



AIRWAY ULTRASOUND

Dr Mmapali Mokapela



Hocus Pocus.. Why on earth?

- **F**ocused
- Peri **O**perative
- **R**isk evaluation
- **S**onograph
- **I**nvolving
- **G**astro,
- **H**aemodynamic
- **T**ransthoracic/Airway u/s

What am I trying to achieve?

- Can I intubate
- Will my single lumen or double lumen tube pass? (tracheal, bronchial diameter and subglottic diameter)
- Where is the tube (tracheal position and depth)
- Where is the crico-thyroid membrane
- Is the recurrent laryngeal nerve damaged
- Can I extubate the patient/(prediction of post extubation stridor)
- Why is the patient hypoxic? (pneumo/insterstitial fluid)
- Will this patient aspirate

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REVIEW

Open Access

Role of upper airway ultrasound in airway management



Adi Osman^{1*} and Kok Meng Sum²

Indications

- Upper airway: Identifying crithothyroid membrane, ETT Position
- Lower airway: detection of pneumothorax, checking ETT position and assessment for interstitial fluid

ABC of Airway ultrasound

Use high frequency linear probe

Or curvilinear probe for deeper structures

Sagittal plane scan (longitudinal along midline)

Cross sectional scan

Air mucosal interface

- Double Tract sign
- String of Pearls
- TACA
- Lung Slide
- Stratisphere or Barcode sign
-

String of pearls

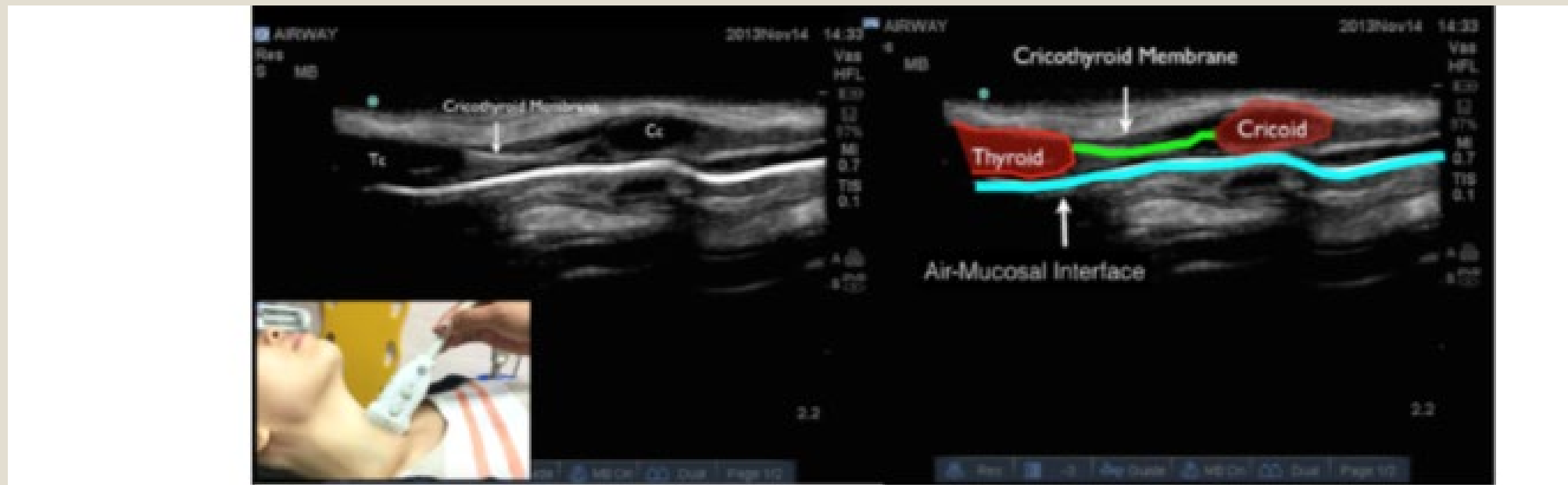
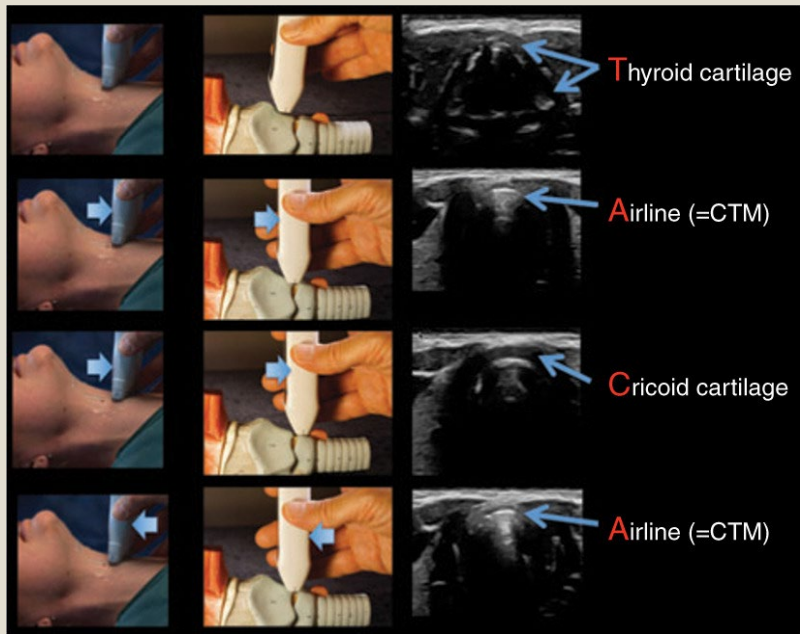
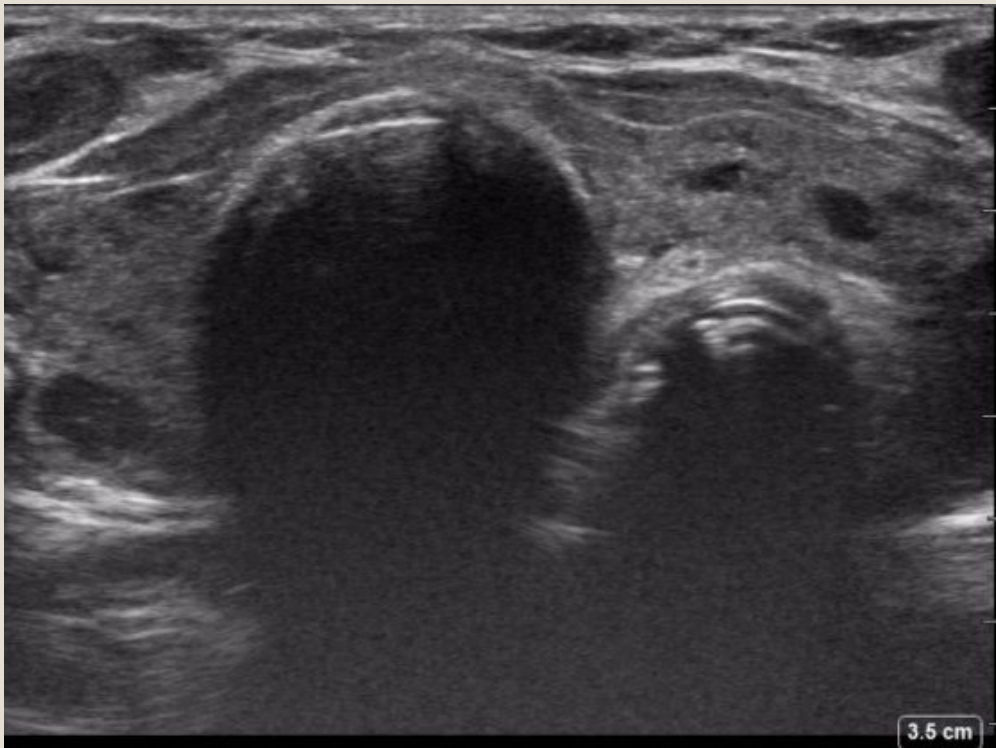


Fig. 1 Cricoid cartilage, thyroid cartilage, and cricothyroid membrane in longitudinal plane. Cc cricoid cartilage, Tc thyroid cartilage

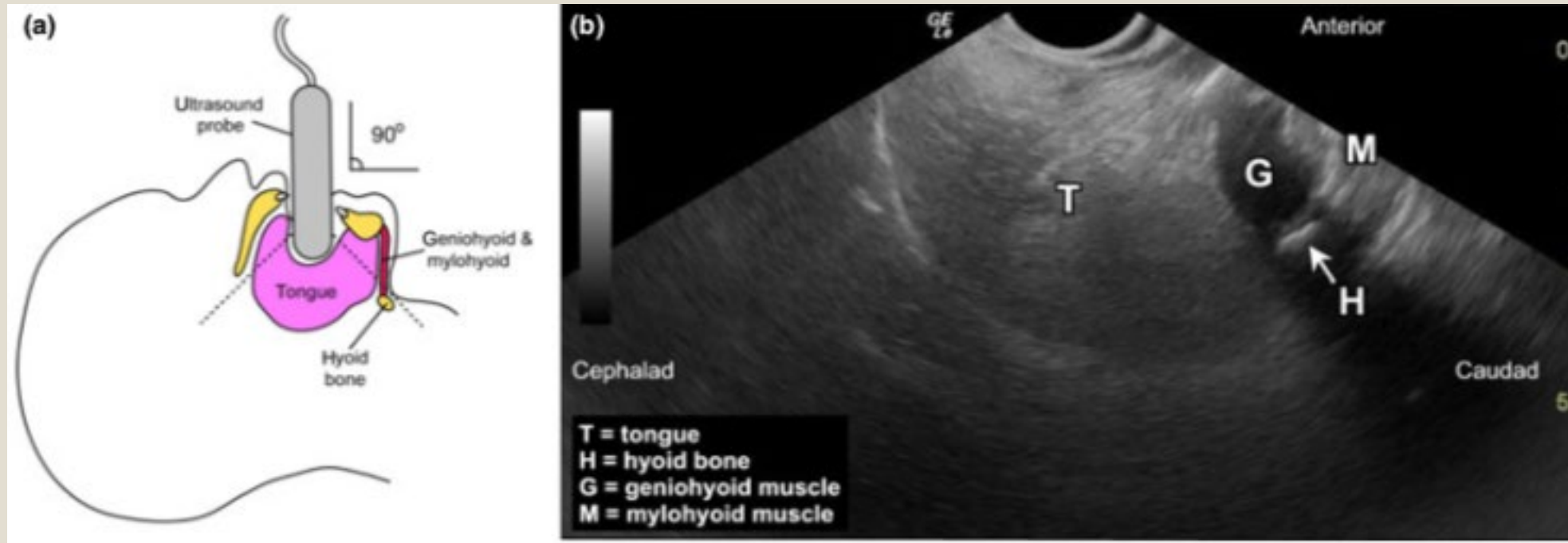
TACA: Identifying CTM



Double tract sign



U/S assisted airway evaluation(1)



U/S assisted airway evaluation (2)

Research Article

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Ultrasound-Assisted Evaluation of the Airway in Clinical Anesthesia Practice: Past, Present and Future

**Gausan Ratna Bajracharya¹,
Angela T Truong²,
Dam-Thuy Truong²
Juan Pablo Cata^{2,3}**

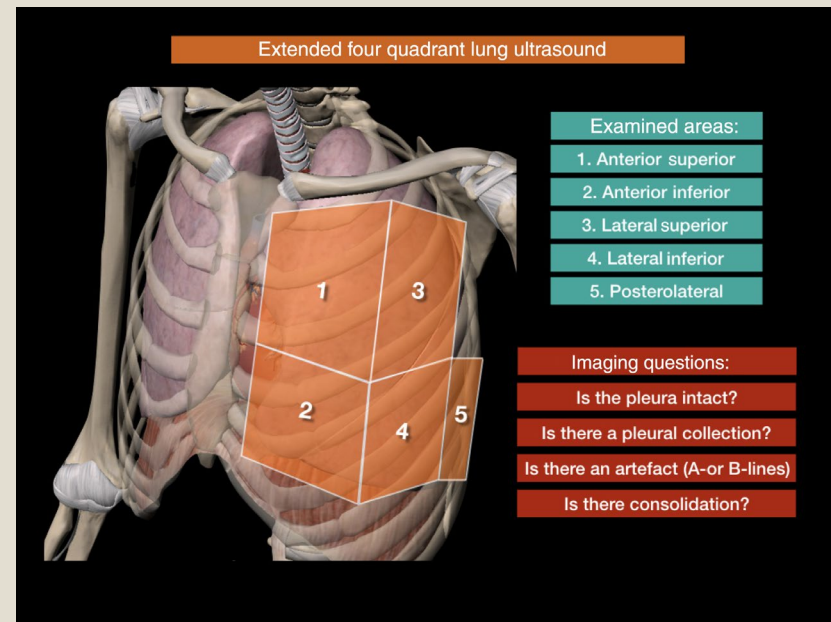


Figure 3 Diagram with US parameters to assess difficult airway.
Ultrasound measurements at various levels. 1: Cross sectional area at base of tongue (TB). 2: Distance from hyoid bone (HB) to mentum (M). 3: Distance from skin to hyoid bone. 4: Distance from skin to epiglottis (E) midway between thyroid cartilage (TC) and hyoid bone. 5: Soft tissue thickness at level of thyrohyoid membrane. 6: Distance from skin to anterior commissure of true vocal cords (VC). 7: Soft tissue thickness at level of thyroid isthmus (TI). 8: Soft tissue thickness at level of suprasternal notch.

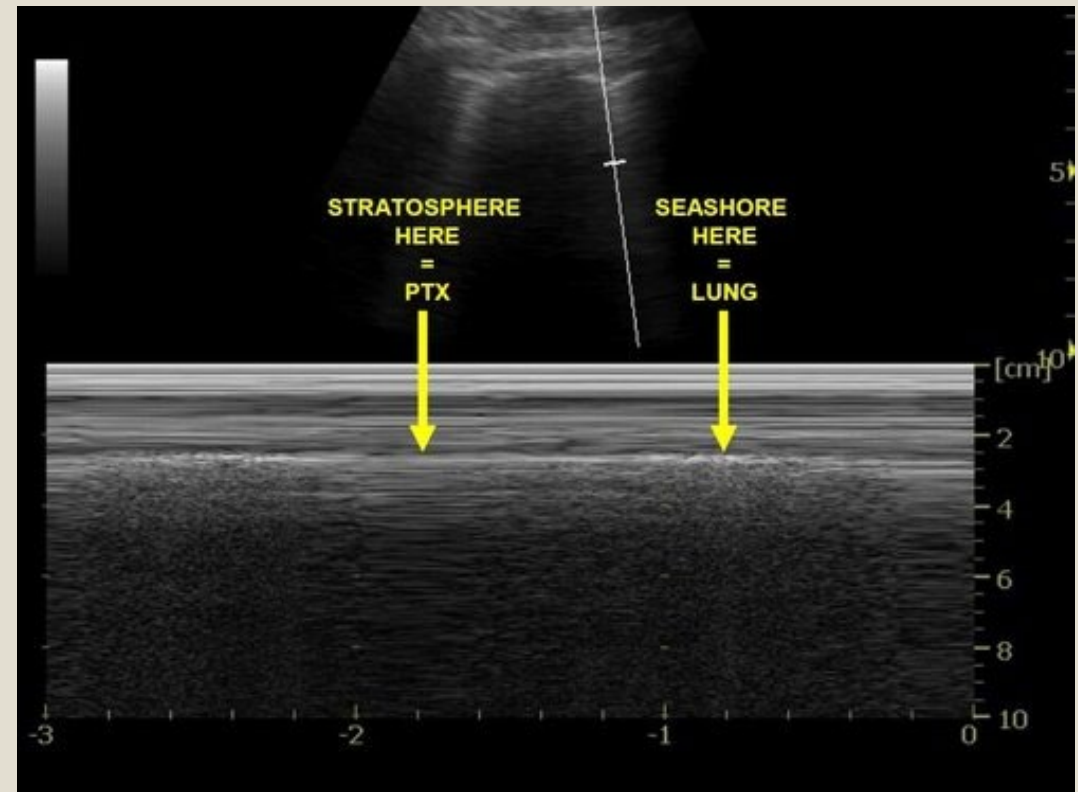
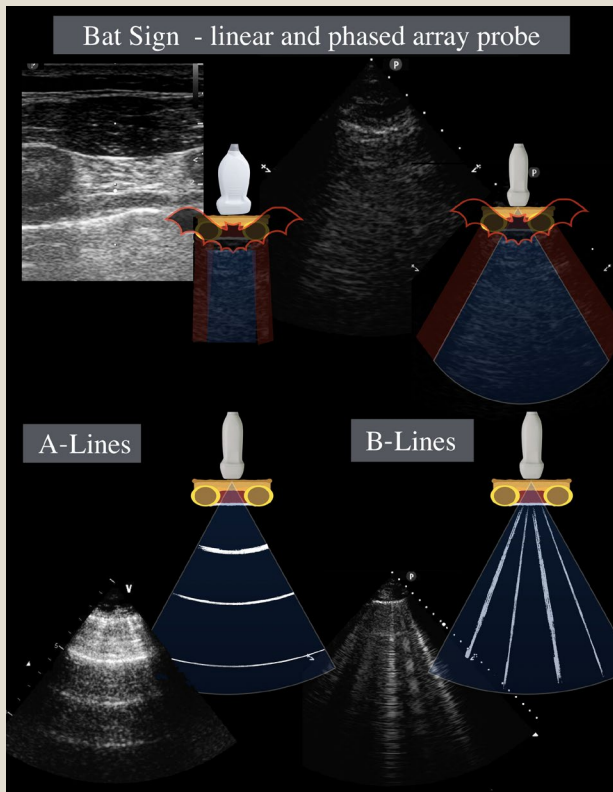
Authors & Year	N= (M/F) Age (mean ± SD)	Difficult/easy laryngoscopy	Parameter studied	Difficult laryngoscopy †	Easy laryngoscopy †	Comment
Ezri, et al. 2003	50(21/29) N/A	9/41	STT at level of: VC*** • Thyroid isthmus • Suprasternal notch*	28 ± 2.7 mm 25 ± 1.3 mm 33 ± 4.3 mm	17.5 ± 1.8 mm 22.8 ± 5 mm 27.4 ± 6.6 mm	Patients of middle eastern descent with DL have significantly more STT at level of VC.
Komatsu, et al. 2007	64(12/52) N/A	20/44	STT at level of VC*	20.4 ± 3.0 mm	22.3 ± 3.8 mm	No clinically significant difference in STT at level of VC could be found between DL and EL groups in patients of Caucasian and African American descent.
Adhikari, et al. 2011	51(19/32) 53.1 ± 13.2	6/45	STT at level of: • Hyoid bone • Thyrohyoid membrane	1.69 [95% CI = 1.19-2.19] cm 3.47 [95% CI = 2.88-4.07] cm	1.37 [95% CI = 1.27-1.46] cm 2.37 [95% CI = 2.29 - 2.44] cm	STT at level of thyrohyoid membrane was significantly more in patients with DL compared to EL
Wojtczak, et al. 2012	12(7/5) 49.3 ± 15.6	6/6	HMDR** HMD _n HMD _e Tongue volume Floor of the mouth muscle volume	1.02 ± 0.01 51.3 ± 5.3 mm 52.6 ± 5.8 mm 137 ± 29 cm ₃ 34.8 ± 11 cm ₃	1.14 ± 0.02 57.5 ± 4.3 mm 65.5 ± 4.1 mm 168 ± 34 cm ₃ 37.7 ± 13 cm ₃	HMDR and HMD _e was greater in patients with DL compared to those with EL.
Hui, et al. 2014	100(55/45) 52.1 ± 15.5	11/89	Hyoid bone not visualized in sublingual ultrasound***	8/11(72.7%)	3/89(3.37%)	Inability to visualize hyoid bone significantly predicted DL.
Wu, et al. 2014	203(83/120) NA	28/175	DSHB*** DSEM*** DSAC***	1.51±2.7cm 2.39±0.34cm 1.30±0.31cm	0.98±0.26cm 1.49±0.39cm 0.92±0.20cm	DSHB, DSEM and DSAC are independent predictors of DL.

Pulmonary Assessment

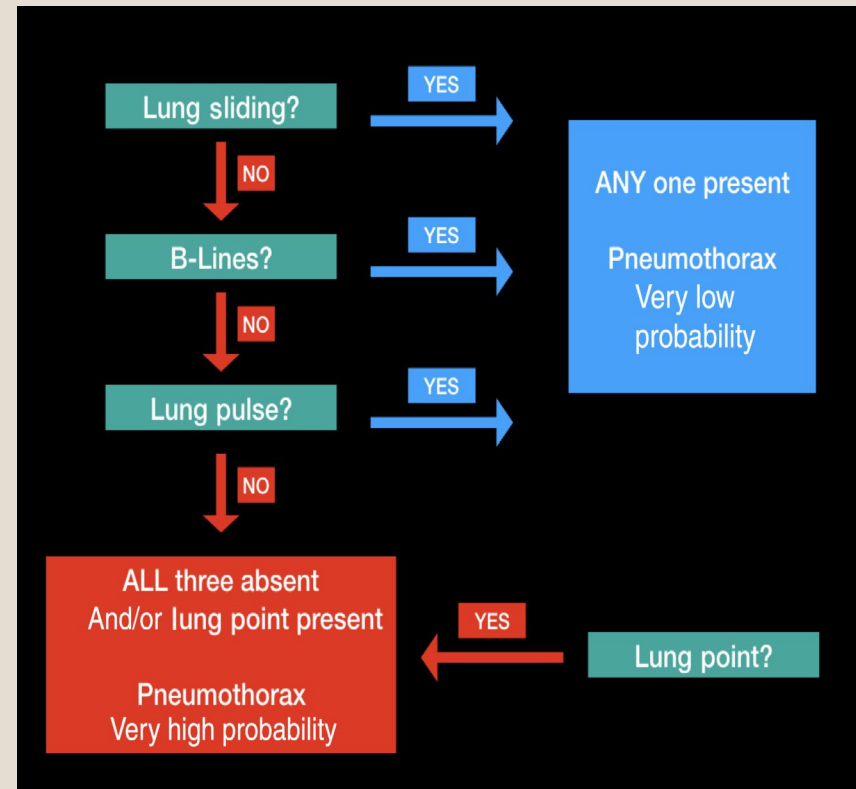
- Better sensitivity than clinical assessment and cxr combined
- FLUS
- Pheunothorax
- Interstitial Fluid



Pulmonary assessment(2)



Pulmonary assessment (3)



Pro's and Cons

- Affordable
- Accessible
- Fairly easy to learn
- Needs Practice
- User dependant
- Still need more research and data

Take home message

- Toy or tool?



openairway.org/airway-devices/airway-ultrasound

References

- Available on request



openairway.org/airway-devices/airway-ultrasound

THANK YOU!

Don't sweat the small stuff!