Historical Guidelines of Pneumothorax

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Guidelines published after 2000

- 2001 ACCP Delphi Statement
- 2003 British Thoracic Society pleural disease guideline
- 2005 Belgian Society of Pneumology, Guidelines on the management of spontaneous pneumothorax
- 2010 British Thoracic Society pleural disease guideline
- 2015 ERS task force statement: diagnosis and treatment of primary spontaneous pneumothorax
- 2018 SECT clinical pricatice guideline on the management of patients with spontaneous pneumothorax
- 2019 Management of spontaneous pneumothorax and post-interventional pneumothorax : German S3 guideline
- 2023 SPLF/SMFU/SRFU/SFCTCV guidelines for the management of patients with primary spontaneous pneumothorax : French
- 2024 ERS/EACTS/ESTS clinical practice guidelines on adults with spontaneous pneumothorax

Abbreviation

- SP : Spontaneous pneumothorax
- PSP : Primary spontaneous pneumothorax
- SSP : Secondary spontaneous pneumothorax
- NA: needle aspiration
- PAL : persistent air leak

Basic characteristics of recent guidelines

	Literatures	Characteristics
2024 ESTS/ERS/EACTS	2000 – 2021 03 Literature	Update of 2015 ERS Task Force State ment
2023 French PSP	2005 – For RCT includes 1990 s	Expert & two patient > 15 yo PSP only Compare treatments based on size, symptom, severity of pneumothorax
2019 German S3	2008 – Postinterventional : includes 196 0 -	Includes Iatrogenic, catamenial 2010 BTS guideline based
2010 BTS	Not clearly mentioned : started 1 990 -	Initial 1993, 2nd version 2003, 3rd versi on 2010
2001 ACCP Delphi	1966 ~ 1997 literatures	PSP / SSP d/t COPD Delphi questionnaires

DIAGNOSIS

Definition

	PSP	SSP
2024 ESTS/ERS/ EACTS	• No comment	• "with underlying disease"
2023 French PSP	• SP in a patient without any known un derlying lung disease	• NA
2019 German S 3	• PTX without occurring previous thora cic intervention or injury in patients l ess than 45 yo without pre-exising pu lmonary disease, with unremarkable CXR contralateral lung finding	• With previous lung disease • Pulmonary symptoms existed prior to the onset of PTX • Pathologic finding observed in non -affected lung on CXR • Patient > 45 yo and smoking
2010 BTS	• PTX occurring in otherwise healthy pa tients	• Associated with underlying lung di sease • Age>50 and significant smoking hi story • Evidence of underlying lung diseas e on exam or CXR
2001 ACCP	• No clinically apparent underlying lun g abnormalities or underlying conditi ons known to promote pneumothora x	• Clinically apparent underlying lung disease

Diagnosis : Chest X ray

	PSP/SSP
2024 ESTS/ERS/EACTS	• No comment
2023 French	• PA chest X ray in inspiration, without expirati on view
2019 German S3	• PA chest X ray standing, in inspiration
2010 BTS	• Standard erect CXR in inspiration
2001 ACCP	• No comment

Diagnosis : chest CT

	PSP	SSP
2024 ESTS/ERS/EACTS	• No comment	• No comment
2023 French	• LDCT in case of persistent diagnostic doubt • Not first line	• No comment
2019 German S3	• Only in case where findings are unclear, in complicated constellations or if SSP is suspected	• CT when SSP is suspected • Recommend orienting operative strategy to individual aspects of the lung disease and imaging (CT)
2010 BTS	• Uncertain or complex case only	• Useful in detecting underlying disease, location of chest tubes
2001 ACCP	• Not for 1st episode of PSP • May be indicated when there is suspicious for underlying lung disease but not apparaent on chest X ray	• No recommendation • Can be considered for management of recurrence, PAL, or planning surgical intervention

Diagnosis : chest sonography

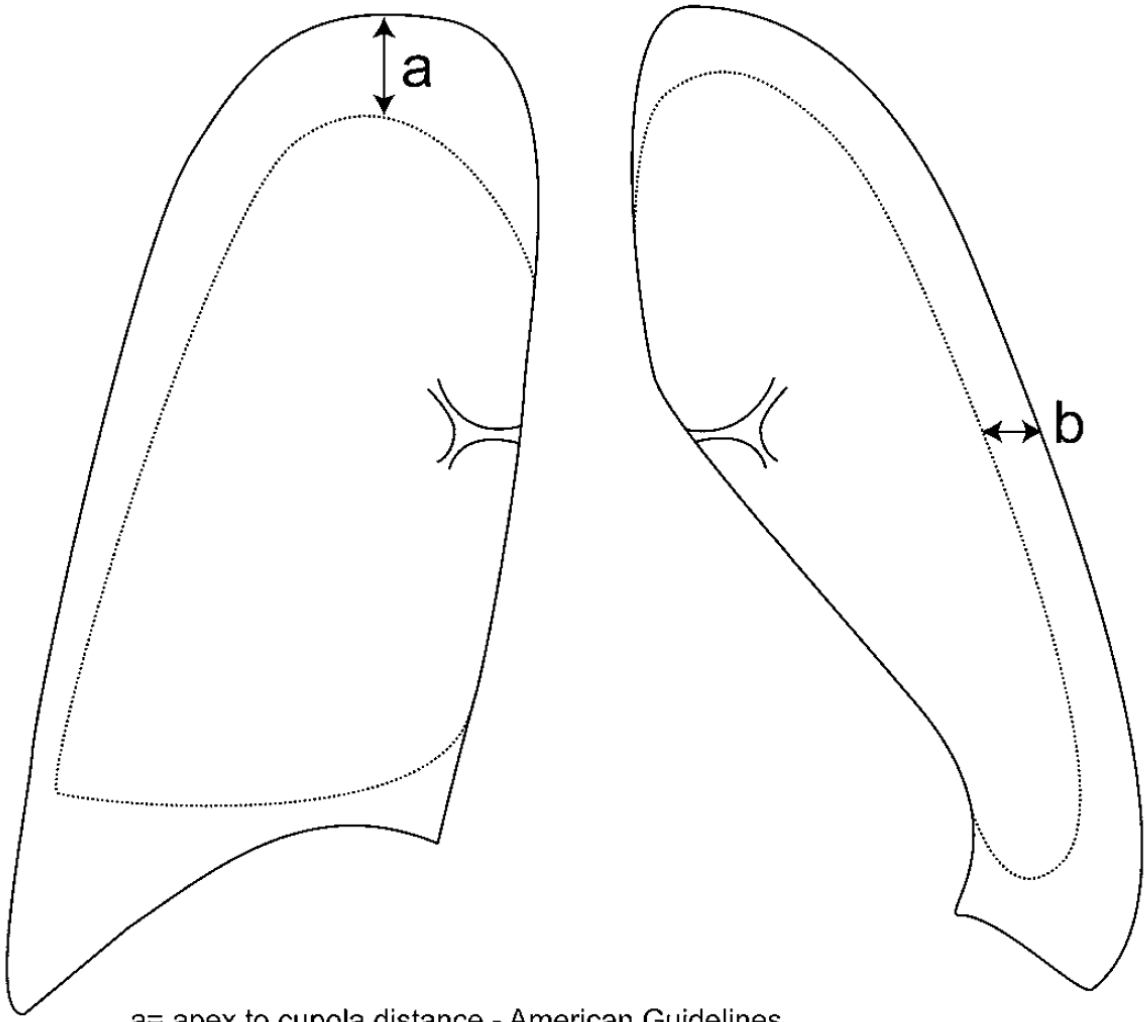
	PSP/SSP
2024 ESTS/ERS/EACTS	• No comment
2023 French	• Supplement
2019 German S3	• adequately qualified examiner • Alternative to CXR , esp post-interventional or ICU
2010 BTS	• Mainly for supine trauma patients
2001 ACCP	

Size of pneumothorax

	PSP
2024 ESTS/ERS/EACTS	• No comment
2023 French	• Visible rim along the entire axillary line, ≥ 2cm between the lung m argin and the chest wall at the hilum level
2019 German S3	• Recommend the size of PTX based on Chest X ray PA in inspiration (Collins equation) • Large PTX is sum of the measured value is ≥ 4
2010 BTS	• large PTX : presence of visible rim of > 2cm between the lung marg in and chest wall • Accurate size calculation can be done by CT
2001 Delphi	• Determined by distance from the lung apex to the ipsilateral thoraci c cupola at the parietal surface as determined by an upright standa rd X ray • Small : < 3cm apex to cupola distance • Large : ≥ 3cm apex-to-cupola distance

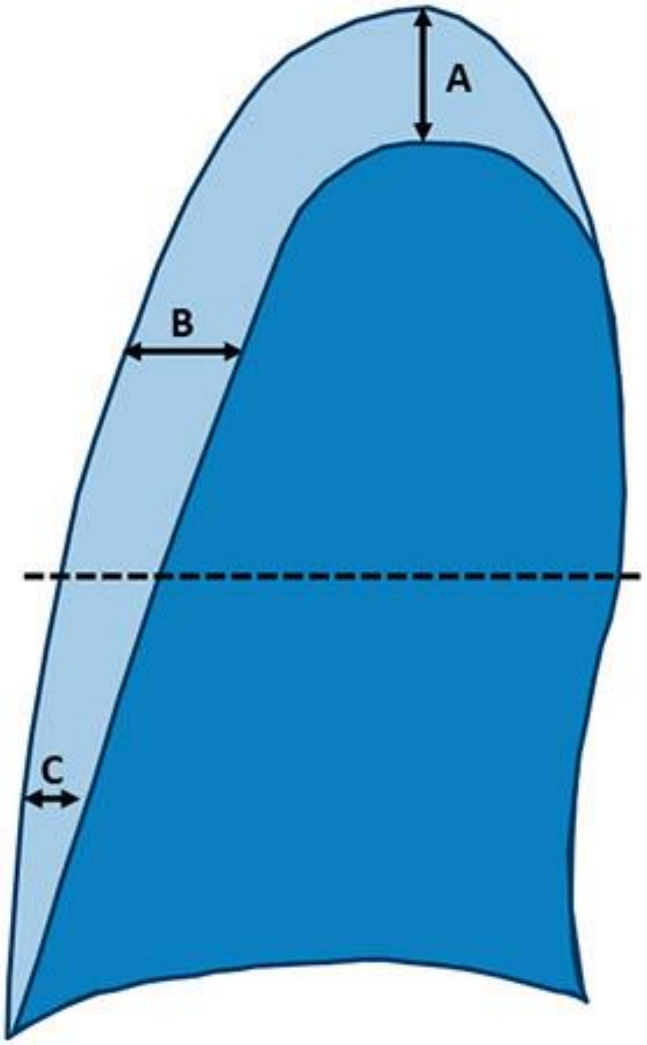
* Size of pneumothorax is less important than degree of clinical compromise (BTS)

Depth of pneumothorax : ACCP vs BTS



a= apex to cupola distance - American Guidelines
b= interpleural distance at level of the hilum - British Guidelines

Calculation of Size of PTX



- X-ray *p.a.* in inspiration: Pneumothorax % = 4.2 + 4.7 * (A+B+C).

- For this, the interpleural distances at the apex (**A**), lateral at the midpoints of the upper (**B**) and lower (**C**) halves of the collapsed lung are measured (Collins et al. [88]).

Definition of clinical stability

- Clinical stability
  - Stable : all of the following present:
    - RR <24 breaths/min
    - HR > 60 or <120 beats/min
    - Normal BP
    - Room air O2 saturation > 90%
    - Patient can speak in whole sentences between breaths
  - Unstable : any patient not fulfilling the definition of stable

Patients with signs of immediate severity – 2023 French

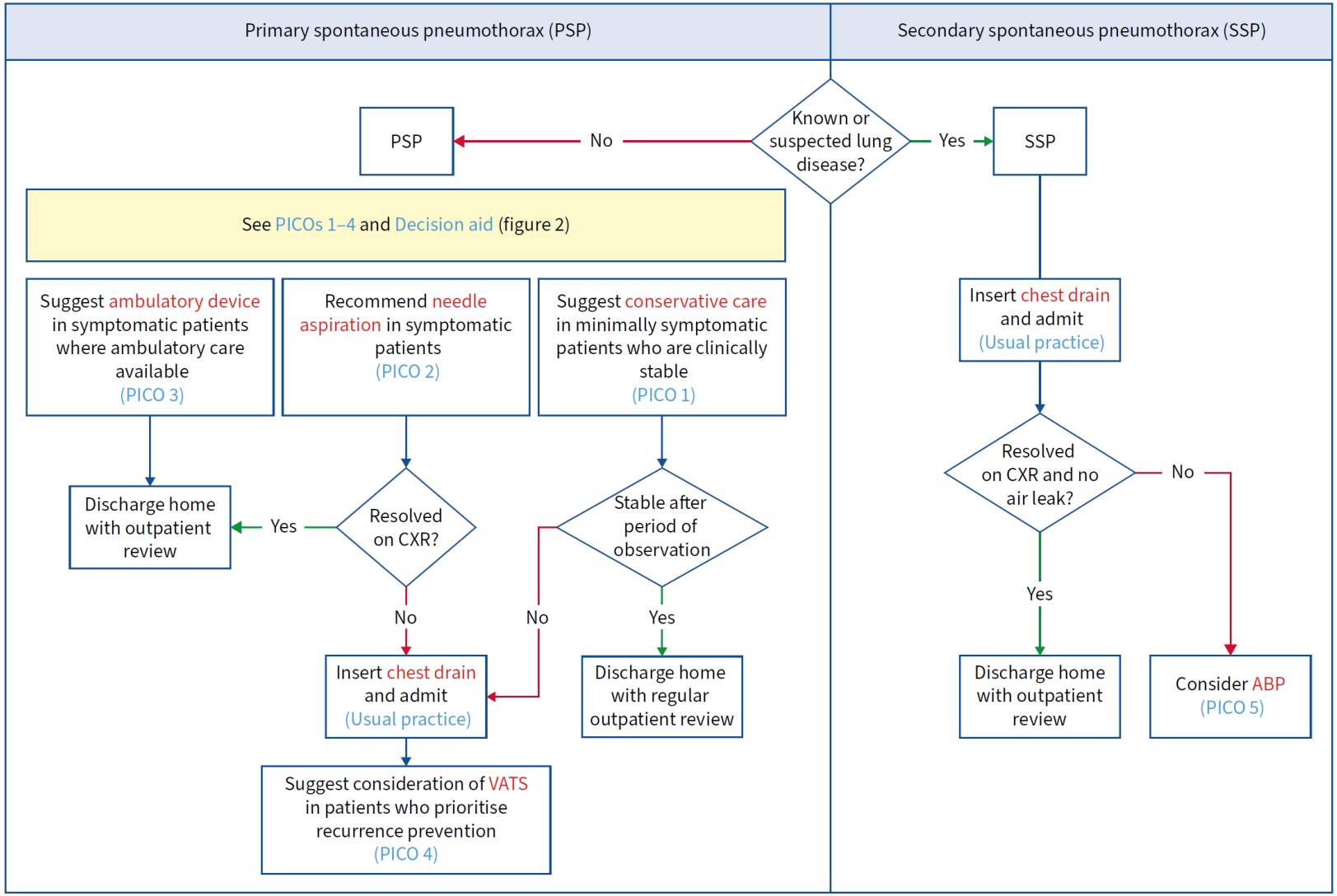
- Clinical definition
  - Respiratory distress or hemodynamic instability in PSP : rare
  - Well tolerated PSP, therapeutic strategies can be discussed according to location, size, first episode or recurrence, complications, patient's characteristics

- PSP with respiratory distress or hemodynamic instability : tension PTX

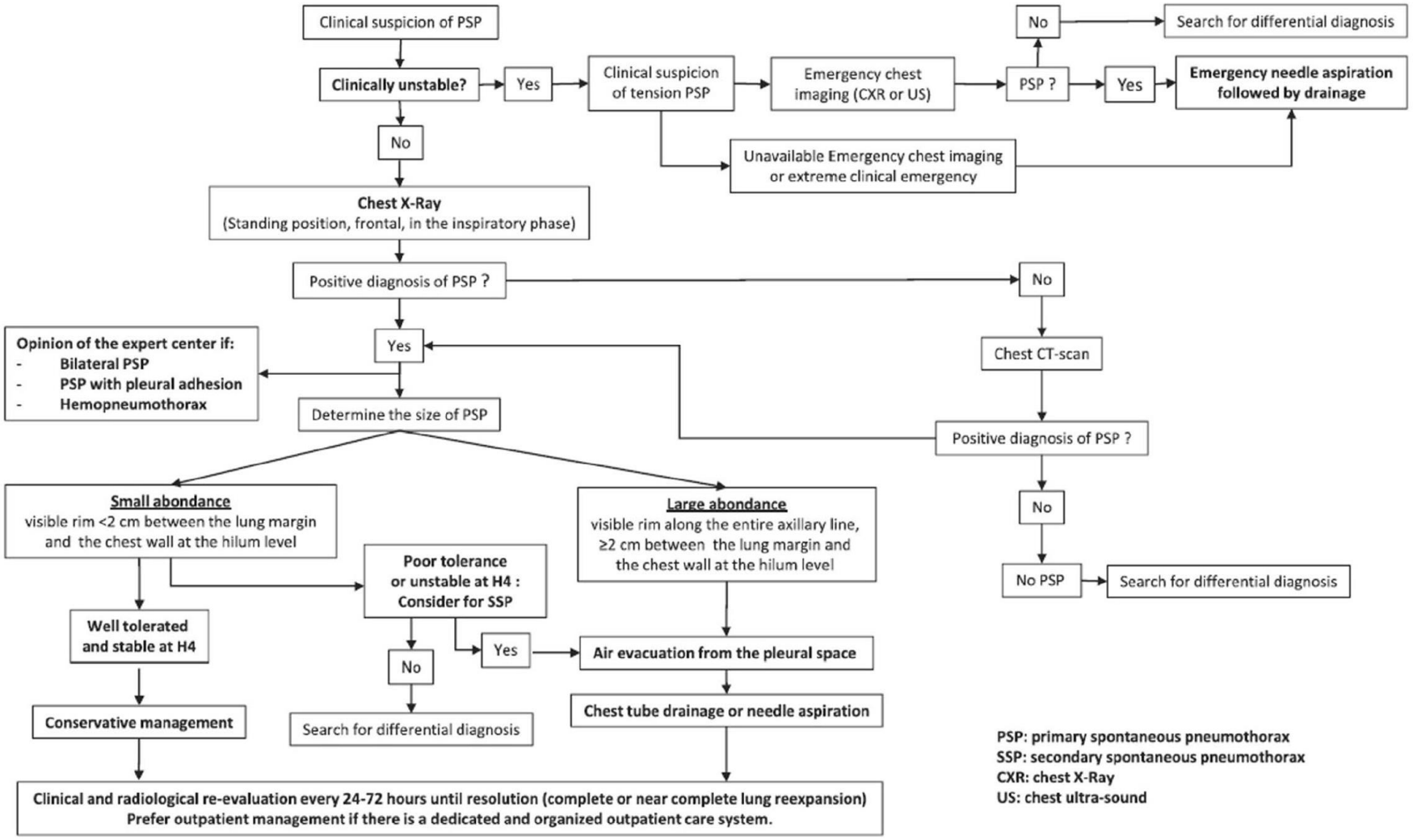
- "large pneumothorax" includes symptomatic or asymptomatic large in most literatures

MANAGEMENT OF 1ST PNEUMOTHORAX EPISODE

2024 ESTS/ERS/EACTS guidline

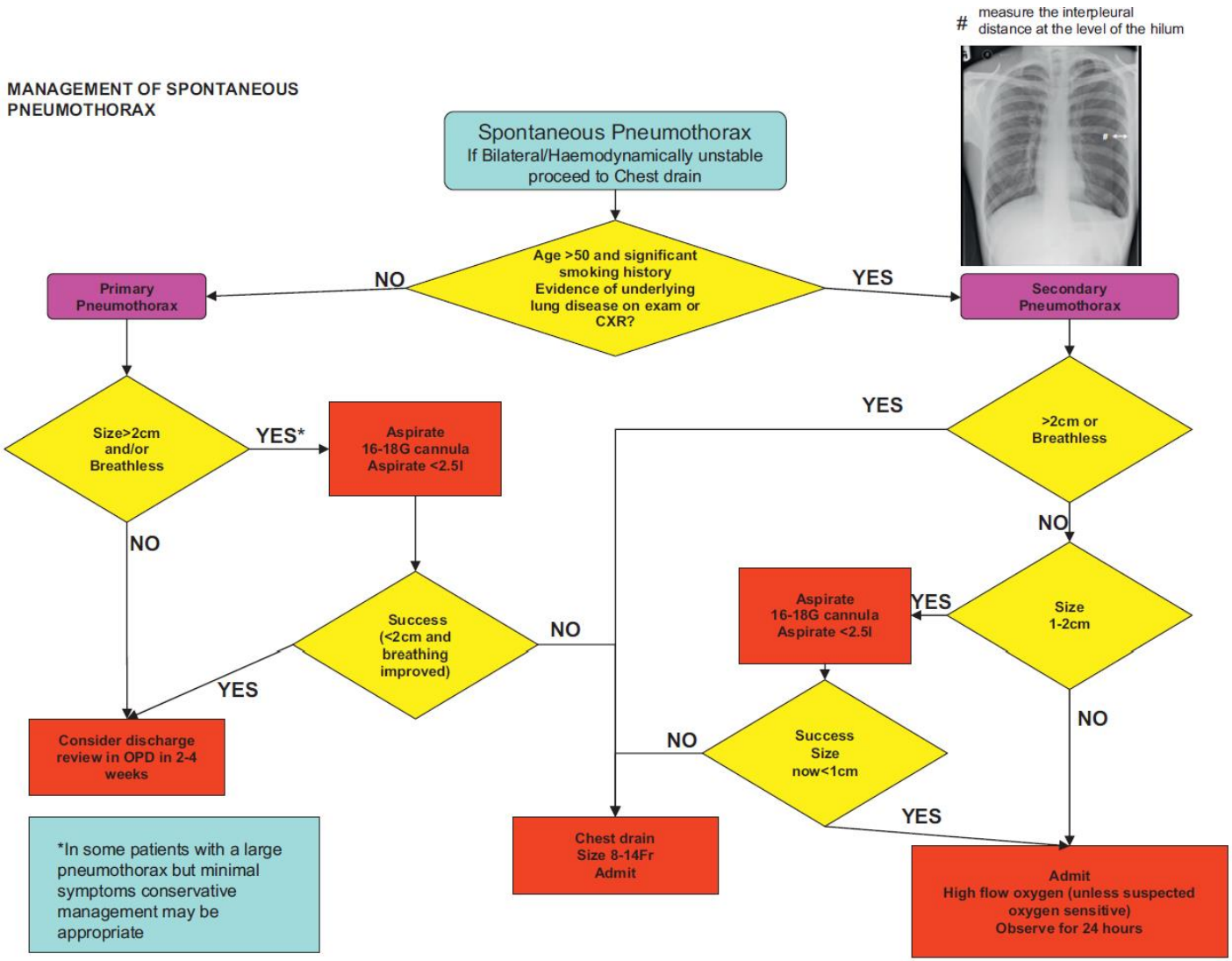


Diagnostic algorithm and initial assessment : 2023 French

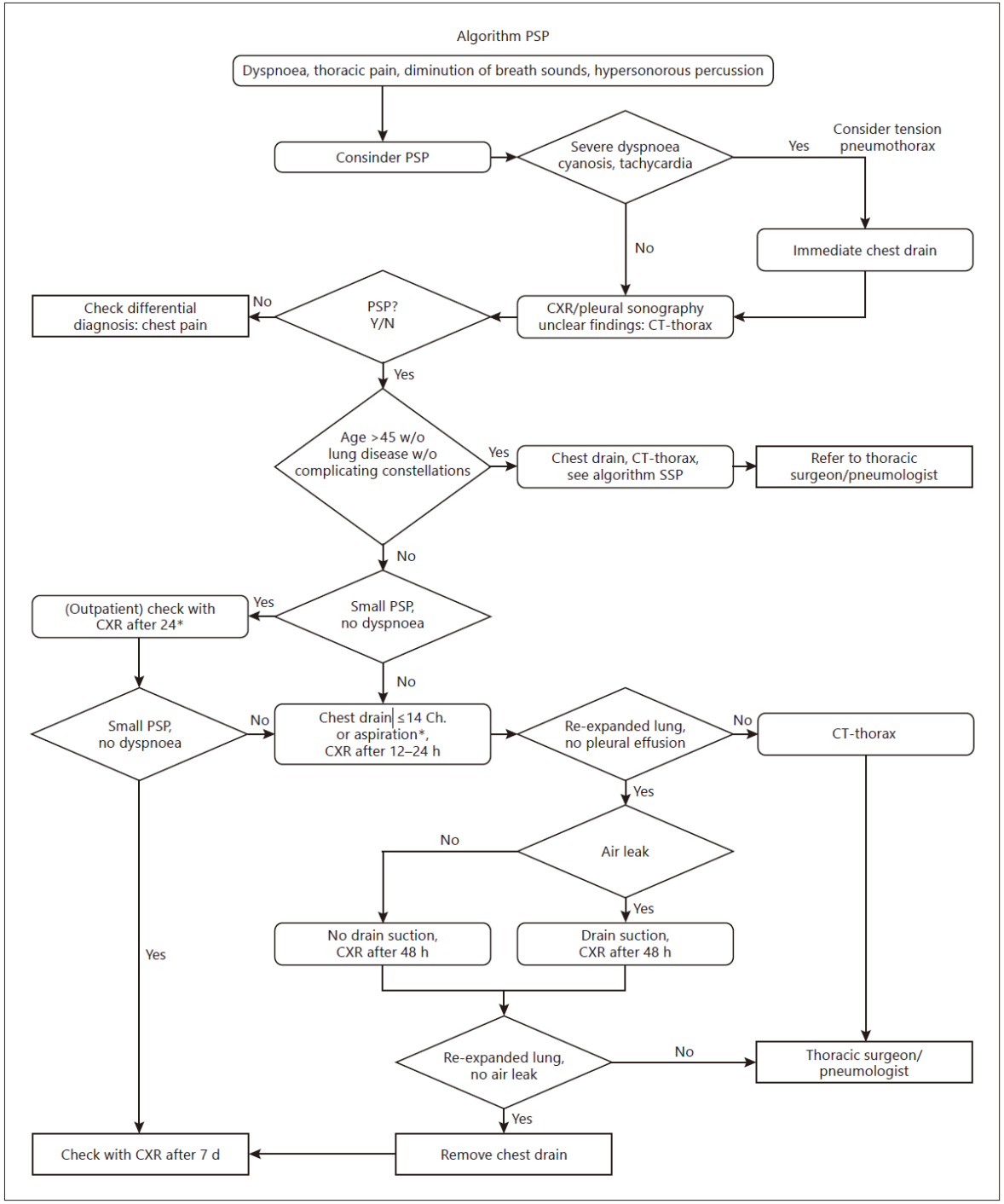


PSP: primary spontaneous pneumothorax
SSP: secondary spontaneous pneumothorax
CXR: chest X-Ray
US: chest ultra-sound

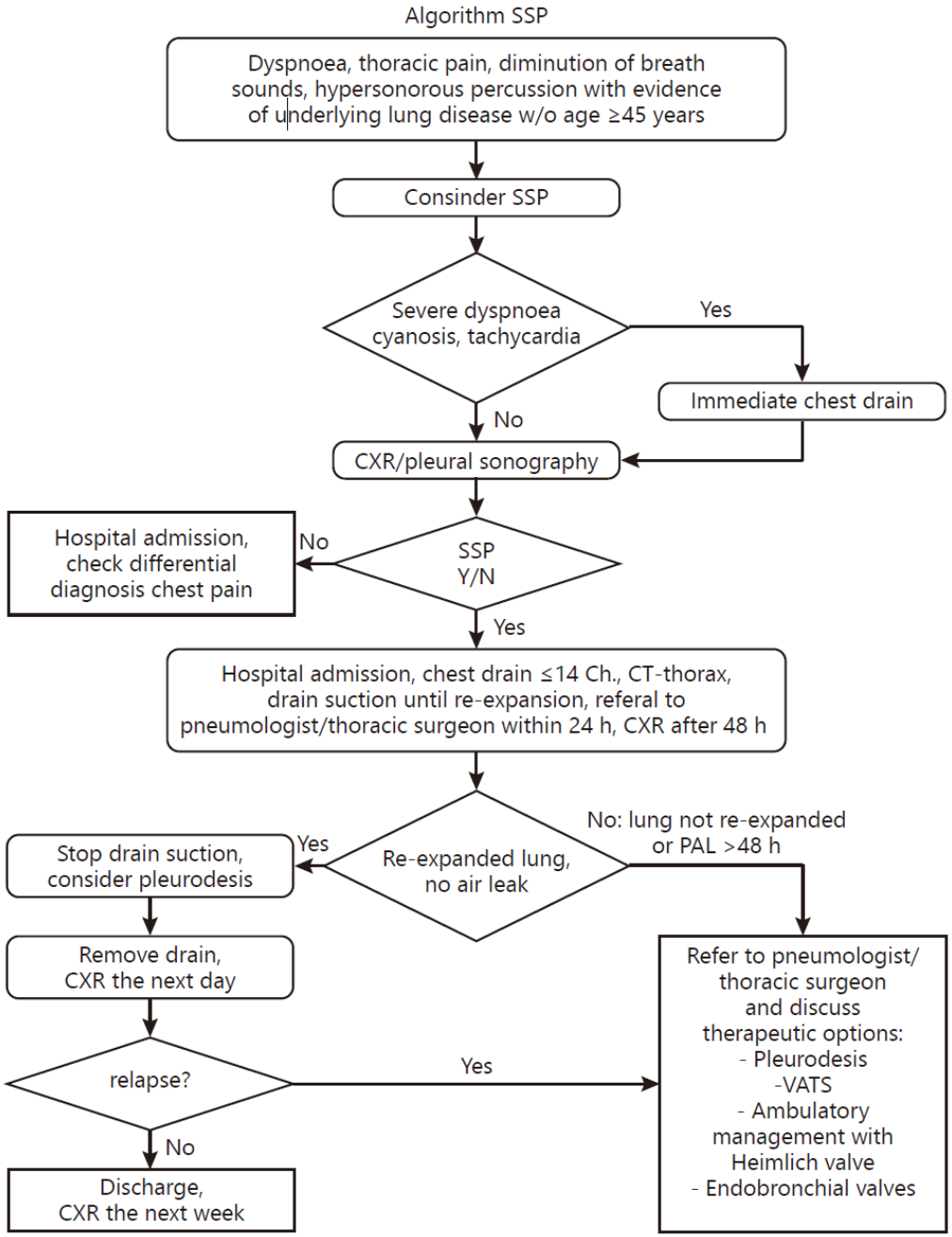
Management of SP (2010 BTS)



German S3


Algorithm PSP
Dyspnoea, thoracic pain, diminution of breath sounds, hypersonorous percussion
Consinder PSP
Severe dyspnoea cyanosis, tachycardia
Yes
Consider tension pneumothorax
No
Immediate chest drain
Check differential diagnosis: chest pain
No
PSP? Y/N
CXR/pleural sonography unclear findings: CT-thorax
Yes
Age >45 w/o lung disease w/o complicating constellations
Yes
Chest drain, CT-thorax, see algorithm SSP
Refer to thoracic surgeon/pneumologist
No
(Outpatient) check with CXR after 24*
Yes
Small PSP, no dyspnoea
No
Small PSP, no dyspnoea
No
Chest drain ≤14 Ch. or aspiration*, CXR after 12–24 h
Re-expanded lung, no pleural effusion
No
CT-thorax
Yes
No
Air leak
Yes
No drain suction, CXR after 48 h
Drain suction, CXR after 48 h
Yes
Re-expanded lung, no air leak
No
Thoracic surgeon/ pneumologist
Yes
Check with CXR after 7 d
Remove chest drain

German S3

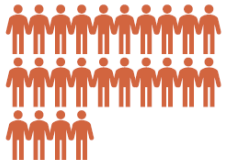
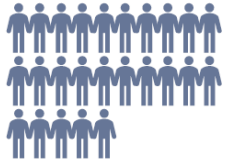

Algorithm SSP
Dyspnoea, thoracic pain, diminution of breath sounds, hypersonorous percussion with evidence of underlying lung disease w/o age ≥45 years
Consinder SSP
Severe dyspnoea cyanosis, tachycardia
Yes
Immediate chest drain
No
CXR/pleural sonography
Hospital admission, check differential diagnosis chest pain
No
SSP Y/N
Yes
Hospital admission, chest drain ≤14 Ch., CT-thorax, drain suction until re-expansion, referal to pneumologist/thoracic surgeon within 24 h, CXR after 48 h
Re-expanded lung, no air leak
Yes
Stop drain suction, consider pleurodesis
No: lung not re-expanded or PAL >48 h
Remove drain, CXR the next day
relapse?
Yes
Refer to pneumologist/ thoracic surgeon and discuss therapeutic options:
- Pleurodesis
-VATS
- Ambulatory management with Heimlich valve
- Endobronchial valves
No
Discharge, CXR the next week

Decision on treatment

	PSP	SSP	
2024 ESTS/ERS/EACTS			
2023 French			
2019 German S3	Dyspnea + : intervention Dyspnea - with small PSP: observation	Size is less important for SSP Degree of clinical impairment is more important	Symptom is most important
2010 BTS	• Pts with PSP and SSP and significant dyspnea indicates the need of active intervention • Size of PTX determines the rate of resolution, relative indication for active intervention (1.25 ~ 2.2 % /24hr)		Presence of dyspnea influence management
2001 ACCP	Clinical stability + size of PTX		

Decision aid for initial management pathways for primary spontaneous pneumothorax

Note: this figure is to aid discussions with patients and should be done in conjunction with guidance within the text. The studies referenced used different designs and may not be directly comparable.

The treatment options: from least invasive (left) to most (right)	**Observational care (conservative)**	**Needle aspiration**	**Ambulatory care**	**Chest drain**	**Surgery**
How long is the average (mean) initial hospital stay?	1.0 days[#] 	2.6 days 	0 days 	4.8 days 	4 days[¶] 
What is the chance of a pneumothorax recurrence within a year?	9 patients in 100 	25 patients in 100 	24 patients in 100 	21 patients in 100 	6 patients in 100[+] 
How often is a further pleural procedure required?	15 patients in 100  Note: no initial procedure with observational care	22 patients in 100 	21 patients in 100 	25 patients in 100 	3 patients in 100  (Further video-assisted thoracic surgery)
What are the complication rates (%)					
Skin infection	1	0	1	3	0
Local bleeding	0	0	7	3	0
Surgical emphysema	0	1	6	6	0
Haemothorax	3[§]	1	3	6	3
Tube blockage or displacement	0	0	5	11	0
Number of studies	1	6	1	6	1[ƒ]

Conservative management : use of systematic oxygen

	PSP	SSP	
2024 ESTS/ERS/EACTS			
2023 French	• Not recommend (poor quality of data)		• Strong recommendation, moderate level of evidence
2019 German S3			
2010 BTS		• All SSP should be admitted at least 24hrs and receive supplemental oxygen, with size PTX < 1-2cm	
2001 ACCP		• Clinically stable, small SSP	

Conservative management : level of activity

	PSP	SSP	
2024 ESTS/ERS/EACTS	No comment	no comment	
2023 French	No absolute bed rest Limit intense or contact sports activites until complete resolution of the PTX		Conditional / expert opinion
2019 German S3	No comment	no comment	
2010 BTS	No comment	no comment	
2001 ACCP	No comment	no comment	

Conservative management for PSP

	PSP
2024 ESTS/ERS/EACTS	Conservative in selected cases*
2023 French	Recommend air removal from the pleural cavity in large PSP /small PSP without signs of immediate severity
2019 German S3	Small PSP without dyspnea: close observation Reexamination within 24 h
2010 BTS	Small PSP without dyspnea : observation is TOC Large asymptomatic PSP, in selected pts, maybe observative tx
2001 ACCP	Clinically stable small TPX : obs for 3-6 hrs in ED Repeat cxr excludes progression of PTX Follow up within 12 to 2 days

Needle aspiration vs Chest tube drain

	PSP	SSP
2024 ESTS/ERS/EACTS	• Needle aspiration (NA)	• No recommendation
2023 French	• NA might superior • NA and CTD are both first line management (ambulatory CTD)	
2013 German S3	• NA or small bore (<14) CTD as primary tx for PSP requiring treatment • Recommend CTD when NA is unsuccessful • Immediate CTD for bilateral or tension PTX	• Recommend application of chest drain and supportive (O2) in SSP with increasi ng dyspnea • Recommend small bore (≤ 14 Fr)
2010 BTS	• NA (14 or 16 G) is effective as large bore (>2 0F) for PSP • Following failed NA, small bore chest drain in sertion is recommended • Large bore chest drain is not needed for PTX	• Small SSP with size 1-2c (at the level of hilum) in an attempt to avoid CTD • Small bore chest drain is usually recom mended
2001 ACCP	• Clinically stable, large PTX : small bore cathet er (14Fr catheter) or 16 ~ 22 FR chest tube • Unstable pts with large PTX : 16 ~22 Fr chest tube / 24 ~ 28 Fr if BPF is anticipated or requ ires positive pressure ventilation	• Clinically stable large PTX : 16 ~ 22 Fr • Clinically unstable with any size of PTX : 24 ~ 28 Fr

- Shorter length of stay, and lower complication for NA on 6 RCT, 2 observational study
- German S3 recommends PSP with dyspnea, interventional treatment should be done without the size of pneumothorax
- Thoracic surgery referral : complicated PSP : initial soft tissue emphysema, initial hemopneumothorax, serious concurrent ds, anticoagulant medication (German S3)

Ambulatory management vs Medical management

	PSP	SSP
2024 ESTS/ERS/EACTS	• Recommend ambulatory • - in expertise center with pathways to manage outpatient setting	• Not small bore (8Fr) ; 12 or more
2023 French	• Recommend outpatient management in large PSP without immediate severity, as NA or mini CTD with one-way valve	
2019 German	• Small PSP without dyspnea : outpatient management	• Recommend hospitalization • For therapy-refractive SSP, indwelling drain (outpatient or inpatient) and endobronchial valve can be considered
2010 BTS		• Can be considered for Heimlich valve
2001 ACCP	• Reliable patient, small bore catheter with Heilich valve, after enough information, after lung expansion	

- Ambulatory management: Heimlich (one-way)device inbuilt or attached to a drainage device (2024)
- Criteria for outpatient management (NA or mini CTD) (2023 French)
  - Patient is stable after intrapleural air removal
  - Dedicated outpatient care system is already organized
  - CXR or chest ultrasound is is scheduled 24 -72 hrs to assess the evolution

* Early surgical intervention : surgery at 1st presentation for pneumothorax, after stabilizing with a chest drain, with an aim of recurrence prevention

	PSP	SSP
2024 ESTS/ERS/ EACTS	• Consider early surgical intervention for pts who priorities recurrence pr evention *	• No recommendation
2023 French	• Surgery should not be first line, in specific situations** only	
2019 German S3	• Referral of pts with PSP and compl icated constellation (initial soft tiss ue emphysema, initial hemopneum othorax, serious concurrent disease , and anticoagulation) to a thoracic surgeon within the first 24 hr • Based on recurrence risk, life situat ion, patient preference, and proced ure risk	• Referral to thoracic surgical assess ment within the first 24 h hospitali zation • Surgical consultation in case of ina dequate reexpanision or PAL over 48 hr • SSP is sign of advanced lung disas e, further treatment of lung diseas e in the specialized center
2010 BTS	• In case of PAL or failure of lung reexpansion, early (3-5) days thoracic surgical opinion should be sought. • There is no evidence that intervention before 5 days of PSP is necessary • No comment for "Early" surgery : traditional indications	
2001 ACCP		

Indications of Surgery for PSP

- 2nd episode of PSP (ipso or contralateral)
- 1st episode
  - Spontaneous hemopneumothorax
  - simultaneous bilateral PSP
  - PSP with signs of severity,
  - persistent air leaks or persistent pneumothorax despite suction drainage ("persistent air leaks/prolonged bubbling" varies in the literature from 2 to 14 days / and often arbitrarily set at 5 days
  - risky occupation or leisure activity (pilot, isolated workplace)
  - PSP occurring during pregnancy (surgery after birth)
  - patient's request

- Reduced rate of recurrence rate : 0 – 10%
- Estimated surgical morbidity rate : 2.4 ~ 9 %

- Factors considered for op in PSP
  - Recurrence risk, life situation, patient preference, procedure risk 고려해서 결정

Medical pleurodesis for PAL ?

	PSP	SSP	
2024 ESTS/ERS/EACTS	• No recommendation, lack of evidence	• Autologous blood patch can be considered in SSP with PAL who are not fit for surgery	Conditional recommendation / heterogenous / no meta
2023 French			
2019 German S3	• Recommend pleurodesis via indwelling chest drain in pts with PSP and high risk of recurrence, or persistent pneumothorax who are inoperable or refuse operation	• Recommend chemical pleurodesis or ABP via indwelling chest drain with SSP in expanded lung and PAL or recurrent PTX, if an op is contraindicated	
2010 BTS	• For inoperable PSP • Tetracycline (1st) for bedside	• Maybe appropriate for inoperable pt • Tetracylcline (1st) bedside	
2001 ACCP			

* Graded talc : for surgical pleurodesis (BTS)

Suggested outpatient ambulatory management protocol

- Patient information leaflet : guidance on the way to behave in case of problem, phone numbers 24/7
- Patient’s comprehension of discharge instructions should be checked
- The patient should not stay alone for the first 24 − 48 h after being discharged home
- The patient should be able to access a medical facility within 1 h, regardless of the means of transportation, in the event of deterioration
- The time of discharge does not matter if all of the above criteria are met (nighttime discharge is possible).

Bronchial valves for PAL?

	PSP	SSP	
2024 ESTS/ERS/EACTS	• No recommendation, lack of evidence	• No recommendation, lack of evidence	• No recommendation, very low quality of evidence
2023 French			
2019 German S3		• Interdisciplinary discussion of indwelling drain (outpatient or inpatient) and endobronchial block process can be considered	
2010 BTS			
2001 ACCP			

Suction or no suction?

	• PSP	• SSP	
2024 ESTS/ERS/EACTS	• No recommendation, lack of evidence	• No recommendation, lack of conclusive evidence	• No recommendation, very low quality of evidence
2023 French (* not PAL)	• Initial passive air evacuation (one way valve or freeflow) . Start suction 5 ~ 20 cmH20 only reexpansion is not achieved		
2019 German S3	• No routine suction after reexpansion	• Not routinely continued after reexpansion	
2010 BTS	• Suction should not be routinely employed		
2001 ACCP	• For reexpansion failure after ches tubes, quickly apply suction • Or at the time of CTD	• Underwater seal with suction ; preferable	

Recurrence prevention: VATs vs VATS + pleurodesis?

	PSP	SSP
2024 ESTS/ERS/EACTS	• No recommendation, lack of conclusive evidence	• No recommendation, lack of conclusive evidence
2023 French	• 2nd episode of PSP (ipsi or contralateral) regardless of management of 1st episode • Pleurodesis for 1st episode (see below) • Recommends minimally invasive approach	• No comment
2019 German S3	• Recommend Taclcum poudrage parietal pleurecotmy • Prefer VATS procedure • In recurrence of surgically treated PSP, talcum pleurodesis or reoperation (VATS or thoracotomy)	• Recommend parietal pleurectomy or pleurodesis procedure • Prefer VATS procedure for SSP
2010 BTS	• Open thoracotomy and pleurectomy remains procedure with lowest recurrence rate (1%) for difficult or recurrent pneumothorax • VATS with pleurectomy and pleural abrasion is better tolerated but has higher recurrence rate of approximately 5% • Surgical chemical pleurdoesis : best achieved by using 5g sterile graded talc	
2001 ACCP		

- Pulmonary intervention : any intervention on the lung itself
- 2024 guideline : no difference in recurrence, LOS (PSP)
- Pleurodesis 1st PSP episode (2023 French) Haemopneumothorax, Simultaneous bilateral PSP, Presence of signs of severity, PAL or persistent pneumothorax despite suction drainage, Risky occupation or leisure activity (pilot,isolated workplace…), PSP during pregnancy

Surgical pleurecetomy vs chemical pleurodesis (either medical / surgical)

	PSP	SSP	
2024 ESTS/ERS/EACTS	• No recommendation, lack of conclusive evidence	• No recommendation, lack of conclusive evidence	No recommendation, very low quality of evidence
2023 French	• **Mechanical and/or chemical pleurodesis as first line > pleurectomy**		
2019 German S3	• Recommend pleurodesis via indwelling catheter if high risk of recurrence, persistent PTX, who are inoperable or refuse operative therapy	• Recommend parietal pleurectomy or alternatively pleurodesis procedure	
2010 BTS		• Surgical chemical pleurodesis is best achieved by 5g sterile talc	No comparison
2001 ACCP			

- 2024: Apical partial surgical pleurectomy and chemical pleurodesis are both acceptable treatments and appear to have comparable recurrence of pneumothorax

Contraindication of Surgery

	SSP	
2024 ESTS/ERS/EACTS	• Type II (hypercapnic) respiratory failure • RV dysfunction • Clinically significant pul hypertension	No recommendation, very low quality of evidence
2023 French		
2019 German S3	• Caution is recommended in setting the indication for operative treatment of pneumothoraces in fibrosing lung diseases and wherever possible giving preference to a pleurodesis procedure via indwelling drainage. • Consider lung transplantation	
2010 BTS		
2001 ACCP		

Post PSP management : smoking cessation

	PSP
2024 ESTS/ERS/EACTS	Smoking cessation "teachable moment"
2023 French	Recommend to offer tobacco-smoking cessation support
2019 German S3	Education, recommend smoking cessation
2010 BTS	
2001 ACCP	

- 2024: smoking cessation : reduced recurrence risk (OR 0.26, 95% CI 0.10 – 0.63)

Post PSP management : air travel

	PSP	SSP
2024 ESTS/ERS/ EACTS	• No flying for untreated PTX • Wait at least 7 days after radiologi cal resolution of spontaneous pneu mothorax before flying due to risk of early recurrence	• Cystic lung disease, LAM has high risk of recurrence during flight
2023 French	• Wait at least 2 weeks of PSP resol ution • Recommend pleurodesis at 1st epis ode for aircrew	
2019 German S 3		
2010 BTS		• Should be avoided until full recov ery
2001 ACCP		

- Many commercial airlines previously advise arbitrarily 6 week interval btw the pneumothorax event and air travel -> 1 week after full resolution
- No evidence air travel itself links to the recurrence, consequence of recurrence during air travel might be serious

Post PSP management : skydiving and freefall, scuba diving with air tanks

	PSP	SSP	
2024 ESTS/ERS/EACTS	• No specific comment		
2023 French	• Perform pleurodesis at 1st episode in sport skydivers, perform chest CT and PFT before resuming activity • Strong contraindications in pts with history of PSP, even if pleurodesis		
2019 German S3	• Diving should be avoided long term, unless pt underwent bilateral pleurectomy in open surgery and normal PFT & normal postop CT		
2010 BTS	• Should be permanently avoided unless the pt had bilateral surgical pleurectomy and normal pulmonary function and chest CT scan postoperatively		
2001 ACCP			

Post PSP management : physical activity

	PSP	SSP	
2024 ESTS/ERS/EACTS	• no reason to avoid		
2023 French	• No limit sport resumption/ practice after PSP resolution • No limit for wind instruments		
2019 German S3			
2010 BTS		• Return to work and normal physical activities once all symptoms have resolved	
2001 ACCP			


THANK YOU