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ATTENTION CHANGEMENT DE DATE

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Thoracic Ultrasound Influences Decision-Making in Chest Physiotherapy for Critical Care Patients
A Multicenter Study

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Lien d’intérêt

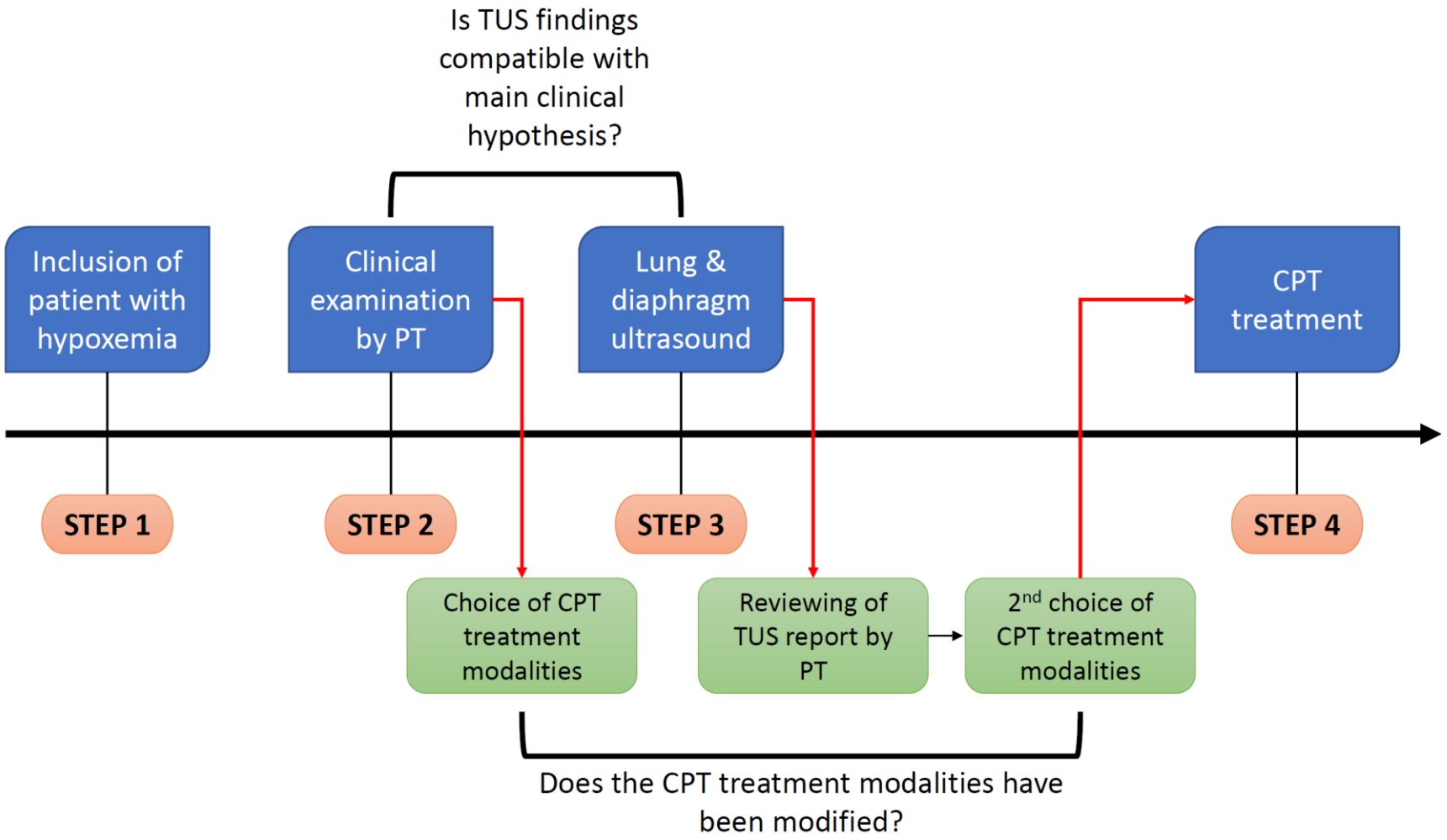
Rational

- Physiotherapist’s are involved in the management of hypoxemic patients
- CPT may be used to improve airway secretion clearance, alveolar recruitment, and ventilation/perfusion matching
- The selection of appropriate interventions relies on a physiotherapist’s assessment
- Inaccurate diagnoses may result in inappropriate CPT
- Thoracic ultrasound has accuracy in the diagnosis of the main conditions commonly encountered by the physiotherapist
- The way in which TUS could guide or modify the choice of chest physiotherapy treatment by physiotherapist’s has never been studied

Methods (1)

- Prospective, observational multicenter-center study conducted between May 2, 2017 and November 18, 2020 at four ICUs
  - Surgical ICU of the University Hospital of Dijon (Dijon, France)
  - General ICU of the Paris St. Joseph Hospital (Paris, France)
  - Respiratory ICU of the Forcilles' Hospital (Férolles-Attilly, France)
  - General ICU of St. Vincent's Hospital (SVH) (Sydney, Australia)
- All patients consecutively admitted to the ICUs, whether ventilated or not, were screened and enrolled in the study if they satisfied the following criteria
  - Presence of hypoxemia
  - Presence of a chest X-ray less than 12 hrs prior to chest physiotherapy
  - Undergoing their first chest physiotherapy session

Methods (2)


Is TUS findings compatible with main clinical hypothesis?
Inclusion of patient with hypoxemia
Clinical examination by PT
Lung & diaphragm ultrasound
CPT treatment
STEP 1
STEP 2
STEP 3
STEP 4
Choice of CPT treatment modalities
Reviewing of TUS report by PT
2nd choice of CPT treatment modalities
Does the CPT treatment modalities have been modified?

Methods (3)

- Primary Outcome
  - Agreement between the clinical and ultrasound diagnoses, and the modification of the CPT before and after thoracic ultrasound
  - Expressed by the NRI which assessed the impact of thoracic ultrasound on the clinical decision-making process
- Secondary outcomes
  - Factors associated with the concordance between the physiotherapist clinical and the ultrasound diagnoses, and the modification of chest physiotherapy treatment
    - Reason for ICU admission
    - Comorbidities
    - Clinical parameters
    - Presence of a chest CT-scan
    - Level of confidence in clinical diagnosis
    - Clinical and ultrasound diagnosis
    - Presence of mechanical ventilation

Results (1)

- 151 were included in the analysis
- Most frequent reasons for ICU admission
  - Acute respiratory failure (30%)
  - COPD exacerbation (11%)
  - Thoracic surgery (10%)
- **Chest physiotherapy treatment was changed in 62% of cases (n = 93)**
  - Significantly more changes when clinical and ultrasound diagnoses were discordant rather than concordant (69% vs 49%, *p* = 0.02, respectively)
- **NRI was - 40% (95% CI (-56- -22%), p = 0.02)**
- Clinical and TUS diagnoses were discordant in 64% of cases (n = 96)
  - **Agreement between clinical and ultrasound diagnosis was poor (kappa = 0.17; *p* < 0.01)**

Results (2)

Table 2: Reasons for Major Change of Chest Physiotherapy Treatment

Treatment change considered as major	n = 38 (41)
Alveolar recruitment vs ACT, n (%)	4 (4)
No CPT vs CPT, n (%)	2 (2)
Change of laterocubitus side, n (%)	8 (9)
Refer to MD vs CPT, n (%)	9 (10)
Alveolar recruitment vs inhaled therapy, n (%)	1 (1)
CPT vs no CPT, n (%)	11 (12)
IMT added to initial treatment, n (%)	3 (3)

Initially planned vs finally implemented chest physiotherapy treatment.

Abbreviations: ACT: Airway clearance techniques; CPT: Chest physiotherapy; MD: Medical doctor; IMT: Inspiratory muscles training.

Results (3)

Variable		N	Odds ratio	p
CHD	no	106	Reference	
	yes	30	0.25 (0.07, 0.74)	0.017
Certainty	no	51	Reference	
	yes	85	3.28 (1.30, 8.71)	0.014
Reason for admission	respiratory	81	Reference	
	othermed	36	0.68 (0.25, 1.78)	0.436
	surgical	19	0.12 (0.02, 0.60)	0.019
Clinical diagnosis	alveolar	70	Reference	
	noparenc	22	0.06 (0.01, 0.26)	<0.001
	noventil	44	0.26 (0.09, 0.69)	0.008
Heart rate		136	1.02 (1.00, 1.04)	0.115

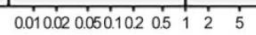


Figure 3. Forest Plot of Multivariate Analysis of Factors Potentially Associated with Diagnosis Concordance

Discussion (1)

- High value of the NRI was explained by
  - The low agreement between clinical and TUS diagnoses
  - The high frequency of treatment change after TUS
  - Which was significantly more frequent when diagnoses were discordant
- Indeed, physical assessment, lung auscultation and chest-X-rays lack
- We hypothesize that thoracic ultrasound is able to provide a more accurate diagnosis
- However, CPT was modified in almost 50% of the cases in which clinical and ultrasound diagnoses were concordant
  - This suggests that additional information was provided by thoracic ultrasound
- The level of confidence of the physiotherapist in their clinical diagnosis was independently associated with diagnostic concordance
  - Reflects that their clinical skill levels are important

Discussion (2)

- Surprisingly, the presence of a chest CT-scan less than 12 hours prior to chest physiotherapy assessment was not associated with diagnostic concordance
- Clinical diagnosis involving non-parenchymal conditions and clinical signs reflecting absence of local lung ventilation were associated with ↑ diagnostic discordance
  - Highlights the low accuracy of the usual tools used by the physiotherapist to diagnose these conditions
- Limits
  - The study design does not allow us to assess the benefit on a patient's outcome
  - In usual practice, physiotherapists provide intervention in patients without the presence of hypoxemia, such as secretion retention

Thank you for your attention