

# Troubleshooting a Chest Drain.

Dr. Richard Morris

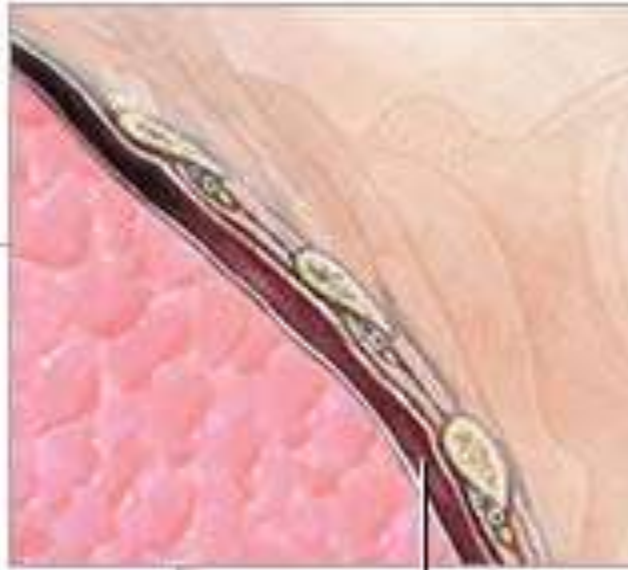
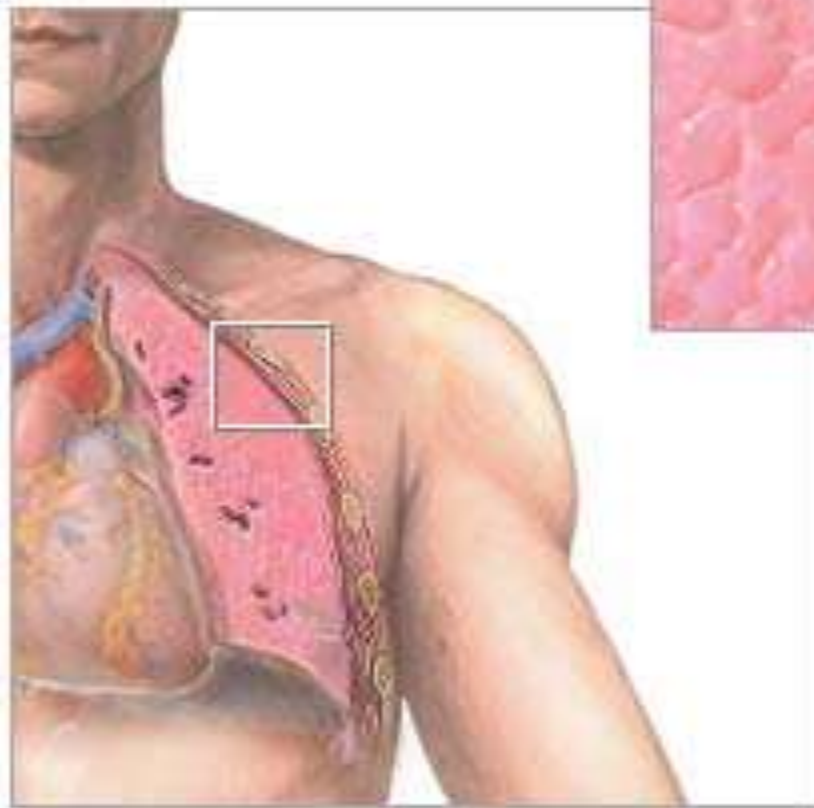


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# Acknowledgements:

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  - Mary Dunford
  - Craig Herbert
  - Richard Morris
  - Ben Siggers
  - Caesar Ursic
  - Helen Ward

# Some Anatomy & Physiology



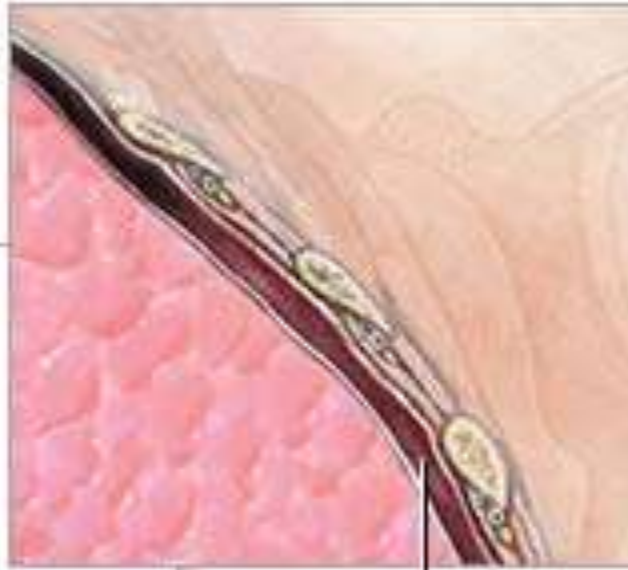
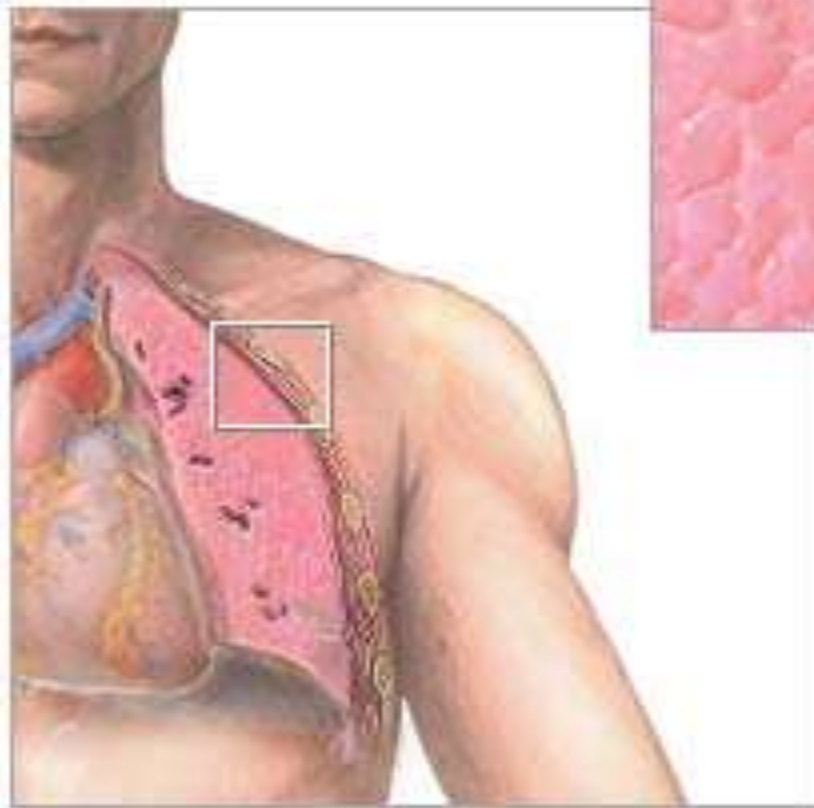
Pleural Pressures [cmH<sub>2</sub>O]

Inspiration Expiration

Spont      ?      ?

IPPV      ?      ?

# Some Anatomy & Physiology



## Pleural Pressures [cmH<sub>2</sub>O]

	Inspiration	Expiration
Spont	-10	-5
IPPV	+10	-5

# A Pneumothorax [you tell me]

## •Closed

- Tear or bleb in lung
- Can reabsorb or tension [esp. IPPV]

## •Open

- Connects to outside
- SV: lung collapses
- IPPV: lung OK

## •Tension

- Pleural air under pressure
- Subcut. emphysema, deviated trachea
- Distorts mediastinum
- Causes circulatory collapse
- Urgent to convert to open or drain it.

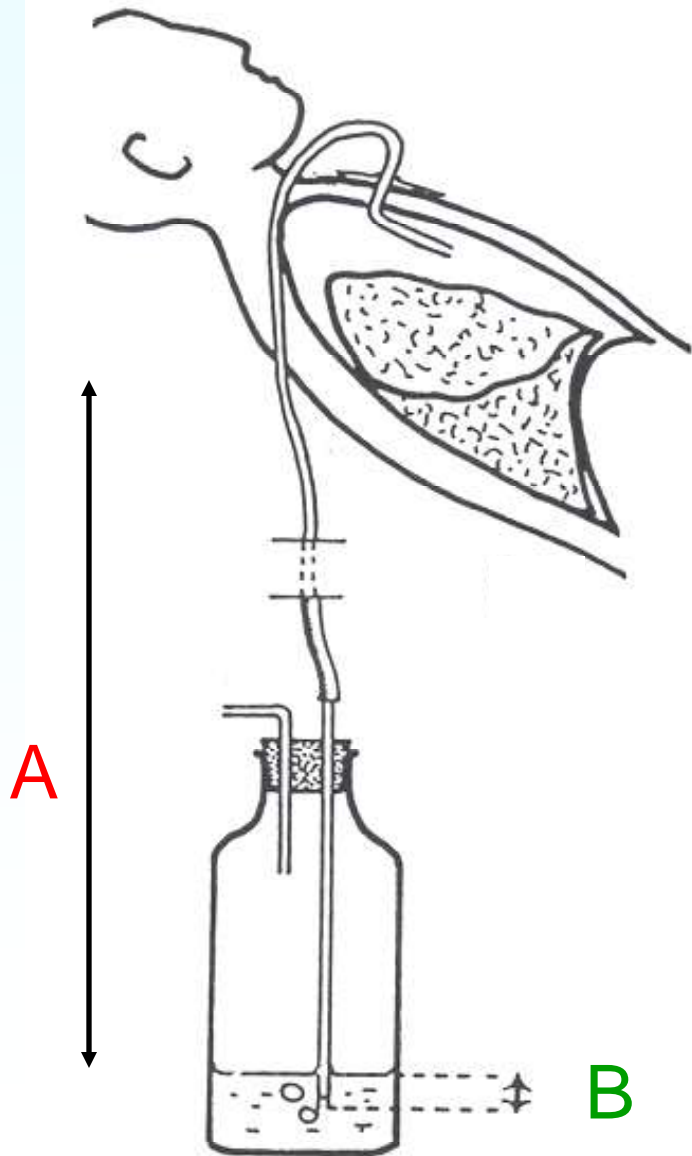
# Incident Reporting

## Australian Patient Safety Foundation

- Disconnection of tubes when moving patient
- Drains inadvertently pulled out
- Connections round the wrong way
- No water in the bottle
- Cap left on vent
- High suction used
- Drain left clamped till reviewed
- Non standard drainage systems failing.

# Understanding a Chest Drain System

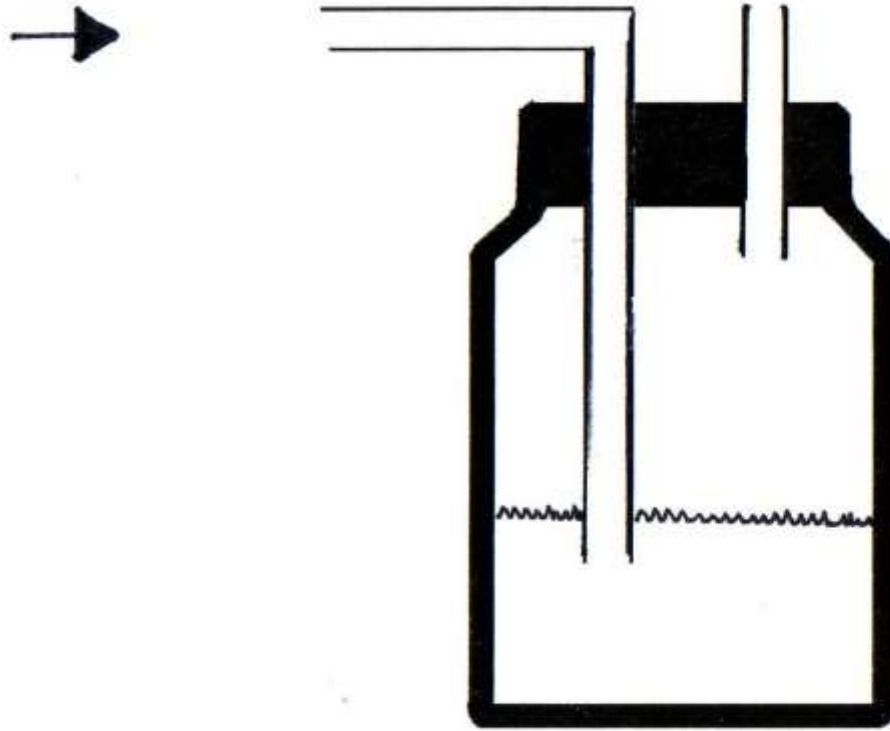
# Underwater Sealed Drain



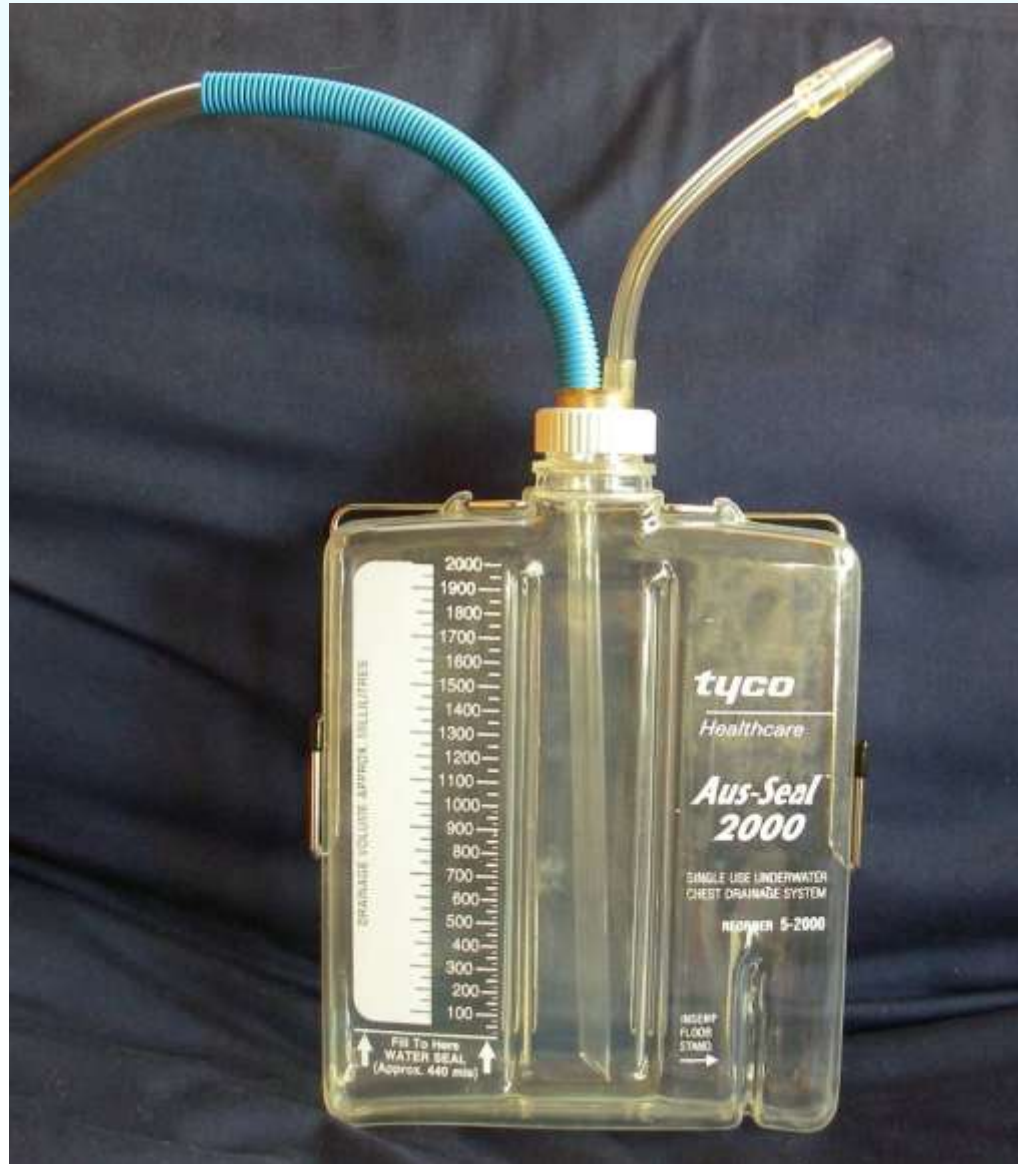
- A one way valve
- Prevents the inflow of air because it is 80 cm below the patient [A].
- Permits the outflow of air/fluid with a small pressure [B].



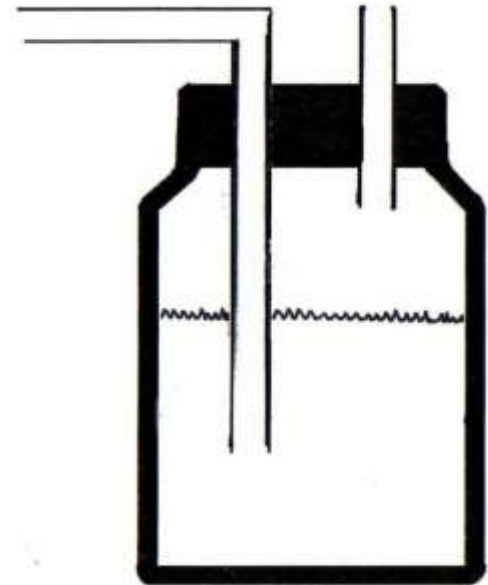
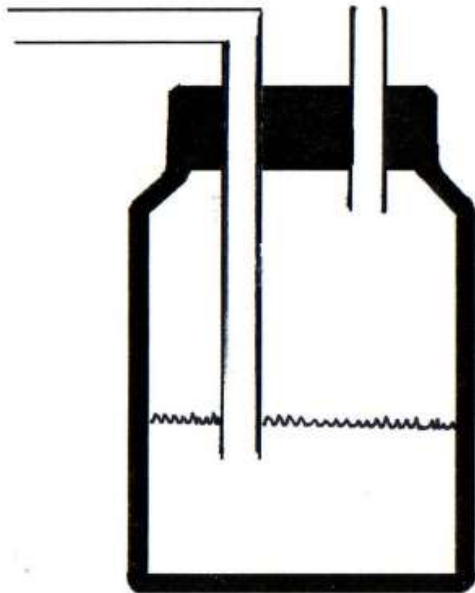
# Simple UWSD



# Tyco Aus-Seal 2000



# What problem as it fills up?



Higher pressures needed  
to vent air. [B]

# Why use suction?

- Aids drainage
- Recreates normal negative pressure
- Keeps pleura empty - promotes healing
- But:  
If you use high pressure [unregulated] suction it can damage the lung.

# Low Pressure Suction.

- Need a low pressure regulator set to  
–15 mmHg
- Or need a more complicated system [4 bottle] if you use unregulated suction.

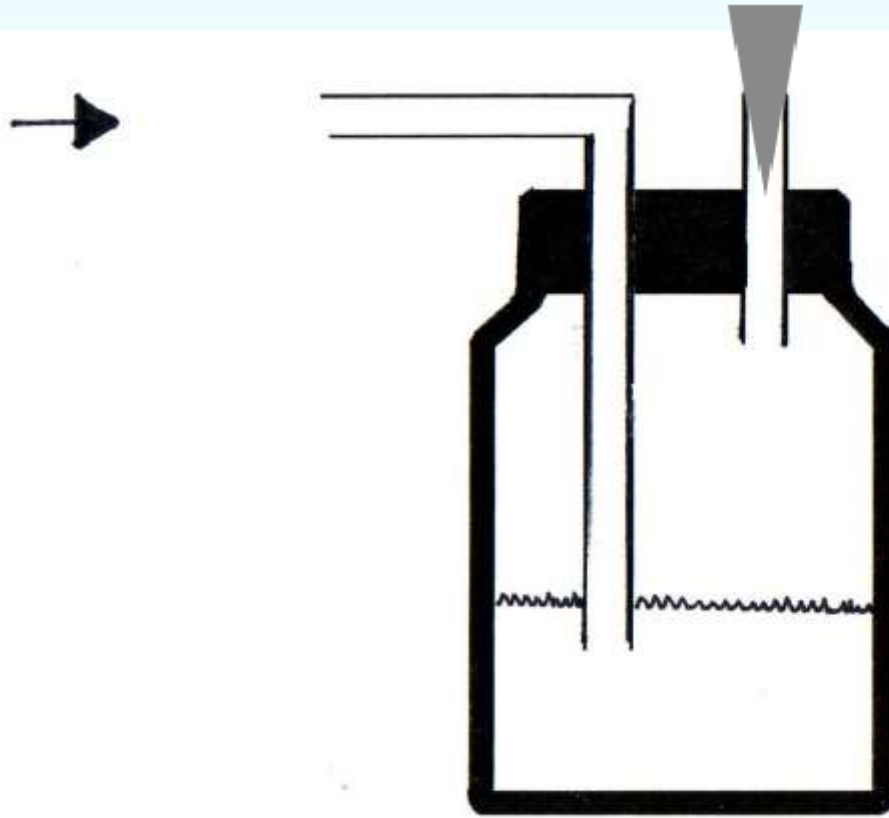






**LOW**

# What happens if the suction is blocked?



# What if the suction is blocked?



Positive pressure relief valve vents excess pressure.

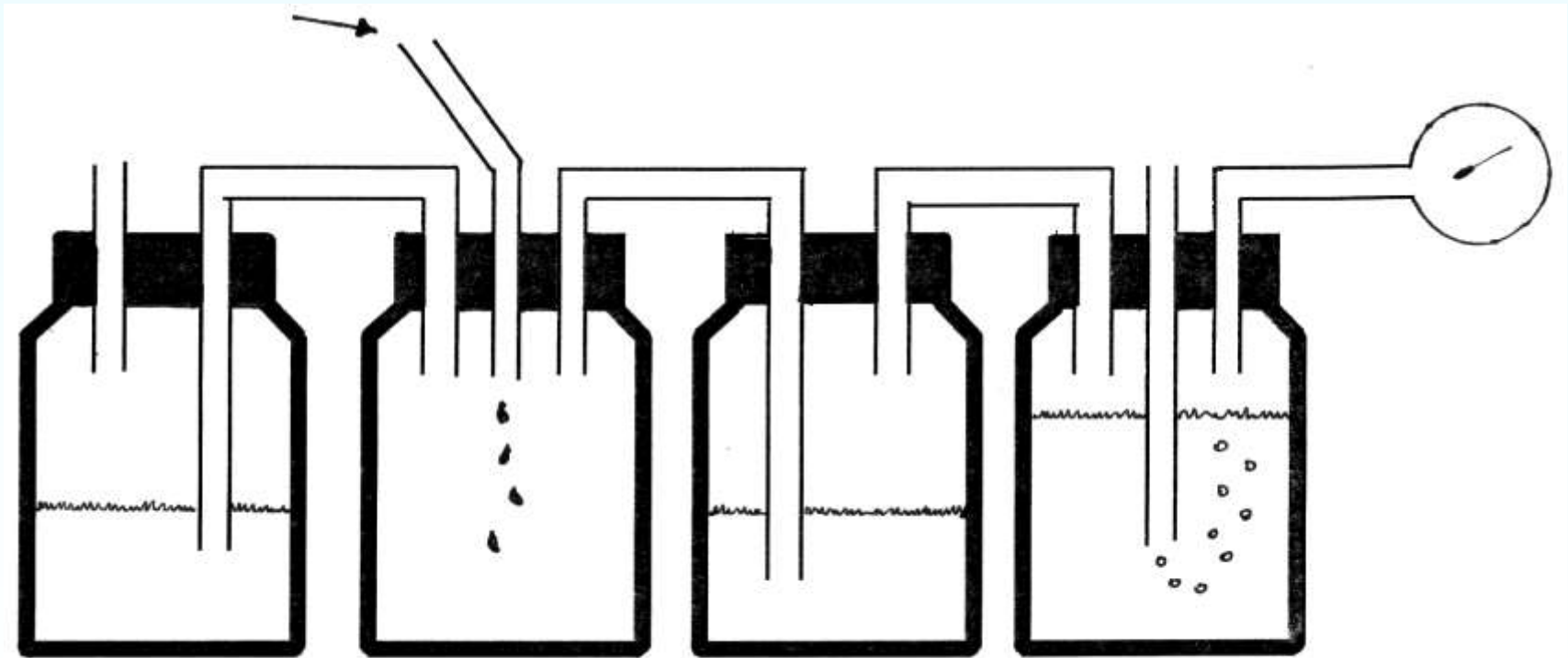


# 4 Bottle System



- Advantages:
  - No problem as it fills up
  - Don't need low suction
  - Positive pressure relief
- Disadvantage:
  - Harder to understand.

# Four Bottle UWSD



Pressure  
relief valve

Drainage  
bottle

Underwater  
seal

Suction  
controller

Pressure relief valve



Drainage bottle



Suction controller

Underwater seal

# How to Review a Chest Drain

- Look at the Patient first:
  - Is there air or fluid left in the pleural cavity?
  - Is there a tension pneumothorax?
- Look at the Drain:
  - Is the system assembled properly?
  - Is the suction working?
  - Is the system blocked?
  - Is the system leaking?

# Look at the Patient First

- Is there air or fluid left in the pleural cavity?
  - Overinflated, resonant, reduced air entry
  - CXR
- Is there a tension pneumothorax?
  - Cardiovascular compromise
  - Tracheal deviation
  - Subcutaneous emphysema.

# Is System Assembled Properly?

- Decide what system is in use
- Confirm it is correctly assembled
- Check water level in bottle
- Check bottle upright and below patient
- Remove all clamps
- Check there are no fluid filled loops.

# Is Suction Working Properly?

- Listen to confirm it is not blocked or disconnected
- Check gauge reads  $-15$  mmHg with finger over end.

# Is Drain Blocked?

- When in continuity with air or fluid in pleural cavity the underwater seal will **swing in the tube with each breath when off suction**
- No swing means either:
  - Drain system blocked
  - Chest tube blocked or misplaced
  - No air or fluid in pleural cavity.



# Is There an Air Leak?

- Air bubbling in the underwater seal indicates an air leak.
- If bubbling continues on suction when tube is clamped near patient there is a leak in the drain system.
- **If there is bubbling present off suction then there is air in the pleural cavity**
  - A small amount of air is revealed with a cough or large IPPV.

# Key Points to Review a Drain

- Look at the Patient first:
  - Is there air or fluid left in the pleural cavity?
  - Is there a tension pneumothorax?
- Look at the Drain second:
  - Is the system assembled properly?
  - Is the suction working?
  - Is the system blocked?
  - Is the system leaking?

# References:

- Guidelines for insertion of a chest drain
  - British Thoracic Society
  - Thorax, 2003 May;58 Suppl 2:ii53-59
- Pleural drainage systems
  - Kam, O'Brien & Kam
  - Anaesthesia 1993 Feb;48[2]:154-161
- Online education program
  - Thoracic Society of Australia & New Zealand
  - ***[www.thoracic.org.au/intercostal.html](http://www.thoracic.org.au/intercostal.html)***

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