

## AUDIT UPDATE

## British Thoracic Society national pleural procedures audit 2010

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► Additional appendices (WA1-5) are published online only. To view these files please visit the journal online (<http://thorax.bmj.com>).

Received 23 February 2011  
Accepted 4 March 2011  
Published Online First  
7 April 2011

**ABSTRACT**

In this report, we detail the results of the 2010 BTS national pleural procedures audit, to which 58 hospitals covering a collective population of more than 20 million patients contributed data regarding local pleural procedure practice and training policies and the process and complications associated with a total of 824 chest drain insertions. The results highlight a promising increase in the use of real time ultrasound guidance for pleural procedures but also deficiencies in pre-procedure consent practice and a significant rate of avoidable minor complications such as drain fall-out and procedure related pain. Action points for improvement to local pleural procedure practice are suggested.

**BACKGROUND**

Recent reports of complications associated with chest drain insertion in the UK have contributed to a sea change in opinion regarding the management of pleural disease.<sup>1 2</sup> This national audit, which in the greatest part relates to chest drain insertion practice, was carried out prior to the publication of the 2010 British Thoracic Society (BTS) pleural disease guidelines.<sup>3</sup> It was conducted with the key objective of establishing current practice and policies regarding chest drain insertion in the UK with an emphasis on complication rates, level of respiratory team involvement in patient care, use of thoracic ultrasound, frequency of out of hours (OOH) procedures and the training of junior doctors.

**AUDIT DESIGN**

The audit was open to all hospitals in the UK.

The 2-month audit period ran from 1 June to 31 July 2010 with a further 10-week period for data entry to the online BTS audit tool system.

Three sections gathered data regarding (1) local policies for pleural procedures, thoracic ultrasound and chest drain insertion training; (2) burden of pleural disease cases and procedures; and (3) detailed records for all chest drain insertions performed for medical patients.

Prospective case identification with retrospective data entry was encouraged.

**RESULTS**

Fifty-eight hospitals, covering a collective patient population of >20 million, contributed adequate data for inclusion (Supplementary appendix WA 1). The minority of participating respiratory departments had a specialist pleural service, with 12

(20%) running a dedicated pleural clinic, 11 (19%) having access to onsite thoracic surgery and 18 (31%) delivering physician-led thoracoscopy.

**Chest drain insertions**

Of 867 records submitted, 824 fulfilled inclusion criteria (585 drains for pleural effusion and 239 for pneumothorax).

Eighty per cent of drains were inserted by the Seldinger technique and 83% for those where size was documented were of small bore (6–14F).

- *Procedure consent.* Consent was taken for 549 (67%); written in 271 (33%) and verbal in 278 (35%). There was no documented evidence of consent in 257 (31%) and no data entered for 18 (2%). Drain insertion for pneumothorax appears to be associated with less reliable consent practice; written in only 24% and no evidence of consent at all in 40% of procedures in this series.
- *Location and timing.* The patient bedside remains the most common location for chest drain insertion (48%) overall, although drains for pneumothorax were most often placed in the Emergency Department (41%). While most drains overall were inserted within daytime working hours, 36% for pneumothorax were placed OOH (Supplementary appendix WA 2).
- *Complications* (table 1). The most serious possible complications were rare in this series, with no instances of organ trauma and one death (mechanism unclear). Patient-reported pain was common both during (4.1%) and following (18%) drain insertion, and is significantly more frequent with drains placed for pneumothorax (Fisher exact test  $p < 0.01$ ). When drains fell out (7.3%), 22/60 (37%) patients underwent another drain insertion and a further 3/42 effusion patients had pleurodesis deferred until fluid re-accumulation. A drain blockage rate of 8.5% among pleural effusions was associated with regular flushing in only 110/585 (19%) of drains and 42/101 (42%) of drains for pleural infection.
- *Specialist care.* A total of 62% patients were nursed on specialist respiratory wards. The medical respiratory team was involved with inpatient management of 78% of patients and 80% were reviewed by a respiratory consultant during their admission. A member of the respiratory team performed or supervised drain insertion in 423/824 (51%) cases overall but only in 90/239 (38%) of drains for pneumothorax.
- *Drains for pneumothorax.* A total of 102 drains were placed for secondary spontaneous

**Table 1** Complications of chest drain insertion

	All drains (n = 824)	Drains for pneumothorax (n = 239)	Drains for pleural effusion (n = 585)
<b>Immediate complications</b>			
Bleeding	11 (1.3%)	3 (1.3%)	8 (1.4%)
Pain	34 (4.1%)	17 (7.1%)	17 (2.9%)
Vasovagal syncope	17 (2.1%)	5 (2.1%)	12 (2.0%)
Organ puncture	0	0	0
Failure to place drain in pleural space	20 (2.4%)	9 (3.8%)	11 (1.8%)
Iatrogenic pneumothorax	NA	NA	22 (3.7%)
Death	0	0	0
<b>Delayed complications</b>			
Drain fell out	60 (7.3%)	19 (8%)	41 (7%)
Pain	148 (18%)	59 (25%)	89 (9.7%)
Drain blocked	61 (7.4%)	11 (4.6%)	50 (8.5%)
Pleural space infection	6 (0.73%)	3 (1.3%)	3 (0.51%)
Skin infection	7 (0.8%)	2 (0.8%)	5 (0.9%)
Surgical emphysema	28 (3.4%)	24 (10%)	4 (0.7%)
Re-expansion pulmonary oedema	3 (0.36%)	0	3 (0.4%)
Death	1 (0.12%)	1 (0.4%)	0

pneumothorax (SSP) in patients with median age 71 (range 20–90) years, 88 for primary spontaneous pneumothorax (PSP) (median age 32 (16–87) years) and 47 for traumatic or iatrogenic pneumothorax. There was a failure to attempt aspiration before drain placement in 37/88 (42%) PSPs, and an inappropriate attempt at aspirating SSPs had been made in 13/102 (13%) of cases (Supplementary appendix WA 3). For the small (<2 cm) pneumothorax cases in this chest drain series (41/239 (17%)), conservative management may have been appropriate and preferable.

- *Drains for pleural effusions.* Patients had a median age of 71 (18–97) years. A total of 41% patients had an undiagnosed effusion, 34% malignant effusion and 18% pleural infection. Of patients drained for pleural malignancy, 96/201 (48%) underwent talc pleurodesis.

### Thoracic ultrasound

A majority of respiratory departments had at least one ultrasound machine (45/58 (77%)). In 34 of 58 departments at least one member of the respiratory team was trained to level 1 competence (Supplementary appendix WA 4) with 27 departments having ≥1 consultant and 25 departments having ≥1 trainee who has been formally accredited in thoracic ultrasound.

There was appropriate real-time ultrasound guidance for 52% of procedures. The remote X-marks the spot approach (carrying no advantage over a blind procedure and potentially

### Action points

- Reduce number of avoidable drains inserted, particularly in patients with new or undiagnosed pleural effusions and small or primary pneumothorax.
- Written consent should be taken for all drain insertions.
- Address common complications of procedure-related pain and drain fall out rate with emphasis on optimum insertion and fixation techniques within formal training programmes.
- Aim for all drains for fluid to be placed with real-time ultrasound guidance, avoiding the remote X marks the spot technique.

being falsely reassuring) was employed for 17% of drains for fluid (Supplementary appendix WA 5).

### Chest drain insertion training

Formal training in chest drain insertion (didactic lectures and/or simulated practice sessions) is available to F2-ST2 trainees in 44/58 (76%) participating hospitals. A smaller proportion offer training to ST3+/SPR level trainees (21/58 (36%)).

### CONCLUSION

These results reflect significant scope for improvement in preprocedure consent practice, rate of 'minor' complications relating to poor drain insertion technique and excessive use of chest drains for patients with undiagnosed effusions and small or primary pneumothorax where initial aspiration may have been preferable. Adherence to guidelines, consent practice and incidence of procedure-related pain are inferior for drains placed for pneumothorax which are more likely to be inserted OOH, in the Emergency Department and without respiratory team input. There is a promising trend towards the use of real-time ultrasound guidance for drains placed for fluid, with many physicians training in the imaging technique.

**Acknowledgements** With thanks to the BTS audit team (Sally Welham, Chris Routh and Dr. Christine Bucknall) for their work on this project.

**Competing interests** None.

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

### REFERENCES

1. **National Patient Safety Agency.** *Risks Associated With the Insertion of Chest Drains.* UK: National patient safety agency, 2008. <http://www.nrls.npsa.nhs.uk/resources/?entryid45=59887>. NPSA/2008/RRR03.
2. **Harris A, O'Driscoll BR, Turkington PM.** Survey of major complications of intercostal chest drain insertion in the UK. *Postgrad Med J* 2010;**86**:68–72.
3. **Havelock T, Teoh R, Laws D, et al.** Pleural procedures and thoracic ultrasound: British Thoracic Society pleural disease guideline 2010. *Thorax* 2010;**65**(Suppl 2): ii61–76.

## WA1

### Participating hospitals

#### Hospital

Borders General Hospital  
Castle Hill Hospital  
Central Middlesex Hospital  
Chase Farm Hospital  
Chelsea and Westminster Hospital  
Colchester General Hospital  
Conquest Hospital  
Ealing Hospital  
Freeman Hospital  
Friarage Hospital  
George Eliot Hospital  
Glasgow Royal Infirmary  
Glenfield Hospital  
Good Hope Hospital  
Hope Hospital  
Ipswich Hospital  
James Paget Hospital  
Jersey General Hospital  
Llandough Hospital  
Macclesfield District General Hospital  
Manchester Royal Infirmary  
Milton Keynes General Hospital  
Musgrove Park Hospital  
Nevill Hall Hospital  
New Cross Hospital  
North Tyneside General Hospital  
Northampton General Hospital  
Northern General Hospital  
Pilgrim Hospital  
Pinderfields General Hospital  
Poole Hospital  
Queen Alexandra Hospital  
Queen Elizabeth II Hospital  
Royal Berkshire Hospital  
Royal Blackburn Hospital  
Royal Cornwall Hospital  
Royal Devon & Exeter Hospital - Wonford  
Royal Gwent Hospital  
Royal Hallamshire Hospital  
Royal Sussex County Hospital  
Royal United Hospital

#### Trust

NHS Borders  
Hull and East Yorkshire Hospitals NHS Trust  
The North West London Hospitals NHS Trust  
Barnet & Chase Farm Hospitals NHS Trust  
Chelsea and Westminster Hosp NHS Found. Trust  
Essex Rivers Healthcare NHS Trust  
East Sussex Hospitals NHS Trust  
Ealing Hospital NHS Trust  
The Newcastle upon Tyne Hospitals NHSFT  
South Tees Hospitals NHS Trust  
George Eliot Hospital NHS Trust  
NHS Greater Glasgow & Clyde  
University Hospitals of Leicester NHS Trust  
Heart of England NHS Foundation Trust  
Salford Royal NHS Foundation Trust  
Ipswich Hospital NHS Trust  
James Paget University Hosp NHS Foundation Trust  
States of Guernsey Health & Social Services  
Cardiff and Vale University Local Health Board  
East Cheshire NHS Trust  
Cent ManchesterUniv Hosp NHST  
Milton Keynes Hospital NHS Foundation Trust  
Taunton & Somerset NHS Foundation Trust  
Aneurin Bevan Health Board  
The Royal Wolverhampton Hospitals NHS Trust  
Northumbria Healthcare NHS Foundation Trust  
Northampton General Hospital NHS Trust  
Sheffield Teaching Hospitals NHS Foundation Trust  
United Lincolnshire Hospitals NHS Trust  
Mid Yorkshire Hospitals NHS Trust  
Poole Hospital NHS Foundation Trust  
Portsmouth Hospitals NHS Trust  
East and North Hertfordshire NHS Trust  
Royal Berkshire NHS Foundation Trust  
East Lancashire Hospitals NHS Trust  
Royal Cornwall Hospitals Trust  
Royal Devon & Exeter NHS Foundation Trust  
Aneurin Bevan Health Board  
Sheffield Teaching Hospitals NHS Foundation Trust  
Brighton and Sussex University Hospitals NHS Trust  
Royal United Hospital Bath NHS Trust

Royal Victoria Infirmary  
Selly Oak Hospital  
Singleton Hospital  
Southmead Hospital  
St James University Hospital  
St Mary's Hospital  
Tameside General Hospital  
The Churchill  
The Great Western Hospital  
University Hospital North Durham  
University Hospital of Wales  
Wansbeck General Hospital  
West Middlesex University Hospital  
Worthing Hospital  
Wrexham Maelor Hospital  
Wycombe Hospital  
Yeovil District Hospital

The Newcastle upon Tyne Hospitals NHSFT  
University Hosp Birmingham NHS Foundation Trust  
ABM University Health Board  
North Bristol NHS Trust  
The Leeds Teaching Hospitals NHS Trust  
Isle of Wight NHS Primary Care Trust  
Tameside and Glossop Acute Services NHS Trust  
Oxford Radcliffe Hospitals NHS Trust  
Great Western Hospitals NHS Foundation Trust  
County Durham & Darlington NHS Found. Trust  
Cardiff and Vale University Local Health Board  
Northumbria Healthcare NHS Foundation Trust  
West Middlesex University Hospital NHS Trust  
Western Sussex Hospitals NHS Trust  
Betsi Cadwaladr University Health Board  
Buckinghamshire Hospitals NHS Trust  
Yeovil District Hospital NHS Foundation Trust

## WA 2

### Location and timing of chest drain insertions

	Drains for Pneumothorax n = 239	Drains for pleural effusions n = 585	All drains n = 824
<b>Procedure location</b>			
Accident and emergency	98 (41%)	14 (2%)	112 (14%)
Medical admissions ward (patient bedside)	48 (20%)	93 (16%)	141 (17%)
Medical ward (patient bedside)	45 (19%)	214 (38%)	259 (31%)
Dedicated procedure room	22 (9%)	151 (26%)	173 (21%)
Radiology department	7 (3%)	62 (11%)	69 (14%)
Other	19 (8%)	41 (7%)	60 (7%)
<b>Procedure timing</b>			
8am – 6pm	118 (49%)	385 (66%)	503 (61%)
6pm-8am	85 (36%)	93 (16%)	178 (22%)
‘Out of hours’			
Not documented	35 (15%)	105 (18%)	143 (17%)

### WA 3

#### Pneumothorax (Ptx) – aspiration prior to drain insertion

Type of Pneumothorax	Prior aspirations in <2cm Ptx	Prior aspirations in $\geq 2$ cm Ptx
Primary spontaneous (n= 88)	7/13 (54%)	44/75 (59%)
Secondary (n= 102)	3/17 (18%)	10/85 (12%)
Iatrogenic/ traumatic (n = 47)	0/11 (0%)	5/36 (14%)

#### **WA 4**

**Web page for definitions of Royal College of Radiologist Guidelines for level 1 and 2 competence in thoracic ultrasound:**

**<http://www.rcr.ac.uk/docs/radiology/pdf/ultrasound.pdf>**

## WA 5

