Vascular Access Device (VAD) Selection and Procedures

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care.*

TABLE OF CONTENTS

CICC = centrally inserted central catheter
CVAD = central vascular access device
PICC = peripherally inserted central catheter

Vascular Access Device (VAD) Selection and Procedures

CONSIDERATIONS FOR CVAD SELECTION AND PLACEMENT

- Choosing the correct venous access device and location for patients requires a prior thorough assessment and evaluation. Considerations include anticipated dwell time, associated risks, relevant vascular history including catheter to vein ratio assessment, history of surgical or anatomical variant(s) affecting, arms, neck, and/or chest, venous thromboembolism, history of multiple or failed device insertion attempts, pacemaker with leads, history of radiation, trauma or lesion/mass/wound to neck, chest or access site, superior vena cava (SVC) syndrome, and urgency of procedure. Interprofessional collaboration is recommended in the decision process.

- Priority is given to vessel health preservation and minimizing the risk of infection by avoiding sites like the femoral vein. In some cases, consideration may include availability of assistance from caregiver for dressing changes and prior surgical history (*i.e.,* mastectomy). The patient's activity level and lifestyle should also be considered. Femoral catheters should be removed or alternate site considered within 72 hours of placement.

- Providers should be aware that the higher the number of catheter lumens, the higher the risk of a catheter related infection and thrombotic complications for the patient. Selecting catheters with the least number of lumens may minimize infectious and thrombotic complications.
  - Separating infusions over time and working with pharmacists may help reduce the need for multi-lumen devices, reducing cost and complications

- Patients with preexisting VAD that require alternate/different vascular access should be assessed for removal of preexisting devices once new VAD is placed and confirmed

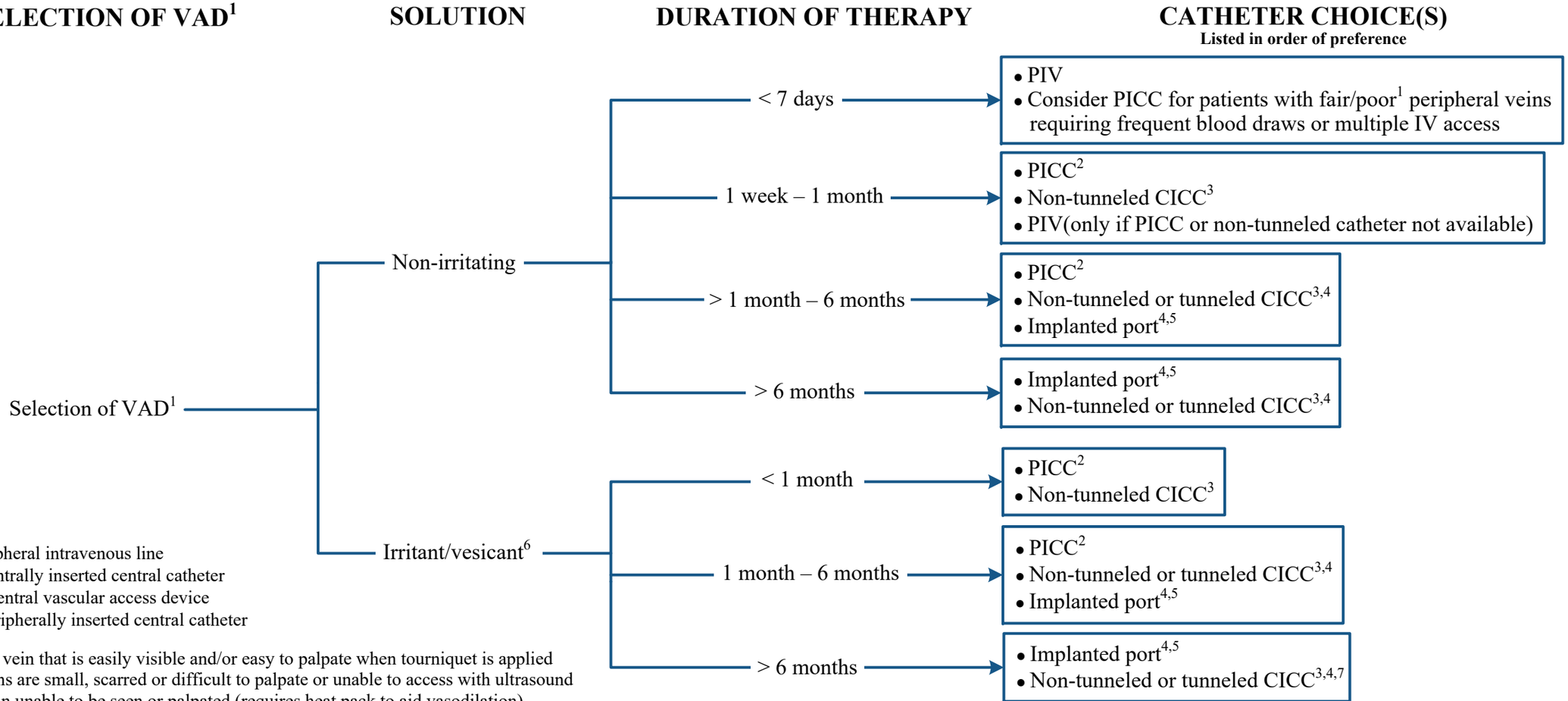
- VADs should be removed once no longer indicated or functional

- For patients with chronic kidney disease requiring central venous access (not for the purpose of hemodialysis), avoid placement of peripherally inserted central catheters (PICCs) and subclavian approach centrally inserted central catheters (CICCs). Based on observational studies demonstrating high rates of new central vein lesions after PICC placement, PICCs and subclavian CICCs are **not** recommended in patients with low glomerular filtration rates (< 30 mL/minute/1.73 m^2) or stage IIIb or higher kidney disease to avoid complications (*i.e.*, deep vein thrombosis, venous stenosis) that may interfere with future hemodialysis arteriovenous access placement.

CVAD = central vascular access device

Vascular Access Device (VAD) Selection and Procedures

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care.*



PIV = peripheral intravenous line
CICC = centrally inserted central catheter
CVAD = central vascular access device
PICC = peripherally inserted central catheter

[1] Good = A vein that is easily visible and/or easy to palpate when tourniquet is applied
Fair = veins are small, scarred or difficult to palpate or unable to access with ultrasound
Poor = vein unable to be seen or palpated (requires heat pack to aid vasodilation)

[2] PICCs should be avoided in patients with renal disease (chronic renal disease is Stage IIIB or higher with glomerular filtration rate (GFR) < 30 mL/minute/1.73 m^2)

[3] Subclavian catheters should be avoided in patients with coagulopathy and renal disease (chronic renal disease is Stage IIIB or higher with GFR < 30 mL/minute/1.73 m^2)

[4] Implanted venous ports and tunneled CICCs are not recommended for leukemia and stem cell transplant patients

[5] Consider if duration of treatment is > 3 months

[6] Irritant is defined as any agent (*i.e.*, chemotherapy, electrolytes) that causes inflammation or irritation characterized by aching, tightness, and phlebitis but without necrosis. Vesicant is defined as any agent (*i.e.*, chemotherapy) that has the potential to cause tissue destruction, blistering, severe tissue injury, or tissue necrosis when extravasated. Refer to Vascular Vesicant/Irritant Administration and Extravasation Policy (#CLN0986) and Extravasation Management (Vesicant and Contrast Agents) algorithm.

[7] Non-tunneled CICC may be used for > 6 months in service specific patients such as leukemia due to neutropenia that require expedited line removal in cases of sepsis and/or suspected line infections without delay. Only FDA designated long-term catheters are used for this purpose.

Department of Clinical Effectiveness V7
Approved by The Executive Committee of the Medical Staff on 09/16/2025

Vascular Access Device (VAD) Selection and Procedures

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care.*

PRESENTATION AND PRE-PROCEDURE ASSESSMENT - PICC

Patient assessed and identified as needing PICC insertion, exchange or PICC removal[1]

Place procedure order using appropriate ordering tool[2,3]

Procedure indicated?

- Yes
- No

PICC insertion or exchange

- Consult Cardiac Device Clinic if patient has an implanted cardiac device (ICD). See Implanted Cardiac Pacemaker and Defibrillator Management algorithm.
- Perform catheter insertion assessment (see Page 2)
- Review of available imaging as indicated
- Post insertion chest x-ray
  - Patients requiring Level Two transport or above may have a one view portable chest x-ray[4]

PICC removal

- Perform catheter removal assessment[7] and document[6]
- Apply petrolatum-based ointment[8] with sterile gauze dressing to exit site. Dressing can be removed after 24 hours.
- Hold pressure at site for at least 3 minutes and until bleeding resolves
- If indication of removal is due to infection, send catheter tip for culture and sensitivities

Proceduralist to document evaluation in patient's EHR

INTRA- AND POST-PROCEDURE

Is tip of CVAD in satisfactory position[5] on chest x-ray?

- Yes
- No

CVAD ready for use

- Document procedure and tip verification[5,6]
- Complete Lines, Drains and Airways (LDA) documentation
- See Vascular Access Device (VAD) Management algorithm for Post-insertion Dressing & Maintenance and Flush Management

- Reposition catheter as clinically indicated
- Repeat chest x-ray
  - Patients requiring Level Two transport or above may have a one view portable chest x-ray[4]

CVAD = central vascular access device
PICC = peripherally inserted central catheter

[1] Indications for removal may include treatment completed, infection [see Infection Control Associated with Vascular Access Devices (VADs) Policy (#CLN0441)], malposition or malfunction, and/or thrombosis. If indication for removal is thrombosis, and catheter is still needed and functioning, consider line preservation, deep vein thrombosis treatment (refer to Adult Venous Thromboembolism (VTE) Treatment for Cancer Patients algorithm), and symptom management.
[2] Adult Venous Access Procedures
[3] Proceduralist to assess and determine most appropriate catheter type and insertion site
[4] Refer to Criteria for Transporting a Patient within MD Anderson (#ATT1849)
[5] Tip of the CVAD is in satisfactory position when the tip resides in the superior vena cava or upper right atrium. See Central Vascular Access Device (CVAD) Assessment and Tip Position Verification Policy (#CLN1036).
[6] Document in EHR procedure note
[7] Removal assessment includes reviewing the ordering indication, patient labs, and medications
[8] Use single-dose petrolatum-based ointment packet

Department of Clinical Effectiveness V7
Approved by The Executive Committee of the Medical Staff on 09/16/2025

Vascular Access Device (VAD) Selection and Procedures

PRESENTATION AND PRE-PROCEDURE ASSESSMENT – Non-Tunneled CICC

Patient assessed and identified as needing non-tunneled CICC insertion or exchange

Place procedure order using appropriate ordering tool[1,2]

Procedure indicated?

Yes

Pre-procedure requirements:
- Chest imaging in prior 6 months
- Consult Cardiac Device Clinic if patient has an implanted cardiac device (ICD). See Implanted Cardiac Pacemaker and Defibrillator Management algorithm.
- Lab parameters:
  - PT/INR, platelet count, and creatinine within **7 days** of procedure if patient has a history of chemotherapy within 1 month, liver disease, coagulopathy, recent history of thrombocytopenia, or history of anticoagulation medication use (refer to Peri-Procedure Management of Anticoagulants and Peri-Procedure Management of Antiplatelet Therapy algorithms for hold recommendations)
  - PT/INR, platelet count, and creatinine within **2 months** of procedure if the above comorbidities do not apply
  - No labs required for exchanges from larger catheter size to smaller catheter size
- Refer to Anxiolysis (Minimal Sedation) for Procedures and Tests algorithm if indicated
- Patient does not require NPO status

No

Proceduralist to document evaluation in patient's EHR

Procedure requirements met?

Yes

- Perform procedure
- Post insertion chest x-ray

No

Coagulopathy (INR > 2 and/or platelet count ≤ 20-30 K/microliter based on insertion site)

- INR > 2: Consider administering fresh frozen plasma (FFP)[5] and/or vitamin K[6] if clinically indicated **or** consider alternate insertion site utilizing parameters below
- Platelet count < 10 K/microliter for internal jugular (IJ) or femoral placement **or** platelet count < 20 K/microliter for subclavian placement: Consider platelet transfusion and post-count until platelet count at minimal threshold (≥ 10 K/microliter for IJ and femoral **or** ≥ 20 K/microliter for subclavian)[5]
- Platelet count 10-20 K/microliter: for IJ or femoral placement **or** platelet count 20-30 K/microliter for subclavian: Consider additional platelets to infuse prior to procedure for ambulatory patients[5] or during the procedure for inpatients

INTRA- AND POST-PROCEDURE

Is tip of CVAD in satisfactory position[3] on chest x-ray?

Yes

CVAD ready for use
- Document procedure and tip verification[4]
- Complete Lines, Drains and Airways (LDA) documentation
- See Vascular Access Device (VAD) Management algorithm for Post-insertion Dressing & Maintenance and Flush Management

No

- Reposition catheter as clinically indicated
- Repeat chest x-ray

CICC = centrally inserted central catheter
CVAD = central vascular access device
NPO = nothing by mouth

[1] Adult Venous Access Procedures
[2] Proceduralist to assess and determine most appropriate catheter type and insertion site
[3] Tip of the CVAD is in satisfactory position when the tip resides in the superior vena cava or upper right atrium. See Central Vascular Access Device (CVAD) Assessment and Tip Position Verification Policy (#CLN1036).
[4] Document in EHR procedure note
[5] Ambulatory patients requiring blood product administration will need to be scheduled for Ambulatory Treatment Center (ATC) appointment by ordering provider
[6] For patients on warfarin: higher doses of vitamin K result in extended duration of subtherapeutic INR. Consider limiting dose of vitamin K for patients with a thrombotic risk who will need to be restarted on warfarin.

Department of Clinical Effectiveness V7
Approved by The Executive Committee of the Medical Staff on 09/16/2025

Vascular Access Device (VAD) Selection and Procedures

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care.*

PRESENTATION AND PRE-PROCEDURE ASSESSMENT – CICC Removal

Patient assessed and identified as needing removal[1] of non-tunneled CICC, implanted venous port or tunneled CICC

Place procedure order using appropriate ordering tool[2]

Procedure indicated?

- Yes
- No

Proceduralist to document evaluation in patient's EHR

Implanted venous port or tunneled CICC removal

Pre-procedure requirements:

- Chest imaging in prior 6 months
- Consult Cardiac Device Clinic if patient has an implanted cardiac device (ICD). See Implanted Cardiac Pacemaker and Defibrillator Management algorithm.
- Lab parameters:
  - PT/INR and platelet count within **7 days** of procedure if patient has a history of chemotherapy within 1 month, liver disease, coagulopathy, recent history of thrombocytopenia, or history of anticoagulation medication use (refer to Peri-Procedure Management of Anticoagulants and Peri-Procedure Management of Antiplatelet Therapy algorithms for hold recommendations)
  - PT/INR and platelet count within **2 months** of procedure if the above comorbidities do not apply
- Refer to Anxiolysis (Minimal Sedation) for Procedures and Tests algorithm if indicated
- Patient does not require NPO status

Non-tunneled CICC removal

- Perform catheter removal assessment[6] and document[3]
- Apply petrolatum-based ointment[7] with sterile gauze dressing to exit site. Dressing can be removed at ≥ 48 hours.
- For platelets > 20 K/microliter: Hold pressure at site for at least 5 minutes; if bleeding persists, continue to hold pressure until bleeding resolves
- For platelets ≤ 20 K/microliter: Hold pressure at site for at least 10 minutes; if bleeding persists, continue to hold pressure until bleeding resolves
- If indication of removal is due to infection, send catheter tip for culture and sensitivities

INTRA- AND POST-PROCEDURE

Procedure requirements met?

- Yes
- No

Coagulopathy (INR > 2 and/or platelet count ≤ 20 K/microliter)

- INR > 2: Consider administering fresh frozen plasma (FFP)[4] and/or vitamin K[5] if clinically indicated
- Platelet count < 10 K/microliter: Consider platelet transfusion and post-count until platelet count ≥ 10 K/microliter[4]
- Platelet count 10-20 K/microliter: Consider additional platelets to infuse prior to procedure for ambulatory patients[4] or during the procedure for inpatients

- Perform procedure and document[3]
- If indication of removal is due to infection, send catheter tip for culture and sensitivities
- Post removal chest x-ray
- Complete Lines, Drains and Airways (LDA) documentation
- Place sterile dressing post removal
- Remove dressing after 48 hours

CICC = centrally inserted central catheter
CVAD = central vascular access device
NPO = nothing by mouth
VA&P = Vascular Access & Procedures

[1] Indications for removal may include treatment completed, infection [see Infection Control Associated with Vascular Access Devices (VADs) Policy (#CLN0441)], malposition or malfunction, and/or thrombosis. For non-tunneled CICC, if indication for removal is thrombosis, and catheter is still needed and functioning, consider line preservation, deep vein thrombosis treatment (refer to Adult Venous Thromboembolism (VTE) Treatment for Cancer Patients algorithm), and symptom management. For implanted venous port or tunneled CICC, VA&P provider to assess and removal to be considered if severe pain and/or swelling.

[2] Adult Venous Access Procedures

[3] Document in EHR procedure note

[4] Ambulatory patients requiring blood product administration will need to be scheduled for Ambulatory Treatment Center (ATC) appointment by ordering provider

[5] For patients on warfarin: higher doses of vitamin K result in extended duration of subtherapeutic INR. Consider limiting dose of vitamin K for patients with a thrombotic risk who will need to be restarted on warfarin.

[6] Removal assessment includes reviewing the ordering indication, patient labs, and medications

[7] Use single-dose petrolatum-based ointment packet

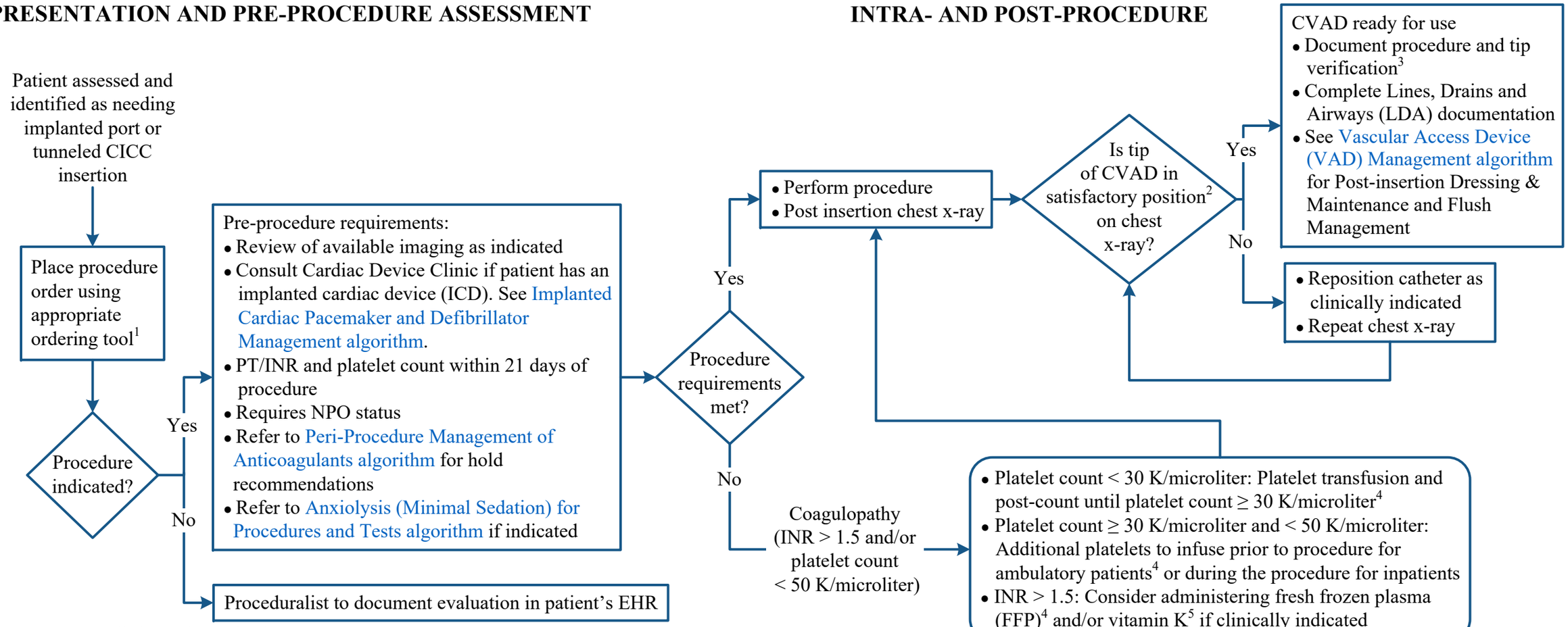
Department of Clinical Effectiveness V7
Approved by The Executive Committee of the Medical Staff on 09/16/2025

Vascular Access Device (VAD) Selection and Procedures

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care.*

PRESENTATION AND PRE-PROCEDURE ASSESSMENT

INTRA- AND POST-PROCEDURE



CICC = centrally inserted central catheter
CVAD = central vascular access device
NPO = nothing by mouth

[1] IR Procedure Order
[2] Tip of the CVAD is in satisfactory position when the tip resides in the superior vena cava or upper right atrium. See Central Vascular Access Device (CVAD) Assessment and Tip Position Verification Policy (#CLN1036).
[3] Document in EHR procedure note
[4] Ambulatory patients requiring blood product administration will need to be scheduled for Ambulatory Treatment Center (ATC) appointment by ordering provider
[5] For patients on warfarin: higher doses of vitamin K result in extended duration of subtherapeutic INR. Consider limiting dose of vitamin K for patients with a thrombotic risk who will need to be restarted on warfarin.

Department of Clinical Effectiveness V7
Approved by The Executive Committee of the Medical Staff on 09/16/2025

SUGGESTED READINGS

Alexander, M., Corrigan, A. M., Gorski, L. A., & Phillips, L. (Eds.). (2014). *Core Curriculum for Infusion Nursing*, (4th ed). Philadelphia, PA: Wolters Kluwer Health and Lippincott Williams & Wilkins.

Barsuk, J. H., Cohen, E. R., Nguyen, D., Mitra, D., O'hara, K., Okuda, Y., . . . Wayne, D. B. (2016). Attending physician adherence to a 29-component central venous catheter bundle checklist during simulated procedures. *Critical Care Medicine, 44*(10), 1871-1881. https://doi.org/10.1097/CCM.0000000000001831

Bertoglio, S., van Boxtel, T., Goossens, G. A., Dougherty, L., Furtwangler, R., Lennan, E., . . . Stas, M. (2017). Improving outcomes of short peripheral vascular access in oncology and chemotherapy administration. *The Journal of Vascular Access*, *18*(2), 89-96. https://doi.org/10.5301/jva.5000668

Bhutani, G., El Ters, M., Kremers, W. K., Klunder, J. L., Taler, S. J., Williams, A. W., . . . Hogan, M. C. (2017). Evaluating safety of tunneled small bore central venous catheters in chronic kidney disease population: A quality improvement initiative. *Hemodialysis International*, *21*(2), 284-293. https://doi.org/10.1111/hdi.12484

Buetti, N., Marschall, J., Drees, M., Fakih, M. G., Hadaway, L., Maragakis, L. L., . . . Mermel, L. A. (2022). Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update. *Infection Control and Hospital Epidemiology, 43*(5), 553-569. https://doi.org/10.1017/ice.2022.87

Camp-Sorrell, D (Ed.). (2010). *Access device guidelines: Recommendations for nursing practice and education* (3rd ed). Pittsburgh, PA: Oncology Nursing Society.

Carr, P. J., Higgins, N. S., Cooke, M. L., Mihala, G., & Rickard, C. M. (2018). Vascular access specialist teams for device insertion and prevention of failure. *Cochrane Database of Systematic Reviews*, *3*, CD011429. https://doi.org/10.1002/14651858.CD011429.pub2

Chopra, V., Flanders, S. A., & Saint, S. (2012). The problem with peripherally inserted central catheters. *The Journal of the American Medical Association, 308*(15), 1527-1528. https://doi.org/10.1001/jama.2012.12704

Chopra, V., Flanders, S. A., Saint, S., Woller, S. C., O'Grady, N. P., Safdar, N., . . . Bernstein, S. J. (2015). The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): Results from a multispecialty panel using the RAND/UCLA appropriateness method. *Annals of Internal Medicine*, *163*(Suppl 6), S1-S39. https://doi.org/10.7326/M15-0744

DeVries, M., & Strimbu, K. (2019). Short peripheral catheter performance following adoption of clinical indication removal. *Journal of Infusion Nursing, 42*(2), 81-90. https://doi.org/10.1097/NAN.0000000000000318

El Ters, M., Schears, G. J., Taler, S. J., Williams, A. W., Albright, R. C., Jenson, B. M., . . . Hogan, M. C. (2012). Association between prior peripherally inserted central catheters and lack of functioning arteriovenous fistulas: A case-control study in hemodialysis patients. *American Journal of Kidney Diseases*, *60*(4), 601-608. https://doi.org/10.1053/j.ajkd.2012.05.007

Estcourt, L., Desborough, M., Hopewell, S., Doree, C., & Stanworth, S. (2015). Comparison of different platelet transfusion thresholds prior to insertion of central lines in patients with thrombocytopenia. *Cochrane Database of Systematic Reviews, 2015*(12), CD011771. https://doi.org/10.1002/14651858.CD011771.pub2

Continued on next page

SUGGESTED READINGS - continued

Ge, X., Cavallazzi, R., Li, C., Pan, S., Wang, Y., & Wang, F. (2012). Central venous access sites for the prevention of venous thrombosis, stenosis and infection. *Cochrane Database of Systematic Reviews, 2012*(3), CD004084. https://doi.org/10.1002/14651858.CD004084.pub3

MD Anderson Institutional Policy #ATT1849 – Criteria for Transporting a Patient within MD Anderson

MD Anderson Institutional Policy #CLN0441 – Infection Control Associated with Vascular Access Devices (VADs) Policy

MD Anderson Institutional Policy #CLN0986 – Vascular Vesicant/Irritant Administration and Extravasation Policy

MD Anderson Institutional Policy #CLN1036 – Central Vascular Access Device (CVAD) Assessment and Tip Position Verification Policy

Nickel, B., Gorski, L., Kleidon, T., Kyes, A., DeVries, M., Keogh, S., . . . Hagle, M. E. (2024). Infusion therapy standards of practice, 9th Edition. *Journal of Infusion Nursing, 47*(Suppl 1), S1-S285. https://doi.org/10.1097/NAN.0000000000000532

O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, P., Garland, J., Heard, S. O., . . . the Healthcare Infection Control Practices Advisory Committee (HICPAC). (2011). Centers for Disease Control and Prevention (CDC): Guidelines for prevention of intravascular catheter-related infections. Retrieved from https://www.cdc.gov/infection-control/media/pdfs/Guideline-BSI-H.pdf

Polovich, M., Olsen, M., & LeFebvre, K. B. (Eds.). (2014). *Chemotherapy and biotherapy guidelines and recommendations for practice*, (4th ed). Pittsburgh, Pennsylvania: Oncology Nursing Society.

van Baarle, F. L. F., van de Weerdt, E. K., van der Velden, W. J. F. M., Ruiterkamp, R. A., Tuinman, P. R., Ypma, P. F., . . . Vlaar, A. P. J. (2023). Platelet transfusion before CVC placement in patients with thrombocytopenia. *The New England Journal of Medicine, 388*(21), 1956-1965. https://doi.org/10.1056/NEJMoa2214322

Woller, S. C., Stevens, S. M., & Evans, R. S. (2016). The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) initiative: A summary and review of peripherally inserted central catheter and venous catheter appropriate use. *Journal of Hospital Medicine*, *11*(4), 306-310. https://doi.org/10.1002/jhm.2525

DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Vascular Access Devices Management experts at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

Core Development Team Leads

Jennifer Acelajado, MSN, RN, VA-BC (Vascular Access and Procedures)
Ivy Cocuzzi, MPAS, PA-C (Acute Care Procedure Team)
Haley Shields Guillory, PA-C (Interventional Radiology)

Workgroup Members

Hammam Ahmed, MSN, RN, VA-BC (Vascular Access and Procedures)
Kamran Ahrar, MD (Interventional Radiology)
Cody Belgarde, BSN, RN (Leukemia)
Roxanne Canicula, MSN, RN, OCN (Vascular Access and Procedures)
Joanne Dalusung, DNP, APRN, AGACNP-BC, VA-BC (Acute Care Procedure Team)
Joylyn Mae Estrella, MSN, RN, OCN, CNL (Nursing Administration)
Wendy Garcia, BS♦
Stacy Hall, MSN, RN, NE-BC (Vascular Access and Procedures)
Catherine Noche, MSN, RN, CCRN, CNL (Vascular Access and Procedures)
Milan Patel, MD (Interventional Radiology)
Nicole Simon, PA-C (Interventional Radiology)
Mary Lou Warren, DNP, APRN, CNS-CC♦

♦Clinical Effectiveness Development Team