UNIL | Université de Lausanne
Faculty of Biology and Medicine

-Urgences pneumologiques 2018 – ce que vous devez savoir

-Pneumologische Notfälle 2018 – das müssen Sie wissen

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VRS Vereinigung Rettungssanitäter Schweiz
ASA Association Suisse des Ambulanciers
ASS Associazione Svizzera Soccorritori

SGNOR • SSMUS • SSERM

ivr ias

Plan

- Epidemiology of dyspnea
- Diagnostic tools
  - Ultrasound
  - CT scan
  - PERC rule
- Treatment
  - High-flow nasal cannula
  - Pneumothorax decompression

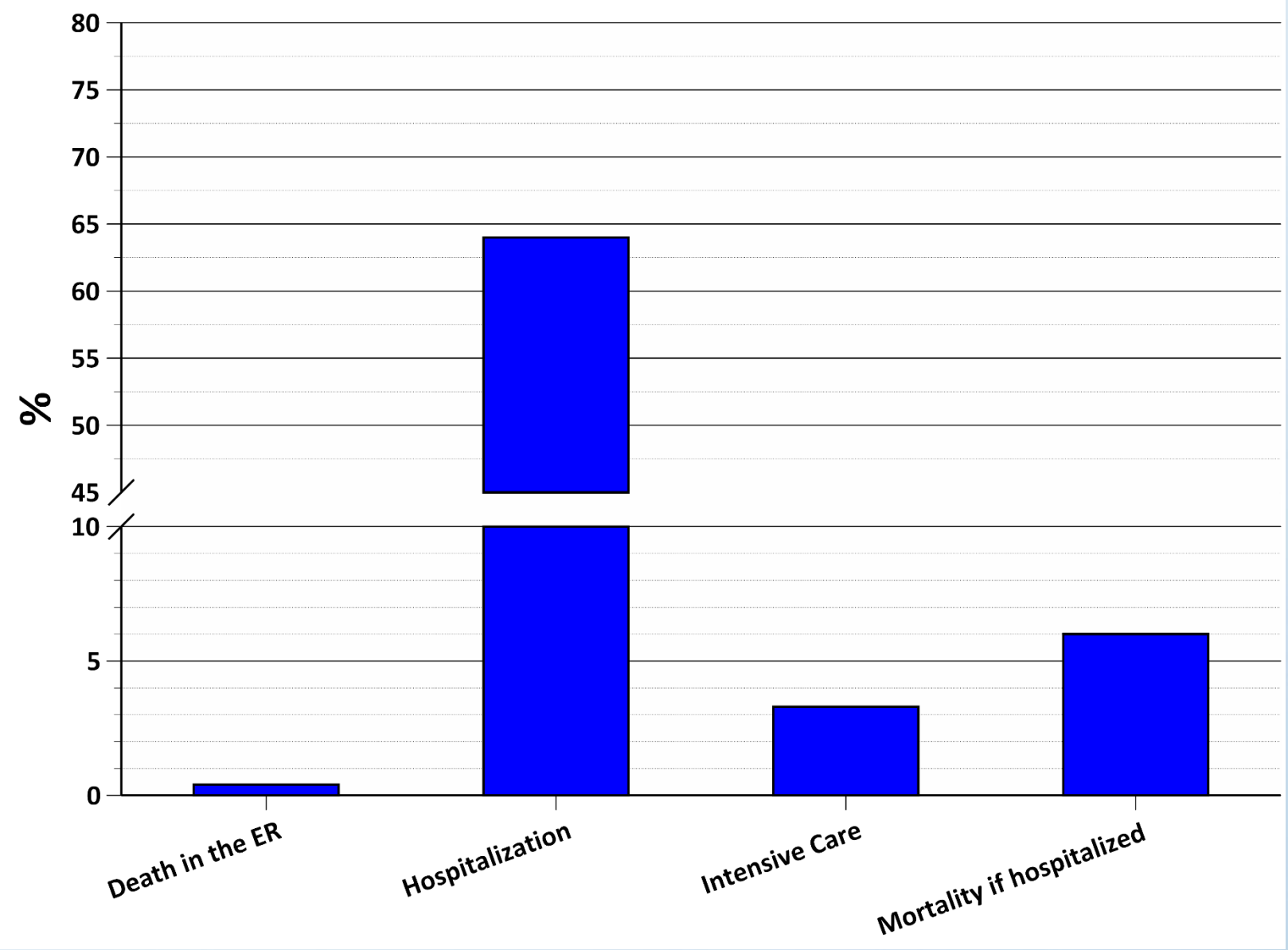
Dyspnea: epidemiology

- About 5% of consultations
- In the USA: 3.4 million emergency room visits in 2014
- Etiology difficult to identify:
  - Forgotten diagnosis in differential diagnosis in **46%** of cases

  → **86%** of cases with erroneous etiology or negative impact on the patient
- Importance of a comprehensive differential diagnosis
  - Not just fatal diagnoses

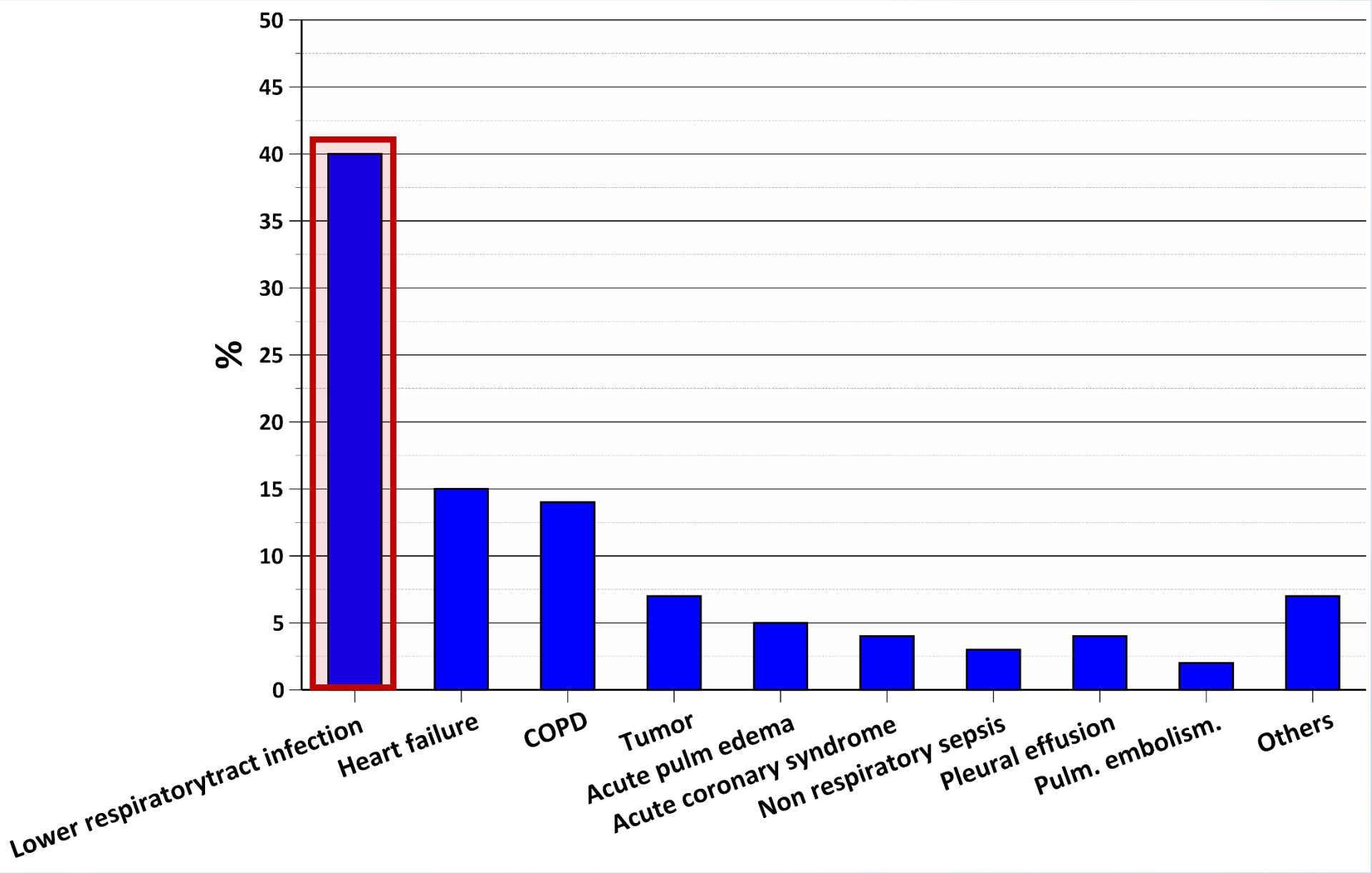
Hale ZE. Acad Emerg Med 2018. doi:10.1111/acem.13448

Dyspnea: clinical outcome



Kelly AM. Acad Emerg Med 2017;24:328–36

Dyspnea: the lethal diagnoses

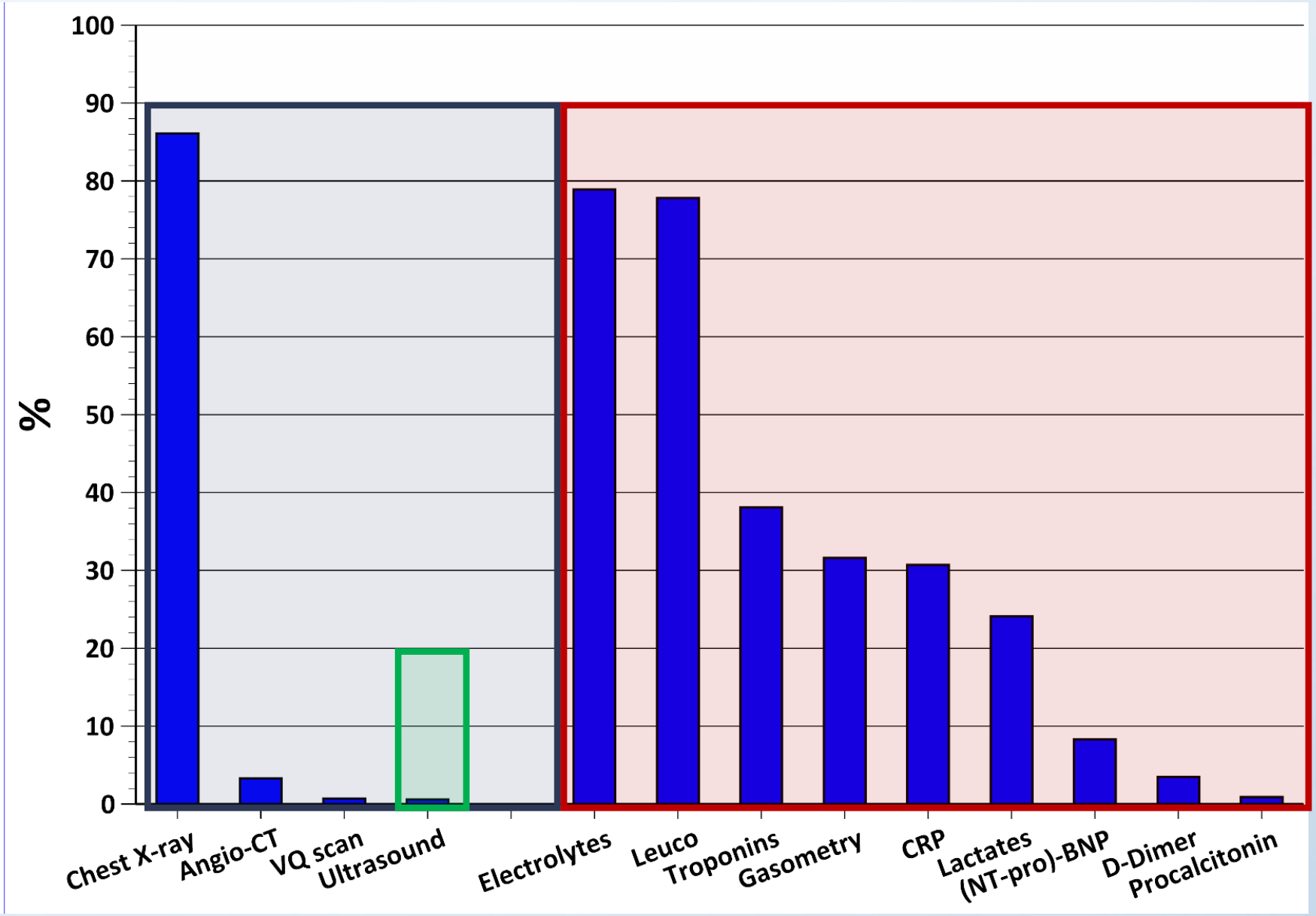


Kelly AM. Acad Emerg Med 2017;24:328–36

Dyspnea: place for Point-Of-Care UltraSound (POCUS)?

- Need to diagnose emergencies quickly and accurately
- History and status insufficient to make an accurate diagnosis
- Usual check-up includes X-ray and/or thoracic CT
- Point-of-care Ultrasound (POCUS) is increasingly being used in addition to history and status:
  - Pulmonary: pulm. edema, pneumothorax, pneumonia, pleural effusion
  - Cardiac: size of heart chambers, LVEF, effusion
  - Lower vena cava diameter: volemic status
- Faster and more accurate diagnosis?

Dyspnea: ED work-up



Kelly AM. Acad Emerg Med 2017;24:328–36

POCUS: impact on management?

- Italian study with 2'683 dyspneic patients in the ED
- 10 ED physicians with ≥ 2 years with POCUS experience

TABLE 1] General Characteristics of the Study Population

Characteristic	Value
Age, mean ± SD, y	71.2 ± 18.6
Women, No. (%)	1,316 (49)
SBP, mm Hg	134.2
DBP, mm Hg	75.2
Heart rate, beats/min	88.2
Respiratory rate, breaths/min	22.6
Body temperature, °C	36.8
SaO_2, %	93
Patients with sinus rhythm, No.	2,120

DBP = diastolic blood pressure; SaO_2 = oxygen saturation; SBP = systolic blood pressure.

Zanobetti M. Chest 2017;1511295-301

POCUS: time to diagnosis

	Ultrasound Diagnoses	ED Diagnosis	P
Total time (mean ± SD) • Pulmonary • Cardiac	7 ± 2 min 3 ± 1 min 4 ± 1 min	-	-
Time to diagnosis	24 ± 10 min	186 ± 72 min	0.025

Δ 2.7 heures

Zanobetti M. Chest 2017;1511295-301

POCUS: diagnostic accuracy

	Ultrasound Diagnoses	ED Diagnosis	Final Diagnosis	κ
Pneumothorax	39	45	44	0.903
Pericardial effusion	45	48	44	0.858
COPD/asthma	735	782	759	0.845
Heart failure	600	503	585	0.81
Pneumonia	1,096	1,091	1,086	0.788
Pleural effusion	97	111	98	0.73
Acute coronary syndrome	32	30	42	0.706
Other causes	86	86	121	0.628
Pulmonary embolism	41	95	95	0.549
ARDS/ALI	20	7	16	0.294
Total	**2,791**	**2,798**	**2,890**	**0.711**

Kappa: $0.8 \leq \kappa \leq 1.0$: excellent; $0.6 \leq \kappa < 0.8$: good; $0.4 \leq \kappa < 0.6$: moderate; <0.4: poor

Zanobetti M. Chest 2017;1511295-301

POCUS: diagnostic value

	PPV (95%CI)	NPV(95%CI)	LR+ (95%CI)	LR- (95%CI)
Pneumothorax	98.8 (89.1-99.9)	99.8 (99.5-99.9)	4634.67 (289.35-74236.28)	0.12 (0.06-0.27)
Pulmonary embolism	92.7 (80.1-98.5)	97.8 (97.2-98.4)	345.07 (108.45-1097.94)	0.60 (0.51-0.71)
Pericardial effusion	84.4 (70.5-93.5)	99.8 (99.5-99.9)	325.59 (153.94-688.65)	0.14 (0.06-0.29)
Acute coronary syndrome	62.5 (43.7-78.9)	99.2 (98.8-99.5)	104.8 (54.85-200.26)	0.53 (0.39-0.70)
Pleural effusion	78.4 (68.8-86.1)	99.2 (98.7-99.5)	95.46 (61.54-148.09)	0.23 (0.16-0.33)
ARDS/ALI	35 (15.4-59.2)	99.7 (99.4-99.9)	89.75 (41.29-195.09)	0.57 (0.37-0.87)
Other causes	64 (52.9-74)	97.5 (96.8-98)	37.57 (25.16-56.08)	0.55 (0.47-0.65)
COPD/asthma	89.7 (87.2-91.8)	94.9 (93.8-95.8)	21.98 (17.60-27.45)	0.14 (0.11-0.16)
Heart failure	85.8 (82.8-88.5)	96.6 (95.8-97.4)	21.73 (17.61-26.82)	0.12 (0.10-0.16)
Pneumonia	87.7 (85.6-89.6)	92.1 (90.7-93.4)	10.47 (8.90-12.32)	0.13 (0.11-0.15)

LR+ ≥ 10 & LR- ≤ 0.1: significant change in the post-test diagnostic probabilities
PPV: positive predictive value; NPV: negative predictive value

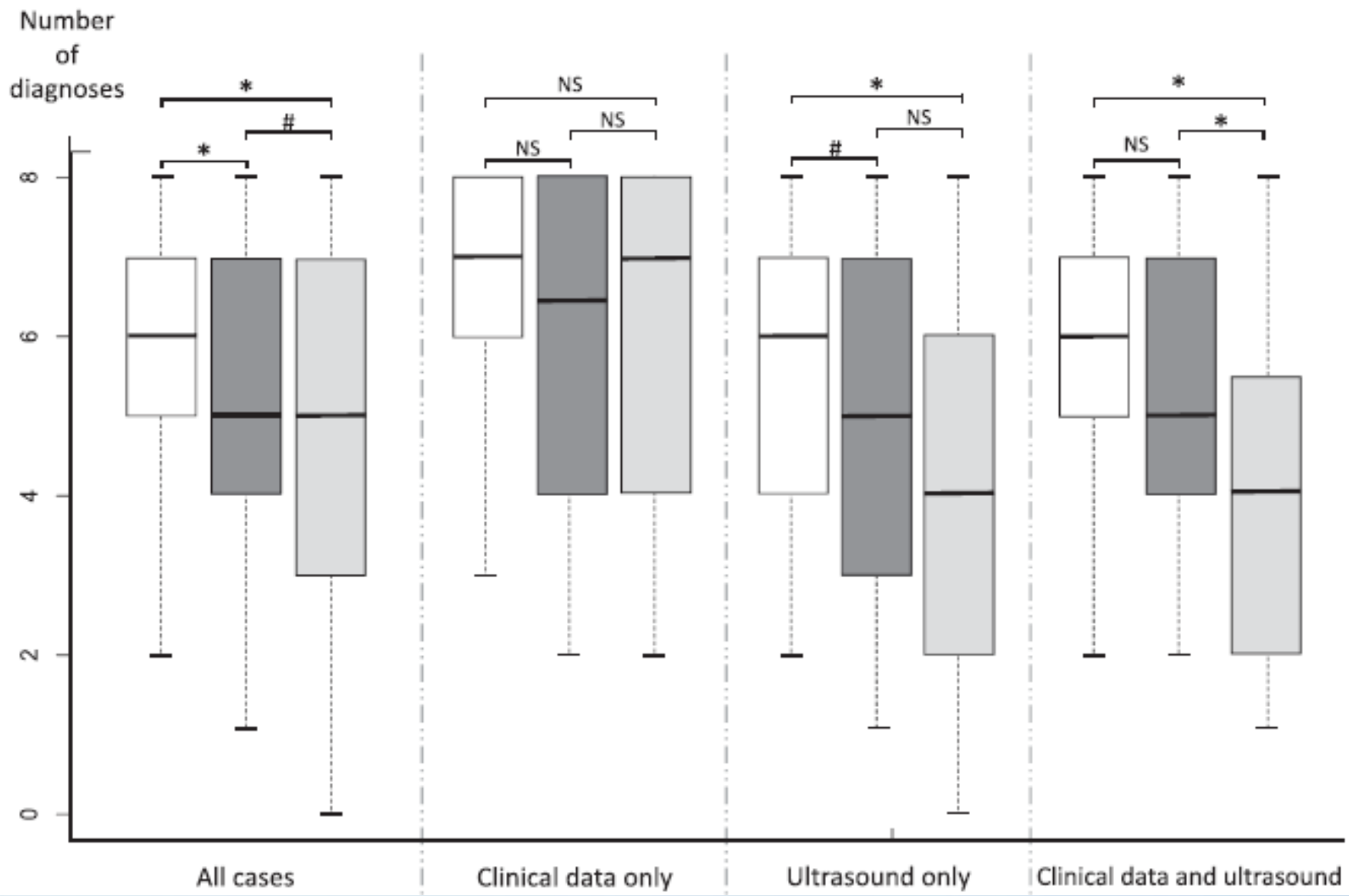
Zanobetti M. Chest 2017;1511295-301

POCUS for acute dyspnea: the weight of experience ?

- Study on 3 vignettes with 64 emergency physicians and 12 intensivists:
  - Acute pulmonary edema
  - Pneumonia
  - COPD
- Doctors in 3 groups:
  - Clinical data only
  - POCUS only (videos)
  - Clinical data + POCUS
- Choice of diagnosis among 8 possibilities: acute cardiogenic pulmary edema, pneumonia, COPD, pneumothorax, neoplasia, asthma, pulmonary embolism, metabolic

Pontis E. Am J Emerg Med 2018; 10.1016/j.ajem.2018.01.041

POCUS for acute dyspnea: the weight of experience ?



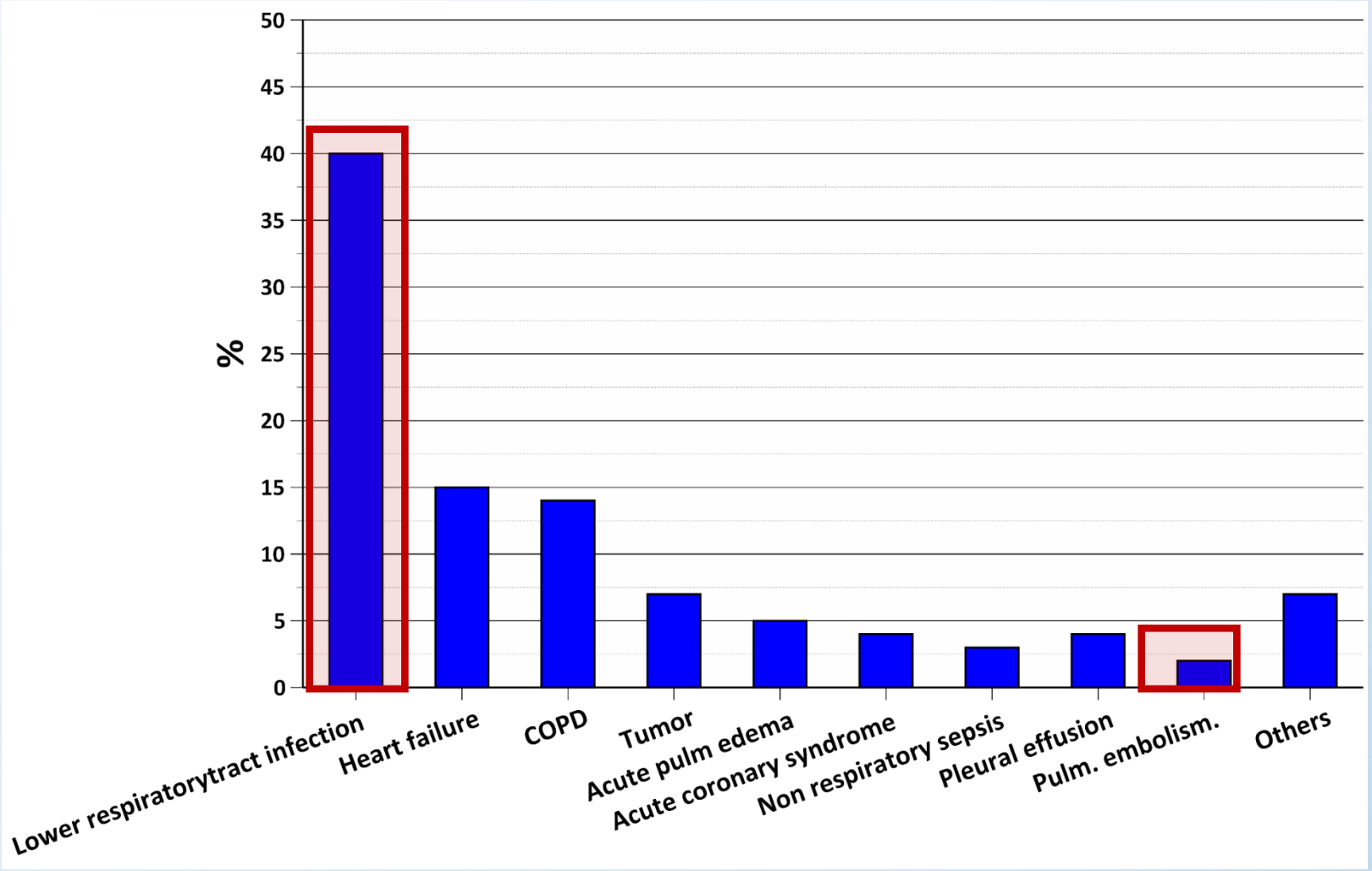
Pontis E. Am J Emerg Med 2018; 10.1016/j.ajem.2018.01.041

POCUS investigation of dyspnea in the ER

Conclusions:

- The POCUS allows:
  - diagnose or reduce the differential diagnosis of most causes of acute dyspnea in emergency departments
  - Save time between admission and diagnosis
- An important element is the quality of basic training **AND** daily practice of the POCUS

Pneumonia


50
45
40
35
30
25
20
15
10
5
0
%
Lower respiratorytract infection
Heart failure
COPD
Tumor
Acute pulm edema
Acute coronary syndrome
Non respiratory sepsis
Pleural effusion
Pulm. embolism.
Others

Diagnosis of pneumonia in the ED

- Clinic suspicion based on (Fever, cough, dyspnea, sputum, rales on auscultation etc.)
- Next step: thoracic X-ray...
- But what if the X-ray shows nothing?
  - Wait for the cultures or tests (sputum, blood, urinary Ag)?
    - Antibiotic delay
    - Increased mortality
  - Antibiotics for all?
    - Overuse of antibiotics
    - Emergence of multi-resistant germs

Pulmonary CT and pneumonia: a place in the ED ?

- Useful when the X-ray is negative?
  - +33% early CT infiltrates if X-ray negative
  - Exclusion of 29.8% of pneumonia if X-ray with infiltrates
  - 51.8% multifocal infiltrates if X-ray with unifocal infiltrate
- In 2015, study of 324 emergency room patients with suspected pneumonia:
  - Change in the probability of pneumonia in 58.6%:
    - Increased in 18.4%
    - Lowered in 40.4%
  - 64.8% with antibiotics -> stopped in 14%
  - For those without antibiotics, initiation in 45.5%

Claessens YE: Am J Resp Crit Care Med 2015;192:974-82

Pneumonia on pulmonary CT: overdiagnosis ?

- 2'251 patients with radiologically confirmed pneumonia
- Pneumonia discovered in 66 (3%) only by CT

TABLE 1] Clinical Characteristics at Hospital Presentation

Variable	CT-Only Pneumonia (n = 66)	Pneumonia on Chest Radiography (n = 2,185)	*P* Value
Demographics			
Age, median (IQR), y	53 (40-63)	58 (47-71)	< .01
Signs and symptoms, No. (%)			
Chest pain	44 (66.7)	1,065 (48.7)	< .01
Vital signs, median (IQR)			
Heart rate, beats/min	100 (88-118)	100 (87-114)	.51
Systolic blood pressure, mm Hg	140 (126-157)	131 (114-148)	< .01
Laboratory values, median (IQR)			
WBC count, cells/μL	11,050 (6,900-14,200)	11,400 (8,000-14,900)	.13
Blood urea nitrogen, mg/dL	12 (9-19)	15 (10-24)	< .01
Blood glucose, mg/dL	120 (102-144)	115 (99-145)	.46
Procalcitonin, ng/mL[a]	< 0.05 (<0.05-0.11)	0.16 (< 0.05-0.85)	< .01
Pneumonia severity			
Index risk class, No. (%)			
I-II (low risk)	41 (62.1)	979 (44.8)	.02
III (moderate risk)	11 (16.7)	439 (20.1)	
IV-V (high risk)	14 (21.2)	767 (35.1)	
CURB-65 score, No. (%)			
0-1 (low risk)	53 (80.3)	1,517 (69.4)	.14
2 (moderate risk)	7 (10.6)	422 (19.3)	
3-5 (high risk)	6 (9.1)	246 (11.3)	

Upchurch CP. Chest 2018;153:601-10

Pneumonia on pulmonary CT: overdiagnosis ?

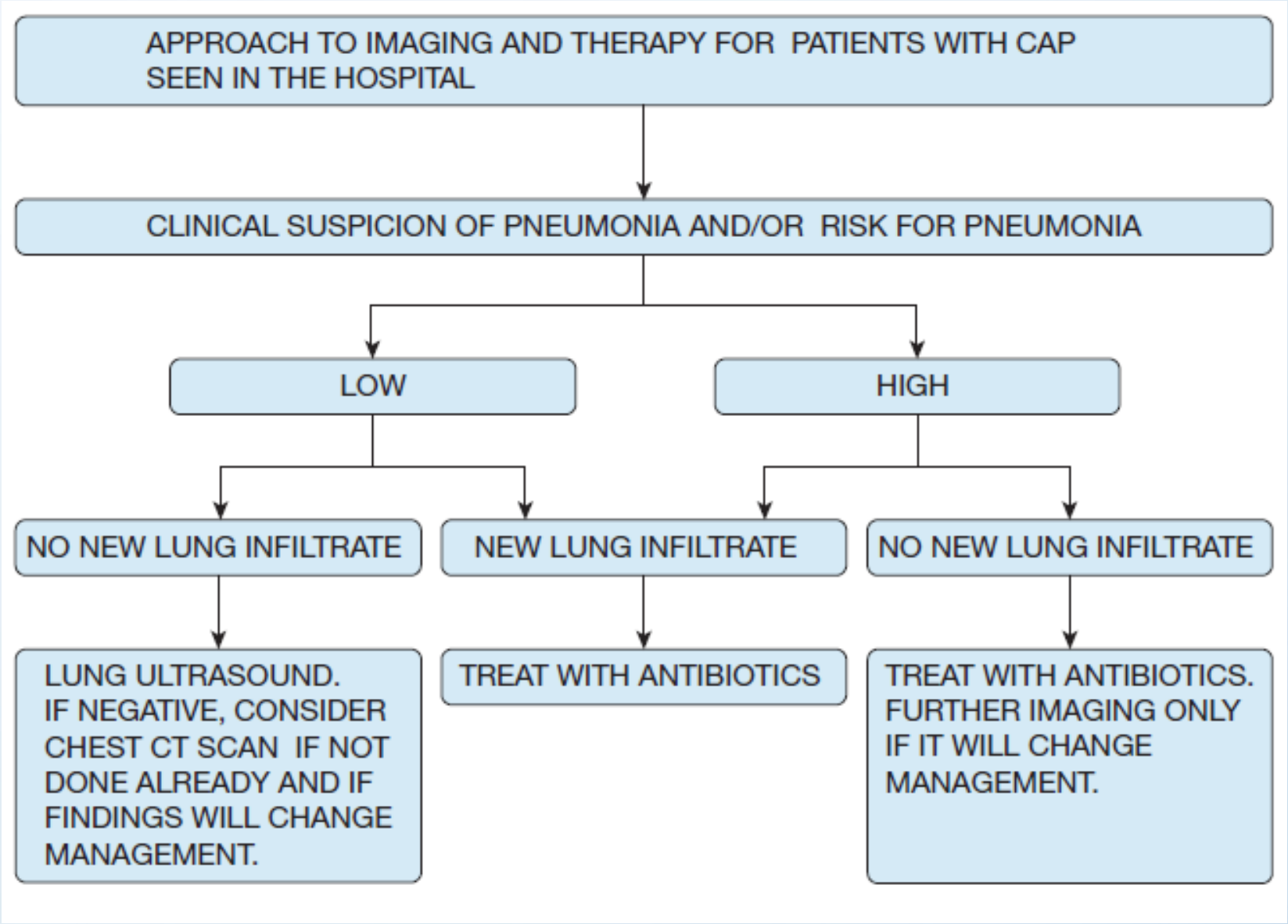
- 59% of CT pneumonia vs. 83% of x-ray pneumonia with abx <6h
- Similar antibiotics between the 2 groups
- No differences in pathogens
- Clinical outcome:

TABLE 4] Clinical Outcomes

Clinical Outcome	CT-Only Pneumonia (n = 66)	Pneumonia on Chest Radiography (n = 2,185)	*P* Value
In-hospital death, No. (%)	0 (0)	49 (2.2)	.40
Hospital length-of-stay among survivors, median (IQR), d	3.5 (2-5)	3 (2-6)	.90
ICU admission, No. (%)	15 (22.7)	467 (21.4)	.80
Invasive mechanical ventilation, No. (%)	4 (6.1)	113 (5.2)	.76
Vasopressor-dependent septic shock, No. (%)	3 (4.6)	84 (3.8)	.74
Moderate-severe ARDS, No. (%)	1 (1.5)	89 (4.1)	.52

Upchurch CP. Chest 2018;153:601-10

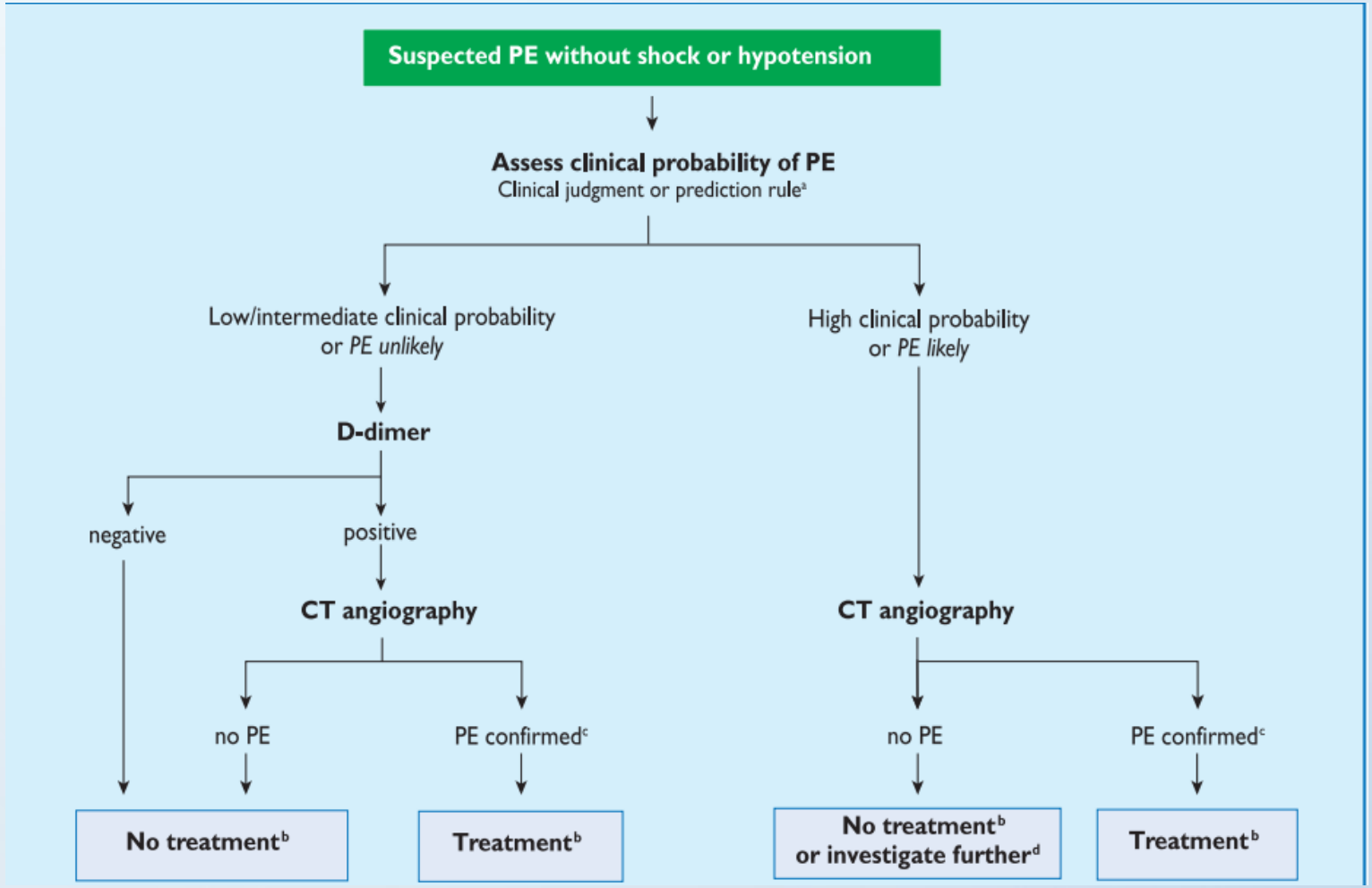
Pneumonia: integrative approach



Niederman MS. Chest 2018;153:583-5

Pulmonary embolism (PE) : safety of the pulmonary embolism rule-out criteria (PERC) rule in Switzerland?

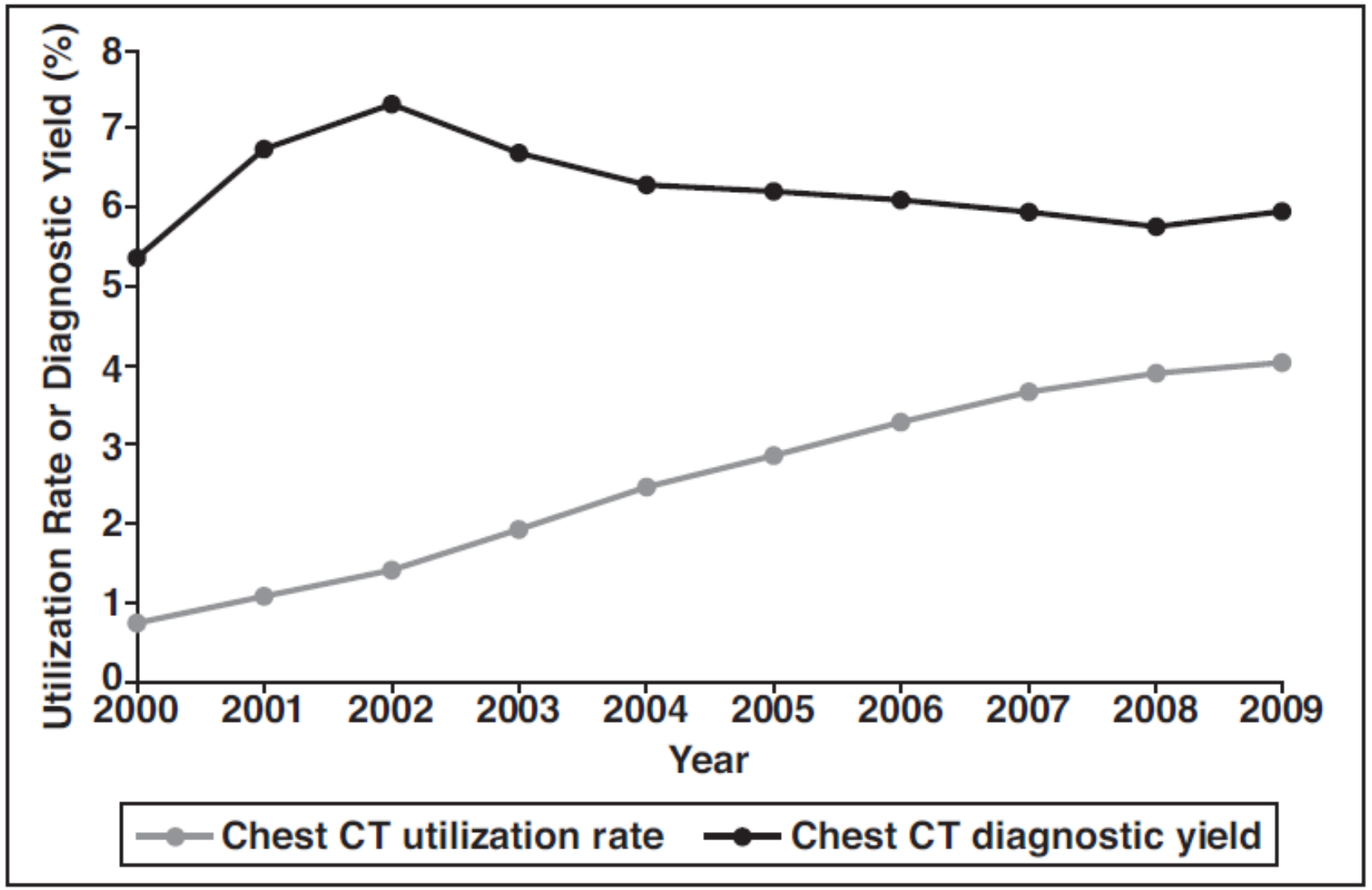
- The diagnostic approach for suspected pulmonary embolism is well codified:



2014 ESC Guidelines. Eur Heart J 2014;35:3033–80

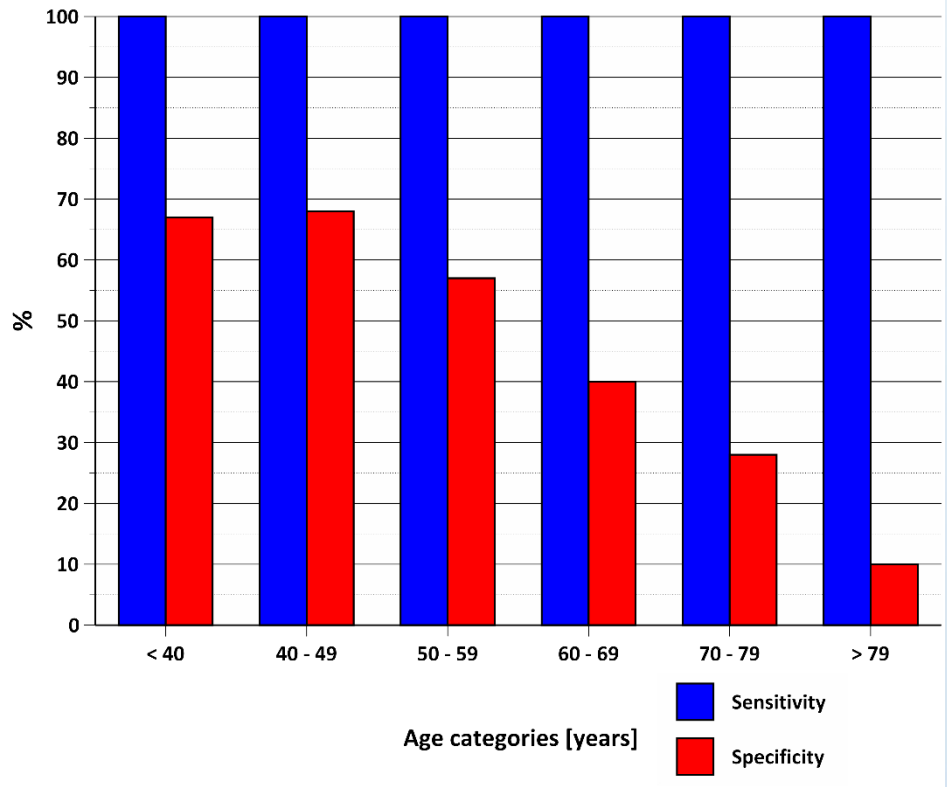
- Problem with this approach: over-consumption of thoracic angio-CT:

Fig. 1—Graph of national trends in emergency department chest CT utilization and diagnostic yield for 2000–2009.



Venkatesh AK.Am J Roentgenol 2018;210:572-77

- Increase partly due to:
  - More defensive medicine
  - Low-risk patients with CT without D-dimer
  - Low-risk patients with CT despite D-dimer negative
  - false positive D-dimer result



Venkatesh AK.Am J Roentgenol 2018;210:572-77
Righini M. Am J Med. 2000;109:357–361

Suspicion of PE & PERC rule

PERC Rule for Pulmonary Embolism ☆

Rules out PE if no criteria are present and pre-test probability is ≤15%.

When to Use ⌄ | Pearls/Pitfalls ⌄ | Why Use ⌄

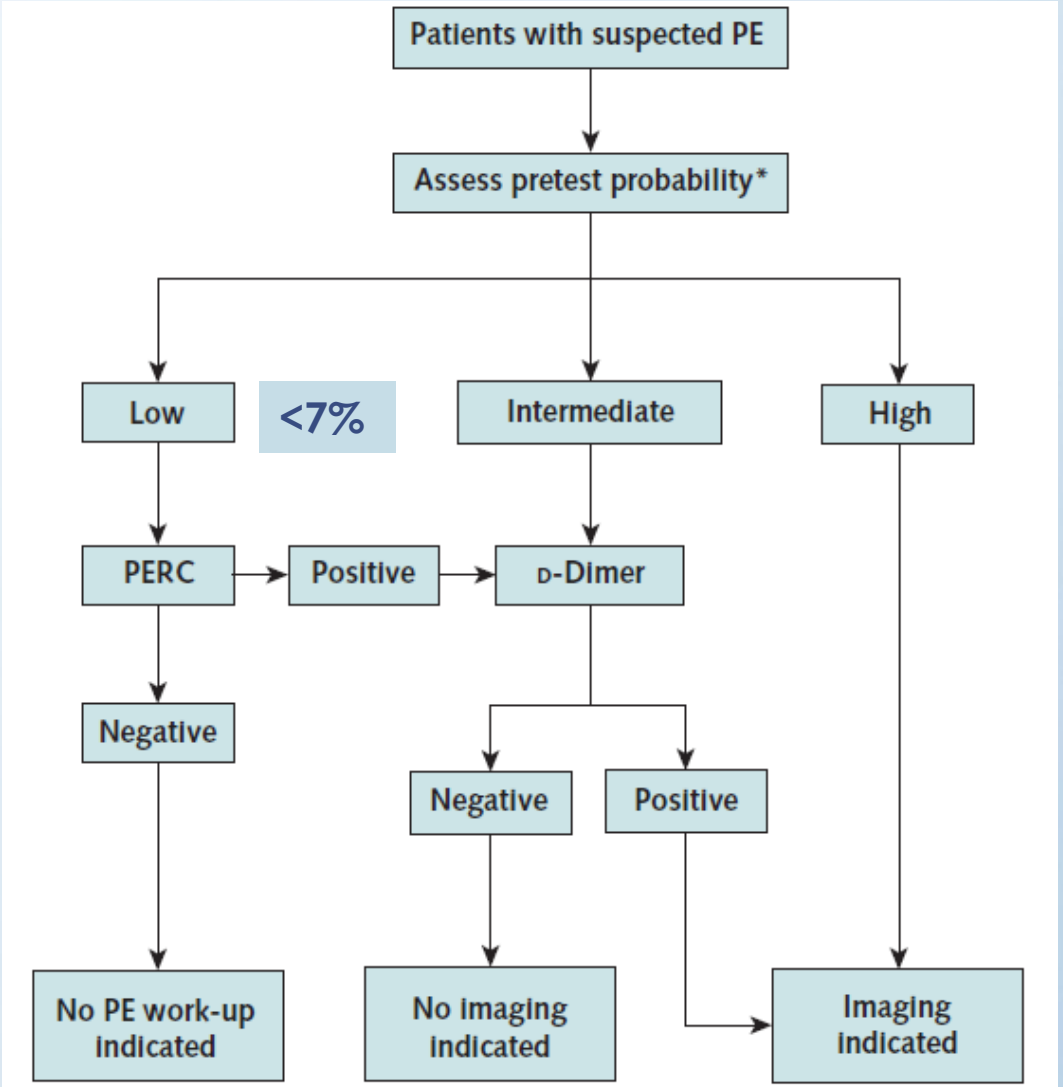
Age ≥50	No 0	Yes +1
HR ≥100	No 0	Yes +1
SaO_2 on room air <95%	No 0	Yes +1
Unilateral leg swelling	No 0	Yes +1
Hemoptysis	No 0	Yes +1
Recent surgery or trauma Surgery or trauma ≤4 weeks ago requiring treatment with general anesthesia	No 0	Yes +1
Prior PE or DVT	No 0	Yes +1
Hormone use Oral contraceptives, hormone replacement or estrogenic hormones use in males or female patients	No 0	Yes +1

0 criteria

No need for further workup, as <2% chance of PE.

If no criteria are positive and clinician's pre-test probability is <15%, PERC Rule criteria are satisfied.

Copy Results | Next Steps »



PE = pulmonary embolism; PERC = Pulmonary Embolism Rule-Out Criteria.
* Using either a clinical decision tool or gestalt.

ACP. Ann Intern Med 2015:163:702-11

PERC rule in Europe

- Rule validated in the USA but debated in Europe:
  - 6.4% missed PE if PE prevalence is 21%

Hugli O. J Thromb Haemost 2011; 9: 300–4

  - Difference in prevalence by estimated probability of PE between the USA et Europe:

Prob. prétest	Europe	USA
Gestalt:		
Low	7.8	3.4
Moderate	26.0	11.4
High	65.1	36.0
Wells score		
Unlikely (≤4 pts)	16.3	3.9
Likely (>4 pts)	52.7	23.8

Penaloza A. J Thromb Haemost 2012;10:375-81

PERC rule in Europe: the PROPER trial

- Randomized non-inferiority study conducted in 14 ED in France (non-inferiority margin: upper 95%CI limit: 3%)
- 1'916 patients with a very low probability of EP (<15%) according to gestalt included
- Comparison between standard support (gestalt<15% + D-dimer ± CT) vs PERC rule (gestalt<15% + PERC(-)=> stop)
- Results:
  - Prevalence of overall PE: **2%**

	PERC	Contrôle
PE	1.5%	2.7%

Δ 1.3%(95%CI: -0.1-2.7

Freund Y. JAMA 2018;319:559-66

PERC rule in Europe: the PROPER trial

- Other benefits:
  - Shortening of the length of stay

	PERC	Contrôle
Median duration (IQR)	4.6h (3.3;6.4)	5.2h (3.8;7.3)

P < 0.01

  - Lower number of angio-CT

	PERC	Contrôle
Angio-CT	13%	23%

Freund Y. JAMA 2018;319:559-66

PROPER trial: successful randomization?

- Significant differences between groups

	No. (%)	
	PERC (n = 962)	Control (n = 954)
Simplified Revised Geneva score[a]		
Low risk (<2)	827 (86)	772 (81)
Wells score[b]		
<2 (Low risk)	875 (91)	746 (78)
PERC score[c]		
0	459 (48)[d]	364 (38)
>0	499 (52)[d]	590 (62)

=>Lower pre-test probability of PE in the PERC group

Freund Y. JAMA 2018;319:559-66

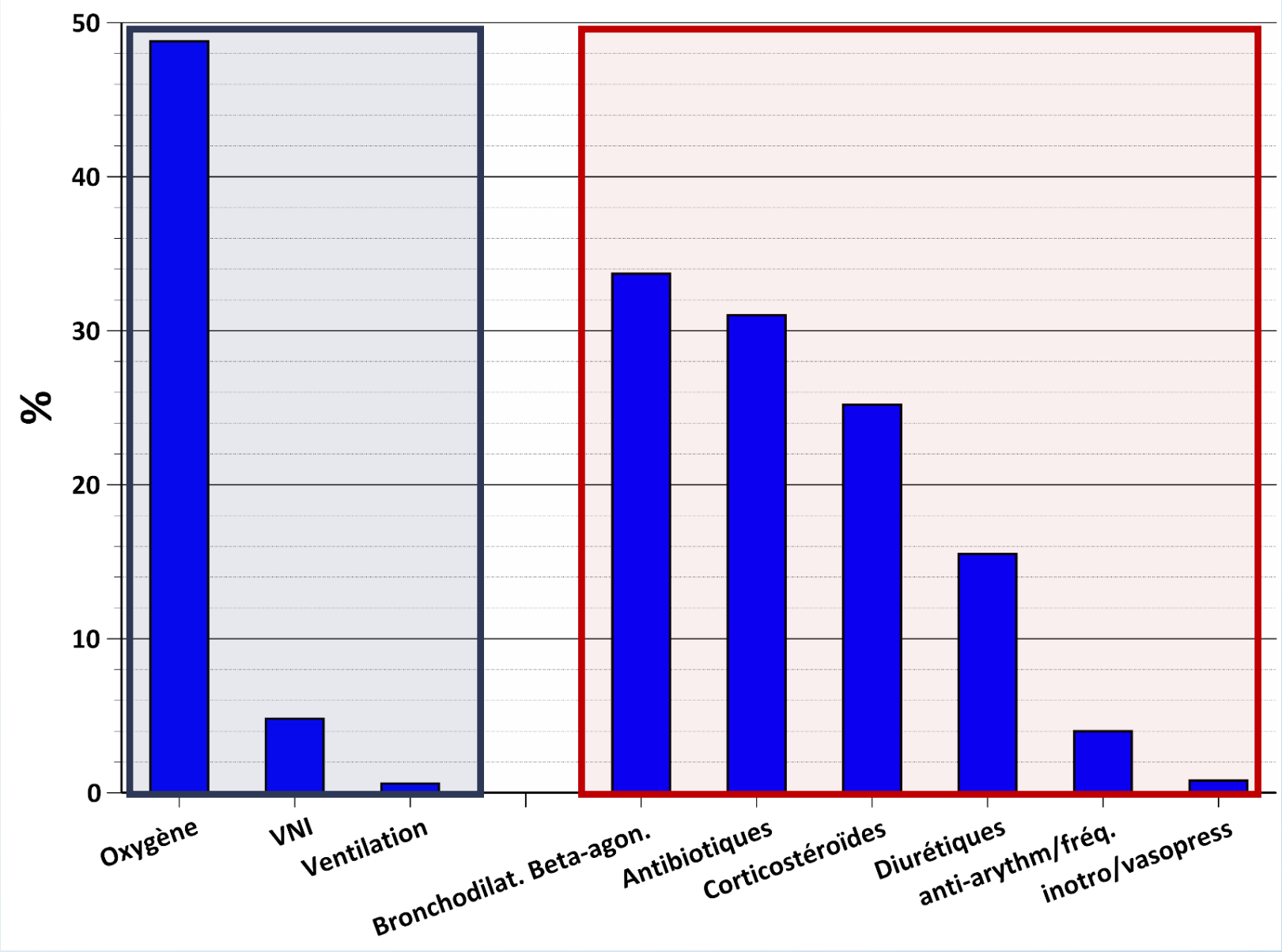
Conclusions: safety of the PERC rule in Switzerland?

- The PERC rule is validated in Europe in emergencies……if the prevalence is <3%…….
- Question: Is the PERC rule a decision rule or a confirmation rule to be used only when the emergency physician does not believe that an PE exists??
- My advice: do not use without understanding the context of application, at the risk of missing PE:

Prevalence <<< 7% ⇨PERC ⇨ no D-dim if PERC(-)

High-flow nasal cannula oxygen therapy for acute hypercapnic respiratory failure

Dyspnea: treatments



Kelly AM. Acad Emerg Med 2017;24:328–36

High-flow nasal cannula

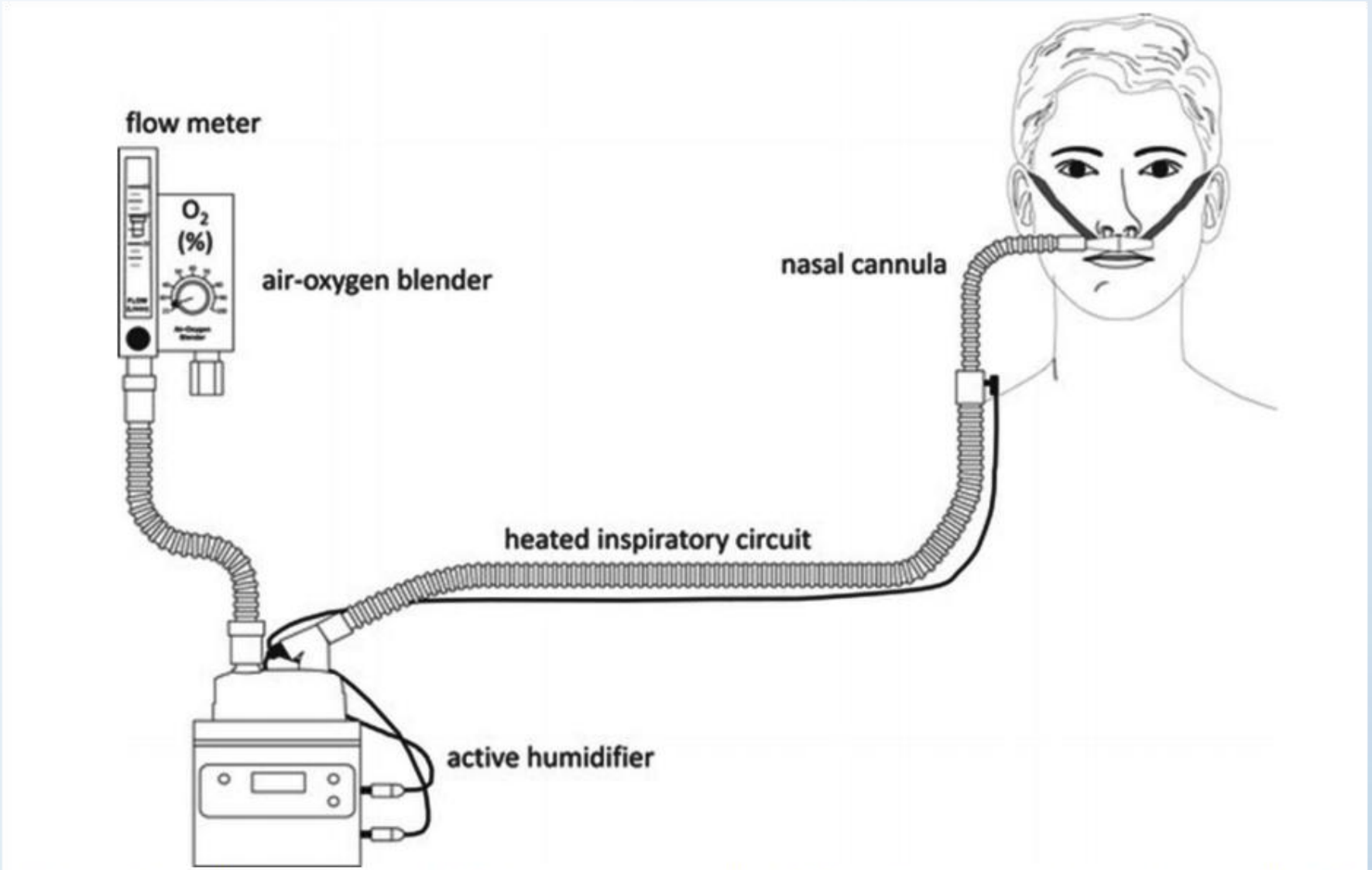


Fig. 1 High-flow nasal cannula oxygenation (HFNCO) device. An air/oxygen blender, allowing FiO_2 ranging from 0.21 to 1.0, generates flows of up to 60 L/min. The gas is heated and humidified by an active heated humidifier and delivered via a single limb

Papazian L. Intensive Care Med 2016;421336-49

High-flow nasal cannula

Table 1 Physiological benefits of high-flow nasal cannula oxygenation (HFNCO) compared to conventional oxygen therapy

FiO_2 values are higher and more stable
Because the delivered flow is higher than the spontaneous inspiratory demand and because the difference between the delivered flow rate and the patient's inspiratory flow rate is smaller
The flow must be set to match the patient's inspiratory demand and/or the severity of the respiratory distress
The anatomical dead space is decreased via washout of the nasopharyngeal space
Consequently, a larger fraction of the minute ventilation participates in gas exchange
Respiratory efforts become more efficient
Thoracoabdominal synchrony improves
The work of breathing is decreased
Because HFNCO mechanically stents the airway
Provides flow rates that match the patient's inspiratory flow, and markedly attenuates the inspiratory resistance associated with the nasopharynx, thereby reducing the work of breathing
The gas delivered is heated and humidified
Warm humid gas reduces the work of breathing and improves mucociliary function, thereby facilitating secretion clearance, decreasing the risk of atelectasis, and improving the ventilation/perfusion ratio and oxygenation
The body is spared the energy cost of warming and humidifying the inspired gas (neonates +++)
Warm humid gas is associated with better conductance and pulmonary compliance compared to dry, cooler gas
HFNCO delivers adequately warmed and humidified gas only when the flow is >40 L/min
Positive airway pressures are increased
The nasal cannula generates continuous positive pressures in the pharynx of up to 8 cmH_2O, depending or flow and mouth opening
The positive pressure distends the lungs, ensuring lung recruitment and decreasing the ventilation–perfusion mismatch in the lungs
End-expiratory lung volume is greater with HFNO than with low-flow oxygen therapy
Minimizing leaks around the cannula prongs is of the utmost importance

Papazian L. Intensive Care Med 2016;421336-49

A role for HFNC in acute hypercapnic respiratory respiratory failure?

- Traditional teaching: no!
- But mechanism to decrease $PaCO_2$:
  - Clearance of the anatomical dead space, thus improving alveolar ventilation
- Recent publications:
  - One prospective and two small recent retrospective study in ICU patients challenge the traditional teaching

A role for HFNC in acute hypercapnic respiratory respiratory failure?

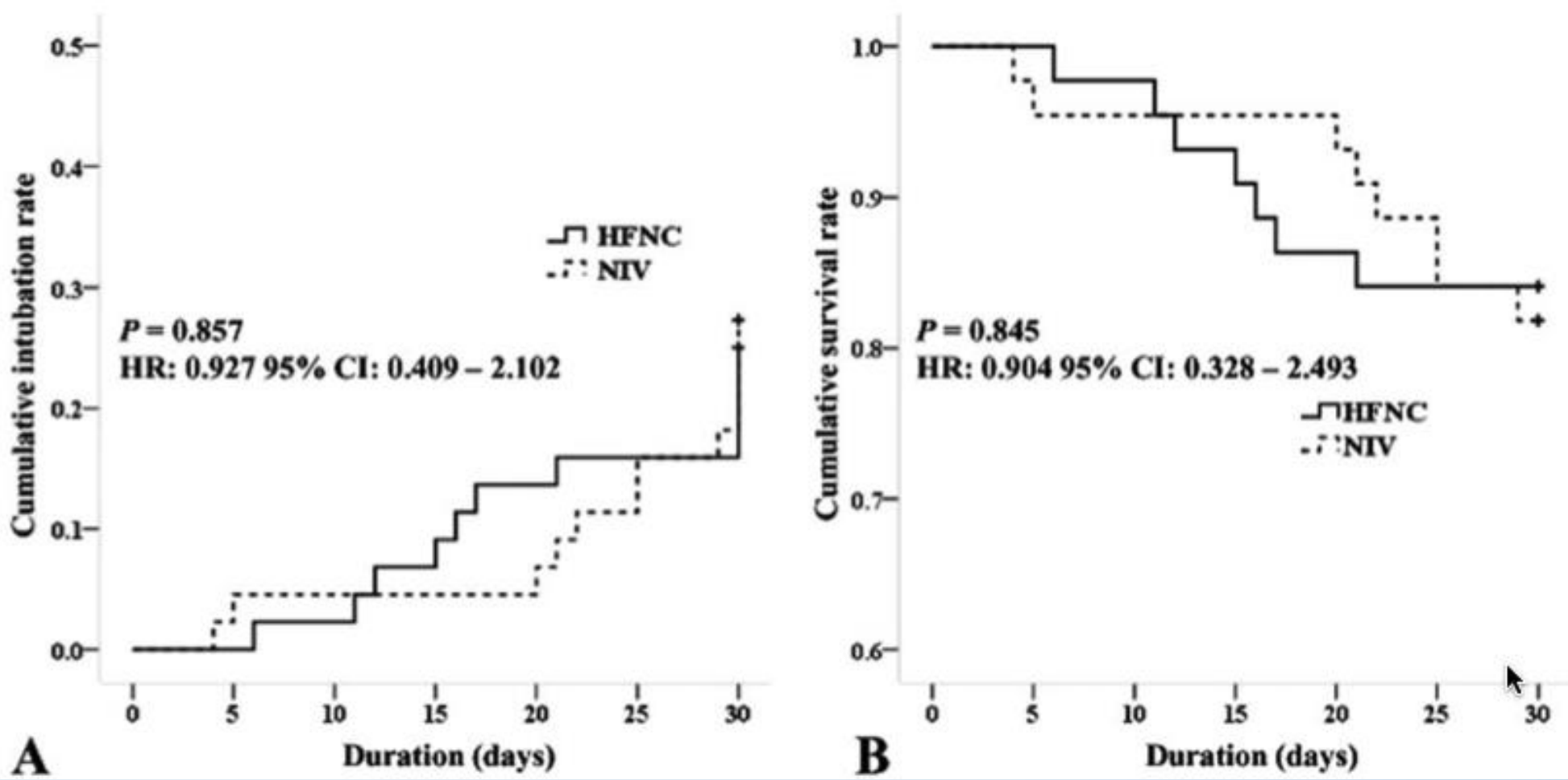
- One small recent prospective observational (randomized ?) study in patients with acute hypercapnic COPD exacerbation:

TABLE 1 Characteristics the patients between HFNC and NIV groups

Characteristics, median (IQR)	Total (n = 88)	HFNC (n = 44)	NIV (n = 44)	P value
Age (years)	73 (66.5–79)	73 (68–79)	77 (71–80)	.412
Etiology of severe AECOPD, n (%)				
Pneumonia	37 (42.0)	19 (43.2)	18 (40.9)	.829
Upper respiratory tract infection	21 (23.9)	8 (18.2)	13 (29.5)	.211
Congestive heart failure	9 (10.2)	3 (6.8)	6 (13.6)	.484
Pulmonary thromboembolism	3 (3.4)	2 (4.5)	1 (2.3)	1.000
Unknown	18 (20.5)	12 (27.3)	6 (13.6)	.113

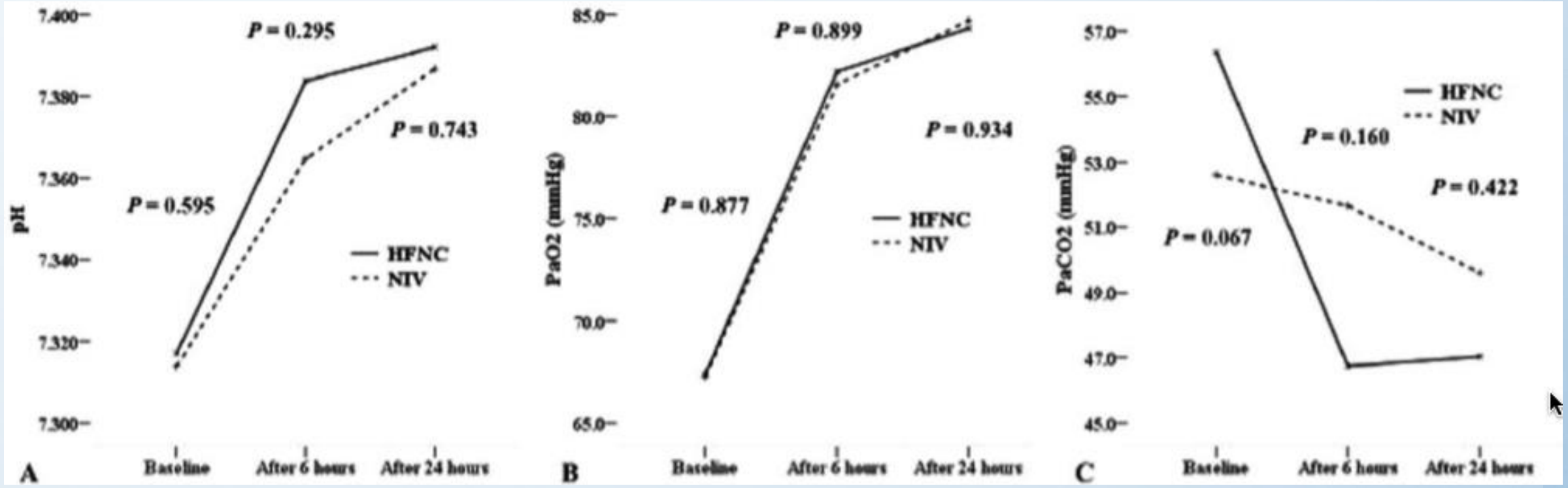
Lee MK. Clin Respir J. 2018;1–11.

A role for HFNC in acute hypercapnic respiratory respiratory failure?



Lee MK. Clin Respir J. 2018;1–11

A role for HFNC in acute hypercapnic respiratory respiratory failure?



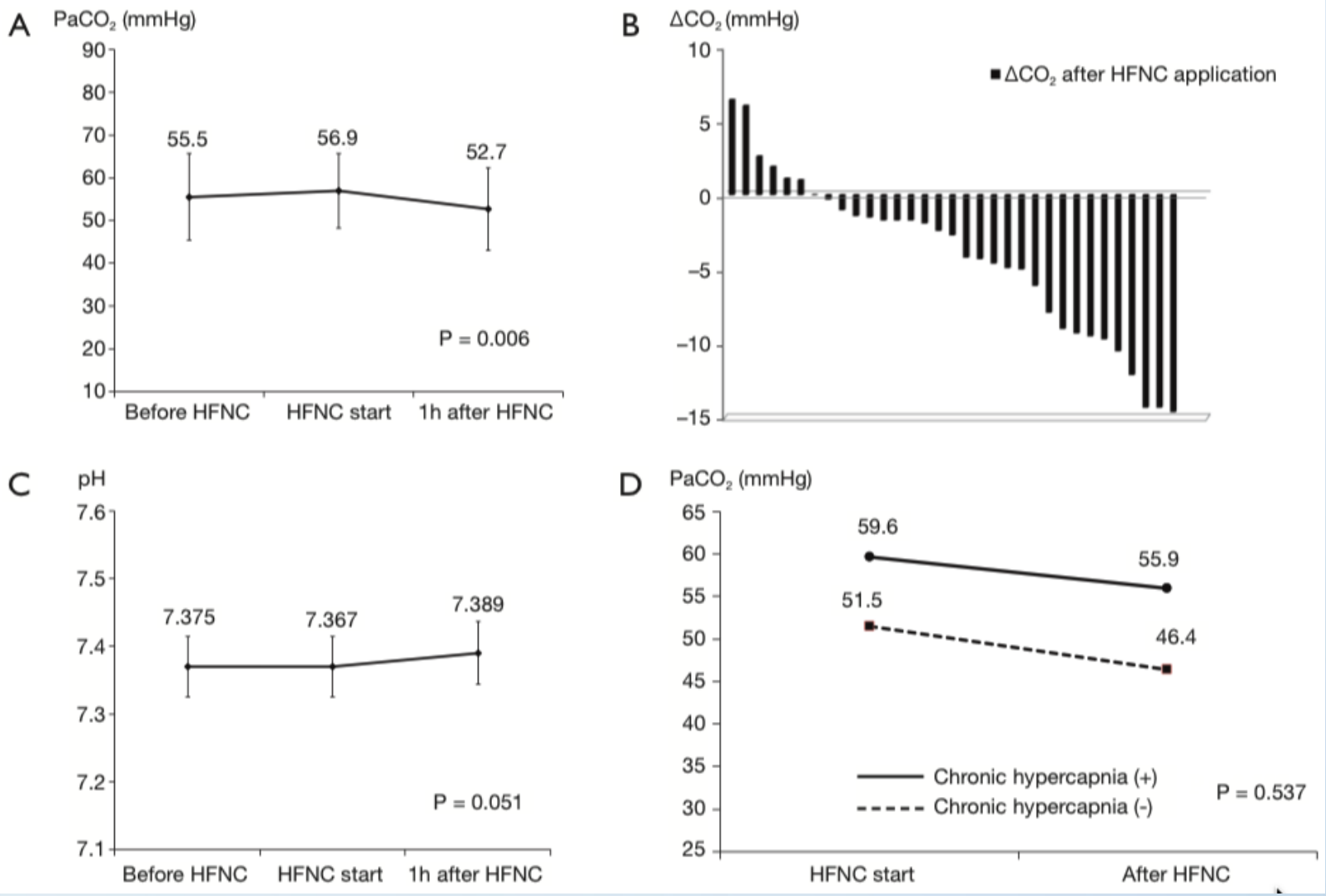
Lee MK. Clin Respir J. 2018;1–11

A role for HFNC in acute hypercapnic respiratory failure?

- One small recent retrospective study in ICU patients show promises (N=40):
  - 67% chronic lung disease and 61% COPD
  - 67% with chronic hypercapnia
  - ICU admission 2° to pneumonia in 36%, and acute exacerbation COPD in 33%

Kim ES. J Thorac Dis 2018;10:882-8

A role for HFNC in acute hypercapnic respiratory failure?



Kim ES. J Thorac Dis 2018;10:882-8

A role for HFNC in acute hypercapnic respiratory failure?

- A 3rd retrospective study (abstract only) on 50 patients in comparison with 31 non-invasive ventilation (NIV) patients:
  - No difference in intubation rate (6.0 HFNC vs. 6.4% NIV)
  - Mean ICU LOS longer in HFNC (4.8 D) than NIV (2.5D)
  - No mortality difference

Stoever J. Am J Respir Crit Care Med 2018;197:A7217

Conclusions for HFNC in acute hypercapnic respiratory failure?

- Limited evidence for benefits but trends encouraging
- Use as a temporary measure if NIV not tolerated by patients or BiPap machine personel resources not available ?
- More data will be available soon….so keep an eye!

Pneumothorax

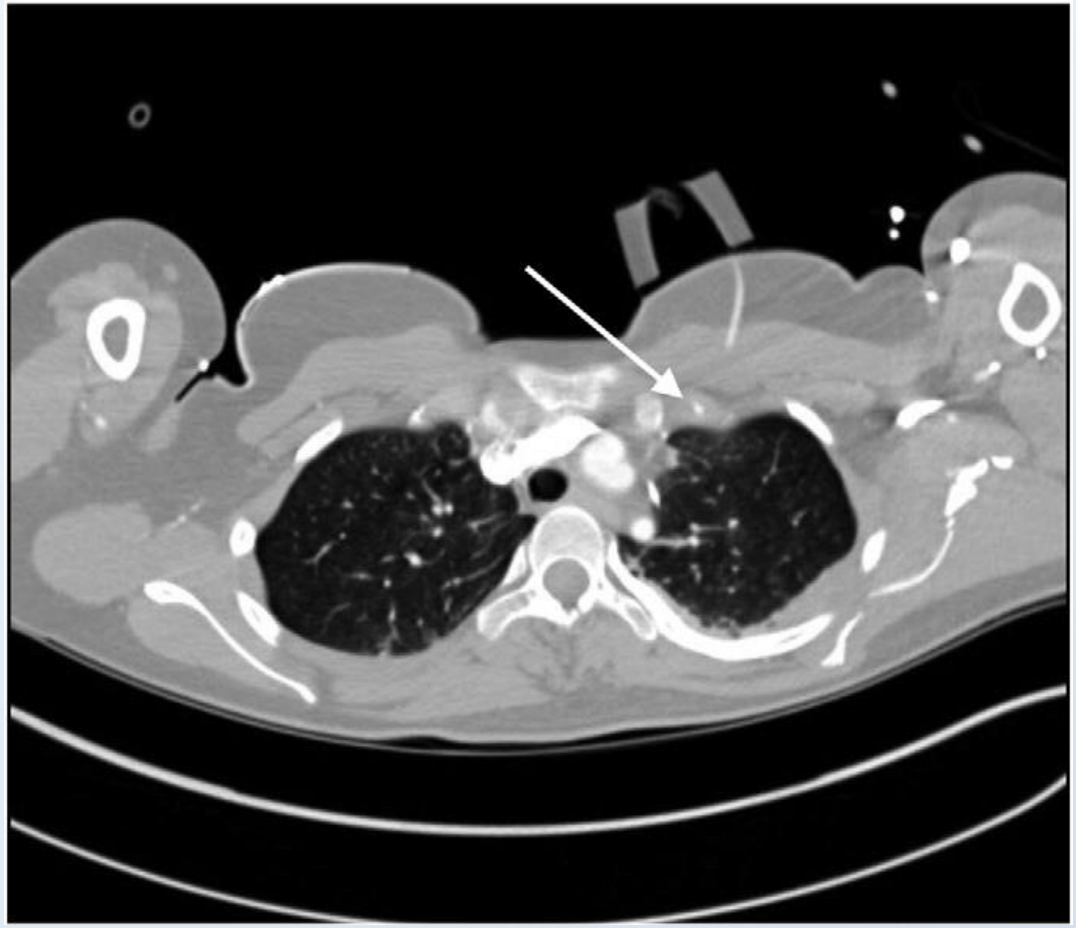
https://pictures.doccheck.com/fr/photo/8398-pneumothorax-sous-tension

Chest decompression after severe thoracic trauma

- Rare but life-saving procedure in trauma patients with tension pneumothorax
- Decompression by:
  - Needle thoracocentesis (NT)
  - Lateral thoracostomy (LT)
  - Chest tube thoracostomy (TT)
- TT performed by prehospital physician
- NT also performed by skilled paramedics

Chest decompression after severe thoracic trauma

- NT success rate 5-96%
  - Failure due to insufficient catheter length in the 2nd intercostal space on the midclavicular line



Kaserer A. Am J Emerg Med 2017;35:469-74

Chest decompression after severe thoracic trauma

- Retrospective study conducted at Zurich university hospital, a trauma Level 1 center for cases between 2009-2015
- 24/2'261 (1.1%) trauma patients with prehospital chest decompression

Thoracic injuries.

	$n = 24$
Pneumothorax	71%
Rib fractures	63%
Flail chest or multiple rib fractures	50%
Lung contusions	50%
Hematothorax	46%
Cardiac injuries (e.g. contusio cordis)	21%
Thoracic great vessel injuries	13%
Diaphragmatic injuries	8%
Bronchus rupture	4%
No intrathoracic injuries	8%

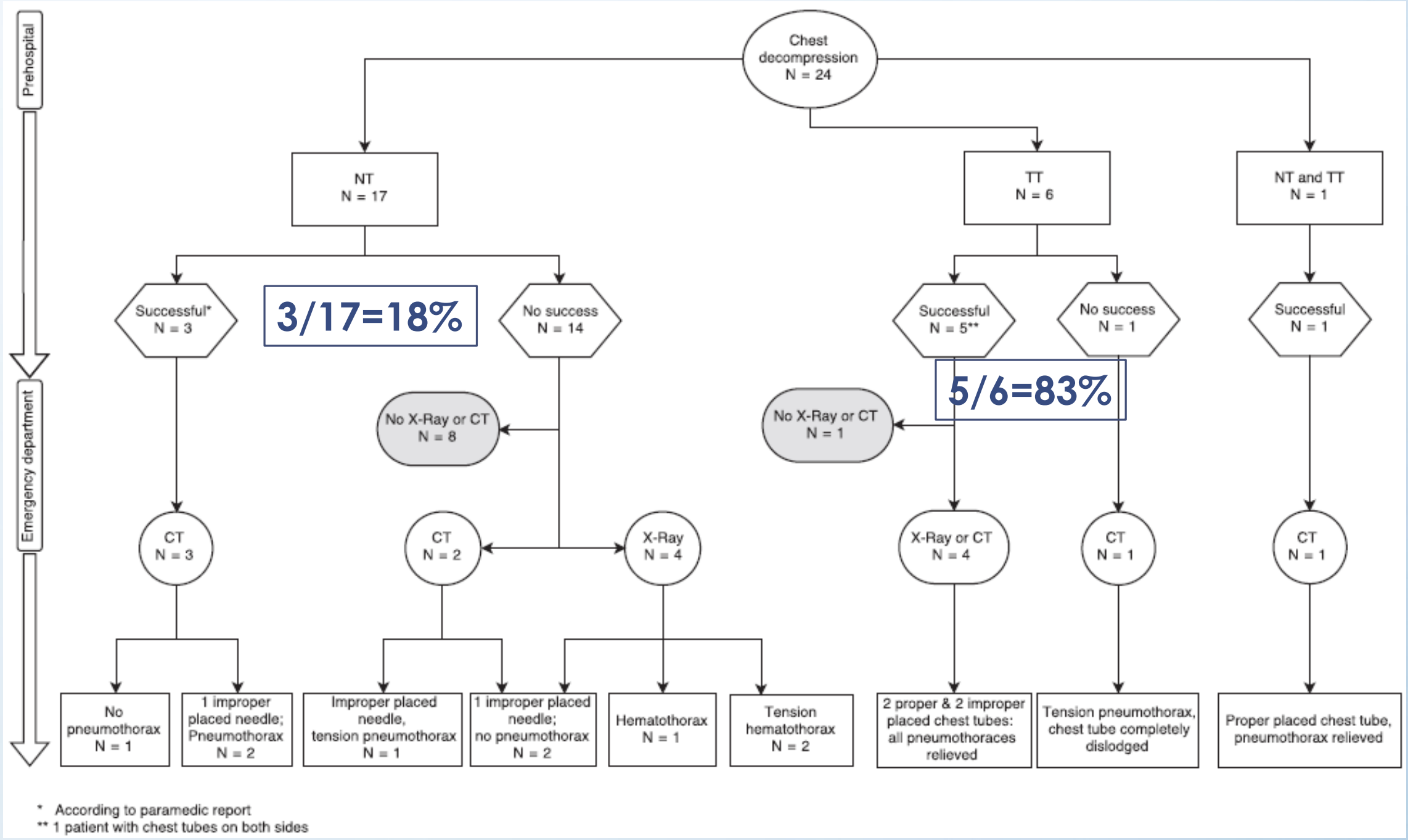
Kaserer A. Am J Emerg Med 2017;35:469-74

Chest decompression after severe thoracic trauma

		$n = 24$
Age, mean (±SD), years	43	(±22)
Sex male	19	79%
Body mass index, mean (±SD), ($n = 18$)	25.2	(±3.1)
Blunt trauma	20	83%
Penetrating trauma	4	17%
Prehospital endotracheal intubation	20	83%
Prehospital cardiopulmonary resuscitation	3	13%
ISS, mean (±SD)	37	(±23)
1-day mortality	6	25%
In-hospital mortality	11	46%
Length of hospital stay, mean (±SD), days	15	(±14)
Late complications related to TT or NT	0	

Data reported as frequency with percentage or mean (±SD).
ISS, Injury Severity Score.
SD, Standard Deviation.

Kaserer A. Am J Emerg Med 2017;35:469-74



Kaserer A. Am J Emerg Med 2017;35:469-74

Conclusions

- Tension pneumothorax in blunt trauma is rare in Switzerland (1.1%)
- Diagnosis difficult in the field (18% of incorrect diagnosis)
- Needle decompression (NT) has a very high failure rate
  - Use of too short catheter (33-50mm in Zürich)

    ⇒Need to use longer catheter (≥64mm?)

    ⇒Insert NT in the 5th intercostal space on the mid-axillary line(13mm thinner in average)?

Spontaneous pneumothorax: chest tube or needle aspiration ?

- Spontaneous pneumothorax can be I^{ary} (no underlying lung disease) or II^{ary} (presence of underlying lung disease)
- Best 1st treatment between chest tube or needle aspiration unclear, particularly for II^{ary} pneumothorax (usually excluded from studies)
- National guidelines discordant as 1st treatment
- Remaining questions :
    1. Does NT reduce hospital length of stay?
    2. What is the immediate success rate in draining the pneumothorax?
    3. Are complications rate related to the procedure different ?

Thelle A. Eur Respir J 2017; 49: 1601296

Spontaneous pneumothorax: chest tube or needle aspiration ?

Randomized clinical trial in 3 Norwegian hospitals with patients ≥ 18 years with spontaneous pneumothorax (I^{ary} or II^{ary}) and:

⇒ >30% size of pneumothorax if I^{ary}

⇒ >20% size of pneumothorax if II^{ary}

OR

⇒ Increased breathlessness

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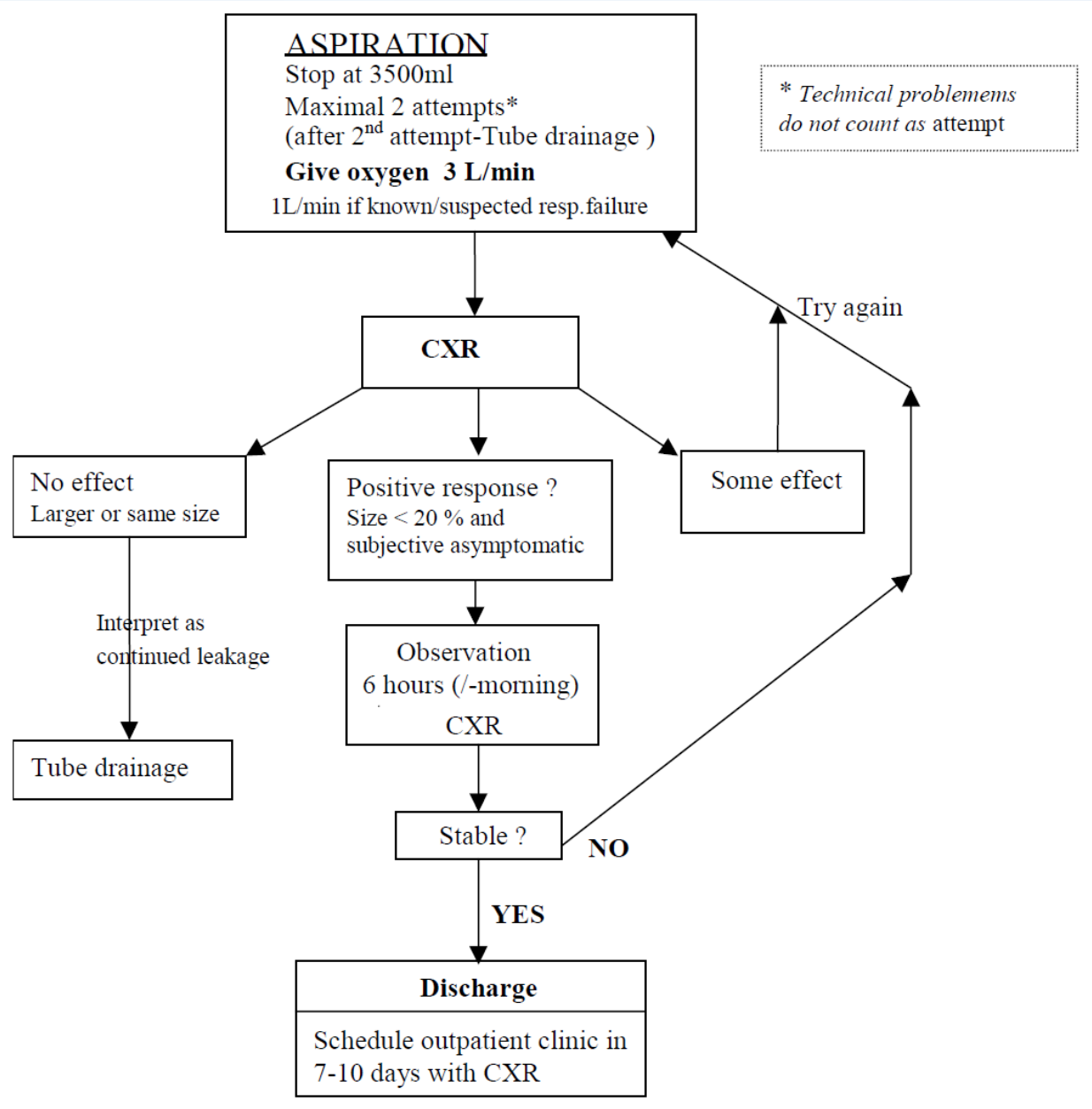

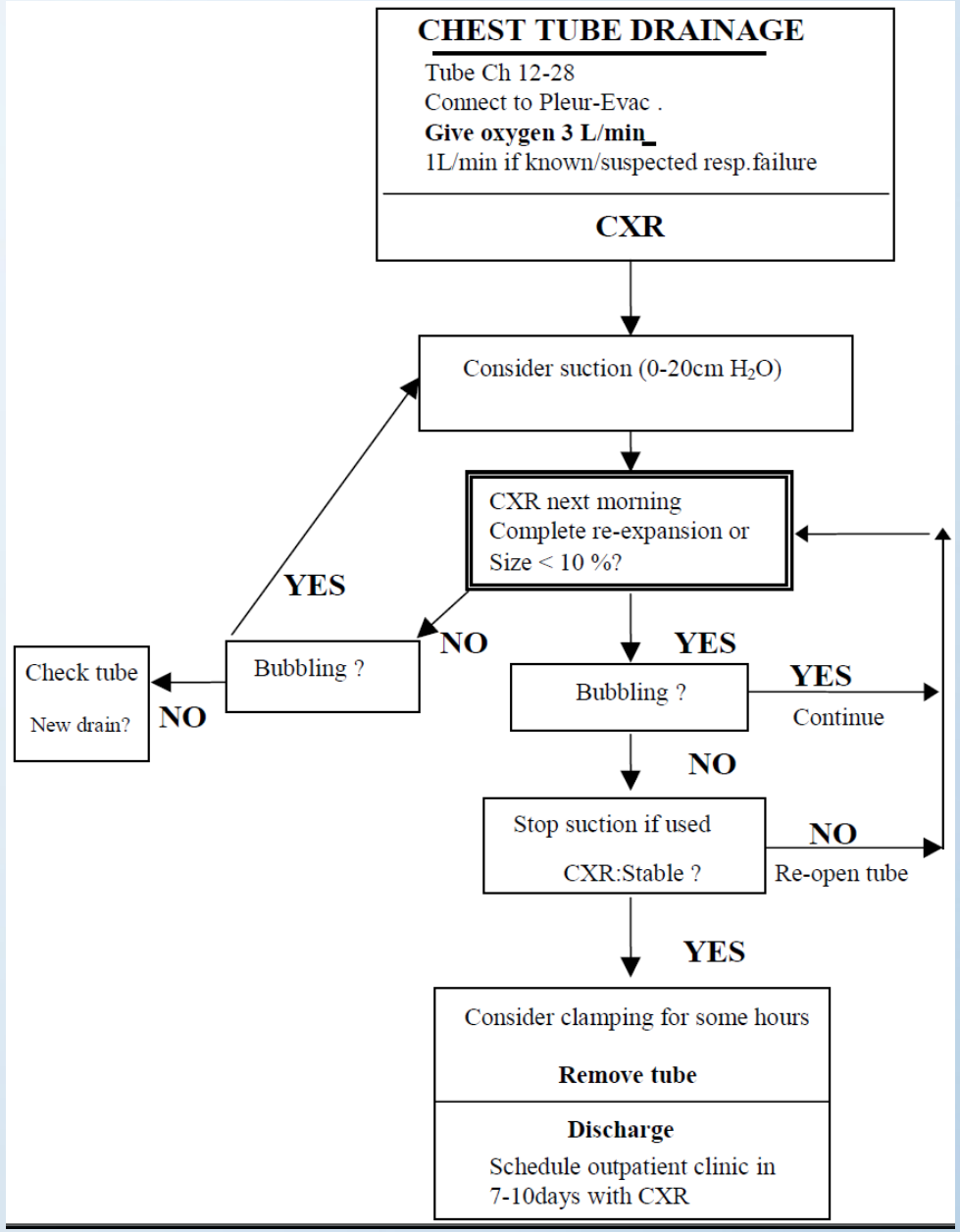

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Spontaneous pneumothorax: chest tube or needle aspiration ?

Characteristics	Needle aspiration	Chest tube drainage (CTD)
Patients n	64	63
Men	54 (84.4)	53 (84.1)
Age years	40.5±21.5	40.9±19.5
Height cm	177.1±10.5	179.4±9.6
BMI $kg \cdot m^{-2}$	21.3±3.2	22.1±3.2
Current smoker	30 (47.6)	27 (44.3)
Smoking history pack-years	6.5 (0.0–17.5)	10.8 (1.8–20.0)
First episode of pneumothorax	38 (69.1)	42 (72.4)
Size of pneumothorax %	47.5±19.8	57.0±25.0
Secondary pneumothorax	22 (34.4)	26 (41.3)
Right-sided pneumothorax	39 (60.9)	36 (57.1)
Hours from first symptoms until treatment	20.5 (6.0–60.0)	15.5 (5.0–72.0)

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Spontaneous pneumothorax: chest tube or needle aspiration ?

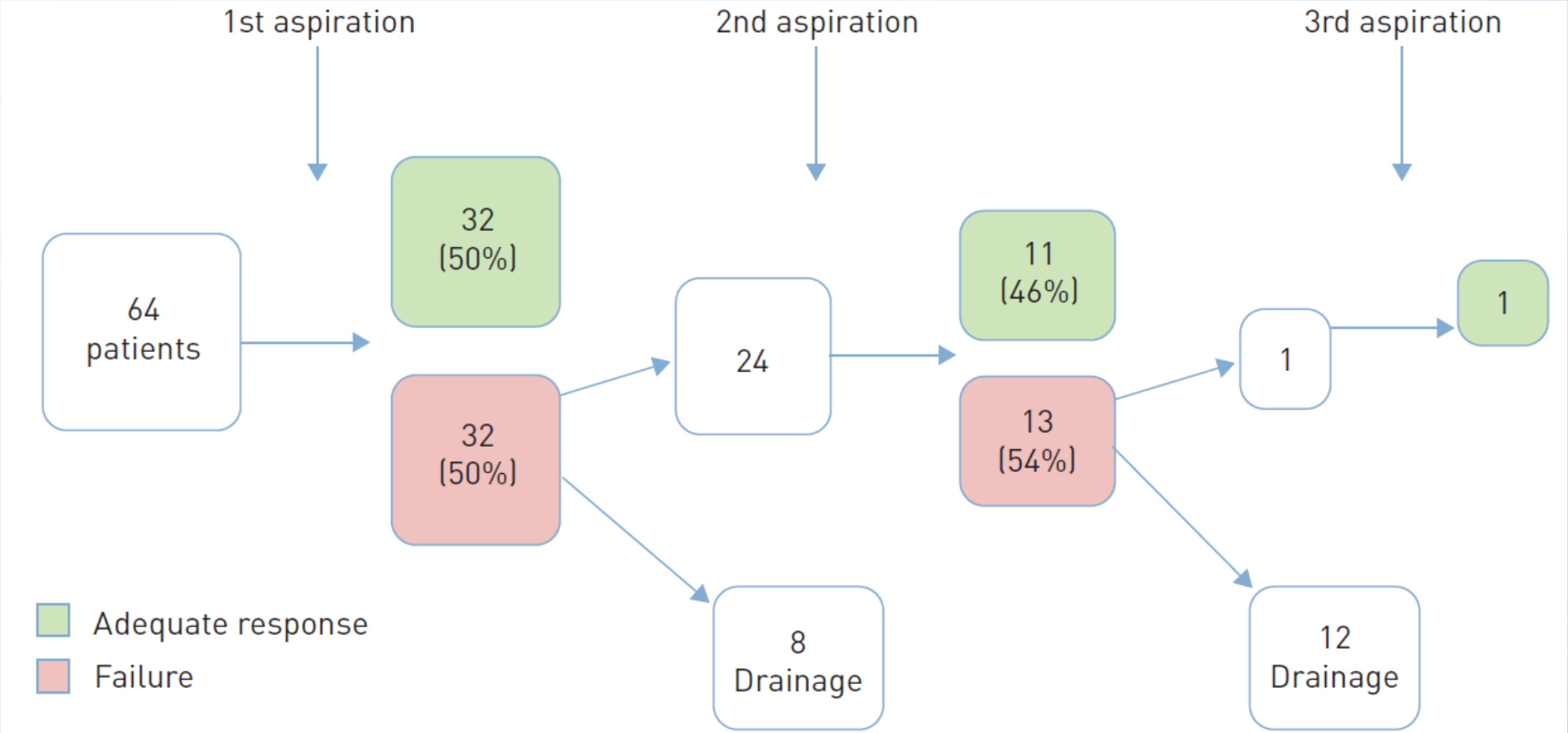

FIGURE 1 Flow of patients in the needle aspiration group.

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Spontaneous pneumothorax: chest tube or needle aspiration ?

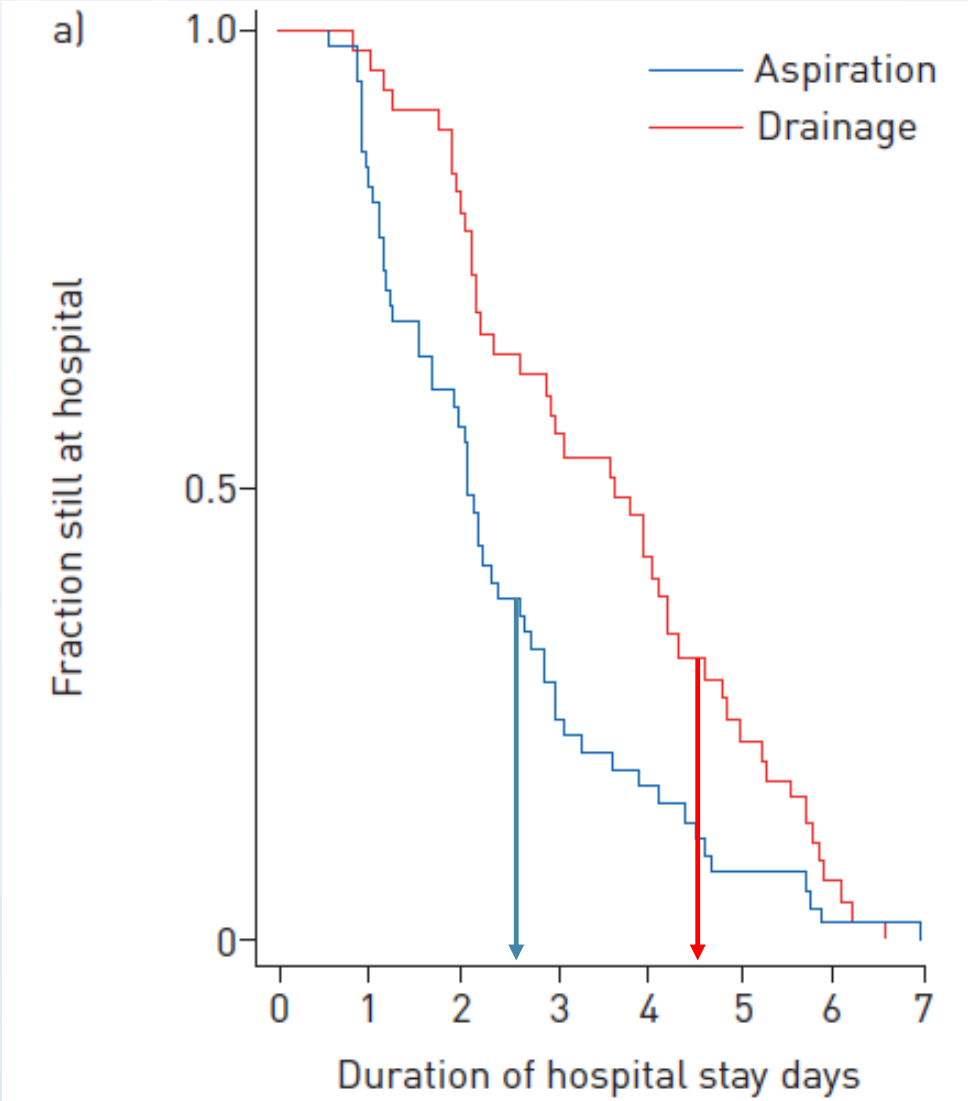

FIGURE 2 Hospital stay, total population. 7-day view.

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Spontaneous pneumothorax: chest tube or needle aspiration ?

Complications:

- Needle aspiration: 0 !
- Chest tube:
  - 4 wound infection
  - 2 bleeding
  - 7 subcutaneous emphysema
  - 1 pneumonia
  - 1 empyema (patient died!)
  - NB: new chest drain in 16 patients because of displacement of the 1st drain

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Conclusions for management of spontaneous pneumothorax

- Needle thoracocentesis:
  - Leads to a shorter hospital stay in both for I^{ary} or II^{ary} pneumothorax
  - Higher success rate than chest tube
    - with NT, first and 2nd attempt had a 50% success rate
- Less complications with NT

Thelle A. Eur Respir J 2017; 49: 1601296

Thank your for attention