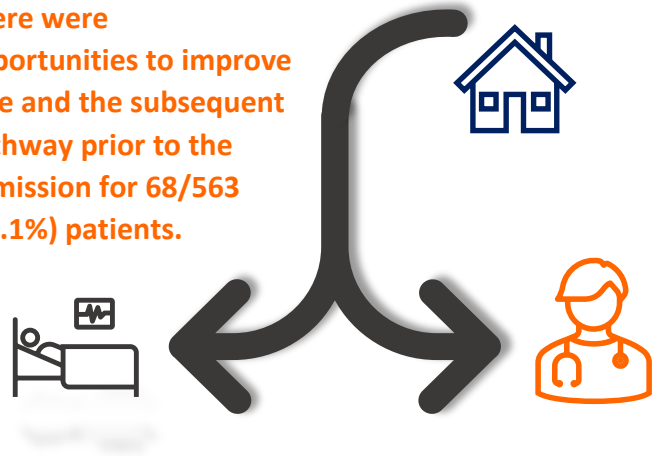
24/7 decision makers may stop patients having unnecessarily invasive procedures

With better decision-making, 82/563 (14.6%) patients could have had a less invasive approach.



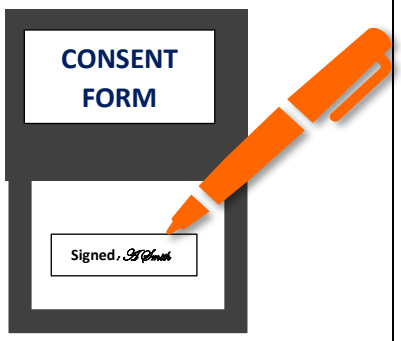
Alternative pathways increase the number of patients treated during normal working hours

There were opportunities to improve care and the subsequent pathway prior to the admission for 68/563 (12.1%) patients.



Procedure specific consent forms would ensure all patients are better informed

Written consent was documented in only 314/563 (55.8%) patients. Use of procedure-specific consent forms was limited, being present in only 68/173 (39.3%) hospitals.



Easy access to skilled clinicians out of hours would provide safe clinical practice



Only 62/173 (35.8%) hospitals had an escalation protocol for complex or high-risk patients out of hours.

Embedding national safety standards would promote consistent care



Procedure safety checklists (LocSSIPs) were only documented in 182/526 (34.6%) cases reviewed.

A clear plan can support pain management and the monitoring and removal of a chest drain.

106/440 (24.1%) patients had no documented post-procedure plan and where there was one, important elements, including drainage targets, monitoring plans and pain management, were frequently omitted.



RECOMMENDATIONS

These recommendations have been formed by a consensus exercise involving all those listed in the acknowledgements. The recommendations have been independently edited by medical editors experienced in developing recommendations for healthcare audiences to act on. The recommendations and **AREAS FOR IMPROVEMENT** highlight areas that are suitable for regular local clinical audit and quality improvement initiatives by those providing care to this group of patients. The results of such work should be presented at quality or governance meetings and action plans to improve care should be shared with executive boards.

1	Agree minimum standards for chest drain insertions and pleural aspirations that can be used for all patients, by all specialties. ▪ The minimum standards should align with the associated guidance listed below and include all the **AREAS FOR IMPROVEMENT** highlighted by this study. *NB: Chest drains inserted in trauma patients were excluded from this study as they are undertaken on a separate pathway.* Documenting the agreed minimum standards on a proforma for medical (non-trauma) procedures would support process reliability from decision making to discharge. *See also recommendation 2 – relating to out of hours procedures.*
FOR ACTION BY	British Thoracic Society as the secretariat in collaboration with the Intensive Care Society, College of Intensive Care Medicine, Royal College of Emergency Medicine, Royal College of Physicians, Society for Acute Medicine, Surgical Royal Colleges, Royal College of Radiologists, Royal College of Nursing, the Association of Respiratory Nurse Specialists, the Association of Chartered Physiotherapists in Respiratory Care, and the Chartered Society of Physiotherapists.
RATIONALE FOR THE RECOMMENDATION	There was variation in the approaches taken to chest drain insertions and pleural aspirations that contributed to risk, including decision making, consent, ultrasound use, safety checks, pain management, post-procedure chest drain care, chest drain removal and management of complications.
ASSOCIATED GUIDANCE	**BRITISH THORACIC SOCIETY: QUALITY STANDARD FOR PLEURAL DISEASE** **BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE** **BRITISH THORACIC SOCIETY: CLINICAL STATEMENT ON PLEURAL PROCEDURES** **INTENSIVE CARE SOCIETY: CHEST DRAIN SAFETY CHECKLIST** **COLLEGE OF INTENSIVE CARE MEDICINE: SAFETY CHECKLISTS NatSSIPs2 and LocSSIPs** **ROYAL COLLEGE OF EMERGENCY MEDICINE: POST-PROCEDURAL CARE** **ROYAL COLLEGE OF EMERGENCY MEDICINE: BEST PRACTICE GUIDELINE ON CONSENT** **GENERAL MEDICAL COUNCIL: PROFESSIONAL STANDARDS: DECISION MAKING AND CONSENT** **NATIONAL SAFETY STANDARDS FOR INVASIVE PROCEDURES (NatSSIPs2)** **GIRFT: RESPIRATORY MEDICINE** **NHSE: BEST PRACTICE TARIFF FOR PLEURAL EFFUSION**
SUGGESTIONS TO AID LOCAL IMPLEMENTATION OF THIS RECOMMENDATION	

2	Embed mechanisms to optimise the safety of chest drain insertion and pleural aspiration out of hours. ▪ By not undertaking a procedure out of hours unless it is an emergency; ▪ By ensuring there are senior clinicians available to decide whether the procedure needs to be undertaken as an emergency; *and* ▪ When an emergency procedure is required, ensuring it is undertaken by a clinician who has the core skills to perform it safely. *NB: Chest drains inserted in trauma patients were excluded from this study as they are undertaken on a separate pathway.* *See also recommendation 1 - the minimum standards that should be applied for all patients.*
FOR ACTION BY	Commissioners working with their local trusts/health boards.
RATIONALE FOR THE RECOMMENDATION	Many clinicians who were undertaking chest drain insertions and pleural aspirations reported a lack of confidence, especially out of hours. Across different specialties there was variation in the delivery of training in these procedures. There were also gaps in the recording of training and competency assessments.
ASSOCIATED GUIDANCE	**ROYAL COLLEGE OF EMERGENCY MEDICINE LEARNING: ATTAINING COMPETENCY** **JOINT ROYAL COLLEGES OF PHYSICIANS TRAINING BOARD: CURRICULUM FOR INTERNAL MEDICINE STAGE 1 IMPLEMENTATION AUGUST 2019** **GIRFT: RESPIRATORY MEDICINE**
SUGGESTIONS TO AID LOCAL IMPLEMENTATION OF THIS RECOMMENDATION	

AREAS FOR IMPROVEMENT

The same standard of care should be available to everyone needing a chest drain/pleural aspiration, wherever and wherever the procedure is performed. We have identified steps needed as a focus for improvement.

PRE-PROCEDURE

Availability of a competent decision maker to determine if a chest drain/pleural aspiration is necessary. This would prevent unnecessary drain insertions and promote more conservative approaches where possible.	
STANDARDS	**REASON**
BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE *Acute management for spontaneous pneumothorax recommendations and small-bore Seldinger chest drains (typically ≤ 14 French) instead of large-bore tubes inserted via blunt dissection.* **BRITISH THORACIC SOCIETY: QUALITY STANDARD FOR PLEURAL DISEASE** *QS14: Pneumothorax treatment according to preference*	Reviewers identified 82/563 (14.6%) patients for whom a less invasive approach could have been taken with better decision making and considered that the quality of care was affected in 39/82 patients.

Dedicated consent forms for chest drain insertion or pleural aspiration and documented evidence that the patient has been provided with information about the procedure.	
STANDARDS	**REASON**
BRITISH THORACIC SOCIETY: QUALITY STANDARD FOR PLEURAL DISEASE *QS3: Safety protocols* **BEST PRACTICE GUIDELINE: INVASIVE PROCEDURES IN THE EMERGENCY DEPARTMENT** **GENERAL MEDICAL COUNCIL: PROFESSIONAL STANDARDS: DECISION MAKING AND CONSENT**	Consent processes showed considerable variation across cases reviewed. Written consent was documented in only 314/563 (55.8%) cases reviewed, with the remainder comprising verbal consent, best-interest decisions or undocumented consent (T5.1). At an organisational level, the use of procedure-specific consent forms were used in only 68/173 (39.3%) hospitals (T5.2).

Where an emergency chest drain or pleural aspiration is required, ensure it is undertaken by a clinician who has the core skills to perform it safely.	
STANDARDS	**REASON**
ROYAL COLLEGE OF EMERGENCY MEDICINE LEARNING: ATTAINING COMPETENCY **JOINT ROYAL COLLEGES OF PHYSICIANS TRAINING BOARD: CURRICULUM FOR INTERNAL MEDICINE STAGE 1 IMPLEMENTATION AUGUST 2019**	Training records were maintained and updated in only 55/124 (44.4%) hospitals and a register of competent clinicians was kept in 23/157 (14.6%) hospitals. Just 16/173 (9.2%) hospitals ensured that a competent operator was present on their on-call rota and only 62/173 (35.8%) hospitals had an escalation protocol for complex or high-risk patients out of hours.

Access to alternative pathways for a chest drain or pleural aspiration, so that it is not undertaken only as an emergency admission.	
STANDARDS	**REASON**
GIRFT: RESPIRATORY MEDICINE **BRITISH THORACIC SOCIETY: QUALITY STANDARD FOR PLEURAL DISEASE** *QS2: Access to pleural services including ambulatory care*	Reviewers identified opportunities to improve care prior to the admission in 68/563 (12.1%) patients, most commonly through rapid access to a specialist pleural clinic, which could help to prevent the emergency admission and take pressure off the acute care pathway. For patients with a pleural effusion, these data describe a group with severe frailty for whom reviewers felt that intervention should have been avoided and palliative care would have been more appropriate. This is particularly relevant when previous attempts at drainage have provided little or no symptomatic relief.

The use of a procedure safety checklist: LocSSIPs/NatSSIPs2 and pre-procedure checks.	
STANDARDS	**REASON**
BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE **NATIONAL SAFETY STANDARDS FOR INVASIVE PROCEDURES2 (NatSSIPs2)** **COLLEGE OF INTENSIVE CARE MEDICINE: SAFETY CHECKLISTS NatSSIPs2 AND LocSSIPs**	It was reported from 23/163 (14.1%) hospitals that they did not routinely employ LocSSIPs for chest drain insertion. Procedure safety checklists (LocSSIPs) were not routinely documented, being present in only 182/526 (34.6%) cases reviewed and reported by clinicians for 353/755 (46.8%) patients (F5.9).

Analgesia and pain management.	
STANDARDS	**REASON**
FACULTY OF PAIN MEDICINE: CORE STANDARDS **BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE**	In the view of the reviewers there was room for improvement in the pain management of 65/373 (17.4%) patients. Furthermore, reviewers were unable to answer in 190 cases, suggesting that documentation was often insufficient to assess the quality of pain management. Data from the patient survey showed that 23/45 patients experienced at least moderate pain during the procedure and 21 post-procedure, suggesting that pain is a significant issue for patients.

PERI-PROCEDURE

Operator expertise and competence, and appropriate supervision/escalation arrangements if needed.	
STANDARDS	**REASON**
BRITISH THORACIC SOCIETY: QUALITY STANDARD FOR PLEURAL DISEASE	Published data from the healthcare professional survey showed that self-reported confidence in chest drain insertion among non-respiratory medical registrars diminishes with increasing time since their last pleural procedure. The survey also showed that doctors in specialties with experience of pleural procedures within the last year were more likely to feel confident inserting

	a chest drain without supervision. However, in no specialty were all doctors confident with pleural procedures. Just 16/173 (9.2%) hospitals ensured that a competent operator was present on their on-call rota and only 62/173 (35.8%) hospitals had an escalation protocol for complex or high-risk patients out of hours.

Analgesia and pain management.	
STANDARDS	**REASON**
FACULTY OF PAIN MEDICINE: CORE STANDARDS **BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE**	In the view of the reviewers there was room for improvement in the pain management of 65/373 (17.4%) patients. Furthermore, reviewers were unable to answer in 190 cases, suggesting that documentation was often insufficient to judge the quality of pain management. Data from the patient survey showed that 23/45 patients experienced at least moderate pain during the procedure and 21 post-procedure, suggesting that pain is a significant issue for patients (F5.14).

Use and documentation of thoracic ultrasound (including image saving) which can be audited.	
STANDARDS	**REASON**
BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE **ROYAL COLLEGE OF RADIOLOGISTS: STANDARDS FOR THE PROVISION OF AN ULTRASOUND SERVICE** **NHS ENGLAND PATIENT SAFETY ALERT ON CHEST DRAINS**	Ultrasound guidance was used for 344/369 (93.2%) patients (T5.6). However, among the 25 patients who did not have an ultrasound, case reviewers considered this appropriate in seven patients.

POST-PROCEDURE – AFTER A CHEST DRAIN INSERTION

Post-procedural planning which may include: ▪ **immediate and ongoing observations** ▪ **chest X-ray** ▪ **a targeted amount of fluid to be drained** ▪ **monitoring plans** ▪ **pain management**	
STANDARDS	**REASON**
NATIONAL PATIENT SAFETY ALERT – DETERIORATION DUE TO RAPID OFFLOAD OF PLEURAL EFFUSION FLUID FROM CHEST DRAINS **BRITISH THORACIC SOCIETY: GUIDELINE FOR PLEURAL DISEASE** **ROYAL COLLEGE OF EMERGENCY MEDICINE: POST-PROCEDURAL CARE** **ASSOCIATION OF RESPIRATORY NURSE SPECIALISTS: GOOD PRACTICE STANDARDS FOR CONTROLLED REMOVAL OF FLUID FROM CHEST DRAINS (ADULTS)**	A post-procedure plan provides clear guidance on decisions regarding monitoring, imaging, and drain removal, all of which are clinically and operationally important. Nearly a quarter of patients (106/440; 24.1%) (unknown in 13) had no documented post-procedure plan. While chest radiography was commonly recorded, other important elements, including drainage targets (170/334; 50.8%), monitoring plans and pain management (128/334; 38.3%), were frequently omitted (F6.1). Of the patients with an effusion, 34/338 (10.0%) had more than 1500ml of fluid drained within the first hour after insertion (F6.2).

Ongoing chest drain care: ▪ daily monitoring ▪ management and escalation of complications ▪ a process for removal of the chest drain.	
STANDARDS	**REASON**
GIRFT: RESPIRATORY MEDICINE **ASSOCIATION OF RESPIRATORY NURSE SPECIALISTS: GOOD PRACTICE STANDARDS FOR CONTROLLED REMOVAL OF FLUID FROM CHEST DRAINS (ADULTS)**	The chest drain was checked on a daily basis in 264/325 (81.2%) patients (T6.1). However, a significant minority did not have a daily drain check documented. While chest radiography was commonly recorded, other important elements, including drainage targets (170/334; 50.8%), monitoring plans and pain management (128/334; 38.3%), were frequently omitted (F6.1). The median length of time a drain was in place was 2.9 days (F6.3). In total, 75/396 (18.9%) chest drains were not left in place for an appropriate duration (T6.2), with both premature removal (n=26) and prolonged retention (n=43) observed (unknown in six).

Post-procedure analgesia and pain management.	
STANDARDS	**REASON**
FACULTY OF PAIN MEDICINE: CORE STANDARDS	Data from the patient survey showed that 23/45 patients experienced at least moderate pain during the procedure and 21 post-procedure, suggesting that pain is a significant issue for patients (F5.14).

Regular clinical audit of the above areas for improvement and of procedural complications.	
STANDARDS	**REASON**
HEALTHCARE QUALITY IMPROVEMENT PARTNERSHIP	There were 70/153 (45.8%) hospitals that reported a local audit approach. However, free text comments noted that this approach was commonly limited to procedures undertaken by the pleural team and would therefore systematically exclude procedures undertaken out of hours, which were the focus of this review.

Robust incident reporting, including the ability for data interrogation and sharing.	
STANDARDS	**REASON**
NHS ENGLAND: PATIENT SAFETY INCIDENT FRAMEWORK **WELSH GOVERNMENT: PATIENT SAFETY INCIDENT REPORTING AND MANAGEMENT** **DEPARTMENT OF HEALTH NORTHERN IRELAND: FRAMEWORK FOR LEARNING AND IMPROVEMENT FROM PATIENT SAFETY INCIDENTS** **THE STATES OF JERSEY DEPARTMENT FOR HEALTH AND SOCIAL SERVICES: PATIENT SAFETY LEARNING EVENT POLICY**	The data also suggested that there was a perception that it was not easy to extract data (or to analyse themes or long-term trends in safety events) from the risk management systems used (T7.2). The reviewers stated that additional learning was possible in 96/423 (22.7%) cases reviewed (unknown in 140). This included choice of procedure, safety processes (such as LocSSIPs), consent, post-procedure care including drain removal, and management of anticoagulants around the time of the procedure.

1 METHODS OF DATA COLLECTION

DETAILED INFORMATION ABOUT THE METHODS IS AVAILABLE HERE

(BACK TO CONTENTS)

Study advisory group (SAG)

A multidisciplinary group of clinicians was convened to steer the study from design to completion, define the objectives of the study and advise on the key questions. The group comprised lay and patient representatives and healthcare professionals in respiratory medicine, acute medicine, emergency medicine, critical care, interventional radiology, respiratory and pleural nursing, general nursing, pharmacy and patient safety.

Study aims and objectives

The aim of the study was to identify areas for improvement in the quality of care for patients undergoing pleural procedures, reviewing any incident investigations relating to pleural procedures and associated lessons learned, and identifying patient safety incidents that had not been reported.

Study population and case ascertainment

Inclusion criteria

Non-elective patients aged 18 and older who were admitted to hospital between 01/01/2024 and 31/12/2024 and had a chest drain inserted, or a pleural aspiration undertaken (OPCS code T12.0-T12.9) during their hospital stay were included. Chest drains were overrepresented in the sample as they provided greater insight and learning across the whole patient pathway.

Exclusion criteria

Procedures performed on already inserted chest drains (e.g. in-dwelling pleural catheters) were excluded. Trauma patients were excluded as they are treated on a different pathway. These patients are to be covered in an upcoming NCEPOD study on rib fractures.

Data collection

Up to eight patients per hospital were selected from this sample. Chest-drains (as opposed to pleural aspirations and other minor pleural procedures) were over-represented in the sample.

Data were collected from the following sources:

- **A clinician questionnaire** was sent to the named respiratory consultant at discharge.
- **An organisational questionnaire** was sent to every hospital.
- **Copies of the case notes** were requested for the included admission for peer review by a multidisciplinary group of case reviewers.
- **Surveys** were completed anonymously by patients and clinician views were collected through a collaboration with the pleural team at Guys and St Thomas' NHS Foundation Trust.

Data analysis rules

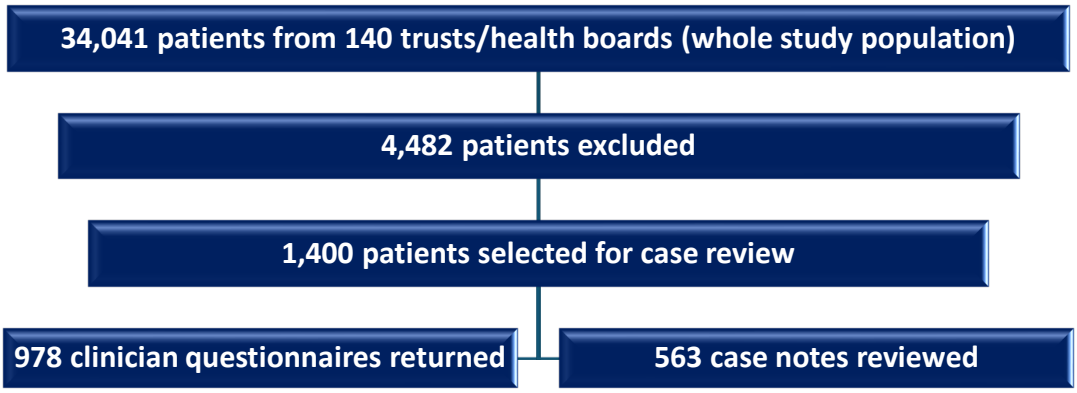
- Small numbers have been suppressed if they risk identifying an individual (usually <3-5).
- Any percentage under 1% has been presented in the report as <1%.
- Percentages were not calculated if the denominator was less than 100 so as not to inflate the findings, unless to compare groups within the same analysis.
- There will be variation in the denominator for different data sources and for each individual question as it is based on the number of answers given.

2 DATA RETURNED AND THE STUDY POPULATION

DETAILED FINDINGS ABOUT THIS ARE AVAILABLE HERE

(BACK TO CONTENTS)

Data returns



F2.1 Data returned

Organisational data

- Organisational questionnaire: 173/200 hospital questionnaires returned

Survey data

- Health and social care professional survey: general medicine 455 and emergency medicine/intensive care medicine 242
- Patient survey: 45

- In total, 34,041 patients who underwent a chest drain or pleural aspiration during the study time period were identified across 140 hospitals. Once patients meeting the exclusion criteria (mainly trauma patients) were removed, 29,559 remained for the analysis.
- Patients were admitted less frequently at weekends and out of hours. The pattern of daytime admissions showed a peak at 7am with a further peak at 2 to 3pm (F2.2).
- The overall patient cohort occupied a total of 411,755 bed days, illustrating the impact on acute hospital bed occupancy at a cost of around £231m.
- Among the patients selected for inclusion in the study, the pattern of hospital admissions showed a more even distribution through the days of the week and a later initial peak in the working day (9-11am) (F2.3), reflecting the sampling strategy's focus on out of hours admission.
- The mean age of the sample population was 66 years (median 70 years) and 580/978 (59.3%) of the sample were men. Overall, 588/978 (60.1%) patients were treated for pleural effusion (mean age 70.2 years).
- Where it was documented, 374/452 (82.7%) of the pleural effusions were exudates and 78/452 (17.3%) were transudates. There were 276/978 (28.2%) patients treated for pneumothorax (mean age 58.5 years), and 159/978 (16.3%) for pleural infection (mean age 63.5 years). Excluding pleural aspirations, case review data showed that of 448 chest drains, 109/448 (24.3%) were in place for less than a day and 323/448 (72.1%) patient for five days or less (unknown in 16).

- The procedure was undertaken as an emergency in 129/933 (13.8%) patients, it was urgent in 542/933 (58.1%) and non-urgent in 262 (28.1%).
- Emergency procedures were most required in acute care areas such as the emergency department (91/241; 37.8%), and critical care (15/53; 28.3%) (F2.4).
- There were 153/475 (32.2%) urgent and 24/219 (11.0%) non-urgent procedures undertaken out of hours (F2.5). Overall, only 74/251 (29.5%) out of hours procedures were considered emergencies, indicating room to improve compliance with best practice.
- Of the 170 patients with a pneumothorax, 51/170 (30.0%) were primary spontaneous, 87/170 (51.2%) were secondary spontaneous, and 20/170 (11.8 %) were iatrogenic.
- There were 5/170 (2.9%) patients with tension pneumothorax and six where the cause was not categorised. Of the 52 patients with infection, the underlying cause was pneumonia in 44.
- There were 144/978 (14.7%) patients who required at least one additional drain insertion during the hospital admission. The majority (117/144; 81.3%) of patients had one additional procedure (F2.6).
- The underlying indication for the procedure in these patients was pleural effusion in 69, pneumothorax in 53 and infection in 22. This means that a greater proportion of those with a pleural infection (22/95; 23.2%) or a pneumothorax (53/260; 20.4%) needed a repeat procedure than those with pleural effusion (69/573; 12.0%).
- Patients aged 60 years or younger made up a higher proportion of those with a pneumothorax (136/276; 49.3%) or pleural infection (65/159; 40.9%) than with a pleural effusion (142/585; 24.3%) (F2.7).
- Data on ethnicity showed that White British/White-other groups were slightly overrepresented compared with UK census data (T2.1). This may in part be explained by the proportion of older people included in this study, as 93.6% of people in the over 65 age group in the UK are of white ethnicity.
- The proportion of fit patients (Rockwood clinical frailty score of 1–4) who had a pneumothorax was greater (208/569: 36.6%) than the proportion who were mildly frail or worse (Rockwood clinical frailty score 5–9: 57/348; 16.4%).
- There was at least one comorbid condition in 871/978 (89.1%) patients. Multimorbidity (the presence of at least two comorbid conditions) has an overall population prevalence of 23-27%, and 468/978 (47.9%) patients had multimorbidity (F2.8).
- The most common comorbidity was cancer (localised or metastatic, including haematological) in 391/978 (40.0%) patients, of whom 254/391 (65.0%) had a pleural effusion and 61/391 (15.6%) a pneumothorax. A total of 201/978 (20.6%) patients had chronic obstructive pulmonary disease (COPD), and among these, 95/201 (47.3%) had a pneumothorax and 90/201 (44.8%) a pleural effusion.
- At their initial assessment, 357/863 (41.4%) patients had a respiratory rate above 20 breaths per minute, and 156/863 (18.1%) had a rate ≥25 (unknown in 112) (F2.9). Both findings would add points to the NEWS2 score, indicating that many of these patients were significantly unwell.

3 ARRANGEMENTS FOR CHEST DRAINS AND PLEURAL ASPIRATIONS

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- Data from the organisational survey showed that a specialist pleural team was available in 118/178 (66.3%) hospitals. Cover by this specialist team was available 24/7 in five hospitals and for 40 hours (five working days of eight hours) or less in 92/118 (78.0%) hospitals, confirming that many hospitals had different arrangements in place for chest drains and pleural aspirations undertaken out of hours.
- Competency for unsupervised insertion of chest drains is included in the specialty curricula for resident doctors in training in acute, critical care, emergency and respiratory medicine. However, responsibility for out of hours chest drain insertion for patients on general wards is generally allocated to the on-call medical registrar who may not be from one of the above specialties.
- Published data from the healthcare professional survey showed that self-reported confidence in chest drain insertion among non-respiratory medical registrars diminishes with increasing time since their last pleural procedure. The survey also showed that doctors in specialties with experience of pleural procedures within the last year were more likely to feel confident inserting a chest drain without supervision. However, in no specialty were all doctors confident with pleural procedures.
- When asked whether they had ever performed an out of hours pleural procedure, 63/64 (98.4%) doctors in respiratory medicine and 63/83 (75.9%) doctors in emergency medicine reported having done so. A lower percentage of doctors in intensive care medicine (85/159; 53.5%) and general medicine (121/391; 30.9%) had actual out of hours experience (T3.1).
- Only 44/391 (11.3%) general medicine clinicians felt confident to insert a chest drain unsupervised.
- Organisational survey data showed that respiratory medicine was the most common specialty for pleural procedure training, with programmes provided in 96/104 (92.3%) hospitals (F3.1). Training records were maintained and updated in only 55/124 (44.4%) hospitals and a register of competent clinicians was kept in 23/157 (14.6%) hospitals.
- Just 16/173 (9.2%) hospitals ensured that a competent operator was present on their on-call rota and only 62/173 (35.8%) hospitals had an escalation protocol for complex or high-risk patients out of hours.
- During working hours, pleural procedures in the study population were most commonly performed by respiratory medicine consultants or respiratory/pleural nurses (370/536; 69.0%).
- Out of hours during the week, this fell to 24/86 (27.9%), with many being undertaken by emergency medicine clinicians (38/86; 44.2%). The remaining procedures were performed by clinicians in: general medicine, 9/86 (10.5%), critical care medicine 11/86 (12.8%), acute medicine (4/86), general surgery (2/86) and interventional radiology (1/86).
- Weekends showed a similar pattern but with equal proportions of procedures undertaken by respiratory medicine and emergency medicine clinicians (48/146; 32.9%) (F3.2).

4 ADMISSION, INVESTIGATION AND DECISION MAKING

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CASE STUDY: GOOD CARE

A young patient with a malignant pleural effusion was seen with breathlessness due to a large pleural effusion. To relieve symptoms, 1.5L of fluid were aspirated in the same day emergency care procedure room. The patient's symptoms immediately improved. An appointment was made 72 hours later in the pleural specialist clinic for review of results and consideration of further intervention.

The reviewers thought that this was an example of a well-organised service and a coordinated care pathway, which helped to reduce pressure on inpatient beds.

CASE STUDY: ROOM FOR IMPROVEMENT

An older patient with a malignant pleural effusion was admitted as an emergency with breathlessness and low oxygen saturations. Urgent drainage of the effusion resulted in relief of symptoms and improved oxygenation. The patient had been admitted ten days previously in a similar situation. A two-week follow-up in pleural clinic had been arranged.

The reviewers considered this an opportunity to improve care before the index admission. A clearly defined pathway that the patient could access and which facilitated rapid review by the pleural service could have prevented the emergency admission and taken pressure off the acute service.

Admission to hospital

- There were 168/929 (18.1%) patients who had a previous admission to hospital where a chest drain was indicated (59 with a pneumothorax and 109 with infection or effusion) (unknown for 49). Of these, 41 had been admitted within the previous two weeks (and 73 in the previous four weeks).
- Reviewers identified opportunities to improve care prior to the admission in 68/563 (12.1%) patients, most commonly through rapid access to a specialist pleural clinic, which could help to prevent the emergency admission and take pressure off the acute care pathway.
- The majority of patients were admitted via the emergency department (739/954; 77.5%) (T4.1). Overall, 497/954 (52.1%) patients in the study were admitted outside of weekday working hours (08:00–17:59). The out of hours admissions were split between weekdays (232/497; 46.7%) and weekends (265/497; 53.3%).

Initial assessment

- The reviewers considered that there was a delay in assessment for 47/563 (8.3%) patients.
- At least one imaging modality was used in 558/563 (99.1%) patients (unable to answer in three, and the remaining three patients were treated for pneumothorax) (F4.1).
- Reviewers found room for improvement in pre-procedure imaging in 49/536 (9.1%) patients. This was mainly due to a lack of ultrasound scanning facilities.

Timing of the procedure, decision making and delays

- The decision to undertake a pleural procedure was most frequently made in the emergency department (300/978; 30.7%) and on the respiratory ward (231/978; 23.6%) (T4.2).
- There was a delay in the decision to insert a chest drain in 94/477 (19.7%) patients. Delays in decision making occurred in all the wards where patients were located (F4.2) (unknown in 85). They were also distributed both within and outside of normal working hours.
- The reviewers considered that the grade and specialty of the person making the decision was appropriate in 449/563 (79.8%) instances. There were only 21/513 (4.1%) cases reviewed where the person making the decision made it remotely (unknown in 50). Advice was sought from another healthcare professional about the pleural procedure in 176/492 (35.8%) cases (unknown in 71).
- There were further delays in carrying out the procedure after the decision had been made in 139/563 (24.7%) instances. They occurred when the patient was under the care of all clinical specialties and the reasons for delay were frequently not documented.
- Organisational data showed that 121/173 (69.9%) hospitals used pleural procedure packs or their equivalent. There is therefore room to improve this in more than a quarter of hospitals.
- Overall, reviewers considered that 400/524 (76.3%) procedures were undertaken at the appropriate time, while 102/524 (19.5%) procedures should have been undertaken sooner (unknown in 39). The main reasons given for inappropriately delayed procedures included waiting for specialist review, imaging delays, anticoagulation and missed diagnosis.
- There were 22/524 (4.2%) instances where the reviewers thought the procedure should have been delayed. The time of arrival in hospital did not appear to have an impact on whether the timing of procedure was considered inappropriate, neither did the specialty of the operator.
- Clinical questionnaire data showed that 186/936 (19.9%) patients required transfer to a new location for their procedure (unknown in 42). The transfer contributed to a delay for 37/186 (19.9%) patients.
- Across the whole clinical pathway, 228/563 (40.5%) patients experienced a delay at one or more step from initial assessment to the procedure itself. There were six patients who experienced a delay at every step of the pathway (T4.3 and F4.3).
- Reviewers identified 82/563 (14.6%) patients for whom a less invasive approach could have been taken with better decision making and considered that the quality of care was affected in 39/82 patients. In this group, 19/82 patients died during the admission, and a further two died within 30 days of discharge.
- For patients with a pleural effusion, these data describe a group with severe frailty for whom reviewers felt that intervention should have been avoided and palliative care would have been more appropriate. This is particularly relevant when previous attempts at drainage have provided little or no symptomatic relief.
- For ten fit and well patients with a pneumothorax, an invasive procedure could have been avoided, potentially shortening their length of stay as well as improving their experience of care (F4.4).

5 PERI-PROCEDURAL CARE

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CASE STUDY: GOOD CARE

An older patient with a moderate pleural effusion had a chest drain inserted by the respiratory registrar. A pleural pathway document was used, which included a standardised consent form, a safety checklist and a proforma for post-procedure monitoring.

The reviewers commented that this standardisation of documentation could be an effective safety intervention.

CASE STUDY: ROOM FOR IMPROVEMENT

A patient had a prolonged admission with a pleural effusion requiring insertion of two separate chest drains. A written consent form was used for both procedures. Neither form noted which side the drain was to be inserted or mentioned pain, bleeding or infection in the list of possible complications.

The reviewers thought that this was a clear example of how practice needed to improve to ensure that patients were better informed and all possible complications were always included in the consent process. Although ultrasound guidance was used for both procedures, they considered that failure to note the side of the procedure was a patient safety issue.

Specialty, grade and location

- Pleural procedures are undertaken across multiple clinical environments, including respiratory wards, general medical wards, procedure areas and the emergency department (F5.1).
- A greater proportion of chest drains inserted in the emergency department are carried out urgently or as an emergency: mainly for pneumothorax. The distribution across settings and specialties highlights that pleural procedures are not delivered within a single, co-ordinated service (F5.2).
- In the opinion of the reviewers the grade and specialty of operators were appropriate for the majority of patients (418/427; 97.9%) (unknown in 136). Most procedures were undertaken by consultants, senior resident doctors or specialty and associate specialist (SAS) grade doctors (F5.3).
- It was of note that formal policies for chest drain insertion were not available in 22/173 (12.7%) hospitals.

Consent process

- Consent processes showed considerable variation across cases reviewed. Written consent was documented in only 314/563 (55.8%) cases reviewed, with the remainder comprising verbal consent, best-interest decisions or undocumented consent (T5.1).
- At an organisational level, procedure-specific consent forms were used in only 68/173 (39.3%) hospitals (T5.2).
- Documentation of consent varied by clinical setting, with more consistent recording in procedural and respiratory areas, and less reliable recording in emergency and critical care settings (F5.4).
- Reviewers identified room for improvement in the consent process in more than half of assessable case notes (278/483; 57.6%), most commonly due to incomplete documentation rather than

complete absence of consent (T5.3). This indicates that the issue is not only whether consent is obtained, but also how thoroughly it is recorded.

- Reviewers were more likely to identify room for improvement in the consent process if the consent was not written (F5.5). Where written consent was obtained, room for improvement was less common if a specific consent form for pleural procedures was used (16/66; 24.2%) compared with other forms of written consent (89/205; 43.4%).
- The use of procedure-specific consent forms was associated with fewer reviewer concerns (F5.6). This indicates that standardised documentation may function as a safety intervention, supporting more consistent and complete consent processes.
- Consent processes also varied by specialty, with the most room for improvement in emergency medicine (F5.7). Differences in consent processes may reflect differences in casemix and urgency but may also be due to less standardised processes.
- Procedural urgency must not be used to excuse poor safety practice but should be recorded to describe the context in which processes were applied. In 289/448 (64.5%) cases, urgency was not recorded, and in emergency cases reviewers identified room for improvement in more than two-thirds of cases (F5.8).

Procedural preparation: Local Safety Standards for Invasive Procedures (LocSSIPs)

- It was reported from 23/163 (14.1%) hospitals that they did not routinely employ LocSSIPs for chest drain insertion.
- Procedure safety checklists (LocSSIPs) were not routinely documented, being present in only 182/526 (34.6%) cases reviewed and reported by clinicians for 353/755 (46.8%) patients (F5.9). This demonstrates that checklist use is not yet embedded as standard practice across settings.
- When a checklist was present, it generally (>90% from both case review and clinician questionnaire data) included all relevant standards, and their use would therefore be likely to result in safer care (F5.10).
- The use of a safety checklist varied significantly by specialty. It was most commonly used in respiratory medicine (125/222; 56.3%) and the intensive care unit (8/17) and was much less commonly used in other specialties (F5.11).
- The presence of a safety checklist was associated with fewer consent-related concerns (F5.12) and improved overall quality of care (F5.13). This suggests that checklist use is a marker of a more structured and safety-focused pathway, rather than simply a documentation exercise.

Procedure documentation

- Documentation of aspects of the pleural procedure were incomplete in the majority of cases, with only 79/978 (8.1%) containing all expected elements (T5.4). Key technical and safety information was frequently omitted including drain size (202/978; 20.7%) drain position (200/978; 20.4%), drain secured (264/978; 26.7%) and sampling recorded (153/978; 15.6%).
- Incomplete documentation limits the ability to assess procedural quality, identify complications and ensure continuity of care. This represents a significant gap in the safety framework surrounding pleural procedures.

Anticoagulation and bleeding risk

- Assessing bleeding risk and managing anticoagulation at the time of the procedure are important aspects of care. A substantial minority of patients had bleeding-related risk factors before the procedure (T5.5).
- Without clear documentation of anticoagulation management, it is not possible to determine whether bleeding risks were appropriately assessed or mitigated. This represents a potential patient safety concern, particularly given the proportion of patients with identifiable risk factors.

Ultrasound for pleural effusions

- Ultrasound guidance was used for 344/369 (93.2%) patients (T5.6). However, among the 25 patients who did not have an ultrasound, case reviewers considered this appropriate in seven patients. In the 18 patients where reviewers believed ultrasound should have been used, 15 had no LocSSIPs used and three had complications.

Pain management

- Data from the patient survey showed that 23/45 patients experienced at least moderate pain during the procedure and 21 post-procedure, suggesting that pain is a significant issue for patients (F5.14).
- Although local anaesthetic was used for most patients (T5.7), documentation of pain assessment and additional analgesia was inconsistent. Pain at the time of the procedure was documented in 91/831 (11.0%) patients (T5.8), likely reflecting under-documentation rather than absence of symptoms.
- The high proportion of cases where reviewers were unable to assess pain management further supports the conclusion that pain is not being consistently assessed or recorded.
- In the view of the reviewers there was room for improvement in the pain management of 65/373 (17.4%) patients. Furthermore, reviewers were unable to answer in 190 cases, suggesting that documentation was often insufficient to judge the quality of pain management.

Procedure proforma

- A procedure proforma standardises documentation of all of the peri-procedural care of patients undergoing chest drain insertion. This differs from a LocSSIPs (pre-procedural checklist) as it often contains consent, procedure note and post-procedure care instructions **(SEE APPENDIX)**.
- It was reported from 44/167 (26.3%) hospitals that standardised documentation for chest drain insertions was not used (T5.9).
- Reviewers reported that peri-procedural care was managed using a specific proforma in only 141/518 (27.2%) patients (T5.10).
- At organisational level, clinicians recorded that a proforma for pleural procedures was used for 353/863 (40.9%) patients (T5.11). For 127/863 (14.7%) patients without a completed proforma, one was available in the organisation but not used.
- Cases reviewed where a proforma had been used showed fewer consent-related concerns than those without one (118/325; 36.3% vs 72/123; 58.5%) (F5.15).

- Use of a proforma was also associated with increased LocSSIPs use (103/133; 77.4%) compared with cases without a proforma 63/358 (17.6%) without (F5.16).
- When a proforma was used there was also less room for improvement in pain management (12/102; 11.8% vs 49/250; 19.6%) (F5.17).
- The use of a proforma was also consistently associated with improved consent processes, greater use of safety checklists, better pain management, and higher overall quality of care. A proforma represents a practical and scalable intervention that addresses multiple areas of variation identified throughout the pathway.

Pleural service

- Pleural services were involved for 143/522 (27.4%) patients (T5.13). For the 379 patients where a service was not used reviewers believed it should have been for 144/357 (40.3%) but identified 213 patients where this was considered appropriate (T5.14).
- Specialist pleural input was more likely to be required for patients with pleural effusion or infection than for pneumothorax (F5.18). This is to be expected, as pneumothorax more commonly requires urgent treatment in an emergency department.
- The pleural service was more likely to be involved in patients for whom a proforma was used (F5.19). This may reflect that better developed pathways were used once the pleural team is involved. However, a proforma could also serve as a prompt to involve the pleural team.
- These findings suggest that access to specialist pleural expertise is variable, and that earlier involvement may improve decision making and pathway efficiency.

6 POST-PROCEDURAL CARE OF CHEST DRAINS

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CASE STUDY: GOOD CARE

An older patient had a chest drain inserted for a large unilateral pleural effusion. The drain remained in place for six days. A pleural pathway document was included in the records. This included a monitoring proforma that prompted all necessary observations at appropriate intervals and specifically noted the safety alerts recommending avoidance of rapid fluid offload.

The reviewers thought this was an example of good practice. In particular, linking the monitoring plan with the previous safety alert kept it relevant, and was likely to improve safe practice.

CASE STUDY: ROOM FOR IMPROVEMENT

A chest drain was inserted for drainage of a moderate sized unilateral pleural effusion. After three days, the drain was still swinging but there was no further drainage. A chest X-ray was requested and shown to be normal but the drain was not removed. The drain remained open with no further drainage and daily X-rays were carried out for two further days before the drain was removed. The patient went home the day after drain removal.

The reviewers considered that the drain had been left in longer than needed, leading to a length of stay three days longer than necessary.

Post-procedure plan

- A post-procedure plan provides clear guidance on decisions regarding monitoring, imaging, and drain removal, all of which are clinically and operationally important. Nearly a quarter of patients (106/440; 24.1%) (unknown in 13) had no documented post-procedure plan.
- While chest radiography was commonly recorded, other important elements, including drainage targets (170/334; 50.8%), monitoring plans and pain management (128/334; 38.3%), were frequently omitted (F6.1).
- Where a proforma was used, there was a trend towards better post-procedure nursing care and medical care. Room for improvement in post-procedure nursing care was identified in 20/100 (20.0%) cases with a proforma, compared with 69/244 (28.3%) without a proforma.

Post-procedure care

- Of the patients with an effusion, 34/338 (10.0%) had more than 1500ml of fluid drained within the first hour after insertion (F6.2).
- The chest drain was checked on a daily basis in 264/325 (81.2%) patients (T6.1). However, a significant minority did not have a daily drain check documented.
- The median length of time a drain was in place was 2.9 days (F6.3). In total, 75/396 (18.9%) chest drains were not left in place for an appropriate duration (T6.2), with both premature removal (n=26) and prolonged retention (n=43) observed (unknown in six).
- The drain removal was planned in over 90% of patients (315/345; 91.3%; unknown in 108) and 30/426 (7.0%) patients needed re-insertion of the drain (unknown in 27). There were 12 patients who experienced a complication at the time of drain removal, including bleeding and pain.

7 COMPLICATIONS, INCIDENT REPORTING AND GOVERNANCE ARRANGEMENTS

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- Data were provided by 47/122 (38.5%) hospitals about incidents reported in patients undergoing pleural procedures (noting that these were not necessarily events directly related to the procedure). An incident was reported in 1,601/7,747 (20.7%) patients.
- Organisational data showed that Datix was the most used risk management system amongst the study participants (124/173; 71.7%) (T7.1).
- The data also suggested that there was a perception that it was not easy to extract data (or to analyse themes or long-term trends in safety events) from the risk management systems used (T7.2).

Complications of the pleural procedure

- Reviewers identified complications on review of 127/542 (23.4%) patients (T7.3). The reviewers considered that 48/127 (37.8%) complications were reportable as a clinical incident, and of these, 37/48 patients had suffered harm as a result. There was evidence in the case records that only four of these events had been reported. This may reflect an acceptance that some complications are 'acceptable' or 'normal' and could be considered a lost opportunity to learn from these events and reduce future harm to patients.
- The most common complications identified were surgical emphysema and pneumothorax (F7.1).

Opportunities for learning

- The reviewers stated that additional learning was possible in 96/423 (22.7%) cases reviewed (unknown in 140). This included choice of procedure, safety processes (such as LocSSIPs), consent, post-procedure care including drain removal, and management of anticoagulants around the time of the procedure.
- There were 70/153 (45.8%) hospitals that reported a local audit approach. However, free text comments noted that this approach was commonly limited to procedures undertaken by the pleural team and would therefore systematically exclude procedures undertaken out of hours, which were the focus of this review.
- Where local clinical audit was undertaken, it was used to update local training and procedural protocols in 66/70 hospitals, results were fed back to clinicians at 61/70 hospitals, and findings were fed back to hospital leadership and relevant committees in 54/70 hospitals.
- There is an opportunity to improve practice by widening the focus of local audit and quality improvement activity to include pleural procedures undertaken in all locations and by all specialties.
- The overall quality of care was rated as good in 160/547 (29.3%) patients (unknown in 16) (F7.2).
- The proportion rated as good practice by urgency was: emergency, 11/47 (23.4%); urgent, 71/237 (29.9%) and non-urgent, 34/116 (29.3%) (F7.3).