The Breathless Patient

Adapted from Lichtenstein's BLUE protocol, with permission

Summary

1. (Ongoing resus) Clinical assessment: formulate the question
2. Rapid US screen
3. Form a working diagnosis
4. Continue resuscitation
5. Re-scan / monitor progress / further investigations

First, formulate the question: why is the patient breathless?

In the severely breathless patient, US can reach a diagnosis in approximately 90% of cases. Note that its accuracy is greatest in the sickest patients, because the US features of the responsible diseases are more obvious.

In fact, these US techniques have not been 'road tested' in those with mild degrees of illness, so its accuracy is unknown in such patients.

How to perform a rapid US screen in the breathless patient

Probe & scanner settings

As for the arrest & shock screens, use the curved (abdominal) probe on abdominal / FAST preset.

A three-step scan

1. Anterior lung fields: 2 points on each side
2. If *A profile*: scan the upper & lower limb veins for DVT
3. If no DVT: PLAPS points

Step 1: scan the anterior lungs

Where shall I look? The anterior chest (upper & lower on each side: ideally the BLUE points; see *Lung* section of this manual)

Q: What am I looking for?

A: Recall this table (and details of the US findings & profiles described) from *Lung* section: which disease, which profile?

Normal lungs	A profile: A lines or no lines at all, lung sliding preserved
Pneumothorax	A' profile: A lines or no lines at all, lung sliding absent
APO	B profile: lung rockets in all lung windows, lung sliding preserved
ARDS or pneumonia	B' profile: lung rockets in all windows, lung sliding absent (and usually pleural line irregular) A/B profile: patchy rockets, alternating with areas of normal lung C profile: areas of consolidation A profile anteriorly, plus PLAPS positive
Pulmonary Embolus	A profile (dry, apparently normal lungs) $\pm$ PLAPS positive C profile (i.e. occasionally areas of pulmonary infarct are seen)
Asthma/ COPD	A profile

**If an *A' profile* may not be a PTX, then how the **** do I diagnose PTX?**

1. clinical picture
2. absent lung sliding
3. *A' profile* (see *Lung* section: even 1 B line rules out PTX)
4. The lung point sign (*Lung* section): This represents the site where normal lung gives way to PTX, so that on one side of the image sliding is present, while on the other side it is absent. Some say this is the only truly reliable sign of PTX. In other words, scan more of the lung & look for evidence that sliding is occurring in the lower chest,

but not the upper chest.

NB if there is no lung point, there might still be a massive PTX which has collapsed the entire lung. Go back to the clinical picture & decide whether you need to go ahead & decompress the chest.

Step 1 findings

One lung not sliding

Both lungs slidng

A' profile: PTX? Look for lung point, consider DDX. Treat	B' profile: Pneumonia Treat.

A profile

Step 2

B profile: Pulmonary Oedema Treat.	A/B or C profile: Pneumonia Treat.
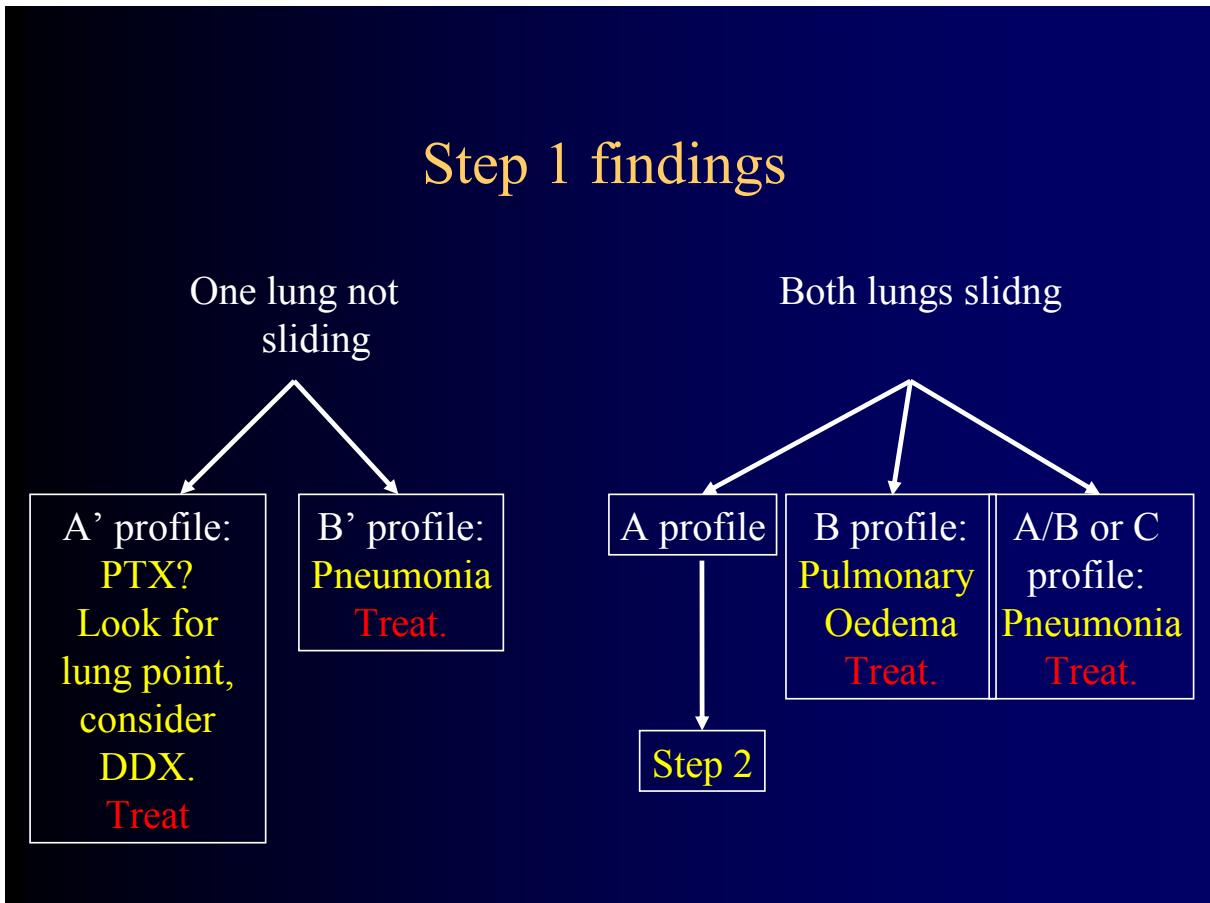
Step 2: the veins

What am I looking for?

A deep venous thrombosis (DVT).

Why?

If you see a DVT in an acutely SOB patient and no other obvious cause for their symptoms, then you can assume it's a PE.

Is that always true?

No. But if you are considering thrombolysis, it's always comforting to see a DVT.

Where and how shall I look?

See the DVT section of this manual for details eg '5 sites to consider compressing'.

You may choose to scan as many or as few of the following sites as you consider appropriate (although most of us only scan three sites on each leg):

- Upper femoral vein (at or around the femoral confluence in the groin)
- Lower femoral vein (just above and medial to the knee)
- Popliteal fossa (behind the knee)
- Below the knee
- Upper limbs: IJV, subclavian vein

NB: this is rule-in, not rule-out. Even if you scan all the above sites and attain the published expert sensitivity of 81%, you'll still miss 19% of patients with PE.

Step 3: the PLAPS points

(see *Lung* section of manual for details)

What are the PLAPS points?

= the most dependent part of the lungs

As far behind & as low as you can scan without hitting the diaphragm

'The Morison's Pouch of the lung' [thanks Dr Chris Wong]

What is PLAPS?

Posterolateral alveolar &/or pleural syndrome

Not as bad as it sounds!

Posterolateral alveolar &/or pleural syndrome

If you see effusion or consolidation at PLAPS points it's 'PLAPS positive'	If you see anything else (A lines, B lines), it's 'PLAPS-negative'

Step 3: the PLAPS points

PLAPS points

PLAPS seen:

Pneumonia

(PE still possible but much less likely)

Treat.

PLAPS not seen:

COPD

Asthma

PE is still possible

Reassess patient; consider other tests.
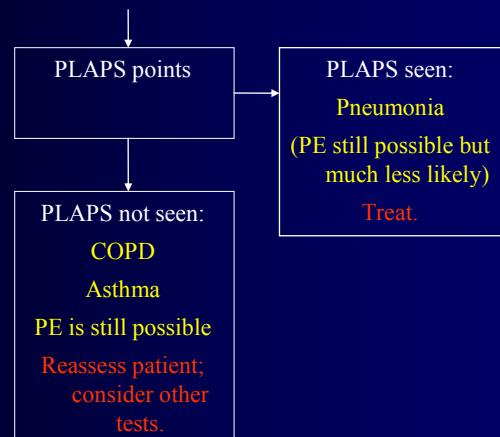
Step 4: heart & IVC

(NB not part of the original BLUE protocol)

For details (window, probe position, possible results): see *Arrest algorithm*
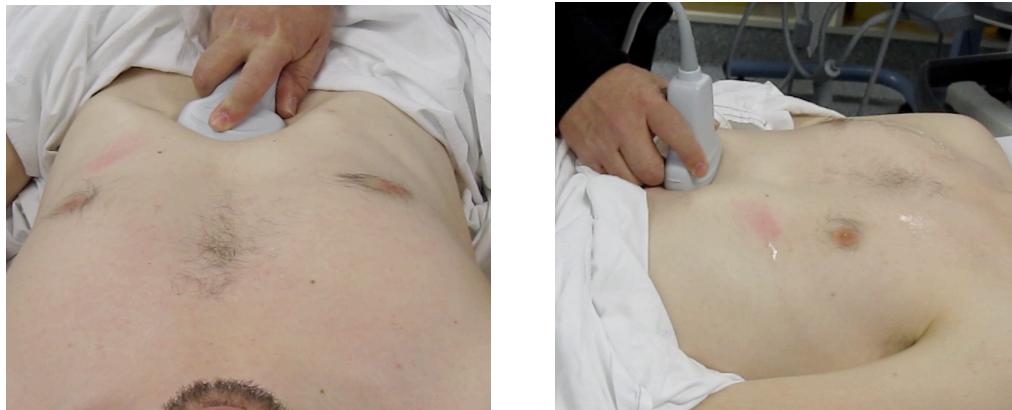
Controversy: why add a cardiac/IVC scan? It's not in the BLUE protocol

All this does is increase the sensitivity for PE.

The BLUE protocol does not make use of cardiac / IVC windows (and misses 19% PE in the hands of an expert, so one might assume that it will be less sensitive in the hands of non-expert scanners.

Technique: as for shock algorithm section of this manual.

3 possible outcomes:

1. High pressure RV & distended IVC: suggest massive PE

2. Grossly normal RV / IVC: PE is still possible, but a massive PE is unlikely. Consider other diagnoses eg COPD & asthma, and reassess patient

3. Inadequate view: either get help with US, or arrange other tests.

Summary: the modified BLUE protocol
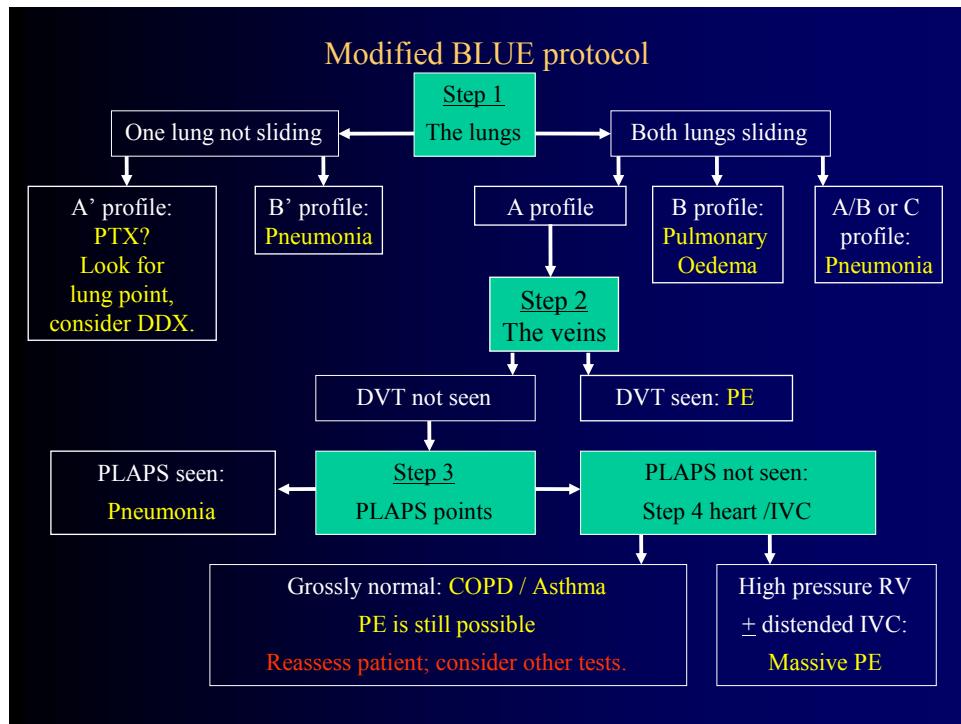
Step 1: anterior lungs

Step 2: the veins

Step 3: the PLAPS points

Step 4: heart & IVC

Outstanding issues

1. Does RV/IVC distension occur in status asthmaticus / severe COPD? If so, this could limit its use as a discriminator for massive PE (and is the reason Lichtenstein does not include it on the BLUE protocol)

BUT realistically we assume that a sensible dr can pick asthma/COPD clinically, so this should not be an issue.

2. Scanning for DVT

• Include upper limb? Only adds 4% sensitivity

• Include below knee? This will be controversial for many

• Details less important than the understanding that this is 'rule-in', not 'rule-out'

3. Should we include heart / IVC or not?

4. Finally, validation studies are needed: by non-experts, in the setting of all breathless patients in the ED.