# Pleural Disease Assessment and Outcomes

## P1 PLEURAL EFFUSION SIZE ESTIMATION: US, CXR OR CT?

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**Introduction and objectives** Chest X-ray (CXR), CT and Ultrasound (US) are commonly used to evaluate the size of pleural effusions. Accurate description of size is important in the communication of findings and urgency of intervention. With currently no standardised measurement system, significant variation in description of size by CXR, CT or US exists. The use of terms 'small, moderate, and large' is common, with no consensus on the limits of these sizes.

This study looked at correlation between qualitative description of effusion size by different imaging modalities and volume of effusion recorded following aspiration.

**Methods** This was a retrospective analysis of patients referred for pleural tap and/or drain after CXR and/or CT. CXR/CT reports were collected from PACS, US reports from the local US database, accessed by at least two US-trained Respiratory physicians.

Effusion size was estimated by the recognised method of counting intercostal spaces (ICS) from costophrenic angle (small- localised to 1 ICS, medium 2–3 ICS, large ≥4 ICS). Effusion size reported was compared to actual volume of fluid drained (till 'dry' or 'safe aspiration'). For the purpose of this study, effusions <500 mL were characterised as small, 500–1000 mL moderate and >1000 mL large. Correlation was analysed using Spearman's correlation.

**Results** 312 patients were referred April 2014–December 2015. 133 patients were excluded due to insufficient data, 179 patients' data analysed. US pleural effusion size estimation correlated most closely with actual volume of fluid drained ($r = 0.833$, $N = 179$, $P < 0.0001$) vs. CXR ($r = 0.548$, $N = 129$, $P < 0.001$) and CT ($r = 0.489$, $N = 107$, $P < 0.001$). The error rate in size estimation was 41% (53/129) for CXR, 57% (61/107) for CT and 16% (28/179) for US. In particular, 29% (31/107) patients with 'small' tapped effusions were reported to be 'medium/large' effusions by CT scan. CT most commonly overestimated fluid present; whilst US tended to underestimate the few cases where it was inaccurate.

**Conclusions** This study demonstrates that US may be the most accurate modality when assessing the size of pleural effusions. CT imaging may over represent the volume of fluid present. Where imaging reports guide further management, reliability and consistency is essential to avoid unnecessary/urgent intervention and patient anxiety.

## P2 INCORPORATION OF AN IN-DEPTH THORACIC ULTRASOUND ASSESSMENT INTO ROUTINE PRE-PROCEDURAL EVALUATION OF PATIENTS WITH PLEURAL EFFUSIONS

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**Background** Pleural disease affects 1 in 300 people annually; furthermore, the incidence of malignant pleural effusion (MPE) is increasing with over 40,000 cases each year in the UK alone. A significant minority of patients will have non-expandable lung (NEL) secondary to underlying disease. At present, there is no way of pre-emptively identifying these individuals; with current strategies such as pleural manometry requiring invasive intervention. Early recognition of patients with NEL would streamline care and allow them to be offered appropriate treatment; i.e., indwelling pleural catheter insertion rather than chemical pleurodesis. Recent research[1] has described the novel use of thoracic ultrasound (TUS) to identify NEL by assessing mobility and compliance of the atelectatic lung within an effusion. However, this work has not been replicated and was delivered by researchers with expertise and facilities not used by or available to most practitioners.

**Method** We incorporated an in-depth TUS protocol into the pre-procedural assessment of patients undergoing intervention for suspected MPE, where ≥500 mL of fluid was expected to be drained. TUS images were acquired by two chest physicians with RCR level 1 competence or above. Data recorded included size and characteristics of the effusion; presence of pleural thickening; behaviour of the lung and diaphragm; and M-mode displacement with cardiac impulse of the atelectatic lung during breath hold manoeuvres. NEL was determined using post-drainage imaging (chest X-ray and/or CT) and clinical notes.

**Results** 34 patients underwent in-depth TUS evaluation (Table 1). Image acquisition and measurements took no more than five minutes in any patient. Poor M-mode displacement (<0.8 mm) was only seen with NEL, whilst good movement (>1.2 mm) was

**Abstract P2 Table 1** In-depth thoracic ultrasound (TUS) findings in 34 patients undergoing pleural drainage for suspected malignant disease

| | | POST-DRAINAGE LUNG CHARACTERISATION | | |
|---|---|---|---|---|
| | | Free (*n* = 23) | Indeterminate (*n* = 5) | Non-expandable (*n* = 6) |
| ***Static TUS features*** | | | | |
| Effusion side | Right | 11/23 | 5/5 | 5/6 |
| | Left | 12/23 | 0/5 | 1/6 |
| Effusion size | Moderate | 10/23 | 2/5 | 4/6 |
| | Large | 13/23 | 3/5 | 2/6 |
| Septations evident | | 2/23 | 2/5 | 4/6 |
| Parietal pleural thickening evident | | 0/23 | 0/5 | 1/6 |
| Visceral pleural thickening evident | | 0/23 | 0/5 | 3/6 |
| Distinct pleural nodularity evident | | 5/23 | 4/5 | 2/6 |
| ***Dynamic TUS features*** | | | | |
| Paradoxical motion of diaphragm evident | | 9/23 | 2/5 | 3/6 |
| Free movement of atelectatic lung evident | | 22/23 | 3/5 | 2/6 |
| Clear inspiratory expansion of atelectatic lung evident | | 7/23 | 0/5 | 0/6 |
| M-mode motion of atelectatic lung (inspiratory hold, near or approaching TLC) | <0.8 mm; *n* (%) | 0/23 | 0/5 | 5/6 |
| | 0.8–1.2 mm; *n* (%) | 7/23 | 3/5 | 1/6 |
| | >1.2 mm; *n* (%) | 16/23 | 2/5 | 0/6 |
| M-mode motion of atelectatic lung (expiratory hold, near or approaching RV) | <0.8 mm; *n* (%) | 0/23 | 0/5 | 3/6 |
| | 0.8–1.2 mm; *n* (%) | 2/23 | 1/5 | 3/6 |
| | >1.2 mm; *n* (%) | 21/23 | 4/5 | 0/6 |

highly predictive of free lung. The presence of visceral thickening on TUS may also predict NEL, although there was only limited data to support this finding.

**Conclusion** In-depth TUS assessment can be delivered and interpreted quickly in the day-case setting using widely available portable ultrasound equipment, with potential implications for patient care and non-invasive diagnosis of NEL. Further research is needed to evaluate the ability of M-mode and other TUS parameters to predict NEL and symptom response prior to invasive intervention.

## REFERENCE

1 Salamonsen MR, *et al*. Novel use of pleural ultrasound can identify malignant entrapped lung prior to effusion drainage. *Chest* 2014;**146**(5):1286–93.

## P3 THORACIC ULTRASOUND EXPERIENCES AMONGST RESPIRATORY TRAINEES – A NATIONAL SURVEY

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**Introduction** Level 1 proficiency in thoracic ultrasound is a mandatory curriculum requirement for respiratory speciality trainees in the UK. Guidance on attaining and maintaining this competency is outlined by The Royal College of Radiologists (RCR).[1] This has been a focus of the GMC survey specialty specific questions.

**Aims** To further evaluate thoracic ultrasound competencies and training experiences amongst respiratory registrars in England.

**Methods** We invited all respiratory trainees in England to complete an online survey. Responses were collected between October 2015 and June 2016.

**Results** 202 (of approximately 600) respiratory trainees completed the survey from 14 deaneries.

65.8% (131/199) trainees are level 1 accredited with 20.6% (22/107) of these performing fewer than 20 ultrasounds in the past year. Figure 1 illustrates the self-reported confidence in identifying pathology.

59% (107/171) of all respondents are never or rarely supervised. 60% (102/169) of queries are answered by real time evaluation or review of stored media. The remaining 40% reported that advice was based on verbal descriptions.

29.2% (50/171) of trainees reported that access to an ultrasonographer for advice was either "not easy" or "impossible". 9% (15/167) reported that there were no level 1 or level 2 accredited consultants at their current hospital.

**Conclusion** Most trainees are level 1 accredited, but many do not perform the minimum 20 scans/year to maintain their competency.[1] Access to supervision is also limited. Though not a requirement, trainees are less confident in identifying pathology pertinent to acute and respiratory medicine, particularly pulmonary oedema and pneumothorax.

Encouragingly ultrasound training has evolved considerably in recent years, but ongoing work needs to focus on improving supervision and training. There is a case for reviewing current guidance and to consider tailoring training and expectations to align with the specific needs of respiratory registrars.

## REFERENCE

1 The Royal College of Radiologists. Ultrasound training recommendations for medical and surgical specialties. 2nd edn. London: The Royal College of Radiologists, 2012.

## P4 A PROSPECTIVE ASSESSMENT OF THE CLINICAL UTILITY OF INTERCOSTAL ARTERY IDENTIFICATION IN PLEURAL INTERVENTION

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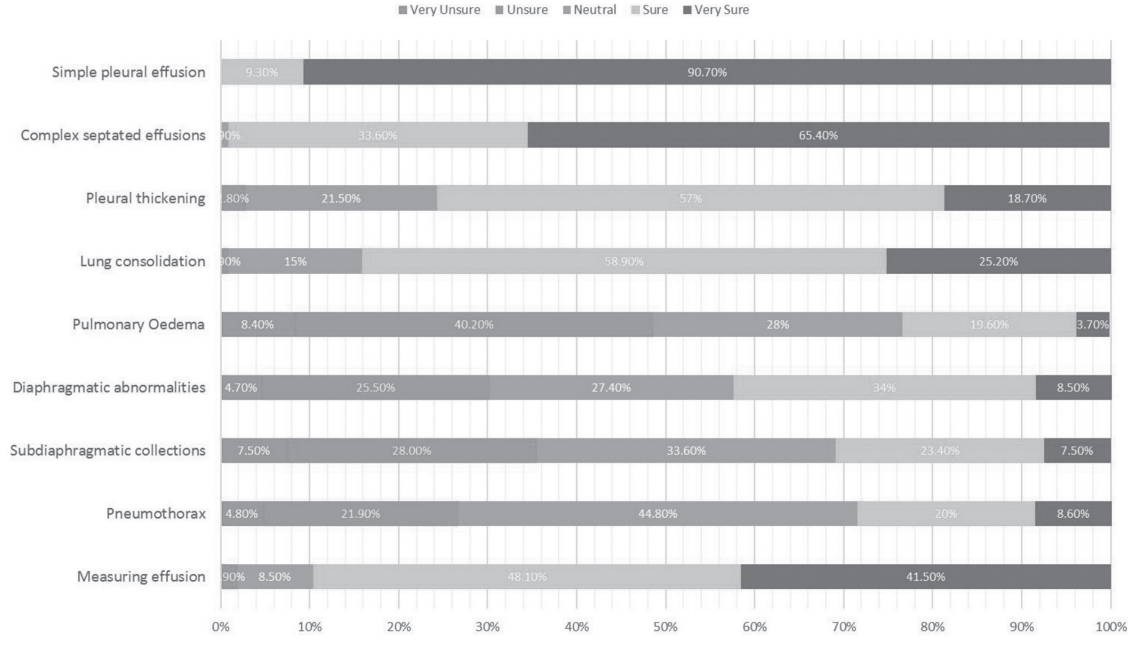
**Background** Respiratory Specialists perform an increasing number of complex pleural procedures. With this comes a greater focus on patient safety and risk reduction. There is strong evidence that ultrasound guidance in procedure site selection for pleural effusion reduces organ puncture and pneumothorax, but




**Abstract P3 Figure 1** Confidence in identifying thoracic pathology amongst level 1 accredited trainees