

PICCs in the ICU Setting

Kathy Kokotis RN BS MBA
Director Global Business Development
Becton Dickinson
Kathy.kokotis@bd.com



Disclosure

- Kathy Kokotis RN, BS, MBA, BD Employee
- This speaker is a direct employee of BD.
- The speaker is being compensated for this presentation.
- Any discussion regarding products during the presentation is limited to information that is consistent with labeling.
- Please consult product labels and inserts for any indications, contraindications, hazards, warnings, cautions and instructions for use.

PICCs in the ICU Setting



Indications for a central line



PICC line advantages



Patient considerations



Thrombosis



Summary

A photograph of a patient in an Intensive Care Unit (ICU) bed, covered with a white sheet. The patient is connected to various medical devices. A large, blue, cylindrical device, likely a Ventricular Assist Device (VAD), is positioned near the patient's head. To the left, there is a monitor displaying vital signs, a control panel with several buttons and lights, and a small screen showing a waveform. A central stand holds multiple IV bags and tubing. The room is dimly lit, with a blue light source visible on the right side of the frame.

VAD needs in the ICU



Indications for a central line



- Drug infusions that could otherwise cause phlebitis or sclerosis¹
 - (e.g., vasopressors and hyperosmolar solutions, nutritional support²)
- Monitoring¹
 - Central venous pressure
 - Central venous oxyhemoglobin saturation (ScvO₂)
 - Pulmonary artery pressure
- Frequent blood sampling²
- Emergency venous access¹
 - (due to difficult peripheral intravenous access)
- Transvenous pacing wire placement¹
- High-volume/flow procedures requiring large-bore access¹
 - (hemodialysis and plasmapheresis)
- Vena cava filter placement¹
- Venous thrombolytic therapy¹

¹Tse A, Schick MA. Central Line Placement. [Updated 2022 Sep 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan.

²Fahy B, Sockider M, (April 2019) Central venous access, American Thoracic Society, www.thoracic.org



PICC Advantages

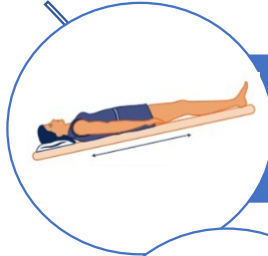




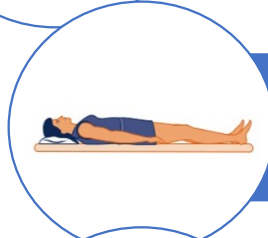
Patient assessment statement

Many clinical situations necessitate placement of central venous catheters. The choice of site is dictated by the specific advantages and disadvantages of each access method in the clinical situation being considered.

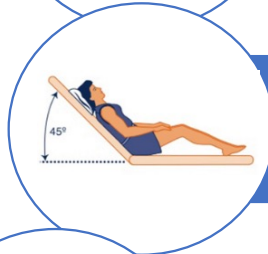
Patient Positions: Central Line Insertion



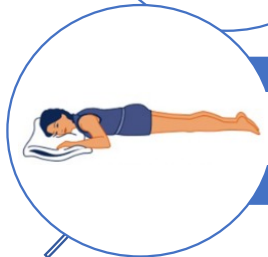
Trendelenburg (head down)



Supine (flat)

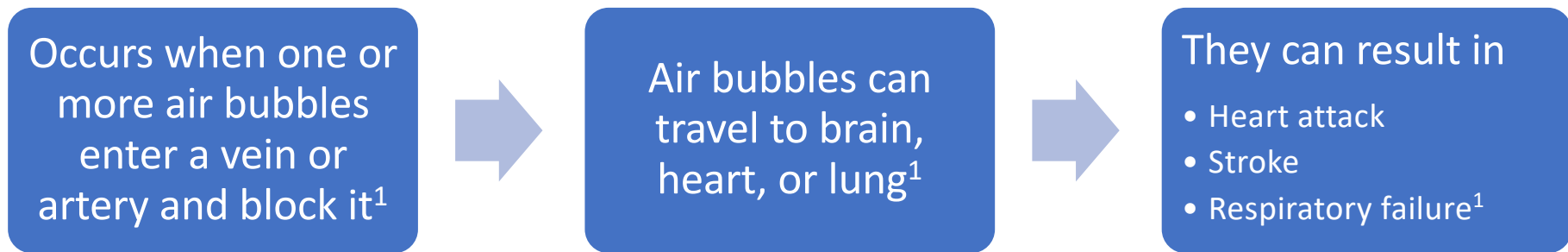


Fowler's (sitting upright)



Prone (on stomach)

Complication insertion: Air embolism



Reduce risk of air embolism during placement of subclavian and internal jugular(IJ) central line catheter²



Place the patient in a supine flat or Trendelenburg position unless contraindicated (Trendelenburg position is contraindicated in premature infants), so that the insertion site is below the level of the heart.³

¹Air Embolism (downloaded 6/28/2022), Healthline, <https://www.healthline.com/health/air-embolism>

²McGee D, Gould MK. (2003) Preventing complications of central venous catheterization, N Engl J Med, 348: 1123-1133

³Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. Journal of Infusion Nursing. 2021; 44(15). doi:10.1097/nan.0000000000000396

Position for CLCC insertion

Physiological changes

Increase in intracerebral and intraocular pressure¹

Cardiovascular changes¹

Diaphragm changes¹

Change airway pressure to ventilate lungs¹

Sliding injuries¹

Trendelenburg patient cautions

- Head trauma¹
- Intracranial pathology¹
- Heart failure¹
- Myocardial infarction¹
- CHF²
- Obesity²
- Pulmonary issues²

¹AST standards of practice for surgical positioning (April 1, 2011) AST Association of Surgical Technologists pg. 16 https://www.ast.org/uploadedFiles/Main_Site/Content/About_Us/Standard%20Surgical%20Positioning.pdf

²Atkinson T, Giraud GD. Et al (2017) Consequences of laparoscopic surgery, circulation, 135(7) 700-710



Placing jugular in prone
position in COVID

A last resort?

Yang MX, Ng PK. Central Venous Catheter Insertion in the Prone Position—A Last Resort in Critically Ill COVID-19 Patients. *Journal of Intensive Care Medicine*. 2021;36(3):373-375. doi:10.1177/0885066620959649

Position for central line removal

CICC (subclavian and jugular)

- Trendelenburg or supine¹
- Not sitting up¹

Removal risks for all central lines

- Air embolism¹
- Bleeding¹

PICC and FICC

- Supine or sitting up²
- No published cases of air embolism²

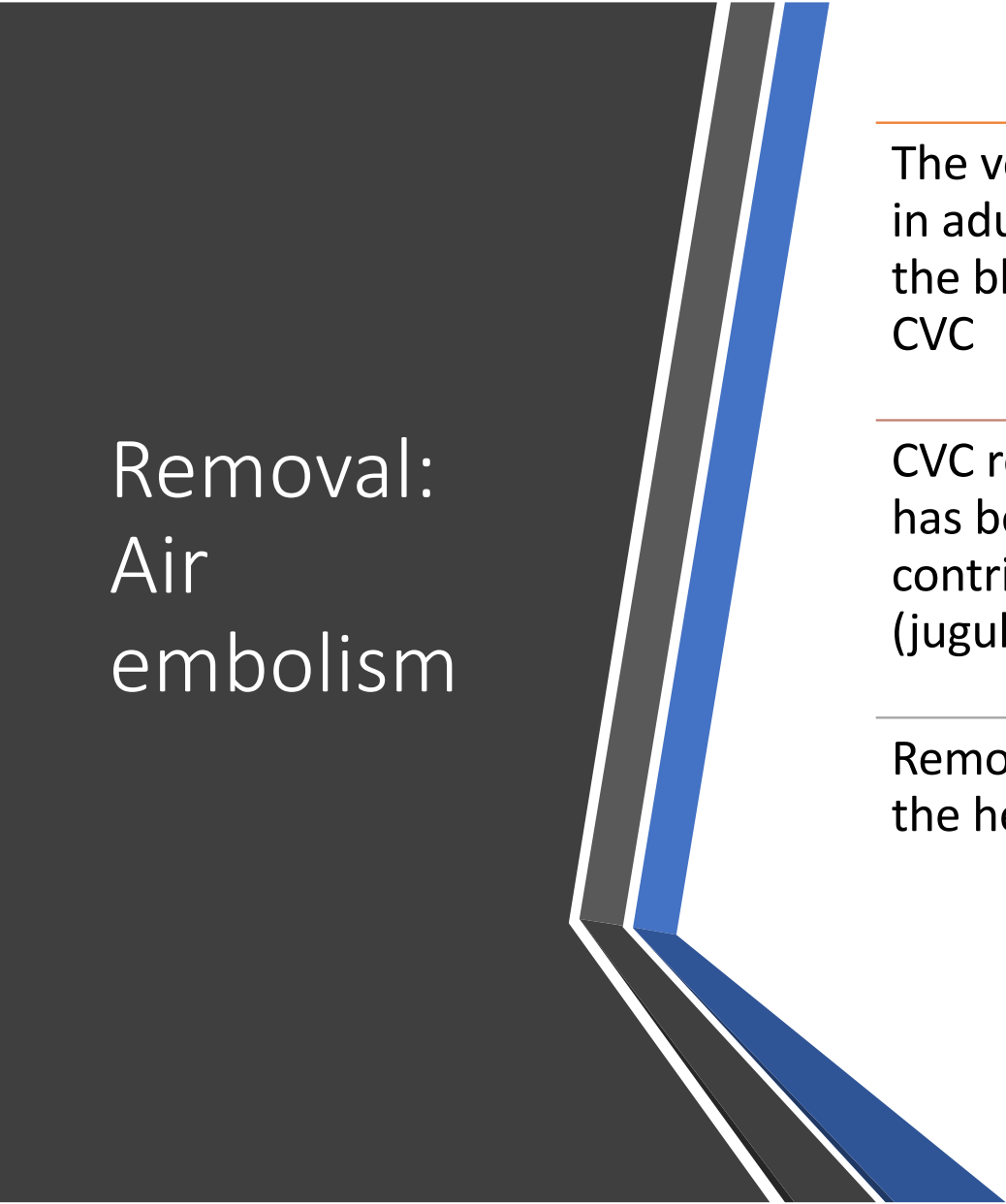
Removal procedure for all lines

- Instruct the patient to do a Valsalva maneuver¹
- Pressure at site for 1 to 5 minutes¹
- Air-occlusive dressing²
- Flat for 30 minutes post removal¹

The closer to the heart air is introduced into the venous system, such as through a central venous catheter, the smaller the volume of air is required to cause symptoms¹

¹Feil M, (2014) CVC removal: A procedure like any other, PSNET Patient Safety Network, AHRQ Agency for Healthcare Research and Quality, <https://psnet.ahrq.gov/web-mm/cvc-removal-procedure-any-other#table>

²Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. Journal of Infusion Nursing. 2021; 44(1S). doi:10.1097/nan.0000000000000396



Removal: Air embolism

The volume of intravenous air necessary to be fatal in adults is 200 to 300 mL, an amount that can enter the bloodstream in a matter of seconds through a CVC

CVC removal while a patient is in an upright position, has been identified as the most frequently reported contributing factor for CVC-associated air embolism (jugular and subclavian removal)

Removal should be with exit site below the level of the heart to increase central venous pressure

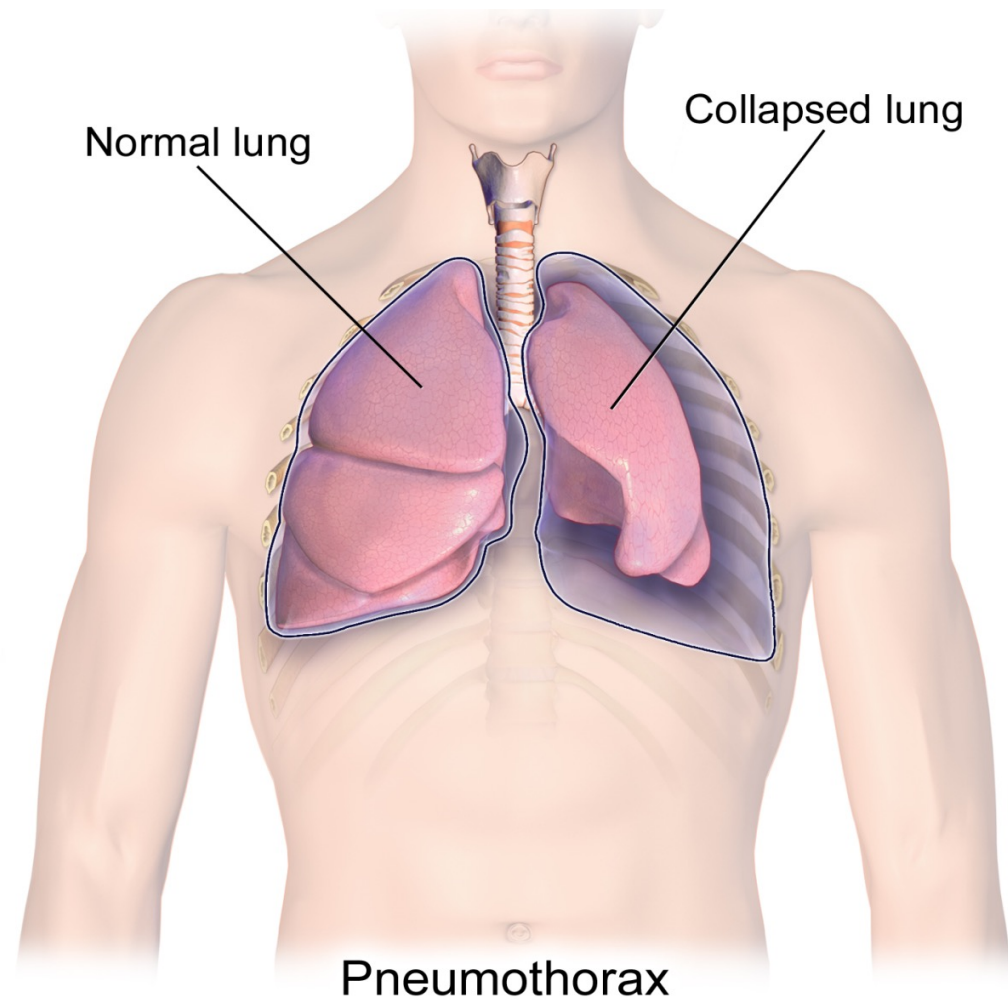
Removal: Air embolism

- Should a jugular, subclavian centrally placed catheter be?
 - Sent to a skilled care facility?
 - Sent home?
 - Send outside of the ICU?

CVC insertion and removal should only be performed by healthcare professionals who have received adequate training and who have been assessed as competent in performing the procedure.

Anatomy
Central line
placement
complications
Pneumothorax

Iatrogenic Pneumothorax:
“One of the most Frequent Complications”
Tsotsolis (2015)

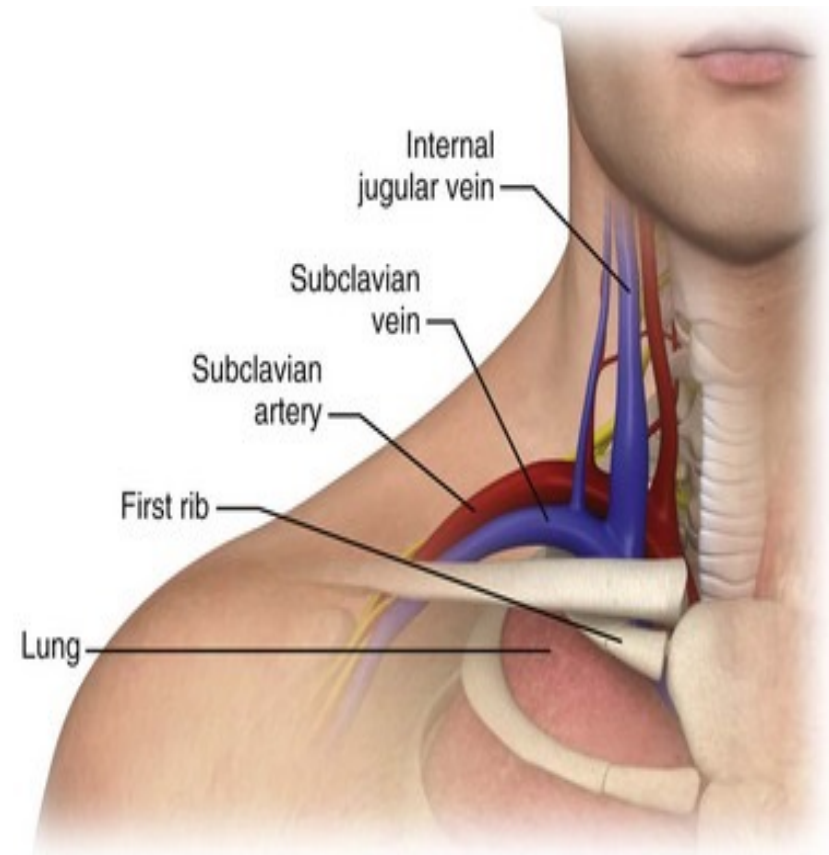


Complication insertion: Iatrogenic pneumothorax

Pneumothorax is gas in the pleural space (full or partial lung collapse)¹

This refers to a pneumothorax that has developed secondary to an invasive procedure such as central venous line¹

Landmark-based subclavian or jugular central venous catheter placement²

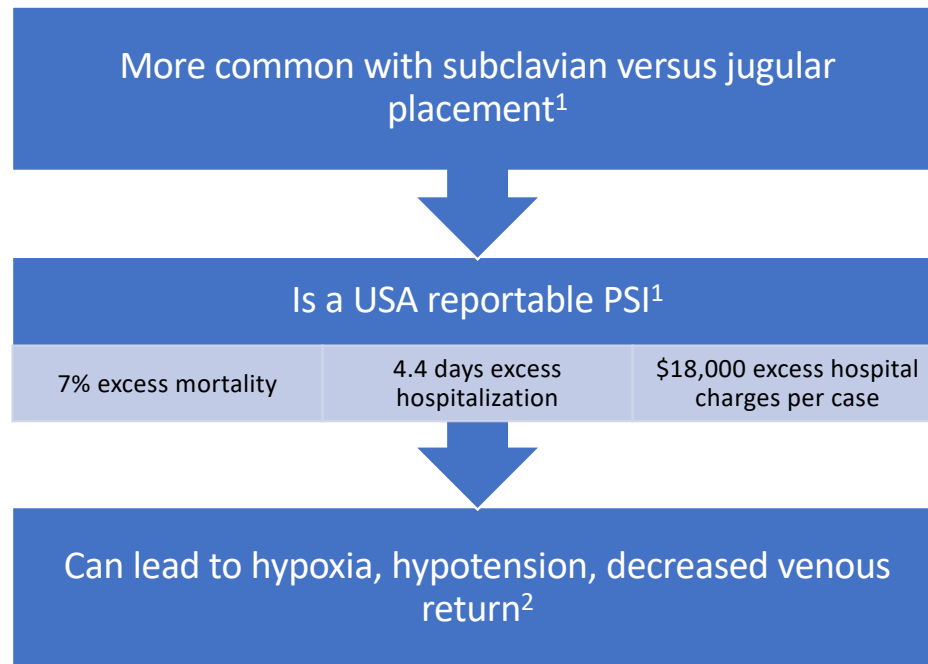


Picture used with permission from Dr Eric Lee Siniem Blog

¹Ojeda Rodriguez JA, Hipskind JE, Iatrogenic pneumothorax, NCBI Bookshelf Stat Pearls, (Downloaded 6/28/2022, [https://www.ncbi.nlm.nih.gov/books/NBK526057/#:~:text=iatrogenic%20pneumothorax%20is%20a%20patient%20safety%20indicator%20\(PSI\)%20condition,central%20venous%20line%20\(CVL\)](https://www.ncbi.nlm.nih.gov/books/NBK526057/#:~:text=iatrogenic%20pneumothorax%20is%20a%20patient%20safety%20indicator%20(PSI)%20condition,central%20venous%20line%20(CVL).)).

²Shieh L, Minjoung GO, (2015) Improving and sustaining a reduction in iatrogenic pneumothorax through a multi-faceted quality improvement approach, Journal of Hospital Medicine 10(9) 599-607

Complication insertion: Iatrogenic pneumothorax



Potential considerations

- Distorted local anatomy (trauma)³
- Combative patients³
- Experience of the placer²
- Skin infection³

¹Shieh L, Minjoung GO, (2015) Improving and sustaining a reduction in iatrogenic pneumothorax through a multi-faceted quality improvement approach, Journal of Hospital Medicine 10(9) 599-607

²Ojeda Rodriguez JA, Hipskind JE, Iatrogenic pneumothorax, NCBI Bookshelf Stat Pearls.

³Schnick TA Central line placement Stat Pearls NCBI Bookshelf (downloaded 6/28/2022)
https://www.ncbi.nlm.nih.gov/books/NBK470286/#_NBK470286_pubdet

⁴Ian Rigby, Daniel Howes, Jason Lord, Ian Walker, central venous access, Resuscitation Education Consortium/Kingston Resuscitation Institute, https://criticalcare.queensu.ca/sites/criticalcare/files/inline-files/Central_Venous_Access.pdf

What patient can be potentially impacted by a pneumothorax?

Pulmonary

Lung
Cancer

Pneumonia

Pneumothorax is not a complication of
PICC or FICC insertion^{1,3}

Pneumothorax is a complication of
subclavian and jugular insertion²

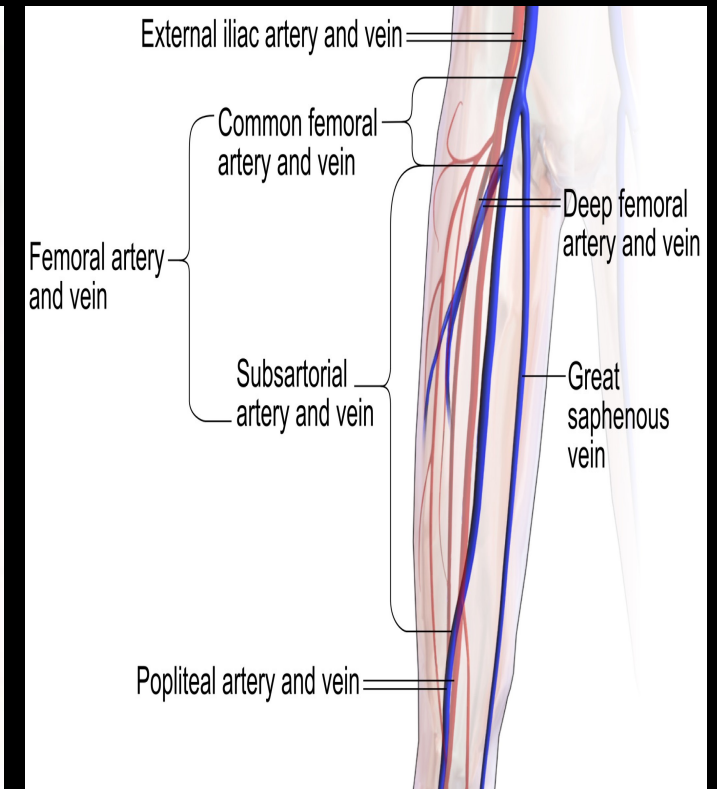
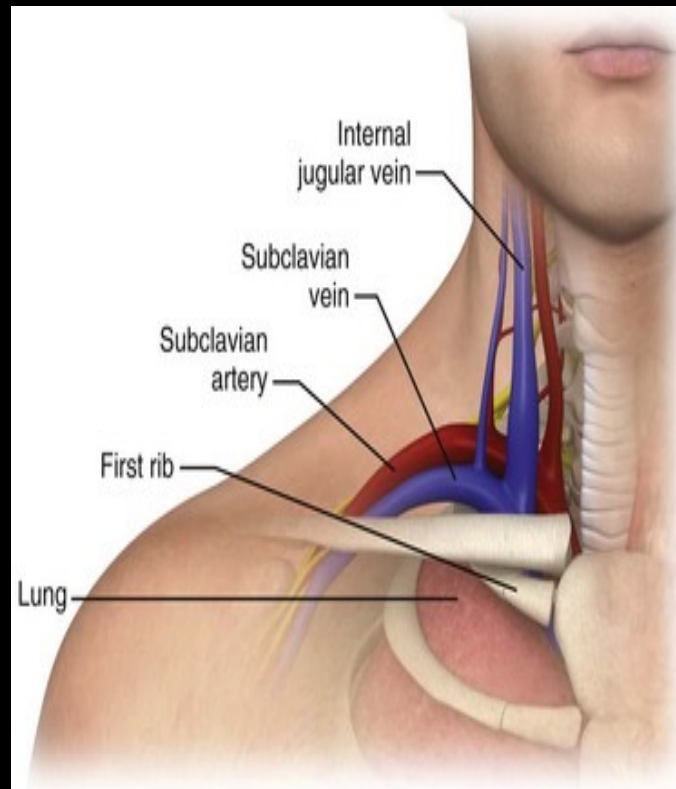
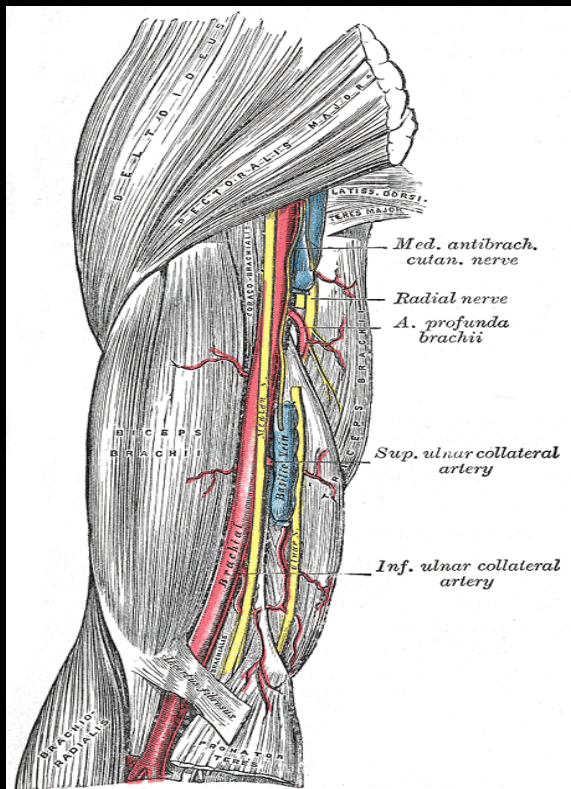
¹Pinelli, F. Little A (2021) Assessment magic recommendations in context of evolving evidence based on use of PICC in the ICU, J VAS Access, 23:11297298211048019

²Shieh L, Minjoung GO, (2015) Improving and sustaining a reduction in iatrogenic pneumothorax through a multi-faceted quality improvement approach, Journal of Hospital Medicine 10(9) 599-607

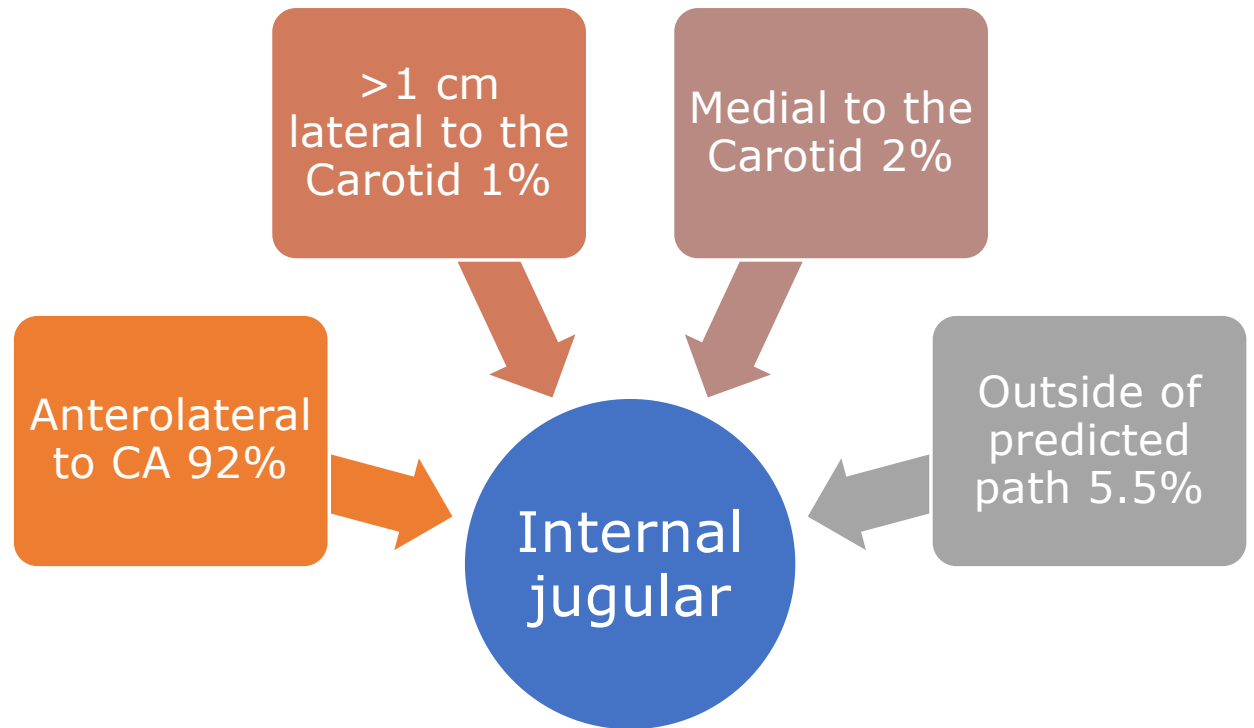
³Tsotsolis N (2015) Pneumothorax as a complication of central venous catheter insertion Annals of Translational Medicine 3(40):1-10

Anatomy

Central line placement complications: Arterial puncture



Internal jugular location anatomically

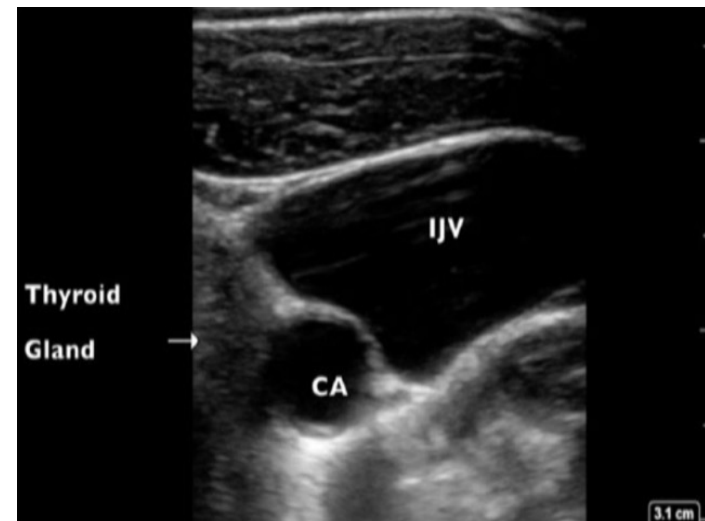


Anatomy of the IJ and carotid is sufficiently different among individuals

Arterial puncture: jugular and ultrasound

Results Single Institution Internal Jugular	Landmark Technique	Ultrasound Guided Technique
Success rate of cannulation ¹	96%	100%
First attempt success rate ¹	54%	73%
Decreased needle attempts ¹	2.8 attempts	1.4 attempts
Time to cannulation ¹	117 seconds	61 seconds
Arterial puncture rate ¹	8.43%	1.39%

Use of ultrasound does not eliminate risk of arterial puncture²



Picture used with permission from Dr. Mauro Pittiruti -E-mail permission 5/19/2019

¹Troianos C (2011) Guidelines for Performing Ultrasound Guided Vascular Cannulation: Recommendations of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists AM Soc Echocardiogr 24 (12): 1291-1318

²Kornbau C., Lee KL, Hughes GD, Firstenberg MS. (July-Sept. 2015) Central line complications: International Journal of Critical Illness and Injury Science 5(3) 170-178

Consensus guidelines: Coagulation status

Procedures with Low Risk of Bleeding, Easily Detected and Controllable (Category 1)

Applicable Vascular Procedures

- Dialysis access intervention
- Central line removal
- PICC line placement

Management related to line placement

Platelet count:

$< 50 \times 10^9 /L$

International normalized ratio (INR): > 2.0

PICC-Small vein, small catheter

CICC-large vein, large catheter

Procedures with Moderate Risk of Bleeding (Category 2)

Applicable Vascular Procedures

- Tunneled central venous catheter
- Subcutaneous port procedure

Platelet count:

$< 50 \times 10^9 /L$

International normalized ratio (INR): 1.5

Complication insertion: Arterial puncture

Arterial puncture centrally

- Leave catheter in place if ≥ 7 French²
- Consult vascular surgeon¹
- Postpone elective surgery²

Arterial puncture peripherally

- Easily managed with compression¹

Arterial accidental cannulation management is based on bleeding and ability to compress vessel¹

¹Moureau, N, (2019) Vessel Health and Preservation: The Right Approach for Vascular Access, Springer, <https://link.springer.com/book/10.1007/978-3-030-03149-7>

²Bowdle. Vascular Complications of Central Venous Catheter Placement: Evidence-Based Methods for Prevention and Treatment. 2014. J Cardiothoracic and Vascular Anesthesia. 21. 358-368

Complication insertion: Arterial puncture

Physiological changes

Compromised airway²

Cerebral ischemia²

Uncontrolled hemorrhage¹

Stroke²

Thrombus²

Pseudoaneurysm¹

Arteriovenous (AV) fistula formation¹

Arterial puncture patient cautions

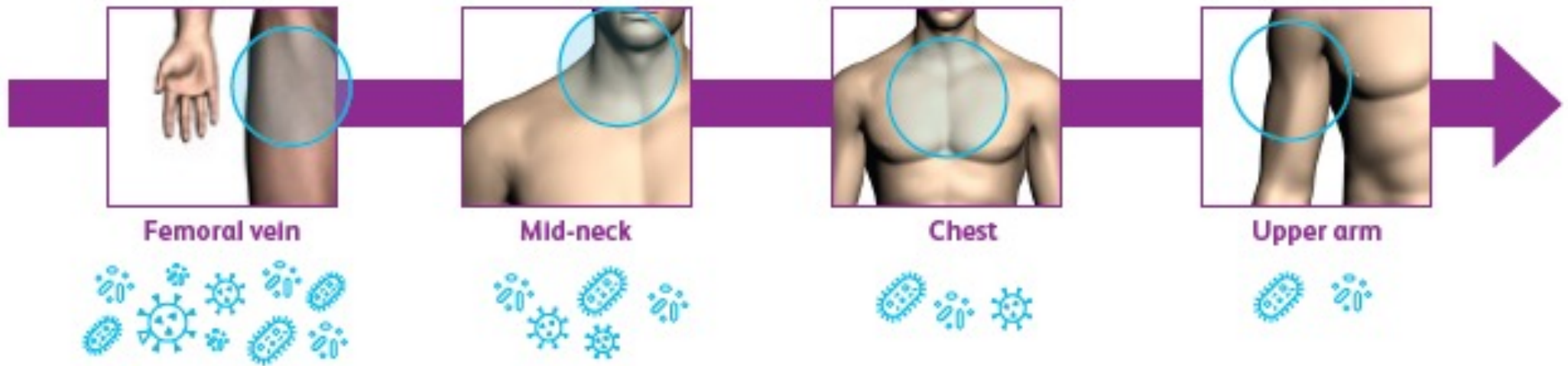
- Hypotensive patients (difficult to recognize)²
- Patients with coagulopathy concerns³
 - Hemophiliac
 - Anticoagulants (Coumadin, Eliquis, etc.)
 - Dialysis (heparin used)
 - Von Willebrand Disease
 - Liver Disease
 - Clotting disorders
 - Known or suspected thrombocytopenia
 - Lupus
 - DIC
 - Vitamin K deficiency
 - Neoplastic disorders

¹Kornbau C., Lee KL, Hughes GD, Firstenberg MS. (July-Sept. 2015) Central line complications: International Journal of Critical Illness and Injury Science 5(3) 170-178

²Moureau, N, (2019) Vessel Health and Preservation: The Right Approach for Vascular Access, Springer, <https://link.springer.com/book/10.1007/978-3-030-03149-7>

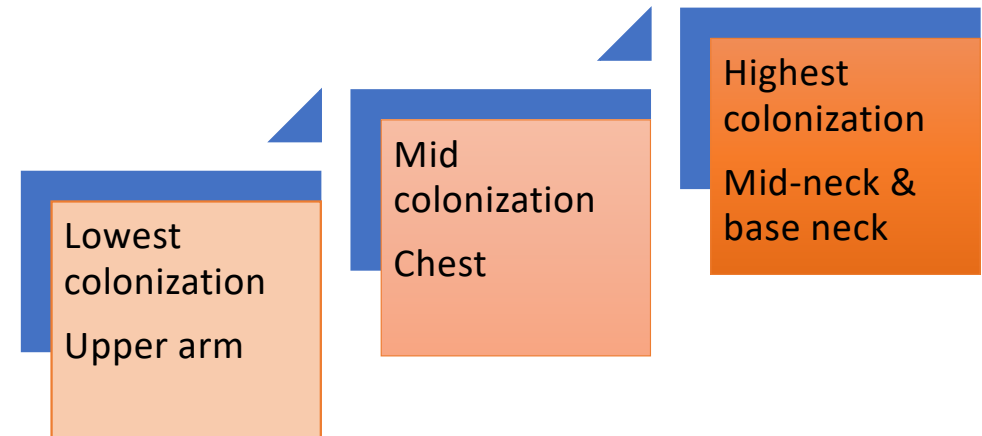
³Patel et al. Consensus Guidelines for Periprocedural Management of Coagulation Status and Hemostasis Risk in Percutaneous Image-guided Interventions. JVIR 2012. 23:727-736

Anatomy
Central line placement complications
Site colonization



Colonization: Site colony forming units (CFU)

Site	≥ 30 CFUs Patients =48 ICU & Medical Surgical	≥ 300 CFUs	Central line insertion site
Mid-neck	45.8% (25/48)	29.1% (14/48)	Jugular site
Base of neck	43.8% (21/48)	14.5% (7/48)	Jugular site
Chest	31.3% (15/48)	27.0% (13/48)	Subclavian site
Upper arm	14.6% (7/48)	6.2% (3/48)	PICC line



Predictors of higher CFU count included prolonged hospitalization and medical/surgical patient status
 Predominant organisms were *S. Aureus*, *S. Epidermidis*, *S. Haemolyticus* (common skin organisms)

Insertion Considerations: Femoral / Upper Groin Site

- CDC Category 1A:
 - Avoid using the femoral vein for central venous access in adult patients
- CDC Category 1B:
 - When adherence to aseptic technique cannot be ensured (e.g., catheters inserted during a medical emergency), replace the catheter as soon as possible (e.g., within 48 hours)



Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011 (www.cdc.gov) edit 2017, <https://www.cdc.gov/infectioncontrol/guidelines/bsi/recommendations.html>

Femoral: Guideline, standards, organization comments

Guideline	Year	Comment
Center for Disease Control (CDC)	2017 update	Avoid using the femoral vein for central venous access in adult patients (Category 1A) ¹
SHEA/IDSA Practice Recommendation	2014	Avoid using the femoral vein for central venous access in obese adult patients when the catheter is placed under planned and controlled conditions (quality of evidence: I) ²
American Society of Anesthesiologists	2020	Select an upper body insertion site, when possible, to minimize the risk of thrombotic complications relative to the femoral site ³
Infusion Nurses Society	2021	Femoral approach: associated with higher risk of infection but easily accessed with use of ultrasound in emergent/short-term situations ⁴

¹Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011 (www.cdc.gov) edit 2017, <https://www.cdc.gov/infectioncontrol/guidelines/bsi/recommendations.html>

²Marschall J, Mermel LA (2014) Strategies to prevent central line –associated bloodstream infections in acute care hospitals 2014 update, Hospital Infection Control and Hospital Epidemiology, 35(7) 753-771

³Practice guidelines for central venous access (2020) An updated report by the American Society of Anesthesiologists task force for central venous access, Anesthesiology, 132, 8-43

⁴Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. Journal of Infusion Nursing. 2021; 44(1S). doi:10.1097/nan.0000000000000396

Patient considerations

- “On admission the patient will have a vascular access plan that meets his/her needs. The plan will be re-evaluated at regular intervals or as the patient’s condition changes”



Patient Considerations: Tracheostomy Patients



Guideline or Standard or Publication	Year	Comment
SHEA/IDSA Recommendation	2014	The risk and benefit of different insertion sites must be considered on an individual basis with regard to infectious and noninfectious complications (e.g., patients with jugular access may have a higher risk if they have a concurrent tracheostomy ¹²
American Society of Anesthesiologists (ASA)	2020	Select an insertion site that is not contaminated or potentially contaminated (e.g., burned or infected skin, inguinal area, adjacent to tracheostomy or open surgical wound) ¹³
GAVeCeLT Working Group for Vascular Access in COVID-19	2020	in patients on CPAP/NIV (little or no interference with the respiratory management), and/or in tracheostomized patients (lower risk of contamination of the exit site and of exposure of the operator to the patient's tracheal secretions, if compared to CICC) ¹⁴

¹²Marschall J, Mermel LA (2014) Strategies to prevent central line –associated bloodstream infections in acute care hospitals 2014 update, Hospital Infection Control and Hospital Epidemiology, 35(7) 753-7712

²Practice guidelines for central venous access (2020) An updated report by the American Society of Anesthesiologists task force for central venous access, Anesthesiology, 132, 8-43

³Pittiruti M, Pinelli F (2020) Recommendations for the use of vascular access in the COVID-19 patient: an Italian perspective, Critical Care, 23:269

Patient Considerations: ECMO



Prolonged cardiac and respiratory support

Extracorporeal membrane oxygenation (ECMO), blood is pumped outside of your body to a heart-lung machine that removes carbon dioxide and sends oxygen-filled blood back to tissues in the body.

The insertion of a PICC leaves the venous vessels in the supraclavicular and inguinal area free for ECMO cannulation. GAVaCeLT (2020)

²Pittiruti M, Pinelli F. (2020) Considerations on the use of vascular access in patient with COVID-19 (and some protocol recommendations GAVeCeLT, <https://www.gavacelt.it/nuovo/sites/default/files/uploads/GAVeCeLT%20-%20Considerations%20on%20the%20use%20of%20vascular%20access%20devices%20in%20patients%20with%20COVID-19.pdf>

Patient Considerations: Halo, Chest Brace, Burn Patient

HALO, Chest Brace



Burn Patient



Patient Considerations: Obesity²



- A body mass index $>30 \text{ kg/m}^2$ resulted in a cannulation **failure rate of 20.1%** for attempted subclavian vein cannulation. (Mansfield et al)¹
- Avoid using the femoral vein for central venous access in obese adult patients when the catheter is placed under planned and controlled conditions. (SHEA/IDSA (2014))³

¹Troianos C (2011) Guidelines for Performing Ultrasound Guided Vascular Cannulation: Recommendations of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists AM Soc Echocardiogr 24 (12): 1291-1318

²Pinelli, F. Little A (2021) Assessment magic recommendations in context of evolving evidence based on use of PICC in the ICU, J VAS Access, 23:1129729821104801933

³Marschall J, Mermel LA (2014) Strategies to prevent central line –associated bloodstream infections in acute care hospitals 2014 update, Hospital Infection Control and Hospital

Patient Considerations: Disoriented patients



Inability to Cooperate

Potential for increased complications on insertion

- Combative¹
- Confused²
- Dementia²

¹Ian Rigby, Daniel Howes, Jason Lord, Ian Walker, central venous access, Resuscitation Education Consortium/Kingston Resuscitation Institute, https://criticalcare.queensu.ca/sites/criticalcare/files/inline-files/Central_Venous_Access.pdf

²Nakano Y, Kondo T (2020) Option of using peripherally inserted central catheter in elderly patients with dementia: an observational study gerontology and geriatric medicine, 6:1-7.

Patient Considerations: Prone Patients

- **Prone Position¹**
 - COVID-19
 - Acute Respiratory Distress Syndrome (ARDS)
- **PICC Line advantages with COVID patients²**
 - Dressing changes
 - Monitor site
 - Connect lines
 - Disconnect lines
 - Lower risk of contamination from oral secretions

¹Kelly L, Dreher D (2021) Placement of a peripherally inserted central catheter in a prone patient with COVID-19, JIN 4(44) 199-202

²Pittiruti M, Pinelli F. (2020) Considerations on the use of vascular access in patient with COVID-19 (and some protocol recommendations GAVeCeLT, <https://www.gavecelt.it/nuovo/sites/default/files/uploads/GAVeCeLT%20-%20Considerations%20on%20the%20use%20of%20vascular%20access%20devices%20in%20patients%20with%20COVID-19.pdf>)



Patient consideration length of therapy

PICCs are indicated for short and long-term dwell and can be used throughout the continuum of care



Patient consideration: Experience placer



- A physician who has performed 50 or more catheterizations is half as likely to result in a mechanical complication as insertion by a physician who has performed < 50
- Reported that with one attempt of catheterization the complication rate is 4.3% which rises to 24% in patients who undergo more than two attempts

Thrombosis: Meta-Analysis (PICCs)

Author	Peer Reviewed Articles	Study Inclusion	Years	MST US	# Studies	# Patients	ICU Oncology
Chopra ¹ 2013	No	Abstracts Posters Phone calls Prospective Retrospective Observational	1979-2012	Some	64	29,503	Yes
Balsorano ² 2019	Yes	Prospective Randomized	2010-2018	All	15	5,420	Yes

¹Chopra V, Anand S, Hickner A, et al. Risk of venous thromboembolism associated with peripherally inserted central catheters: a systematic review and meta-analysis. Lancet. 2013;382(9889):311-325.

²Balsorano P Peripherally inserted central catheter-related thrombosis rate in modern vascular access era – when insertion technique matters: A systematic review and meta-analysis JVA May 2019,; 1-10

Thrombosis: Meta-Analysis (PICCs)

Author	CR-DVT	Symptomatic CR-DVT Rate	Cancer CR-DVT	Onco-Hematologic	Pulmonary Embolism
Chopra ¹ 2013	Non Symptomatic Symptomatic	3.44% Non ICU and non cancer	6.67%	Not Specified	0%
Balsorano ² 2019	Only Symptomatic	2.4% Overall	2.2%	5.9%	Not Noted

¹Chopra V, Anand S, Hickner A, et al. Risk of venous thromboembolism associated with peripherally inserted central catheters: a systematic review and meta-analysis. Lancet. 2013;382(9889):311-325.

²Balsorano P Peripherally inserted central catheter-related thrombosis rate in modern vascular access era – when insertion technique matters: A systematic review and meta-analysis JVA May 2019;; 1-10

Thrombosis: Clinical studies CR-DVT

Author	Year	# hospitals	# catheters	Design	CR-DVT	CLABSI	PE
Kleidon Chopra USA	2021	52	42,687	Prospective	1.3%	NR	NR

Insertion protocol

>5 French	US/ECG	Fluoroscopy	Triple lumen PICC	ICU PICC
5.4%	~50%	~50%	~11%	~28%

Thrombosis: Clinical studies CR-DVT

Author	Year	# hospitals	# catheters	Design	ICU PICC	CR-DVT	CLABSI	PE
Silva Chopra Brazil	2022	16	12,725	Observational Prospective Cohort	32% 4,079	1.0%	0.9%	.0%

Insertion protocol

USG/MST/ECG	USG/MST	ZIM Ideal/green zone	Atrial cavity junction	Vessel ratio <45%
72.2%	Not reported	98.3%	75%	99.6%

Are FICC
particularly at risk
of a CRT?
(catheter related
thrombosis)

- Yes
- Much evidence shows that Femoral Inserted Central Catheters are at increased risk of CRT (**2.2-69%** in adult patients)
- Lower limb CRT is also associated with a four-fold increase of risk of pulmonary embolism (Minet 2015)

Safe Insertion PICCs
Reduce thrombosis risk
SIP Protocol (2014)



Complication rates: PICC vs. CICC septic shock ICU

Outcomes	PICC (N=215)	CICC (N= 347)	P Value
DVT symptomatic	5(2%)	0(0%)	0.008
CLABSI	1(0.5%)	0(0%)	0.38
PE	0(0%)	NR	NR
Median dwell days	6.2(1.6-9.6)	2.5(1.4-4.4)	<0.0001

Single center retrospective observational cohort study design

Notably, there was only one CLABSI within the PICC group, which was not significantly different than the CICC group ($p = 0.38$). There is often a fear of placing PICCs in septic patients due to concern over line seeding. Our data do not support this fear, nor is there sufficient literature to justify this concern.



Summary:
PICCs in the
ICU setting

Suitability of catheter type can differ by patient condition

Example conditions favoring PICC

- **Anatomical** - Helmets, Halo brace, Neck collar
- **Coagulopathy** - Clotting disorders, Anticoagulant medications
- **Severe Pulmonary Conditions** - Respiratory failure, COVID-19 pneumonia, pleuropulmonary conditions
- **Burns and infected skin** in the chest and neck areas
- **Obesity**

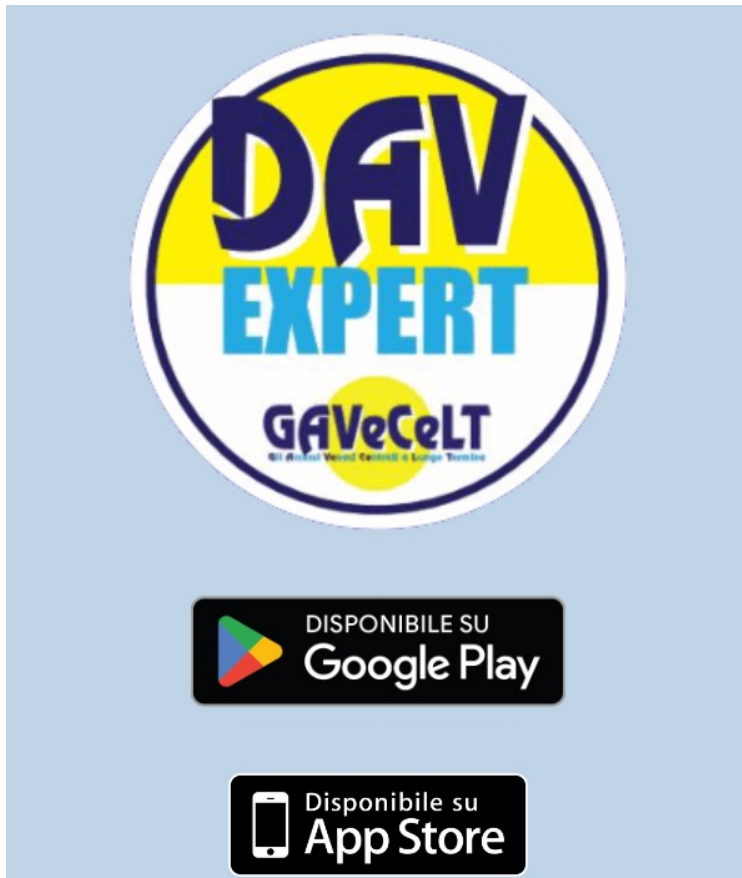
Example conditions favoring CICC

- **Need for >3 lumens**
- **Emergency central line access**
- **Chronic renal failure** with or without arteriovenous fistula

Considerations: COVID central line selection in ICU

Considerations	Concern
Respiratory impairment patient	Pneumothorax risk on insertion CVAD
Pronated patients	Ability to manage and monitor exit site
Anticoagulants patient	Risk of bleeding on accidental arterial puncture
CPAP/NIV patient	Interference with respiratory management
Tracheostomized patient	Risk of contamination at exit site
Patient tracheal secretions	Risk of exposure to staff of virus
Repeated CT Scans patient	CVAD ability to use power injection
Hemodynamic monitoring patient	CVAD device ability to do CVP monitoring
Transport to radiology for placement	Risk of staff exposure to virus and equipment contamination
Securement CVAD for patient	Risk of CVAD dislodgement and adverse event
Tip confirmation for central line placement with x-ray	Risk of virus transmission to staff and contamination of equipment

DAV EXPERT APP: Device selection



- **Languages**
 - Italian
 - Portuguese
 - Spanish
 - English
- **Patients**
 - Adult
 - Children
 - Newborn
- **Situation**
 - Emergent/election
 - Intra-hospital
 - Extra- hospital

PICCs in the ICU Setting

Advantages of placing PICCs in the ICU



- Central access for high-acuity complex cases such as collars, burns, halos¹



- No risk of iatrogenic pneumothorax and iatrogenic hemothorax¹



- Reduced risk of bleeding during placement compared to other central lines²



- Microbial load demonstrated to be lower in peripheral insertion sites in comparison to neck and chest³



- More options for patient positioning during insertion and removal^{4,5}



- Reduced need for confirmatory X-ray with tip confirmation technology compared to blind placement⁶



- Can be used for short- and long-term vascular access⁷

¹Pinelli, F. Little A., Assessment magic recommendations in context of evolving evidence based on use of PICC in the ICU, J VAS Access, 23:112972982110480193. 2021.

²Patel et al., Consensus Guidelines for Periprocedural Management of Coagulation Status and Hemostasis Risk in Percutaneous Image-guided Interventions. JVIR 2012. 23:727-736

³Moureau N, Marsch N, Evaluation of skin colonization and placement of vascular access device exit sites (ESCAPE Study), Journal of Infection Prevention, 20(1) 51-59. 2019.

⁴Mitusda S, Tokumine J et al., PICC insertion in a sitting position for a patient with congestive heart failure, Medicine 98(6). 2019.

⁵Kelly L, Dreker D. et al., Placement of a peripherally inserted central catheter in a prone patient with Covid 19, JIN, 4(44) 199-202. 2021.

⁶Kwon S, Son SM, Lee SH, Kim JH, Kim H, Kim JY, Kim JI, Moon IS. Outcomes of bedside peripherally inserted central catheter placement: a retrospective study at a single institution. Acute Crit Care. 2020 Feb; 35(1):31-37. doi: 10.4266/acc.2019.00731. Epub 2020 Feb 11. PMID: 32131579; PMCID: PMC7056959.

⁷BARD,C.R. PowerPICC SOLO² Instruction for use. 2012.

Thank You

BD and the BD Logo are trademarks of Becton, Dickinson and Company or its affiliates. All other trademarks are the property of their respective owners. © 2022 BD. All rights reserved. BD-78165 (12/22)