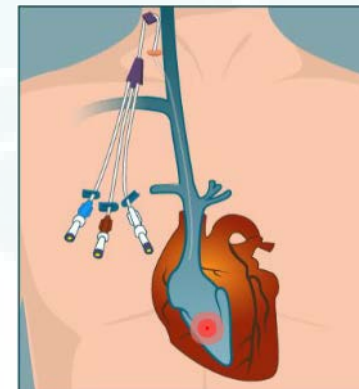


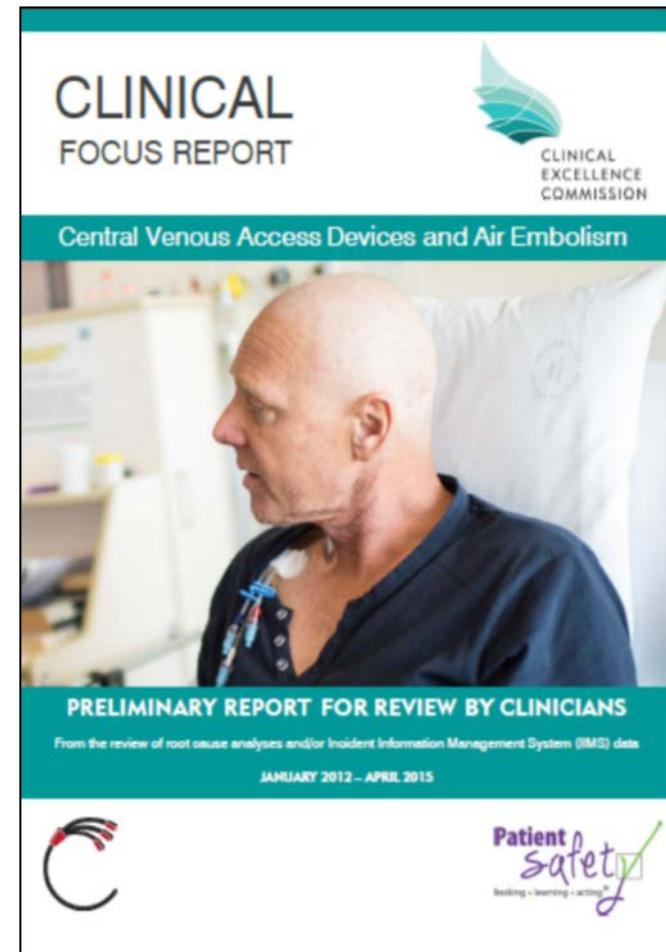
# Vascular air embolism



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# Introduction

- What is a vascular air embolism?
- Recent NSW experience
- Prevention strategies



**A vascular air embolism (VAE) is when air enters the vascular system and produces systemic effects**

**CVAD  
risks**

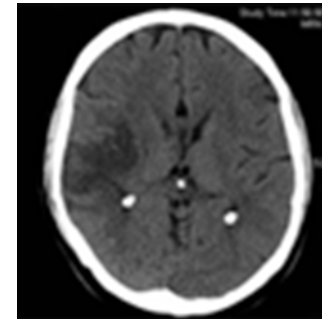
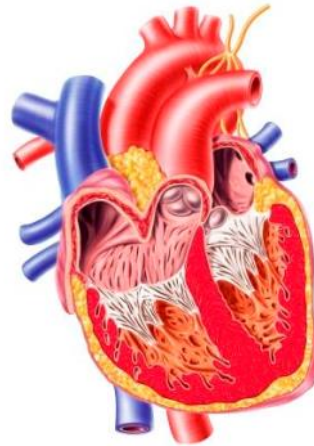
**insertion**

**management**

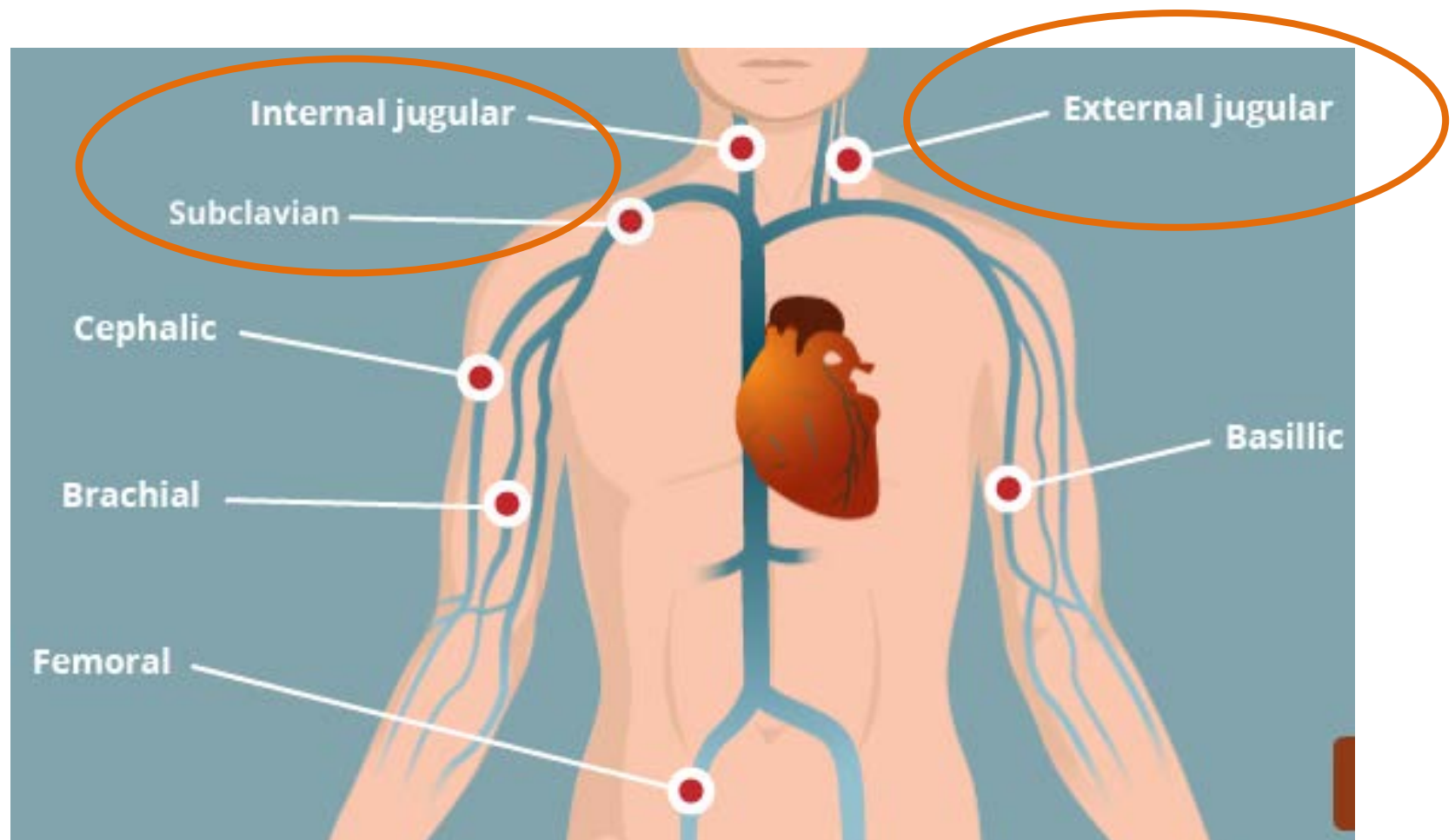
**removal**

**Direct communication  
between atmosphere &  
circulation**

**Pressure in vessels  
< atmosphere**



# Which devices?



# Signs & Symptoms

Small < 0.5 ml/kg

Altered mental status  
Dyspnoea  
Wheezing  
↓ SpO<sub>2</sub>

Medium 0.5-2ml/kg

↑ RR  
↑ HR  
↓ BP  
ECG changes

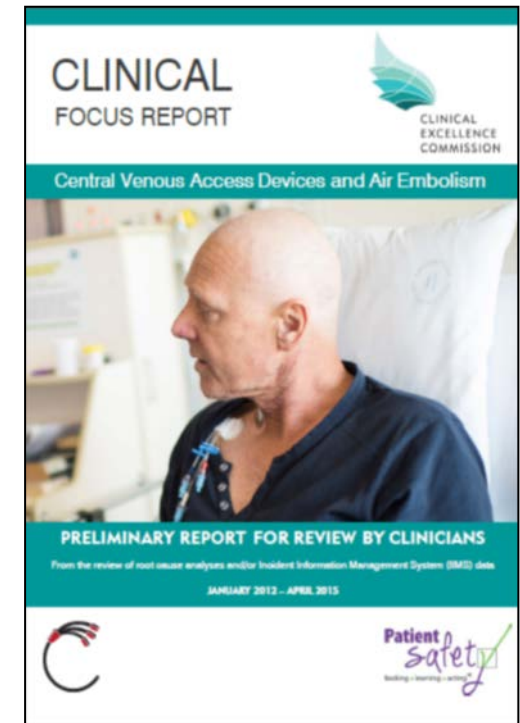
Large > 2ml/kg

Chest pain  
Acute right heart failure  
↓ LOC  
Cardiac arrest

***Activate emergency team  
based on the patient condition***

# NSW Incidents Jan 2012-Apr 2015

- 14 events
- 9 incidents in critical care
- 6 deaths
- 9 during removal procedures
  - 7 semi-recumbent position



# Prevention – INSERTION

## Assess & Plan

- Most appropriate device
- Assess patient risks & plan

## Position

- Supine or trendelenberg in bed

## Prepare

- Priming, clamping & apply valves to each lumen
- Secure at 2 sites

## Monitor

- Monitor patient



# Prevention – LINE MAINTENANCE

## Assessment

- CVAD still needed?
- Check connections each shift
- Document length of catheter outside vessel

## Admin sets

- Minimise connectors
- Valves on each lumen with luer locks
- Clamps ON when disconnecting

## IV pumps

- Use 'air in line' alarms

# Prevention – REMOVAL

## Assess & Plan

- Assess patient risks
- Seek advice if pt unable to lie flat or has high RR
- Plan & explain the procedure

## Position

- Supine or trendelenberg in bed

## Removal

- End inspiration & apply pressure to site until haemostasis
- Apply occlusive dressing for 48 hours

## Monitor

- Check obs in the immediate post removal period
- Do not transfer patients within 30 minutes

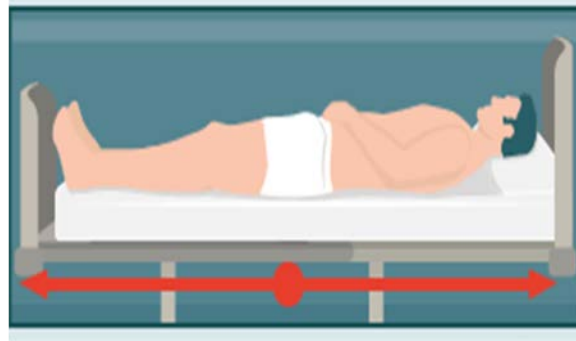
# Summary

CVAD  
needed

Assess &  
plan

Connections

Monitor



Role model

# CVAD Training Information



HETI code	Name of course
92712530	Central Venous Access Devices: the Fundamentals – e learning module
92382298	CVAD Intravenous (IV) Administration Set Change Assessment Tool
92381360	CVAD Dressing and Swabable Capless Valve (SCV) Change Assessment Tool
92382007	CVAD Removal of Non- Tunnelled Assessment Tool
96342016	Vascular Air Embolism PODCAST (link out)
N/A	ACI -CVAD Training resources: <a href="http://www.aci.health.nsw.gov.au/networks/intensive-care/clinicians/ic-manual/cvad">http://www.aci.health.nsw.gov.au/networks/intensive-care/clinicians/ic-manual/cvad</a>
N/A	Central Line Insertion NSW Health staff link <a href="http://edmoretraining.com.au/doh/">http://edmoretraining.com.au/doh/</a> External link via CEC Website <a href="http://cec.health.nsw.gov.au/concluded-programs/clab-icu/cli-training/cli">http://cec.health.nsw.gov.au/concluded-programs/clab-icu/cli-training/cli</a>
N/A	Central Line Insertion Training Framework <a href="http://www.cec.health.nsw.gov.au/_data/assets/pdf_file/0005/258350/training-framework.pdf">http://www.cec.health.nsw.gov.au/_data/assets/pdf_file/0005/258350/training-framework.pdf</a>

# NSW Health

- Report CEC <http://www.cec.health.nsw.gov.au/programs/patient-safety/reports>
- Safety notice 002/15  
<http://internal.health.nsw.gov.au/quality/sabs/pdf/2015-sn-002.pdf>
- Safety notice 004/14  
<http://internal.health.nsw.gov.au/quality/sabs/pdf/sn004-14.pdf>
- PD2011\_060  
[http://www0.health.nsw.gov.au/policies/pd/2011/pdf/PD2011\\_060.pdf](http://www0.health.nsw.gov.au/policies/pd/2011/pdf/PD2011_060.pdf)
- ACI Guideline  
<http://www.aci.health.nsw.gov.au/networks/intensive-care/clinicians/ic-manual/cvad>

# Further reading

- Pennsylvania Patient Safety Authority Reducing Risk of Air Embolism associated with Central Venous Access Devices 2012:  
[http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2012/Jun;9\(2\)/Pages/58.aspx](http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2012/Jun;9(2)/Pages/58.aspx)
- Mirski MA (2007) Anaesthesiology 106(1): 164-177
- Pinho J (2016) Journal of the Neurological Sciences. 362, p.160-4.

# Case Studies

- **Vascular air embolism**

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3665124/>

- **A Patient With Acute COPD Exacerbation and Shock**

<http://journal.publications.chestnet.org/article.aspx?articleid=1775337>

# Contacts

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