ARCOTHOVA
Anesthésistes Réanimateurs
Cœur – THOrax - VAisseaux

Comité SFAR ARCOTHOVA

Intensive Care Anesthesiology Marseille

Détresses respiratoires en SSPI : « les bons réflexes »

Dr Ambroise Labarrière, Hôpital Nord, AP –HM

- Pas de conflits d’intérêts

PLAN

- Principales étiologies
- Outils diagnostiques
- Thérapeutiques

Etiologies

- Complications postopératoires des exérèses pulmonaires, Brioude et al, Revue des maladie respiratoire, 2019
- Postoperative complications of pulmonary resection, Thorpe et al, Clinical radiology, 2020

Complications chirurgicales

- Fuites aériques / brèches
- Pneumothorax
- Fistule broncho pleurale
- Sténose bronchique
- Torsion lobaire
- Hernie / rupture diaphragmatique
- Fistule vasculaire
- Suture artérielle
- Sténose trachéale

- Luxation cardiaque
- Tamponnade
- Etc etc etc…

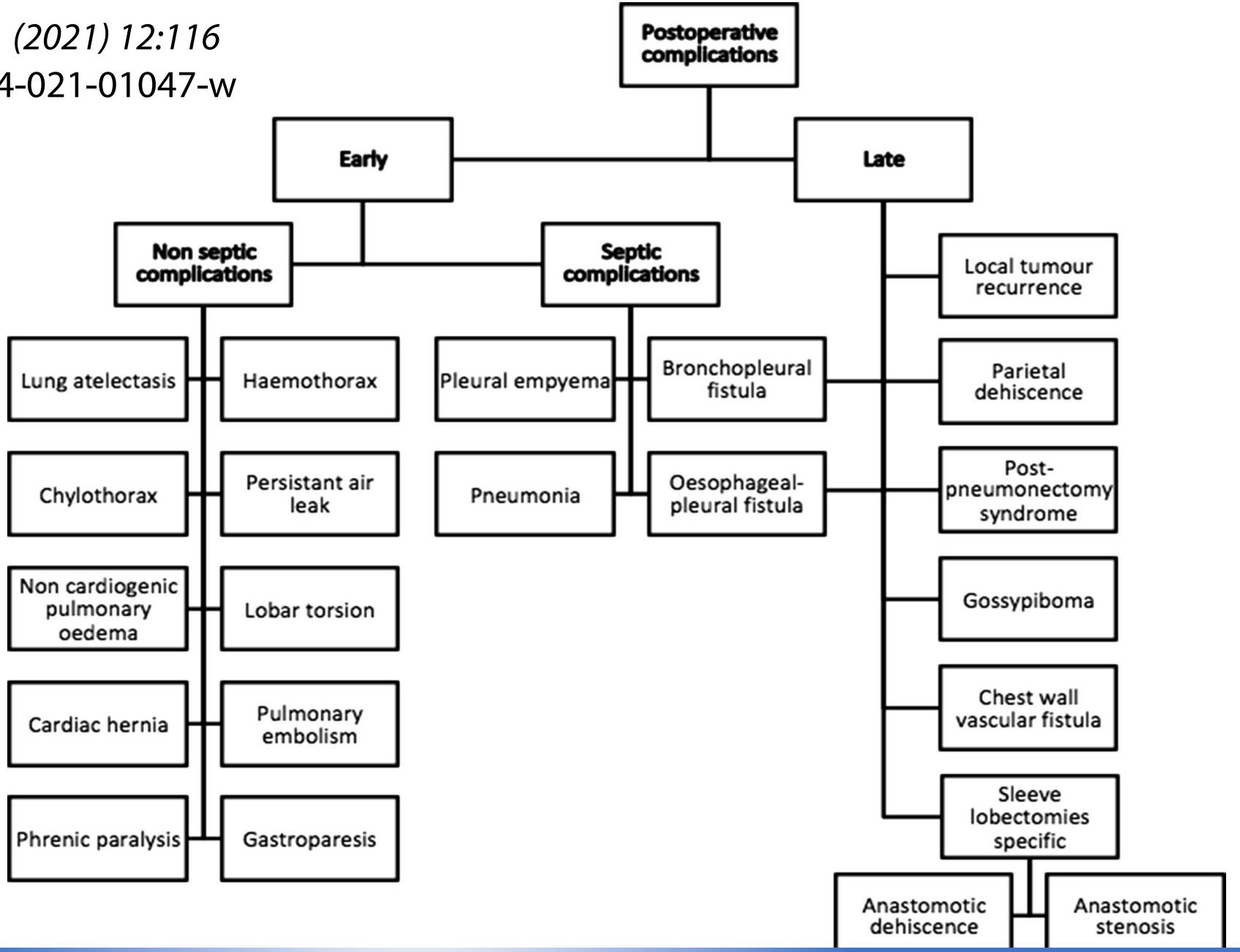
Complications médicales

- Curarisation résiduelle
- Surdosage anesthésique / morpinique
- Intoxications aux anesthésiques locaux
- Inhalation
- Dyspnée laryngée
- Hypoglycémie
- AVC
- Infarctus
- OAP
- Atélectasie
- SDRA lobaire
- Choc septique
- Acidose
- Etc etc etc…

Eliminer les causes « classiques »

- Cardio-vasculaire :
  - Choc
  - IdM
  - EP
  - Tamponnade
  - Anémie
- Neurologique :
  - Curarisation résiduelle
  - Surdosage en anesthésique
  - Intoxication
  - AVC
  - Hypo/hyperglycémie
- Respiratoire
  - Atélectasie
  - Inhalation
  - Epanchement pleural
  - Pneumothorax
  - SAHOS / SOH
  - Bronchospasme

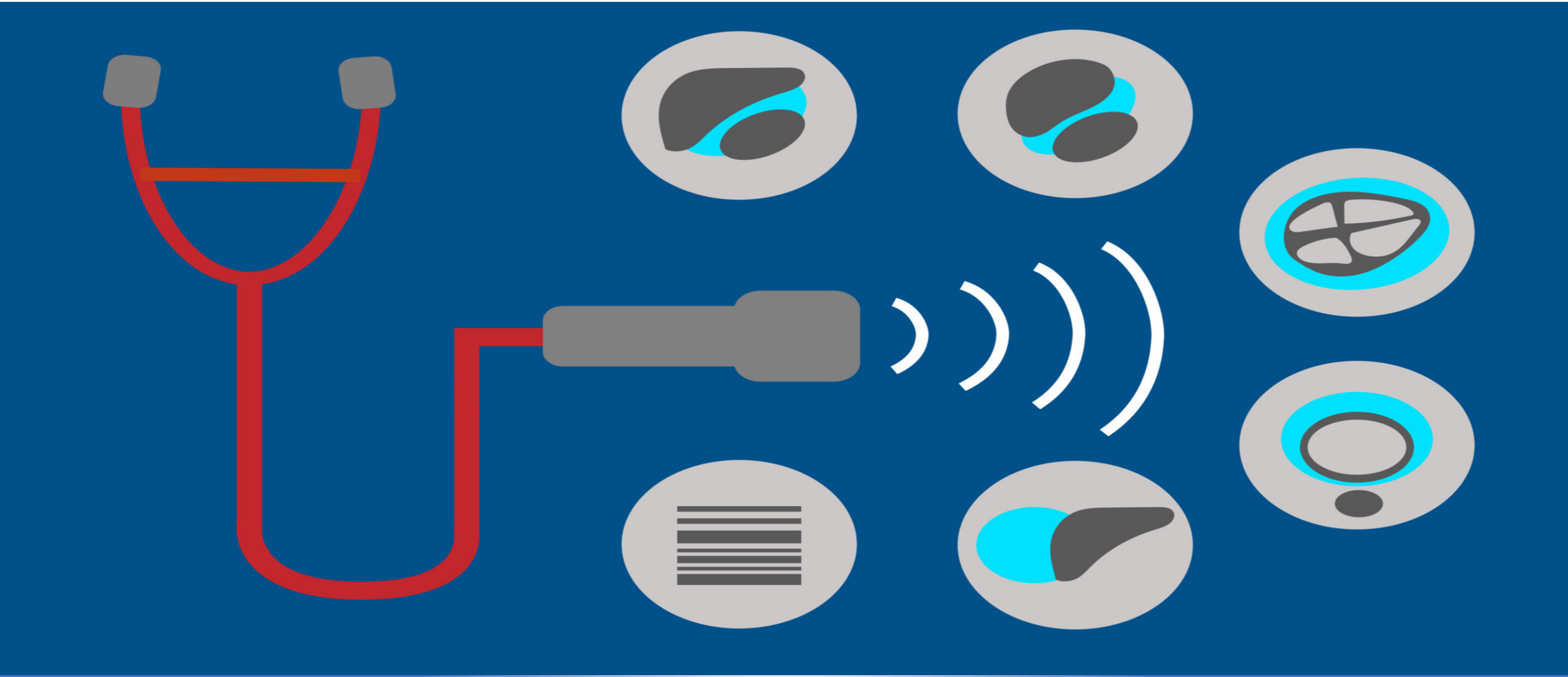
Burel *et al. Insights Imaging* (2021) 12:116
https://doi.org/10.1186/s13244-021-01047-w



Quels examens ?

- Examen clinique rapide
  - HGT TOF
  - PA / signes de choc
  - SpO2 FR
  - Vigilance / pupille / focalisation
- Paraclinique indispensable
  - ECG troponinémie
  - GDS artériel
  - Radio thoracique

DIAGNOSTIQUE IMMEDIAT : POINT - OF - CARE ULTRA - SOUND



Point-of-care ultrasonography in patients admitted with respiratory symptoms: a single-blind, randomised controlled trial

Lancet Respir Med 2014; 2: 638–46

Christian B Laursen, Erik Sloth, Annmarie Touborg Lassen, René dePont Christensen, Jess Lambrechtsen, Poul Henning Madsen, Daniel Pilsgaard Henriksen, Jesper Rømhild Davidsen, Finn Rasmussen

	Point-of-care ultrasonography group (n=158)	Control group (n=157)	p value	Absolute effect (95% CI)	Relative effect (95% CI)
4 h after admission to emergency department					
Patients with correct presumptive diagnoses	139 (88·0%; 82·8 to 93·1)	100 (63·7%; 56·1 to 71·3)	<0·0001	24·3% (15·0 to 33·1)	1·38 (1·01 to 1·31)
Appropriate treatment ordered*	123 (78%; 71·3 to 84·4)	89 (56·7%; 48·9 to 64·5)	<0·0001	21·2% (10·8 to 30·9)	1·37 (0·98 to 1·35)

CHEST

Original Research

PULMONARY PROCEDURES

Focused Sonography of the Heart, Lungs, and Deep Veins Identifies Missed Life-Threatening Conditions in Admitted Patients With Acute Respiratory Symptoms

Christian B. Laursen, MD; Erik Sloth, MD, DrMedSc, PhD; Jess Lambrechtsen, MD, PhD; Annmarie Touborg Lassen, MD, DrMedSc, PhD; Poul Henning Madsen, MD; Daniel Pilsgaard Henriksen, MD; Jesper Rømhild Davidsen, MD, PhD; and Finn Rasmussen, MD, DrMedSc, PhD

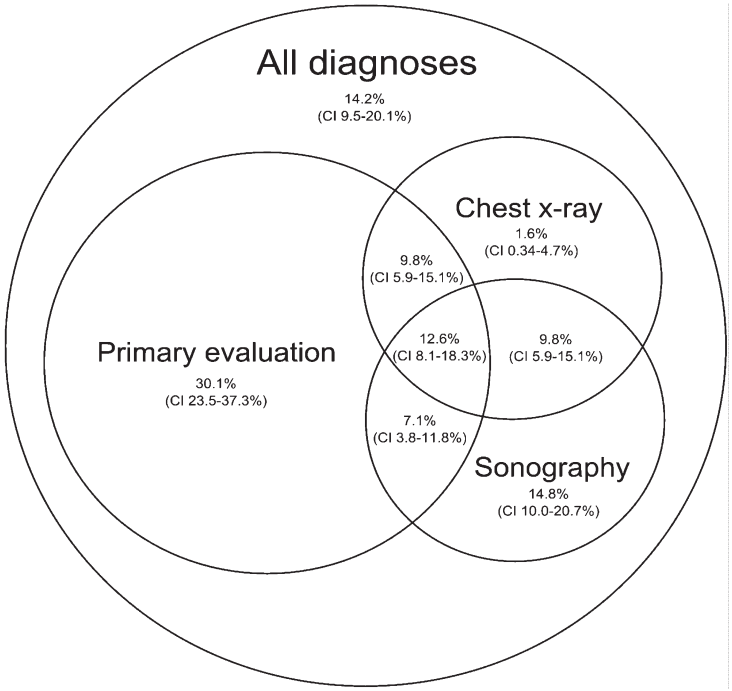
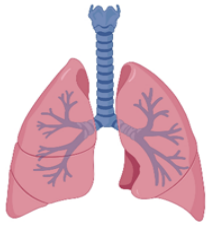


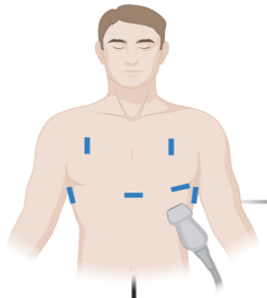
FIGURE 3. Comparison of primary assessment, chest radiography,



Respiratory failure Protocol

Zieleskiewicz *et al. Crit Care* (2021) 25:34
https://doi.org/10.1186/s13054-021-03466-z

Clinical exam and medical history
Ultrasound examination



Pleural effusion

LUNG SLIDING ?

YES

NO

Bilateral B lines

Bilateral A lines

Unilateral B lines or consolidation

Unilateral B lines

Lung point

Cardiac ultrasound *(Visual EFLV)*

Deep vein ultrasound *(femoral - popliteal)*

Pneumonia
(Dynamic air bronchogram)

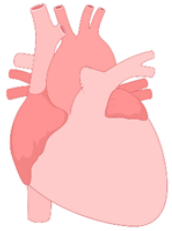
Atelectasia
(Static air bronchogram)

Pneumothorax

Cardiogenic edema

Acute interstitial lung disease

Tamponade or Pulmonary embolism → If normal → COPD or Asthma exacerbation



Circulatory failure Protocol

Clinical exam and medical history
Ultrasound examination

Zieleskiewicz *et al. Crit Care* (2021) 25:34
https://doi.org/10.1186/s13054-021-03466-z

LV function

1. Telesystolic exclusion of LV
2. Visual estimation of the inferior vena cava diameter

→ Septic shock or Hypovolemic and/or hemorraghic shock

1. Visual EFLV
2. Myocardial sideration
3. Dyskinesia of LV

→ Cardiogenic shock

RV function

1. Dyskinesia of RV
2. Dilatation of RV
3. Paradoxical septum
4. Pericardial effusion

→ Pulmonary embolism (1-2-3)

→ Tamponade (4)

Pulmonary assessment

1. Abolished lung sliding
2. Lung point
3. Pleural effusion

→ Pneumothorax (1-2)

→ Pleural effusion (3)

Table 2 Primary and secondary outcomes of patients[a]

Outcome category	Control group *n* = 82	POCUS group *n* = 83	P value
Primary outcome			
Immediate adequate diagnosis			
General	66 (80)	78 (94)	0.009
Circulatory	24/26 (92)	21/22 (95)	0.65
Respiratory	42/56 (75)	57/61 (93)	0.006
Secondary outcomes			
Appropriate intervention in ward			
General	72 (88)		
Circulatory	22/26 (84)		
Respiratory	48/56 (86)		
Time to immediate diagnosis, median [IQR], min			
General	11 [5–20]		
Circulatory	14 [7–20]		
Respiratory	16 [5–20]		
Time to first treatment/intervention, median [IQR], min			
General	34 [15–40]		
Circulatory	22 [14–45]		
Respiratory	30 [15–38]	15 [20–61]	0.00003

Table 4 In-hospital and ICU mortality rates in POCUS group versus control group[a]

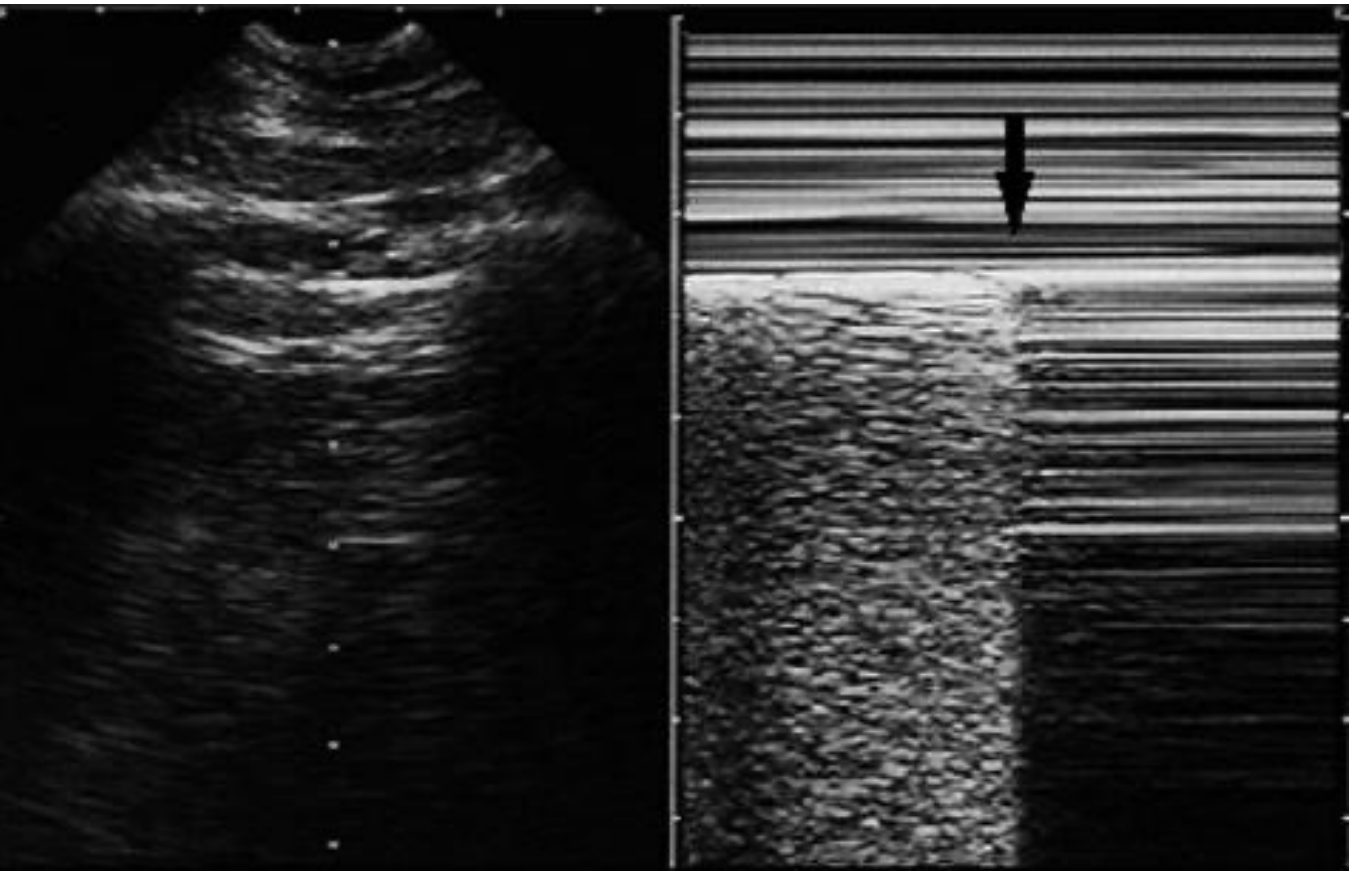
	Control group *n* = 82	POCUS group *n* = 83	*P* value
In-ICU mortality			
General	* 17 (25)	* 7 (11)	0.04
Circulatory	7/23 (30)	1/17 (6)	0.11
Respiratory	10/44 (23)	6/45 (13)	0.25
In-hospital mortality			
General	29 (35)	14 (17)	0.007
Circulatory	12/26 (46)	3/22 (14)	0.02
Respiratory	17/56 (30)	11/61 (18)	0.12

Bedside POCUS during ward emergencies is associated with improved diagnosis and outcome: an observational, prospective, controlled study, Zieleskiewicz *et al. Crit Care, 2021*

Chest Ultrasound Can Reduce the Use of Roentgenograms in Postoperative Care After Thoracic Surgery

Marek Malík, MD, Anton Dzian, MD, PhD, Michaela Skaličanová, MD, Ľuboš Hamada, MD, Kamil Zeleňák, MD, PhD, and Marián Grendár, Mgr, PhD

Department of Thoracic Surgery, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava and University Hospital in Martin, Martin, Slovakia; Department of Radiology, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava and University Hospital in Martin, Martin, Slovakia; and Biomedical Centre Martin, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, Martin, Slovakia



Ann Thorac Surg
2021;112:897-904

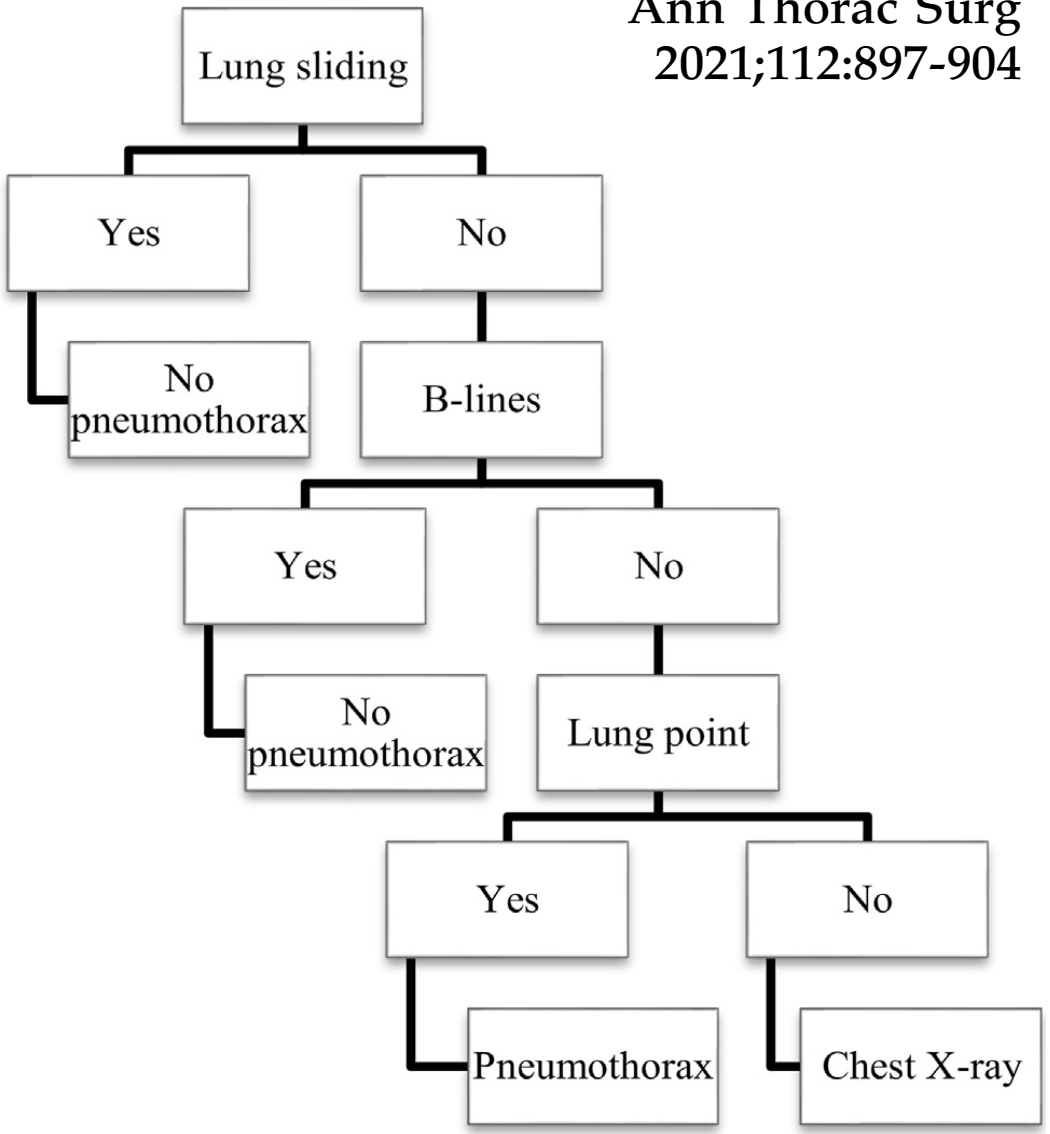
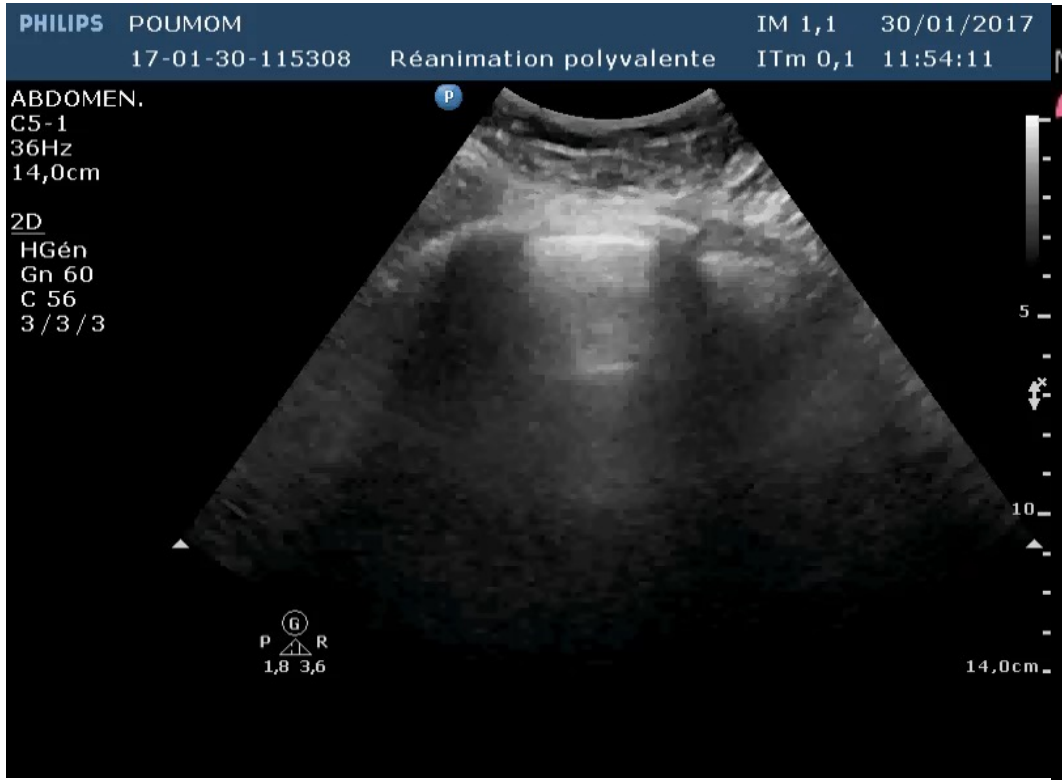


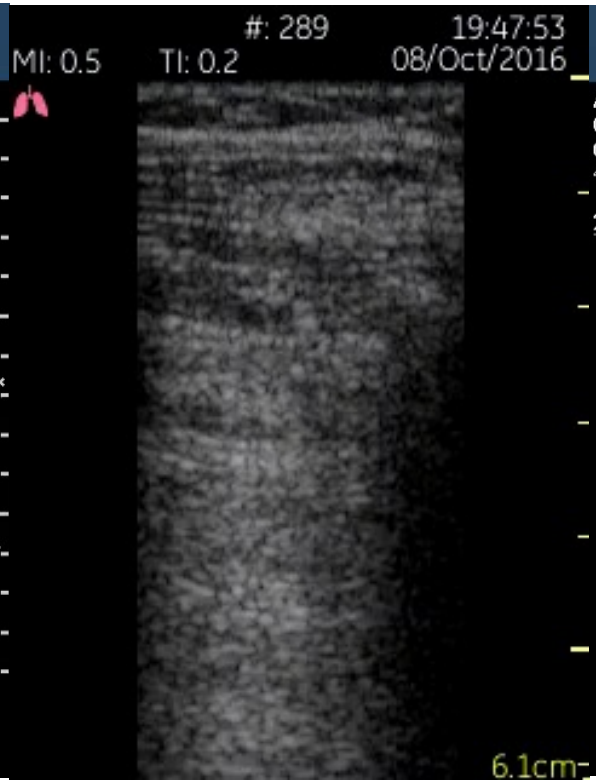
Figure 1. Diagnostic algorithm for ultrasound detection of pneumothorax in our trial.

Echographie pleurale

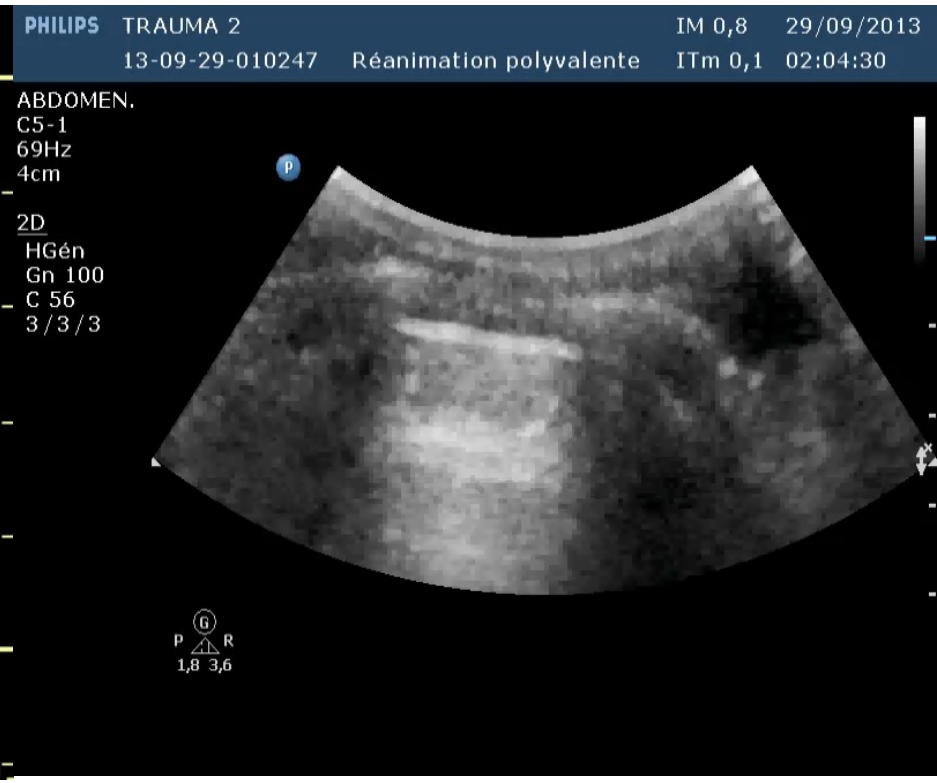
Normal lung



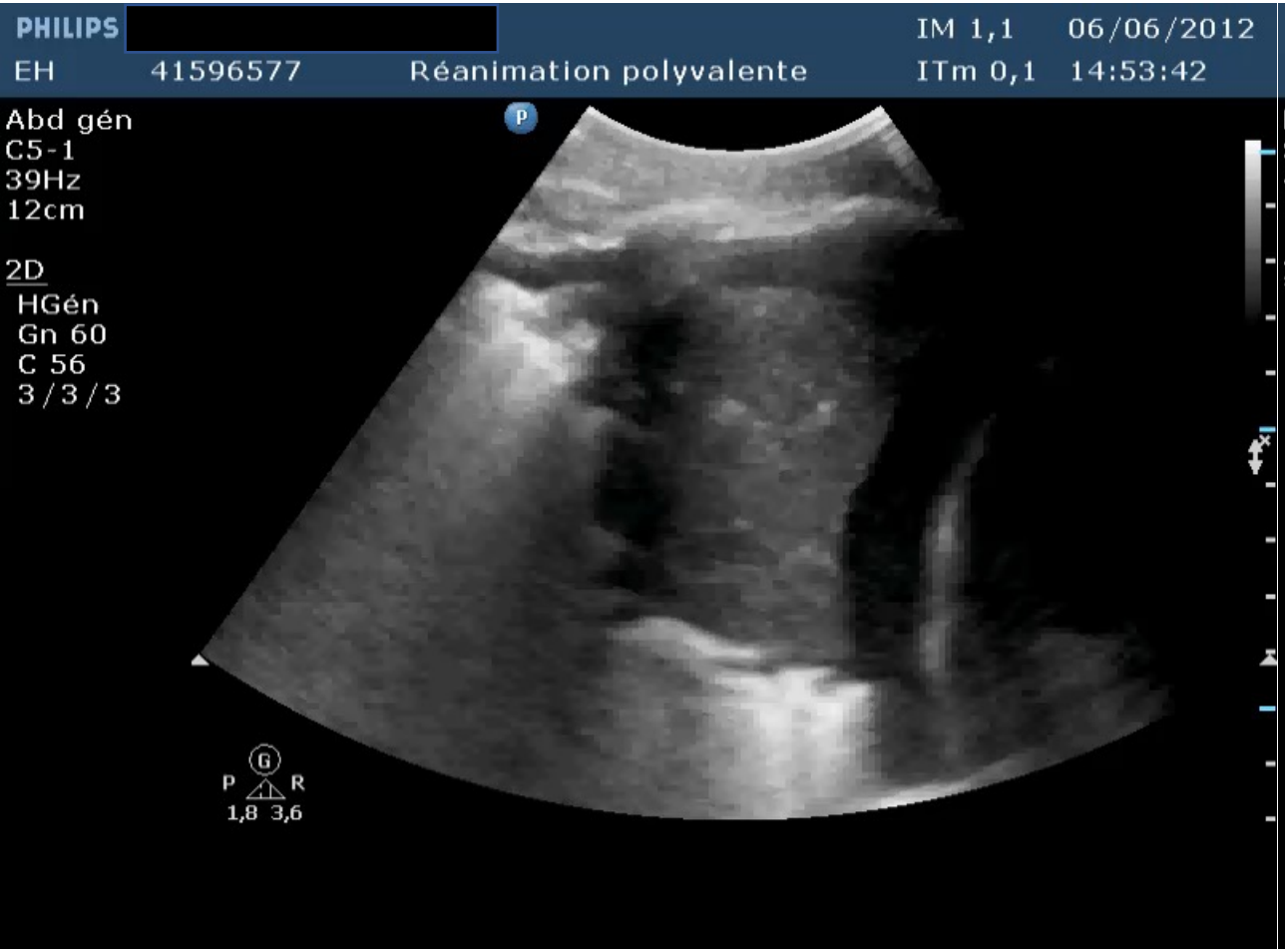
Lung point



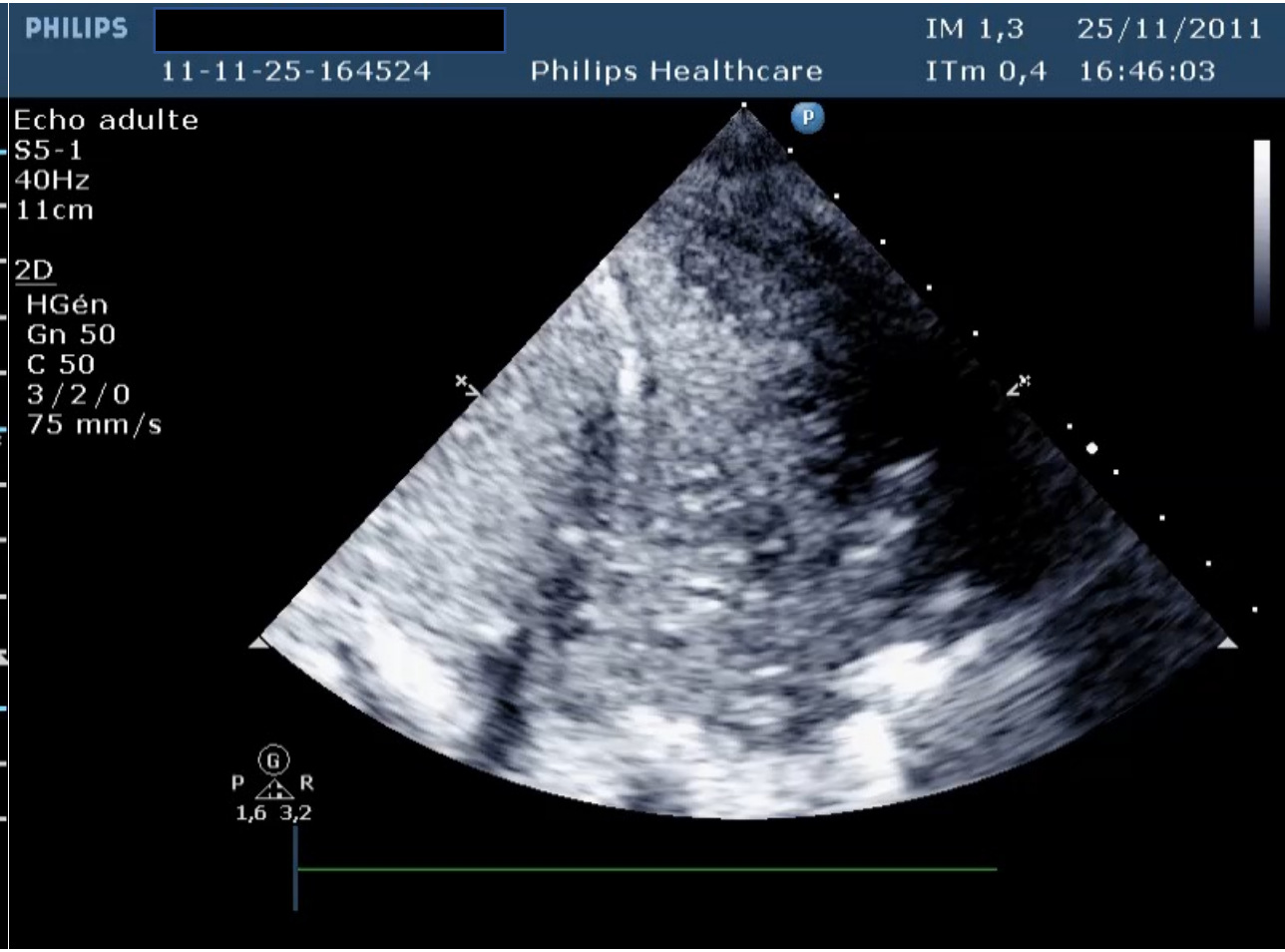
No lung sliding



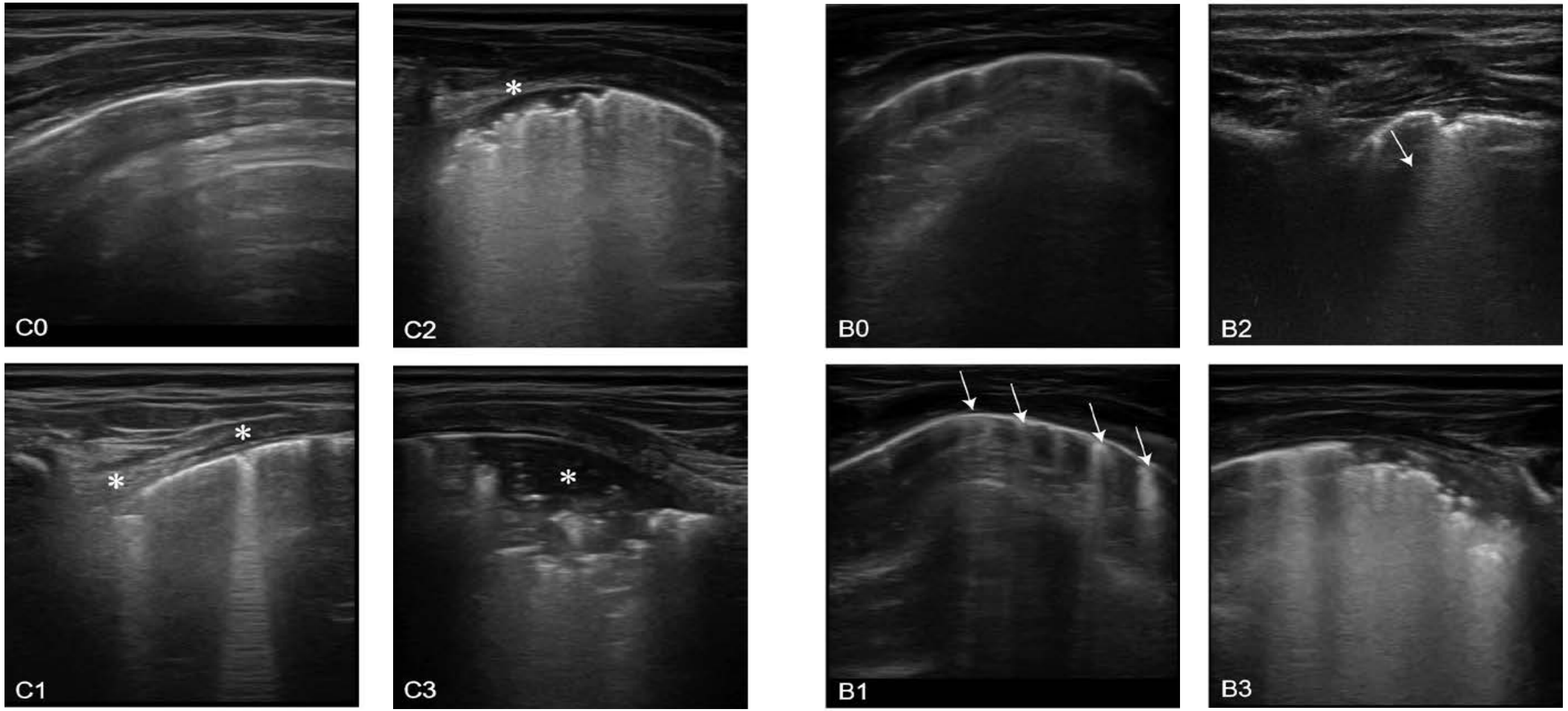
Epanchement pleural

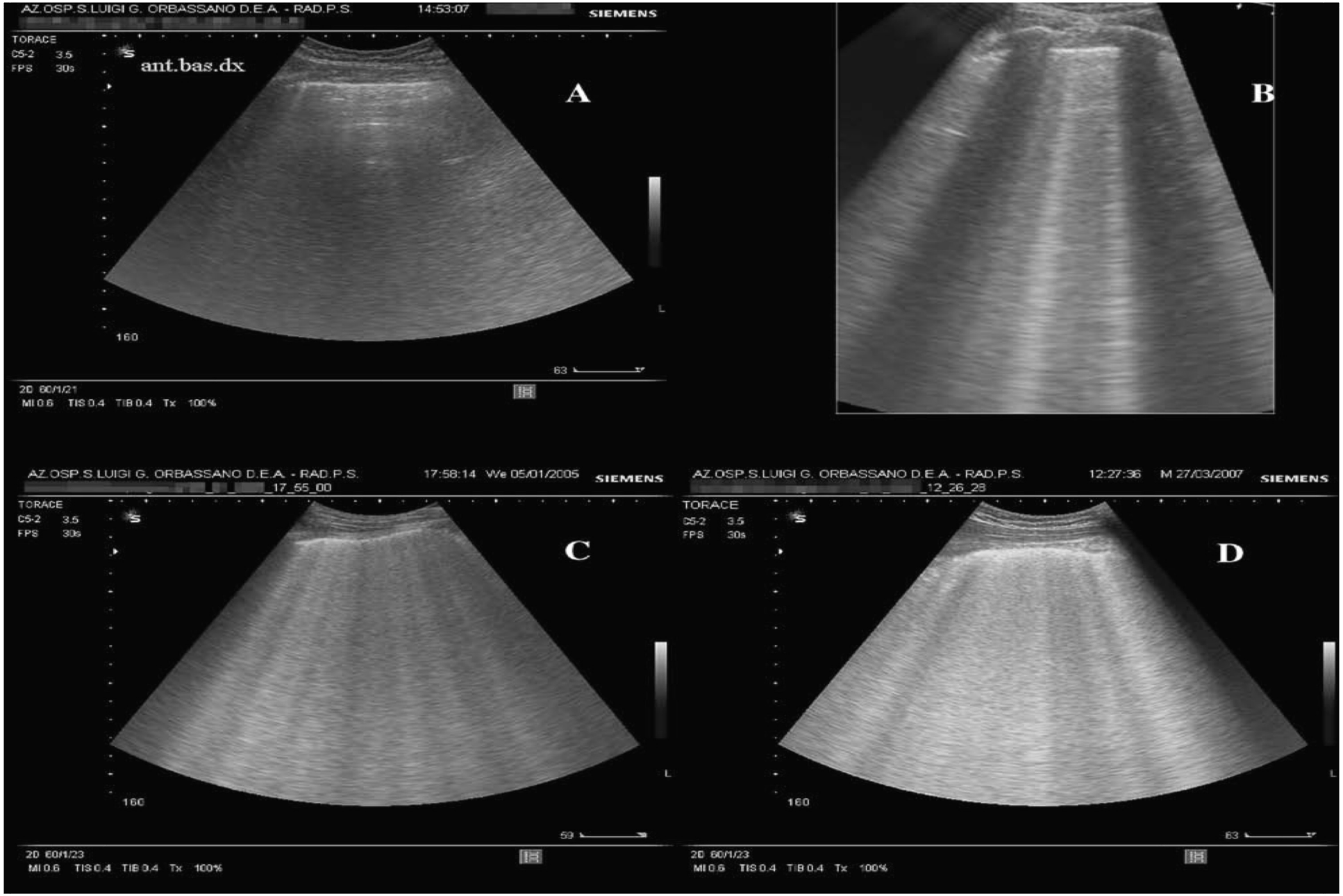


Consolidation = Hépatisation



Application of a High-Flow Nasal Cannula for Prevention of Postextubation Atelectasis in Children Undergoing Surgery: A Randomized Controlled Trial




AZ.OSP.S.LUIGI G. ORBASSANO D.E.A. - RAD.P.S.
14:53:07
SIEMENS
TORACE
C5-2 3.5
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160
63
2D 60/1/21
MI 0.6 TIS 0.4 TIB 0.4 Tx 100%
B
AZ.OSP.S.LUIGI G. ORBASSANO D.E.A. - RAD.P.S.
17:58:14 We 05/01/2005
SIEMENS
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MI 0.6 TIS 0.4 TIB 0.4 Tx 100%
AZ.OSP.S.LUIGI G. ORBASSANO D.E.A. - RAD.P.S.
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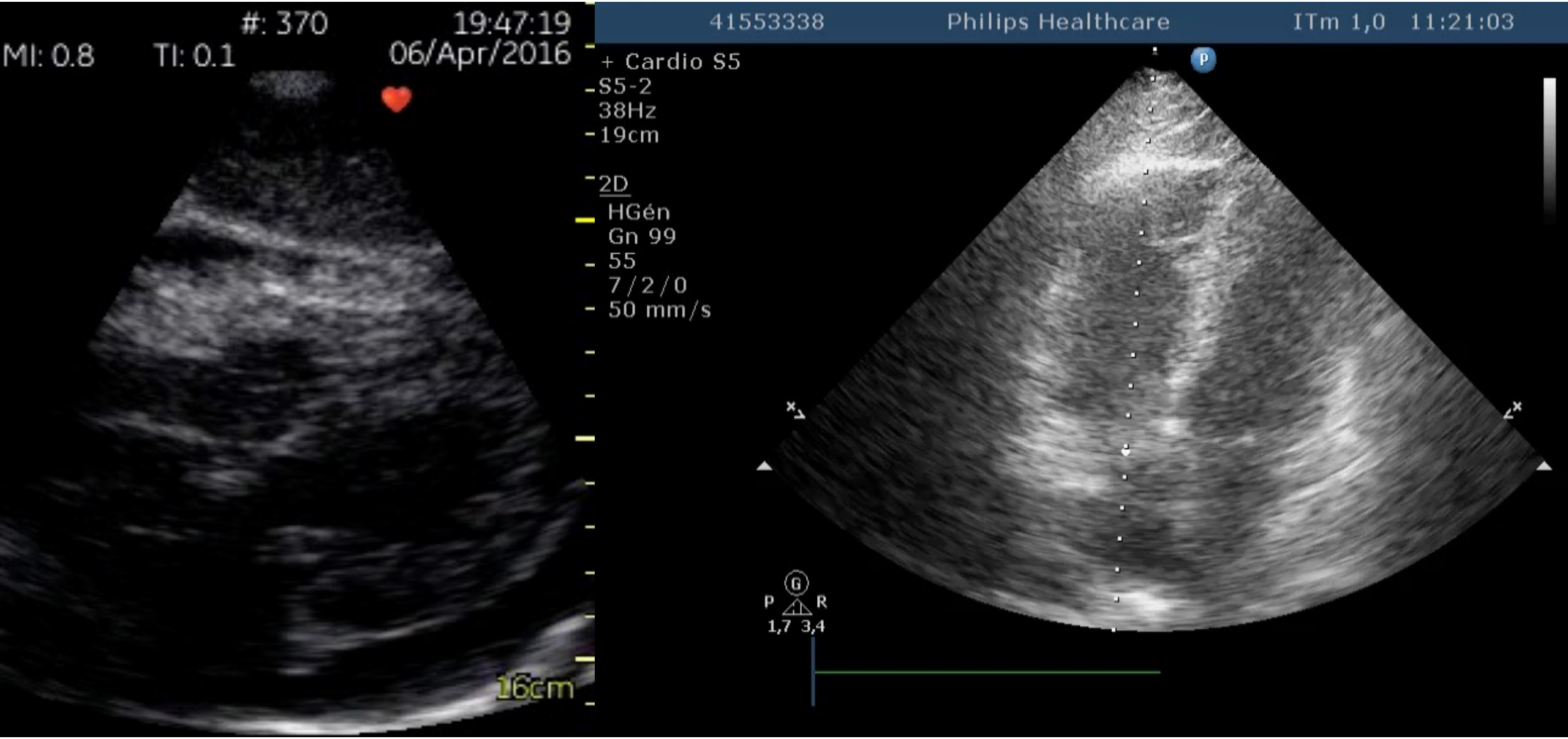
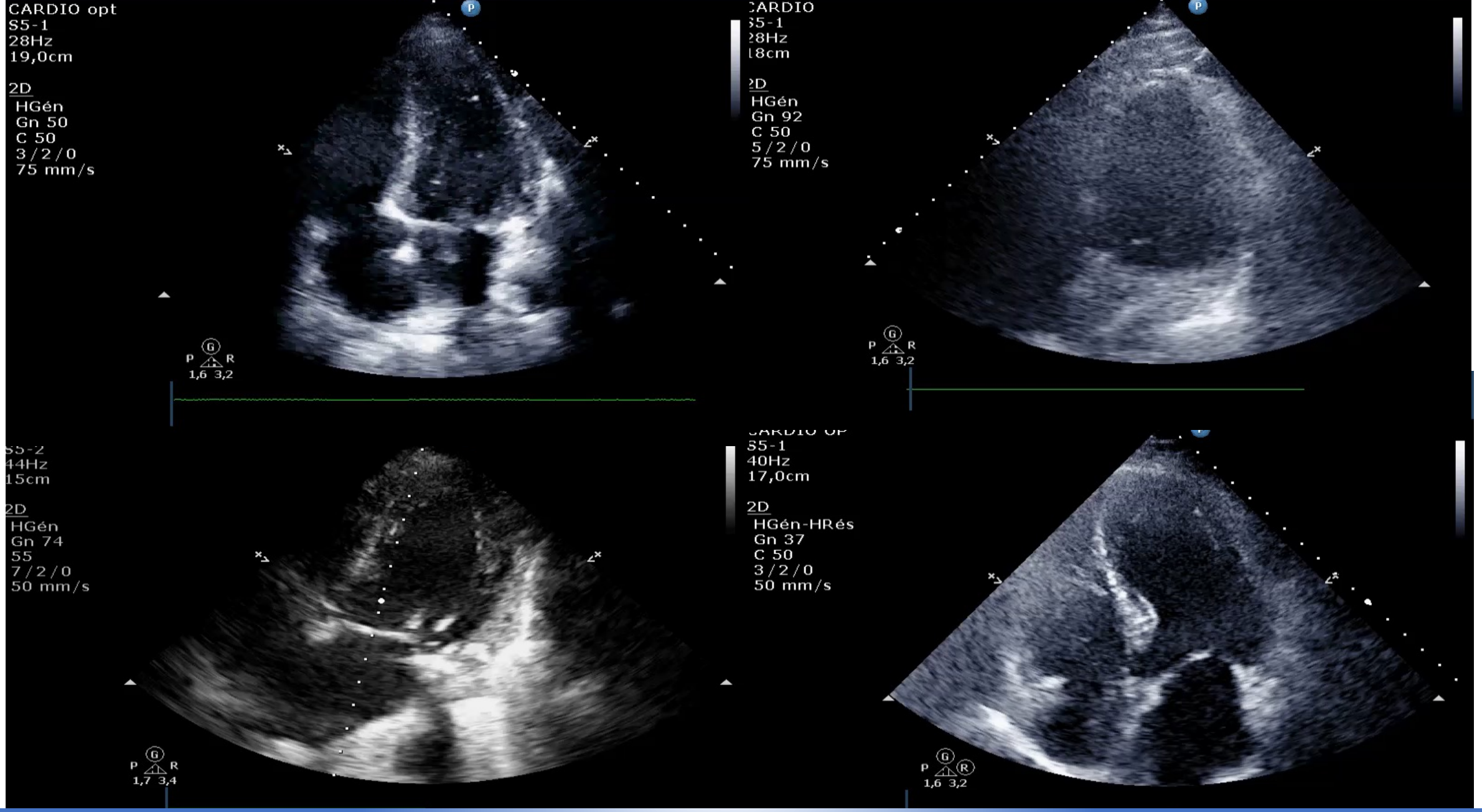

#: 370
19:47:19
MI: 0.8
TI: 0.1
06/Apr/2016
16cm
41553338
Philips Healthcare
ITm 1,0
11:21:03
+ Cardio S5
S5-2
38Hz
19cm
2D
HGén
Gn 99
55
7/2/0
50 mm/s
P
R
1,7 3,4


CARDIO opt
S5-1
28Hz
19,0cm
2D
HGén
Gn 50
C 50
3/2/0
75 mm/s
1,6 3,2
2D
HGén
Gn 92
C 50
5/2/0
75 mm/s
1,6 3,2
2D
HGén
Gn 74
55
7/2/0
50 mm/s
1,7 3,4
55-1
40Hz
17,0cm
2D
HGén-HRés
Gn 37
C 50
3/2/0
50 mm/s
1,6 3,2

Prise en charge thérapeutique

- Causes chirurgicales
  - Discussion reprise
  - Traitement symptomatique
- Analgésie
- Hypoxémie isolée / échanges gazeux ?
  - Œdème
  - Shunt
- Troubles de la ventilation= hypercapnie ?
  - Trouble de la pompe ventilatoire
  - Muscles / diaphragme

The role for high flow nasal cannula as a respiratory support strategy in adults: a clinical practice guideline

Intensive Care Med (2020) 46:2226–2237
https://doi.org/10.1007/s00134-020-06312-y

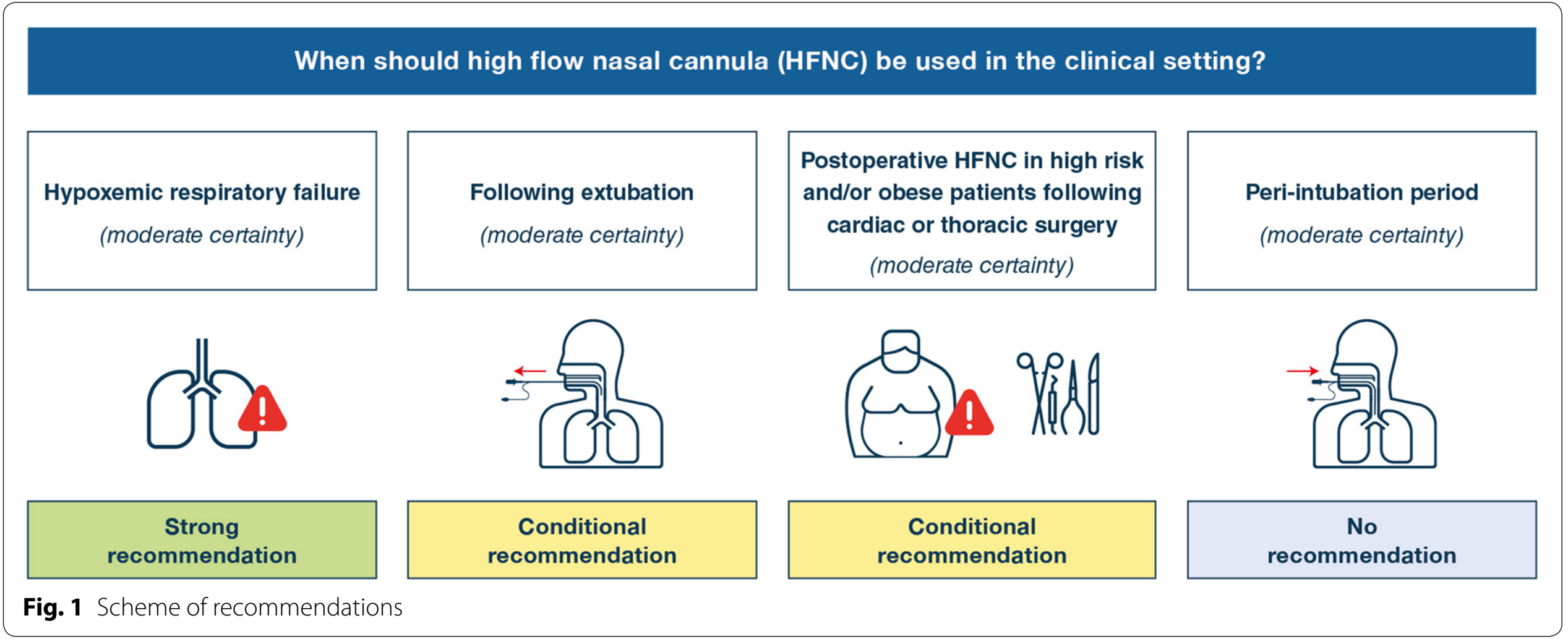


Fig. 1 Scheme of recommendations

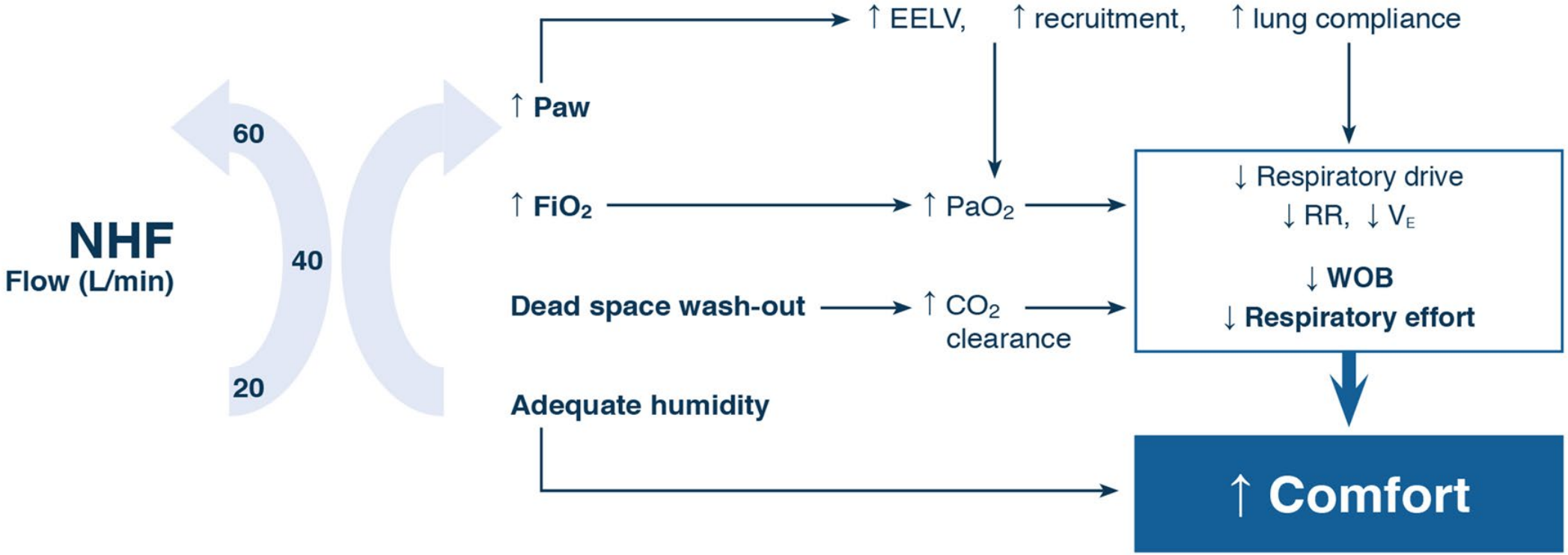


Fig. 1 Schematic representation of the physiologic effects of Nasal High Flow (NHF) and possible impact of the flow. Increase in airway pressure and FiO_2 improve oxygenation by different mechanisms and may be optimal at higher flows. Most of dead-space wash-out-related effects (increased CO_2 clearance, decrease respiratory drive, respiratory rate and effort to breathe) may be obtained for lower flows. All these physiological effects probably explain the improved comfort in patients with respiratory failure and possibly the outcomes. *NHF* nasal high flow, *Paw* airway pressure; *FiO_2* fraction of inspired oxygen, *EELV* end-expiratory lung volume, *RR* respiratory rate, *V_E* minute volume, *WOB* work of breathing

Ricard et al, ICM 2020

Intensive Care Med (2020) 46:2238–2247
https://doi.org/10.1007/s00134-020-06228-7

Physiologic Effects of High-Flow Nasal Cannula in Acute Hypoxemic Respiratory Failure

Tommaso Mauri[1,2], Cecilia Turrini[1,3], Nilde Eronia[4], Giacomo Grasselli[1], Carlo Alberto Volta[3], Giacomo Bellani[4,5], and Antonio Pesenti[1,2]

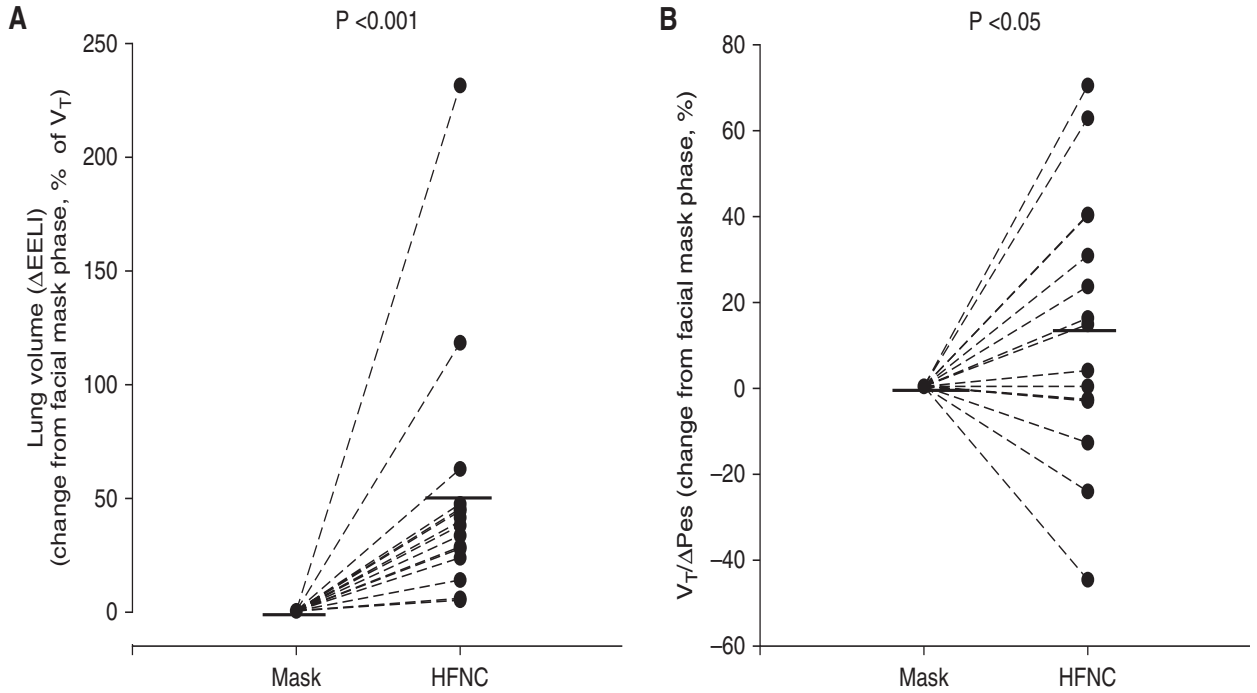


Figure 3. High-flow nasal cannula (HFNC) increases lung volume (*A*) and raises the ratio of V_T to inspiratory effort (*B*). In comparison with a standard nonocclusive low-flow facial mask, in patients with acute hypoxemic respiratory failure HFNC increased the lung volume at end-expiration as measured by electrical impedance tomography (*see* text and the online supplement for details), suggesting a positive end-expiratory pressure effect. HFNC

AJRCCM 2017,
https://doi.org/10.1164/rccm.201605-0916OC

Oxygen delivery through high-flow nasal cannulae increase end-expiratory lung volume and reduce respiratory rate in post-cardiac surgical patients

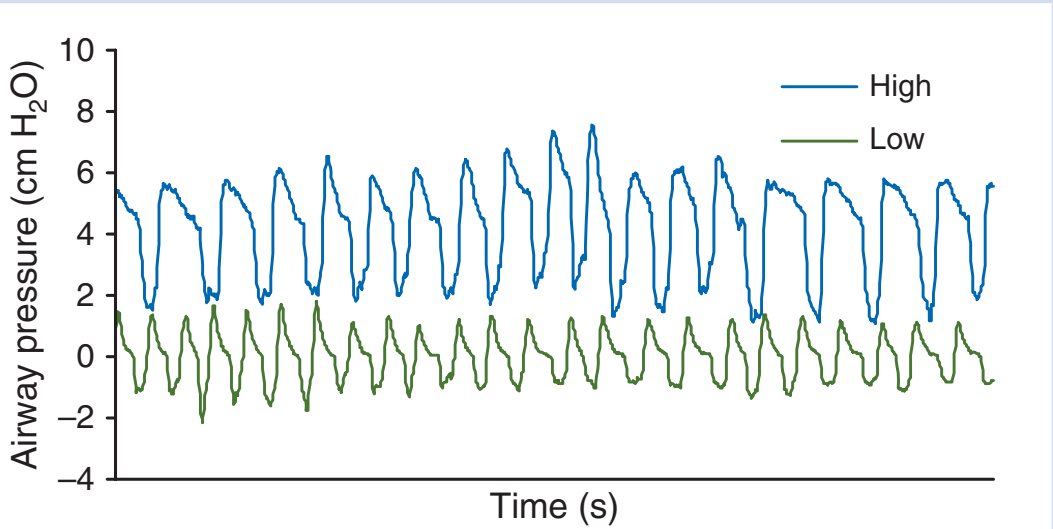
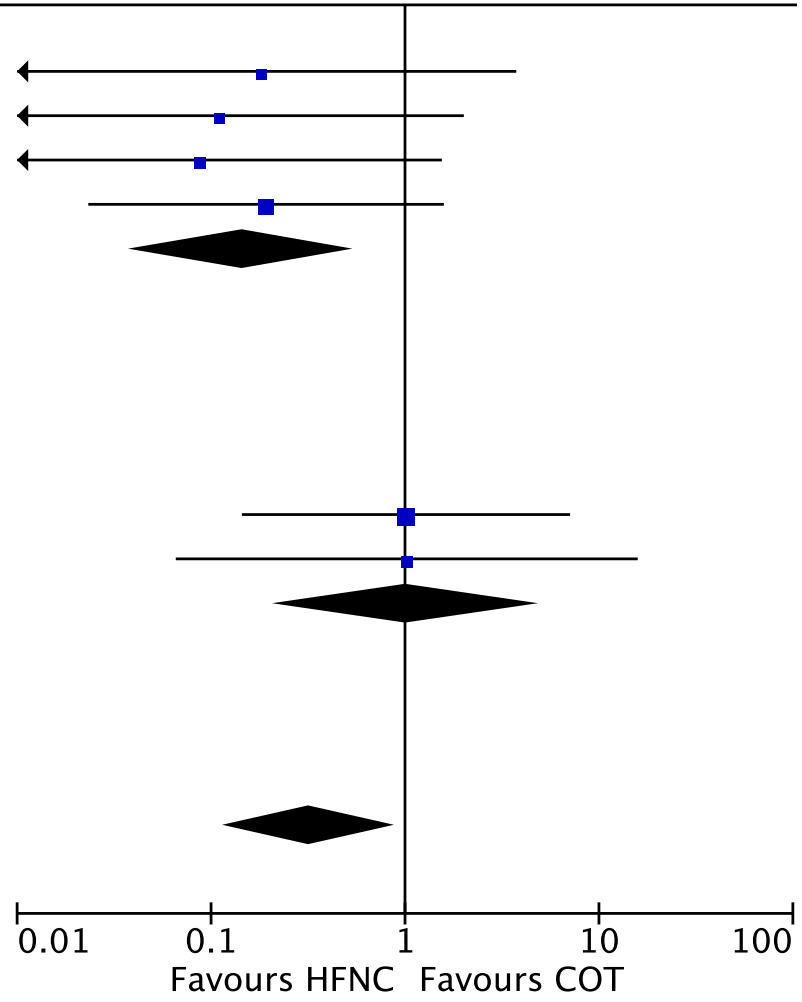


Fig 2 Oropharyngeal airway pressure tracing on HFNC and low-flow oxygen over 1 min. For this participant, mean airway pressure on HFNC was 4.4 cm H_2O and on low-flow oxygen was 0 cm H_2O.

British Journal of Anaesthesia **107** (6): 998–1004 (2011)

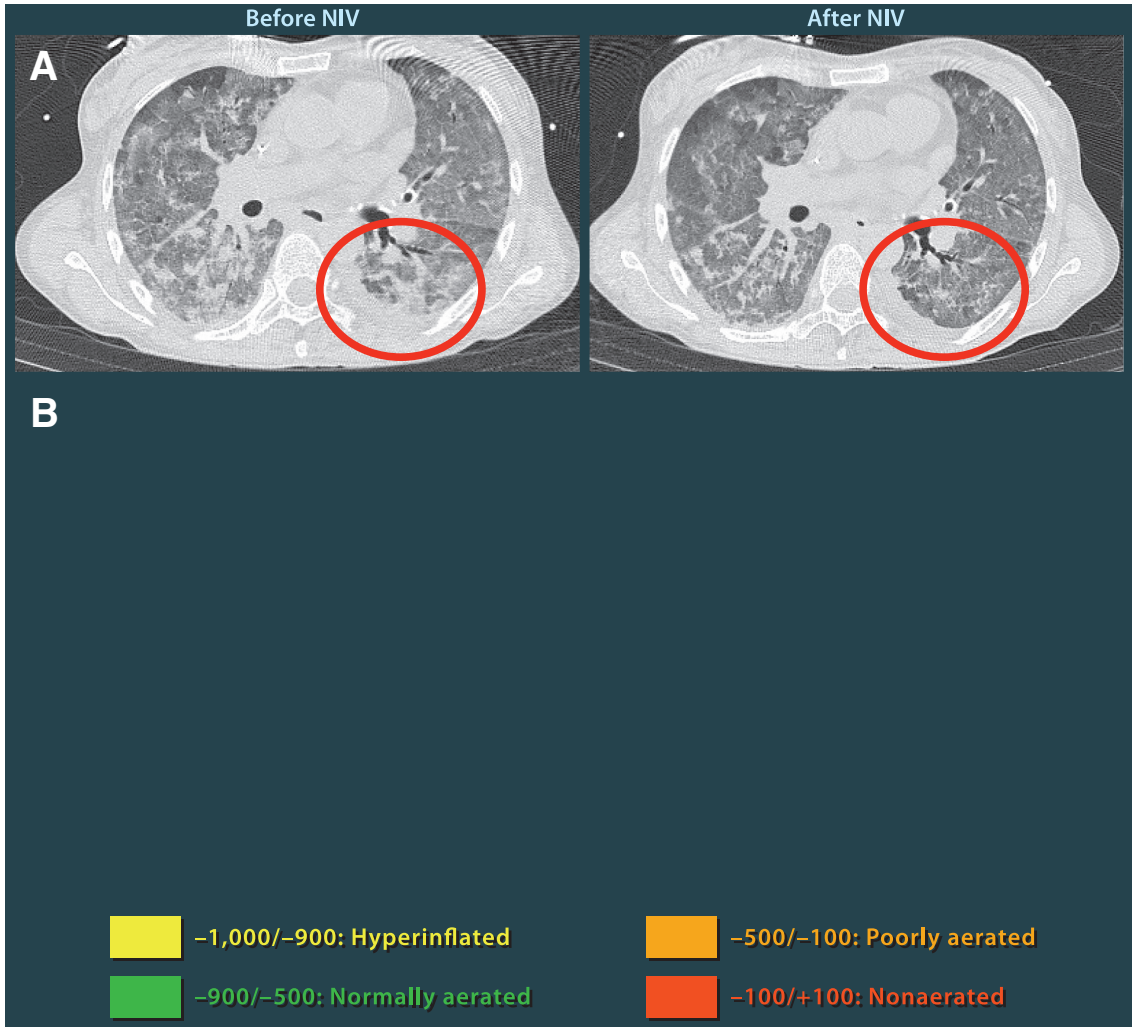
High flow nasal cannula in the immediate post-operative period: a systematic review and meta-analysis , doi.org/10.1016/j.chest.2020.06.038, Dipayan Chaudhuri et al

Study or Subgroup	HFNC Events	HFNC Total	COT Events	COT Total	Weight	Risk Ratio M-H, Random, 95% CI
1.15.1 High risk						
Corley 2015	0	81	2	74	11.3%	0.18 [0.01, 3.75]
Sahin 2018	0	50	4	50	12.3%	0.11 [0.01, 2.01]
Yu 2017	0	56	5	54	12.5%	0.09 [0.00, 1.55]
Zochios 2018	1	51	5	49	23.1%	0.19 [0.02, 1.59]
Subtotal (95% CI)		**238**		**227**	**59.2%**	**0.14 [0.04, 0.54]**
Total events	1		16			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.25$, df = 3 (P = 0.97); $I^2 = 0\%$						
Test for overall effect: Z = 2.88 (P = 0.004)						
1.15.2 Average risk						
Parke 2013	2	169	2	171	27.1%	1.01 [0.14, 7.10]
Pennisi 2019	1	47	1	48	13.7%	1.02 [0.07, 15.86]
Subtotal (95% CI)		**216**		**219**	**40.8%**	**1.01 [0.21, 4.97]**
Total events	3		3			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.00$, df = 1 (P = 1.00); $I^2 = 0\%$						
Test for overall effect: Z = 0.02 (P = 0.99)						
Total (95% CI)		**454**		**446**	**100.0%**	**0.32 [0.12, 0.88]**
Total events	4		19			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 3.82$, df = 5 (P = 0.58); $I^2 = 0\%$						
Test for overall effect: Z = 2.20 (P = 0.03)						
Test for subgroup differences: $Chi^2 = 3.44$, df = 1 (P = 0.06), $I^2 = 70.9\%$						



Postoperative Noninvasive Ventilation

Samir Jaber, M.D., Ph.D.,* Gerald Chanques, M.D.,† Boris Jung, M.D.†

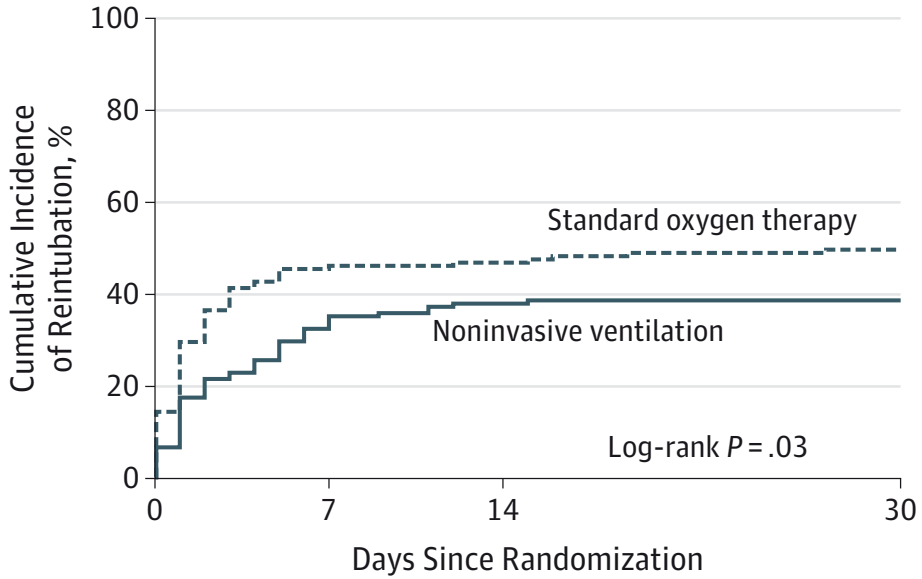


Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Noninvasive Ventilation on Tracheal Reintubation Among Patients With Hypoxemic Respiratory Failure Following Abdominal Surgery

A Randomized Clinical Trial

Figure 2. Cumulative Incidence of Reintubation Between Randomization and Day 30 According to Study Group

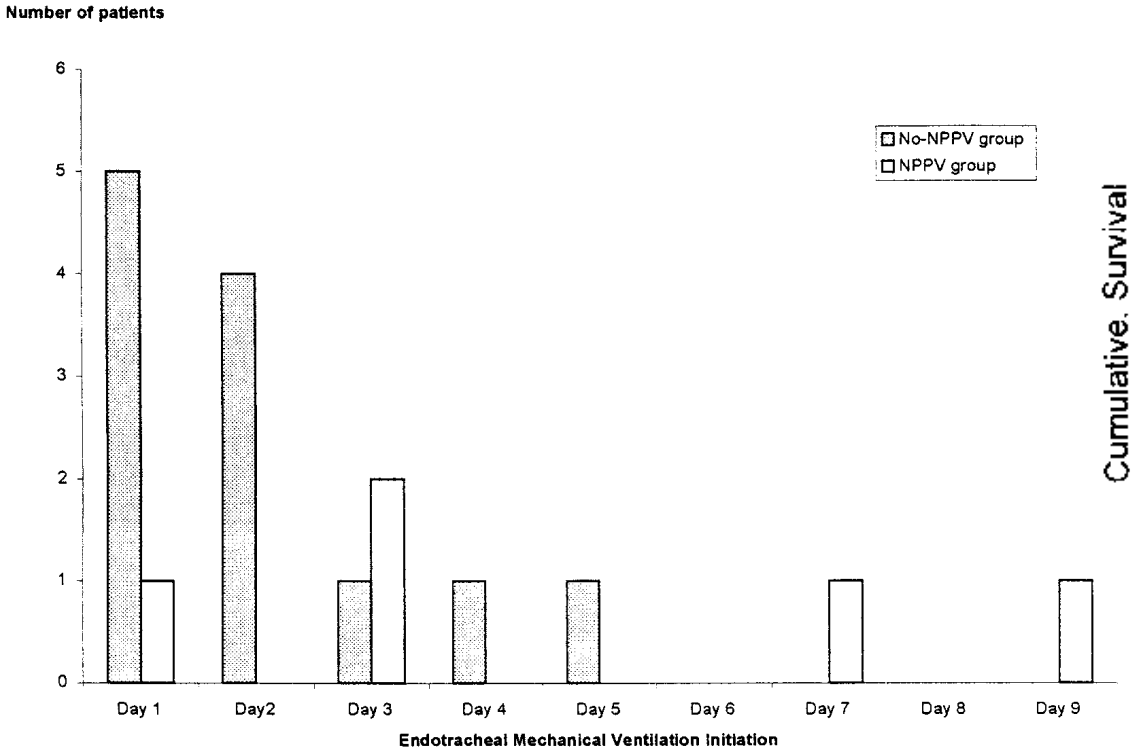


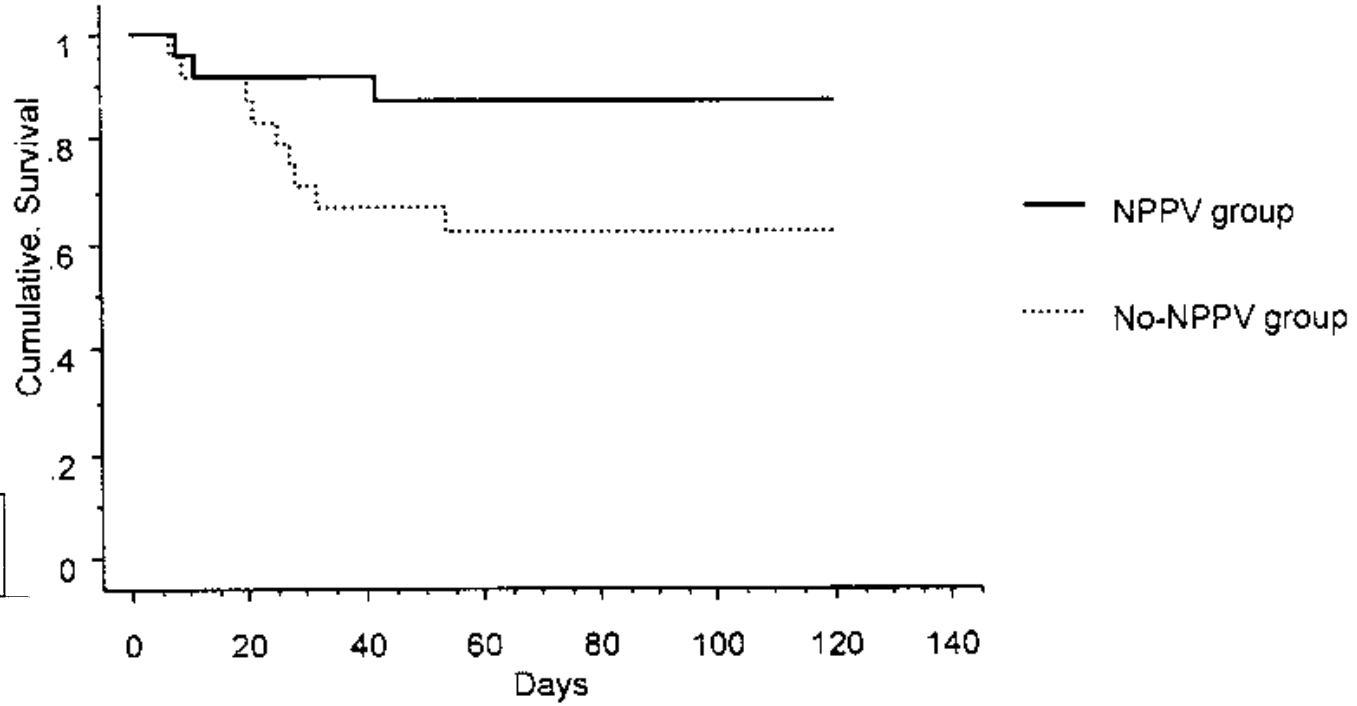
No. at risk				
Standard oxygen therapy	145	79	76	71
Noninvasive ventilation	148	99	90	87

Noninvasive Ventilation Reduces Mortality in Acute Respiratory Failure following Lung Resection

IGOR AURIANT, ANNE JALLOT, PHILIPPE HERVÉ, JACQUES CERRINA, FRANCOIS LE ROY LADURIE, JEAN LAMET FOURNIER, BERNARD LESCOT, and FRANCOIS PARQUIN

AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE VOL 164 2001





Official ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure

Eur Respir J 2017; 50: 1602426

TABLE 2 Recommendations for actionable PICO questions

Clinical indication[#]	Certainty of evidence[¶]	Recommendation
Prevention of hypercapnia in COPD exacerbation	⊕⊕	Conditional recommendation against
Hypercapnia with COPD exacerbation	⊕⊕⊕⊕	Strong recommendation for
Cardiogenic pulmonary oedema	⊕⊕⊕	Strong recommendation for
Acute asthma exacerbation		No recommendation made
Immunocompromised	⊕⊕⊕	Conditional recommendation for
***De novo* respiratory failure**		No recommendation made
Post-operative patients	⊕⊕⊕	Conditional recommendation for
Palliative care	⊕⊕⊕	Conditional recommendation for
Trauma	⊕⊕⊕	Conditional recommendation for
Pandemic viral illness		No recommendation made
Post-extubation in high-risk patients (prophylaxis)	⊕⊕	Conditional recommendation for
Post-extubation respiratory failure	⊕⊕	Conditional recommendation against
Weaning in hypercapnic patients	⊕⊕⊕	Conditional recommendation for

[#]: all in the setting of acute respiratory failure; [¶]: certainty of effect estimates: ⊕⊕⊕⊕, high; ⊕⊕⊕, moderate; ⊕⊕, low; ⊕, very low.

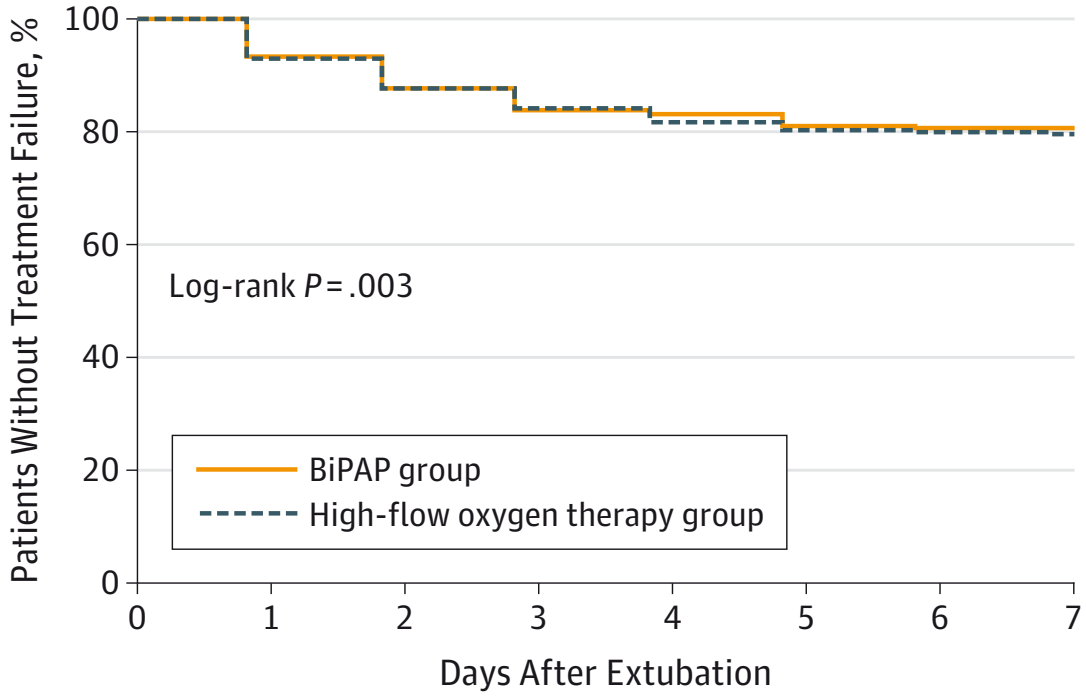
High-Flow Nasal Oxygen vs Noninvasive Positive Airway Pressure in Hypoxemic Patients After Cardiothoracic Surgery

A Randomized Clinical Trial

François Stéphan, MD, PhD; Benoit Barrucand, MD; Pascal Petit, MD; Saida Rézaiguia-Delclaux, MD; Anne Médard, MD; Bertrand Delannoy, MD; Bernard Cosserant, MD; Guillaume Flicoteaux, MD; Audrey Imbert, MD; Catherine Pilorge, MD; Laurence Bérard, MD; for the BiPOP Study Group

Surgical procedures, No. (%)		
Coronary artery bypass grafting	111 (26.7)	122 (29.5)
Valvular surgery	83 (20.0)	88 (21.3)
Combined cardiac surgery with coronary artery bypass grafting	27 (6.5)	26 (6.3)
Thoracic aorta	28 (6.7)	23 (5.6)
Pulmonary thromboendarterectomy	90 (21.6)	68 (16.4)
Lung resection	30 (7.2)	34 (8.2)
Heart, lung, and heart-lung transplantations	9 (2.2)	18 (4.3)
Others	38 (9.1)	35 (8.5)

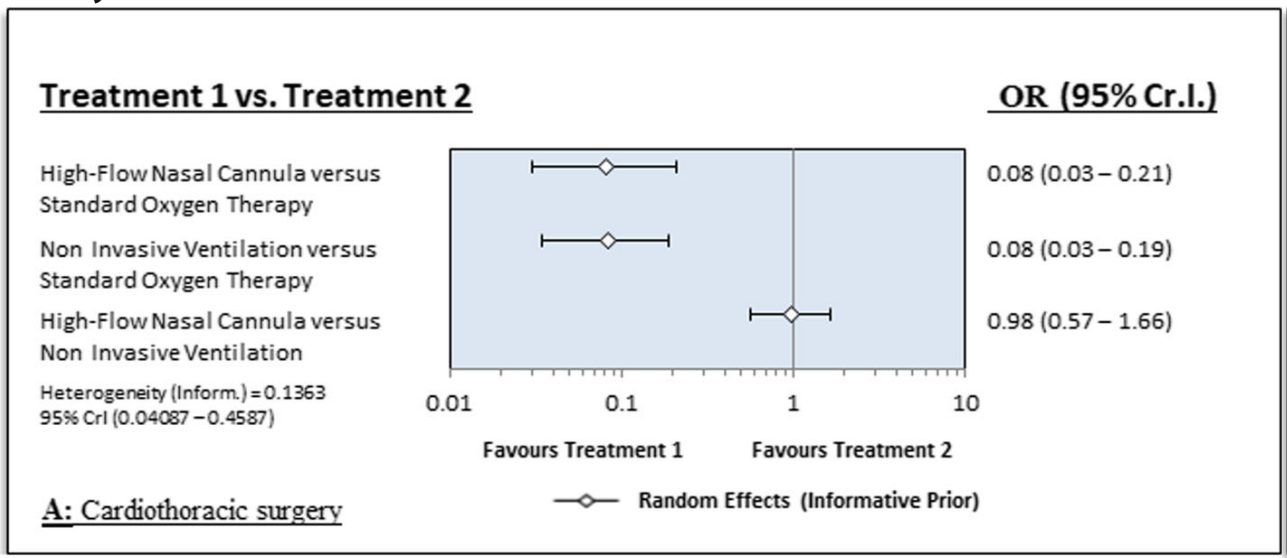
Figure 2. Postoperative Patients Without Treatment Failure After Extubation

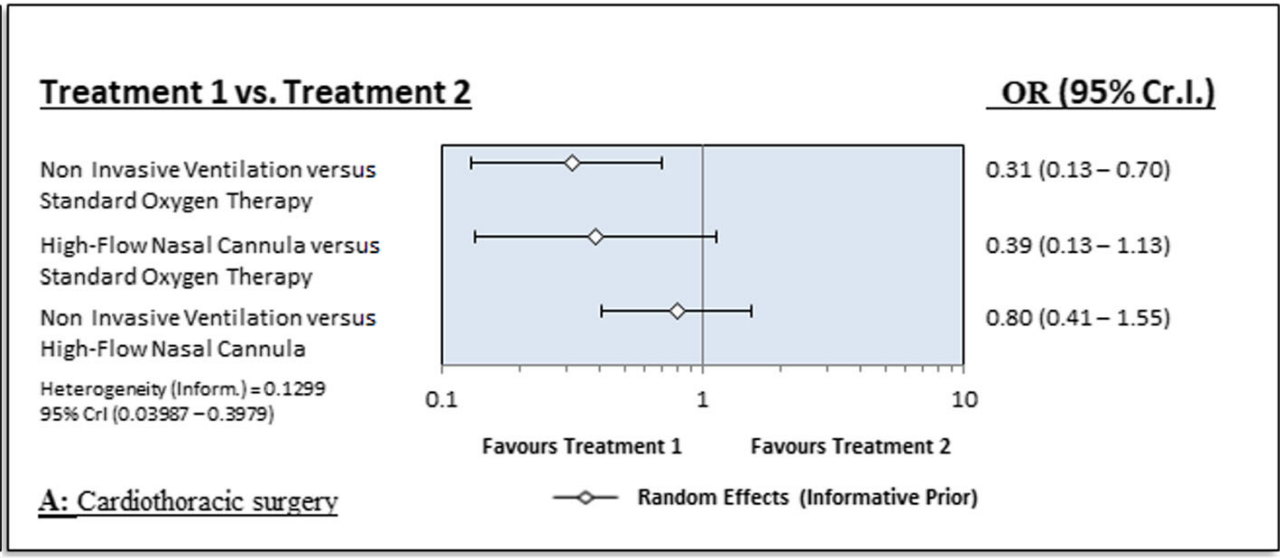


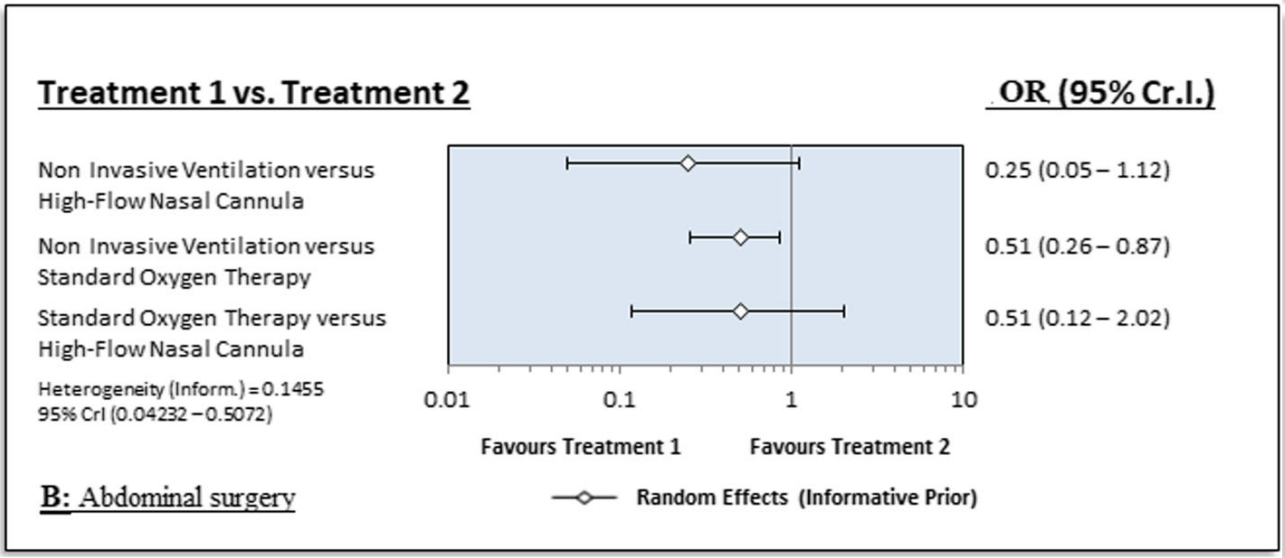
No. at risk								
BiPAP	416	385	363	348	339	333	331	329
High-flow oxygen therapy	414	385	361	346	342	334	333	331

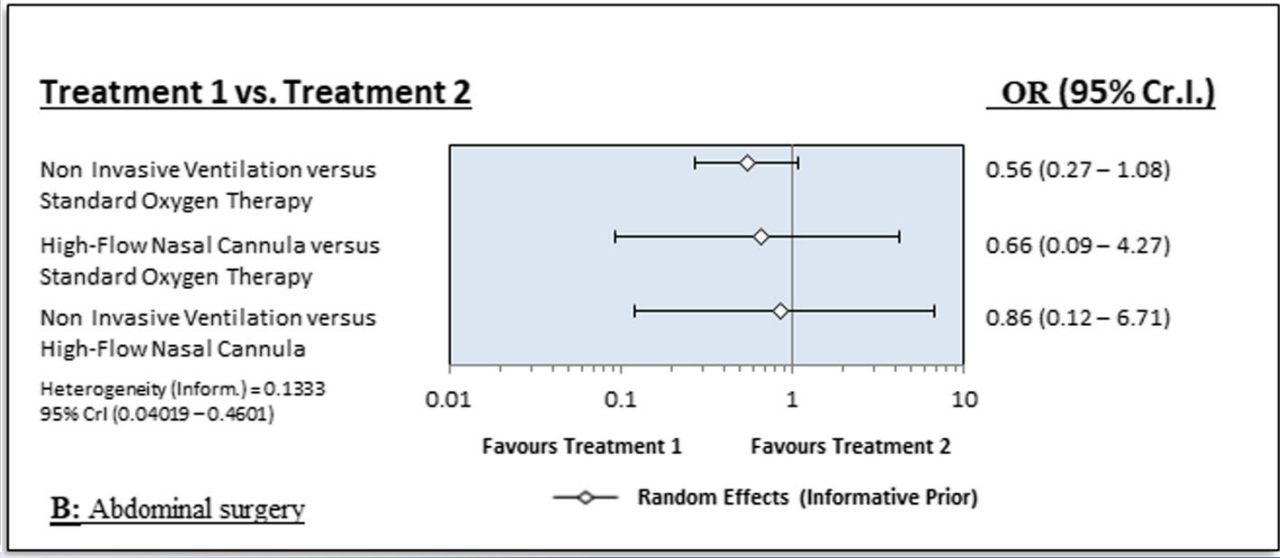
Effect of oxygenation modalities among patients with postoperative respiratory failure: a pairwise and network meta-analysis of randomized controlled trials

Zayed *et al. Journal of Intensive Care* (2020) 8:51
https://doi.org/10.1186/s40560-020-00468-x









Take home messages

- Urgence diagnostique
- Complication chirurgicale jusqu'à preuve du contraire
- Apport POC - US
- Support ventilatoire en pression positive
  - VNI > OHD
  - Bénéfices possibles à une association des 2
- Ne pas retarder une réintubation
- Support Echo pleurale :
  - European Respiratory Society statement on thoracic ultrasound
  - https://doi.org/10.1183/13993003.01519-2020