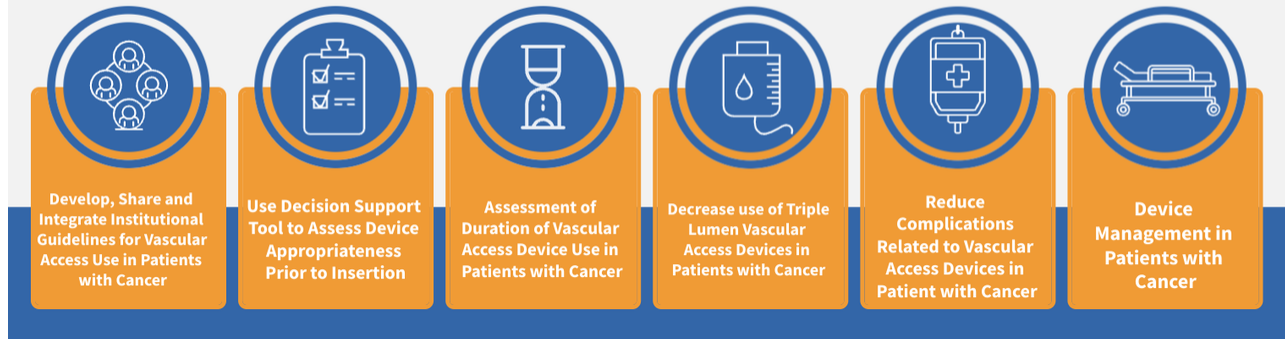


HMS PICC Active Malignancy Toolkit

Implement Global Strategies to Improve Vascular Access Use in Patients with Cancer



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This toolkit is a live document and will continually be updated as new tools are developed. Please visit the HMS website for the most up-to-date toolkit. If you have tools to be added to the toolkit, please see the HMS contact information below.

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1. Develop Institutional Guidelines for Vascular Access Use in Patients with

Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- Establishing clear guidelines for vascular access use ensures consistency in the quality of care across departments and practitioners. This reduces variability, which is often associated with increased rates of complications.
- Developing guidelines based on the latest research and clinical evidence ensures patients receive care aligned with the current best practices, reducing the likelihood of adverse events.
- Standardized protocols can lead to improved patient outcomes by minimizing complications related to vascular access, such as infections or thrombosis, thereby improving overall patient safety and satisfaction.
- Guidelines serve as a valuable educational resource for all staff, ensuring that all healthcare providers are knowledgeable about the best practices in vascular access management.
- Instituting guidelines provides a framework for continuous quality improvement initiatives. Data on vascular access outcomes can be collected, monitored, and used to refine guidelines over time.

Suggested Implementation Strategies:

- Customize by leveraging national or international guidelines, tailor recommendations to address specific institutional needs, such as patient demographics or logistical constraints
- Conduct workshops, seminars, and hands-on training sessions to educate staff about the guidelines. Ensure educational materials are accessible and that there are opportunities for staff to ask questions and seek clarifications.
- Incorporate guidelines into the institution's electronic health records (EHR) system, providing prompts or checklists to support adherence during the clinical decision-making process.

Resources

- [Cancer Nurses Society of Australia: Vascular Access Guidelines](#)
 - Version Two: January 2024
- [Catheter selection algorithm developed by the Foundation for Excellence and Quality in Oncology \(ECO\), the Spanish Society of Medical Oncology \(SEOM\), and the Spanish Society of Oncology Nursing \(SEEO\)](#)
 - Magallón-Pedrera, I et al. *Therapy Clin Transl Oncol* 2020

References

General Hematology/Oncology

- Chopra, V. et al. [The Michigan Appropriateness Guide for Intravenous Catheters \(MAGIC\): Results From a Multispecialty Panel Using the RAND/UCLA Appropriateness Method](#) *Ann Intern Med* 2015.
 - Criteria for the use of PICCs was developed, adopting the RAND/UCLA Appropriateness Method. After a review of 665 scenarios, 43% of PICCs were flagged as inappropriate. Applying these criteria as a guide can help decrease the likelihood of an inappropriate catheter, improve care, and inform quality improvement efforts.
 - Jahanzeb, M et al. [An International Expert Consensus on Improving the Quality of Care in Patients with Cancer by Optimal Central Vascular Access Device Selection](#) *Journal of Clinical Oncology* 2024.
 - A panel of 11 experts from three continents to conduct a comprehensive review of clinical trials and guidelines on CVADS
 - Magallón-Pedrera, I et al. [ECO-SEOM-SEEO Safety Recommendations Guideline for Cancer Patients Receiving Intravenous](#) *Therapy Clin Transl Oncol* 2020
 - Guidelines developed by the Foundation for Excellence and Quality in Oncology (ECO), the Spanish Society of Medical Oncology (SEOM), and the Spanish Society of Oncology Nursing (SEEO).
 - Massouh, A et al. [ACR Appropriateness Criteria® Central Venous Access Device and Site Selection](#) *J Am Coll Radiol* 2023
 - American College of Radiology Appropriateness Criteria are evidence-based guidelines reviewed annually by an expert multi-disciplinary panel, using the RAND/UCLA Appropriateness Method. Includes limited recommendations for cancer patients.
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2. Use a Decision Tool to Guide Appropriateness of Vascular Access Device Use Prior to Insertion in Patients with Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- A decision support tool provides structured guidance that can support clinicians in selecting the most appropriate vascular access device based on the type of cancer, duration of therapy, and risk factors.
- Proper selection of vascular access devices can reduce complications such as catheter-related bloodstream infections and thrombosis, improving patient safety and outcomes.
- By guiding appropriate device selection, a decision support tool can optimize resource use, reducing unnecessary procedures and the need for device changes, ultimately leading to cost savings.
- A device selection tool can help standardize decision-making processes across different healthcare providers and departments, ensuring consistent, high-quality care.
- The use of a device selection tool can serve as a learning tool for less experienced clinicians, providing them with a framework to improve their knowledge and skills in vascular access device selection.

Suggested Implementation Strategies:

- Form a team comprised of hematologists, oncologists, interventional radiology, vascular access nurses, information technology specialists, and other relevant stakeholders to develop and customize the device selection tool.
- Base the decision support tool on the latest clinical guidelines and evidence-based practices. Consider factors such as patient-specific requirements, anticipated duration of therapy, and the risk for complications.
- Integration with Clinical Workflow: Embed the device selection tool within the EHR system to enable automatic prompts and guidance at the point of care.

Ensure it aligns seamlessly with clinical workflows to encourage adoption.

- Train healthcare providers on how to effectively use the decision support tool through workshops, demonstrations, and online modules. Highlight the benefits of the tool in optimizing patient care and outcomes.
- Create a system for ongoing feedback from users to ensure the tool remains relevant and user-friendly. Encourage collaboration and communication among users to share experiences and best practices.

Resources

General Appropriateness:

- [The Michigan Appropriateness Guide for Intravenous Catheters \(MAGIC\): Annals of Internal Medicine. 2015.](#)
 - Video: [The Michigan MAGIC, PICC Appropriateness & Mindful Medicine](#)
 - App: [ImprovePICC MAGIC App](#)
 - [Badge Card](#)

References

General Hematology/Oncology.

- He, E. et al. [Clinical Effect and Safety of Venous Access Ports and Peripherally Inserted Central Catheters in Patients Receiving Tumor Chemotherapy: A Systematic Review and Meta-Analysis.](#) *Ann Palliat Med* 2021.
 - A systematic review and meta-analysis of 2,585 patients with cancer receiving either a PICC or PORT for chemotherapy. PORTs had similar clinical effects to PICCs in cancer patients receiving chemotherapy. However, PICCs had more complications than PORTs, including occlusion and thrombosis risk.
- Lin, B. et al. [Peripherally Inserted Central Catheters Versus Implantable Port Catheters For Cancer Patients: A Meta Analysis.](#) *Front Oncol* 2023.
 - A systematic review and meta-analysis including 22 studies including patients with cancer receiving chemotherapy either through a PICC or an implanted vascular access port. The results suggested that ports have a superior safety profile, with lower incidences of overall adverse effects, catheter-related thrombosis, and allergic reactions than typically expected with PICC. Additionally, PICC was non-inferior to ports with respect to DVT and infection.

- Moss, J et al. [Central Venous Access Devices for the Delivery of Systemic Anticancer Therapy \(CAVA\): A Randomised Controlled Trial](#). *Lancet* 2021.
 - Open-label, multi-center randomized controlled trial of 1,061 adult patients receiving systemic anticancer treatment (SACT) for solid or hematological malignancy via PICCs vs Hickman vs Ports. Findings suggest that for most patients receiving SACT, Ports are more effective and safer than both Hickman and PICCs.
- Pu, Y. et al. [Complications and Costs of Peripherally Inserted Central Venous Catheters Compared with Implantable Port Catheters for Cancer Patients: A Meta-Analysis](#). *Cancer Nursing* 2020.
 - A meta-analysis of 15 articles of patients with PICCs and implantable port catheters (IPC) in place for patients with cancer receiving chemotherapy. PICC use was associated with higher complication rates than IPC, including occlusion, infection, malposition, catheter-related thrombosis, extravasation, phlebitis, and accidental removal rate. The life span of IPC was longer than that of PICC, and the costs of IPC were lower.
- Sheng Y. et al. [Implementation of Tunneled Peripherally Inserted Central Catheters Placement in Cancer Patients: A Randomized Multicenter Study](#). *Clin Nurs Res* 2024
 - 694 patients who needed PICC placement were randomized to either a tunneled PICC group (experimental group) or non-tunneled PICC group (control group). After 6 months of follow-up, the tunneled PICCs group showed a significant decrease in the frequency of total complications, especially in infection (3.0% vs. 7.1%, $p = .021$) and catheter-related thrombosis (3.3% vs. 8.3%, $p = .008$), although approximately 0.5 ml bleeding and 3.5 min time were increased.
- Sun, Y. et al. [Complications of Implanted Port Catheters and Peripherally Inserted Central Catheters in Chemotherapy-Treated Cancer Patients: A Meta-Analysis](#). *Adv Clin Exp Med* 2023.
 - A meta-analysis of 11,801 patients in 28 articles. These patients were receiving chemotherapy via either PICCs or implanted port catheter. PICCs had significantly higher incidence of occlusion complications, longer durations of local infection, higher incidence of catheter-related infection, higher rate of malposition, higher rates of catheter-related thrombosis, higher incidence of phlebitis complications, higher incidence of accidental removal, and a shorter catheter lifespan in subjects undergoing chemotherapy compared to those in whom implanted port catheters were used.

- Yeow, M. et al. [A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials on Choice of Central Venous Access Device for Delivery of Chemotherapy](#). *J Vasc Surg Venous Lymphat Disord* 2022.
 - A meta-analysis of 11 articles of patients receiving chemotherapy via non-tunneled central venous catheter, PICC, totally implantable venous access ports (TIVAPs) and tunneled CVC. All articles included in the meta-analysis were randomized controlled trials. TIVAPs were found to be superior in terms of complications and quality of life compared with other CVADs, without compromising cost-effectiveness, and should be considered the standard of care for patients receiving chemotherapy.

Acute Leukemia/Aggressive Lymphoma

- Picardi, M. et al. [A Frontline Approach with Peripherally Inserted Versus Centrally Inserted Central Venous Catheters for Remission Induction Chemotherapy Phase of Acute Myeloid Leukemia: A Randomized Comparison](#) *Clin Lymphoma Myeloma Leuk* 2019.
 - A randomized trial of patients with previously untreated acute myeloid leukemia (AML) in patients receiving a PICC (N=46) and centrally inserted central catheters (N=47). The use of a PICC is safer than that of a CICC and maintains the effectiveness for patients with AML undergoing chemotherapy, with an approximate fourfold lower combined risk of infection or thrombosis at 30 days.

Solid Tumor Malignancy

- Clatot, F. et al. [Randomised Phase II Trial Evaluating the Safety of Peripherally Inserted Catheters Versus Implanted Port Catheters During Adjuvant Chemotherapy in Patients with Early Breast Cancer](#). *Eur J Cancer* 2020.
 - A randomized trial of patients with early breast cancer (EBC) who were eligible for adjuvant chemotherapy. Catheter-related significant adverse events (CR-SAE) in patients with EBC are frequent but rarely impact the adjuvant chemotherapy process. Compared with PORTs, PICCs are associated with a significantly higher risk of CR-SAEs and more discomfort.
- Liu, Y. et al. [Comparison Between Arm Port and Chest Port for Optimal Vascular Access Port in Patients with Breast Cancer: A Systematic Review and Meta-Analysis](#). *Biomed Res Int* 2020.
 - A meta-analysis and systematic review of 22 articles (6 comparative studies and 16 single-arm studies) involving 4,131 cases and 5,272 controls. Included patients had breast cancer and were receiving treatment via a chest port or

arm port. This study indicated that an arm port might increase the risk of overall complications, as well as risk of catheter-related thrombosis compared to a chest port.

- Peng, SY. et al. [A Model to Assess the Risk of Peripherally Inserted Central Venous Catheter-Related Thrombosis in Patients with Breast Cancer: A Retrospective Cohort Study](#). *Support Care Cancer* 2021.
 - Study developed a model to assess the risk of PICC-related thrombosis. In their cohort, a PICC-related thrombosis occurred in 40/1,284 patients (4.1%). Multivariable analysis identified 9 variables: chronic obstructive pulmonary disease, prior central venous catheter placement, higher level of platelets, higher level of D-dimer, lower level of activated partial thromboplastin time, menopause, no prior breast surgery, upper extremity lymphedema, and endocrine therapy as a predictor for PICC-related thrombosis.
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3. Assessment of Duration of Vascular Access Device Use in Patients with Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- Create or share educational materials regarding the appropriateness of dwell time for various vascular access devices.
- Educating staff about the appropriate indications for each type of catheter supports evidence-based practice and enhances the quality of care delivered.

Suggested Implementation Strategies:

- Create and/or use guidelines based on evidence that outline the scenarios in which different types of devices would be appropriate based on length of treatment, ensuring alignment with national safety standards.
- Engage with key stakeholders, including nurses, physicians, and administrators, to secure buy-in and support for optimizing dwell type by device type,

highlighting the benefits for patient safety and cost savings.

Resources

References

General Hematology/Oncology

- Moss, J et al. [Central Venous Access Devices for the Delivery of Systemic Anticancer Therapy \(CAVA\): A Randomised Controlled Trial](#). *Lancet* 2021.
 - Open-label, multi-center randomized controlled trial of 1,061 adult patients receiving systemic anticancer treatment (SACT) for solid or hematological malignancy via PICCs vs Hickman vs Ports. The median dwell time of ports (over 350 days) was much greater than Hickman (around 160 days) and PICCs (around 120 days).
 - Skummer, P. et al. [Risk Factors for Early Port Infections in Adult Oncologic Patients](#). *J Vasc Interv Radiol* 2020.
 - Retrospective study of 1,714 patients who underwent port placements. A total of 20 patients (1.2%) had early port infections; 15 patients (0.9%) had positive blood cultures. The mean time to infection was 20 days (range, 9-30 days). The port-related 30-day mortality rate was 0.2% (4 of 1,714 patients).
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4. Assessment of Number of Lumens in Vascular Access Devices in Patients with Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- Create or share educational materials regarding the importance of the risk of complications associated with vascular access devices with multiple lumens.

- Educating staff about appropriate indications for the number of catheter lumens supports evidence-based practice and enhances the quality of care delivered.

Suggested Implementation Strategies:

- Create and/or use guidelines based on evidence that outline the scenarios in which single, double, or triple lumen PICCs are appropriate, ensuring alignment with national safety standards.
- Establish a feedback loop where healthcare workers can share experiences, challenges, and successes in reducing number of lumens to continuously improve and adapt practices.
- Engage with key stakeholders, including nurses, physicians, and administrators, to secure buy-in and support for reducing number of lumens by highlighting the benefits for patient safety and cost savings.

Resources

References

General Hematology/Oncology

- Larcher, R. et al. [Peripherally Inserted Central Venous Catheter \(PICC\) Related Bloodstream Infection in Cancer Patients Treated with Chemotherapy Compared with Noncancer Patients: A Propensity-Score-Matched Analysis](#). *Cancers* 2023.
 - A retrospective analysis examined 721 PICCs in 627 patients to evaluate risk of infection in patients with cancer treated with chemotherapy who are immunocompromised. After propensity-score matching, PICCR-BSI incidence rate was 2.6/1,000 catheter days in cancer patients and 1.0/1,000 catheter days in non-cancer patients ($p < 0.05$). However, after adjusting for variables resulting in an imbalance between groups after propensity-score matching, only the number of PICC lumens was independently associated with PICCR-BSI (adjusted hazard ratio 1.81, 95% confidence interval: 1.01–3.22; $p = 0.04$).
- She, R. et al. [Comparison of Infection Rates Between Single-Lumen and Double-Lumen Chest Ports Among Patients with Cancer: A Propensity Score Matching Analysis](#). *J Vasc Interv Radiol* 2024.
 - A retrospective analysis of 2,573 adult oncologic patients who received either a single lumen (N=841) or double lumen (N=1,732) chest port. The port infection rate of the double lumen group was significantly higher than that of

the single lumen group (0.232 vs 0.113 infections per 1,000 catheter-days; P = .001). Analysis demonstrated that use of a double lumen port was an independent risk factor of port infection (sub-distribution hazard ratio, 2.30; 95% CI, 1.33-3.78; P = .002).

Acute Leukemia/Aggressive Lymphoma

Solid Tumor Malignancy

- Fukuda, S. et al. [Use of Double-Lumen Peripherally Inserted Central Catheters for Safer Perioperative Management of Esophageal Cancer Patients](#). *J Vasc Access* 2015.
 - 40 thoracic esophageal cancer patients requiring central venous catheterization during the perioperative period were assigned to the double lumen-PICC (4.5-French, 60-cm) group or the double lumen-CICC (16-gauge, 30-cm) group, with 1:1 randomization. The secondary lumen of the double lumen-PICCs performed as well as the secondary lumen of the double lumen-CICCs with acceptable safety during the relatively short perioperative period of these thoracic esophageal cancer patients
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5. Reduce Complications Related to Vascular Access Devices in Patients with Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- Complications from vascular access device use can significantly impact patient outcomes. Focusing on reducing these complications directly improves patient safety and quality of care.
- Complications often lead to increased healthcare costs due to prolonged hospital stays, additional treatments, and interventions. Reducing complications can lead to significant cost savings.

- Utilizing evidence-based strategies and guidelines helps in standardizing care, reducing variability in practice, and ultimately improving outcomes.
- Educating staff on best practices can not only reduce complications but also reduce staff workload related to managing complications, allowing for more focus on proactive care measures.

Suggested Implementation Strategies:

- Establish evidence-based protocols for the insertion, maintenance, and removal of vascular access devices. Ensure guidelines align with national and international standards and best practices.
- Involve a multidisciplinary team, including infection control specialists, to oversee vascular access practices and provide regular feedback on performance and outcomes.
- Include patient assessments in guiding the selection of the most appropriate vascular access devices, considering factors such as the intended duration of use and patient-specific risks.

Resources

- [CDC Guidelines for Prevention of IV Catheter-Related Infections, 2011](#)
- [SHEA Strategies to Prevent Central Line Associated Bloodstream Infections in Acute-Care Hospitals: 2022 Update](#)

References

General Hematology/Oncology.

- Böll, B et al. [Central Venous Catheter-Related Infections in Hematology and Oncology: 2020 Updated Guidelines on Diagnosis, Management, and Prevention by the Infectious Diseases Working Party \(AGIHO\) of the German Society of Hematology and Medical Oncology \(DGHO\) *Ann Hematol* 2021](#)
 - Guidelines developed by a multi-disciplinary panel of 20 experts. Guidelines address definition, diagnosis, management, and prevention of central venous catheter-related infections.
- daCosta ACC. et al. [Interventions to Obstructive Long-Term Central Venous Catheter in Cancer Patients: A Meta-Analysis. *Support Care Cancer* 2019.](#)
 - A systematic review and meta-analysis of 15 observational studies and clinical trials evaluating the drugs used to treat obstructive catheter events in cancer

patients. The most common interventions used to treat thrombotic catheter occlusion in cancer patients were urokinase and alteplase. No evidence was found about the treatment for non-thrombotic occlusion.

- Farge, D et al. 2019 [International Clinical Practice Guidelines For the Treatment and Prophylaxis of Venous Thromboembolism in Patients with Cancer](#). *Lancet Oncol* 2019.
 - These guidelines were developed by The International Initiative on Thrombosis and Cancer, an independent academic working group aimed at establishing a global consensus for the treatment and prophylaxis of VTE in patients with cancer.
- Jiang, M. et al. [Risk of Venous Thromboembolism Associated with Totally Implantable Venous Access Ports in Cancer Patients: A Systematic Review and Meta-Analysis](#). *J Thromb Haemost* 2020.
 - A systematic review and meta-analysis of 80 studies with 39,148 patients with a totally implantable venous access port (TIVAP) being used for chemotherapy. Current evidence suggests that patients with cancer with TIVAP are less likely to develop VTE compared with external CVCs. This should be considered when choosing the indwelling intravenous device for chemotherapy. However, more attention should be paid when choosing upper-extremity veins as the insertion site.
- Jones, M. et al. [Catheter Associated Bloodstream Infection in Patients with Cancer: Comparison of Left- and Right-Sided Insertions](#). *J Hosp Infect* 2021.
 - Exploratory randomized control trial of 634 CVADs placed in patients aged >14 years with cancer. There were 141 CABSIs; analysis showed strong evidence of right-side allocated insertions having an increased risk of early infection by 2.5 times (95% confidence interval (CI): 1.3-4.7); however, there was no evidence of increased risk for late infection (hazard ratio: 1.06; 95% CI: 0.71-1.59).
- Lafuente Cabrero, E. et al. [Risk Factors of Catheter-Associated Bloodstream Infection: Systematic Review and Meta-Analysis](#). *PloS One* 2023.
 - A systematic review and meta-analysis of 23 studies (17 were included in the meta-analysis) that assessed the risk factors predisposing patients to CLABSI. The risk factors found to increase the probability of developing CLABSI were TPN (total parenteral nutrition), multi-lumen devices, chemotherapy treatment, immunosuppression, and the number of days of catheterization. Single lumen devices presented a lower likelihood of triggering CLABSI.

- Lv, Y. et al. [Risk Associated With Central Catheters for Malignant Tumor Patients: A Systematic Review and Meta-Analysis](#). *Oncotarget* 2018.
 - A systematic review and meta-analysis of patients with PICCs and central catheters for malignant tumors, which found that PICCs are associated with a raised risk of deep vein thrombosis (DVT), and pharmacological DVT prophylaxis drugs are a beneficial factor in decreasing the incidence of thrombosis, while warfarin may decrease the risk of mortality of malignant tumor patients with central catheters.
- Shengmiao, M. et al. [Clinical Factors of PICC-RVT in Cancer Patients: A Meta-Analysis](#). *Support Care Cancer* 2023.
 - A systematic review and meta-analysis of 19,824 patients in 19 articles. Patients included in this study had cancer and an indwelling PICC. This study systematically evaluated the clinical factors of catheter-related venous thrombosis in cancer patients with indwelling PICC, and the results showed that history of chemotherapy, tumor type, tumor stage, metastasis, use of fluorouracil, etoposide, platinum drugs, and taxane were risk factors for PICC-related catheter thrombosis in these patients. These patients should be monitored with greater care. Radiotherapy cannot be considered to be related to the formation of PICC-RVT (related venous thromboembolism).
- Wang, P. et al. [Risk of VTE Associated with PORTs and PICCs in Cancer Patients: A Systematic Review and Meta-Analysis](#). *Thromb Res* 2022.
 - This study included 22 studies with 11,940 adult patients with cancer. This study compared the rates of PORT-related VTE vs. PICC-related VTE. PORTs are associated with a lower risk of VTE than PICCs in cancer patients. The risk of VTE and benefits should be considered when selecting PORTs or PICCs for cancer patients.
- Wang, TF. et al. [Management of Catheter-Related Upper Extremity Deep Vein Thrombosis in Patients with Cancer: A Systematic Review and Meta-Analysis](#). *J Thromb Haemost* 2024.
 - This study evaluated 29 studies with 2,836 cancer patients. This study systematically evaluated the rates of recurrent VTE and bleeding in patients with cancer and catheter-related upper extremity DVT. The study reported a relatively low rate of recurrent VTE and moderate rate of major bleeding events within the first 3 months in these patients.
- Wu, S. et al. [Comparison of Complications Between Peripheral Arm Ports and Central Chest Ports: A Meta-Analysis](#). *J Adv Nurs* 2018.
 - A meta-analysis of 3,524 patients in 15 articles. Study systematically evaluated complications of arm ports compared with complications in chest

ports in patients with cancer and found that arm ports are a safe option beside chest ports for adult patients with malignancy, especially in patients with head-neck cancer or breast cancer. Patients should be well informed of the advantages and disadvantages of different vascular access devices and provided a choice.

Solid Tumor Malignancy

- Capozzi, VA. et al. [Peripherally Inserted Central Venous Catheters \(PICC\) versus totally implantable venous access device \(PORT\) for chemotherapy administration: A Meta-Analysis on Gynecological Cancer Patients](#). *Acta Biomed* 2021.
 - A meta-analysis of observational studies in epidemiology (n = 1,320); 794 receiving PORTs and 526 receiving PICCs. PORTs had fewer thrombotic complications and fewer malfunction problems than PICC devices. Unless there are specific contraindications, PORTs can be preferred for systemic treatment in gynecological cancer patients.
 - Meng, F. et al. [Incidence and Risk Factors of PICC-Related Thrombosis in Breast Cancer: A Meta-Analysis](#). *Jpn J Clin Oncol* 2024.
 - A meta-analysis of 15 articles involving 8,635 patients who underwent PICC placement for breast cancer. The incidence rate of PICC-related thrombosis in breast cancer patients was 7.0% (12.9% after correction for estimation of the specific number of missing studies). Body mass index ≥ 25 , D-dimer > 500 ng/ml, elevated fibrinogen, elevated platelet count, and catheter malposition were risk factors for PICC-related thrombosis in breast cancer patients.
 - Taxbro, K. et al. [Clinical Impact of Peripherally Inserted Central Catheters vs Implanted Port Catheters in Patients with Cancer: An Open-Label, Randomised Two-Centre Trial](#). *Br J Anaesth* 2019.
 - This randomized clinical trial evaluated the incidence of catheter-related deep venous thrombosis in 399 adult patients with cancer receiving chemotherapy through either a PICC or a PORT. PICCs are associated with higher risk for catheter-related deep venous thrombosis and other adverse events when compared with PORTs. This increased risk should be considered when choosing a vascular access device for chemotherapy, especially in patients with solid malignancy.
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6. Management of Vascular Access Devices in Patient with Cancer

Background, Rationale, and Suggested Implementation Strategies

Background/Rationale:

- Complications from vascular access device use can significantly impact patient outcomes. Standardization of maintenance practice is one tool that can reduce these complications directly improves patient safety and quality of care.
- Complications often lead to increased healthcare costs due to prolonged hospital stays, additional treatments, and interventions. Reducing complications can lead to significant cost savings.
- Utilizing evidence-based strategies and guidelines helps in standardizing care, reducing variability in practice, and ultimately improving outcomes.
- Educating staff on best practices can not only improve patient safety and comfort, but also reduce staff workload related to managing complications, allowing for more focus on proactive care measures.

Suggested Implementation Strategies:

- Establish evidence-based protocols for maintaining the various vascular access devices in patients with cancer. Ensure guidelines align with national and international standards and best practices.
- Involve a multidisciplinary team, including infection control specialists, to oversee vascular access practices and provide regular feedback on performance and outcomes.

Resources

- [Central Venous Catheters: Heparin Harms and Recommendations for Flushing \(34:18\)](#)
 - **From:** Oncology Nurses Society
 - **Presenters:** Moderator: Stephanie Jardine, BSN, RN – oncology specialist at ONS with MiKaela Olsen, DNP, APRN-CNS, AOCNS®, FAAN, clinical program director in oncology at Johns Hopkins Hospital and Johns Hopkins Health System in Baltimore, MD

- **CE Information:** None available (opportunity expired)
- **Session Overview:** In this podcast, presenters discuss the harms of heparin flushes and the latest recommendations for flushing central venous catheters.
- [Reduce and Manage Extravasations When Administering Cancer Treatments](#) (38:19)
 - **From:** Oncology Nurses Society
 - **Presenters:** Moderator: Stephanie Jardine, BSN, RN – oncology specialist at ONS with MiKaela Olsen, DNP, APRN-CNS, AOCNS®, FAAN, clinical program director in oncology at Johns Hopkins Hospital and Johns Hopkins Health System in Baltimore, MD
 - **CE Information:** None available (opportunity expired)
 - **Session Overview:** In this podcast, presenters discuss extravasation of antineoplastic agents used in cancer care and what oncology nurses need to know about administering vesicant chemotherapy.
- [What Nurses Need to Know about Central Lines and Ports](#) (49:10)
 - **From:** Oncology Nurses Society
 - **Presenters:** Moderator: Stephanie Jardine, BSN, RN – oncology specialist at ONS with MiKaela Olsen, DNP, APRN-CNS, AOCNS®, FAAN, clinical program director in oncology at Johns Hopkins Hospital and Johns Hopkins Health System in Baltimore, MD
 - **CE Information:** None available (opportunity expired)
 - **Session Overview:** In this podcast, presenters discuss preventing CLABSI (central line-associated bloodstream infections) and other best practices for central lines and ports.

References

General Hematology/Oncology

- Clari, M. et al. [Short Versus Long Timing of Flushing of Totally Implantable Venous Access Devices When Not Used Routinely: A Systematic Review and Meta-Analysis](#). *Cancer Nurs* 2021.
 - A systematic review of six articles including 1,255 patients with cancer. Low-quality evidence suggests that prolonged schedule flushing and locking intervals has no effect on catheter patency.
- Wu, XH. et al. [Prolonging the Flush-Lock Interval of Totally Implantable Venous Access Ports in Patients with Cancer: A Systematic Review and Meta-Analysis](#). *J Vasc Access* 2021.

- A systematic review and meta-analysis of 4 studies including 862 patients with cancer. The study evaluated studies of flush intervals less than 4 weeks versus longer than 4 weeks for patients who completed chemotherapy. Extending the flush interval to longer than 4 weeks is safe and feasible. Based on previous studies, extending the flush interval to 8 weeks might not increase the incidence of total complications and catheter occlusions. However, there is no conclusion on whether the flush interval could be extended to 3 months or longer.
- Wu, XH. et al. [Heparin versus 0.9% Saline Solution to Maintain Patency of Totally Implanted Venous Access Ports in Cancer Patients: A Systematic Review and Meta-Analysis](#). *Int J Nurs Pract* 2021.
 - A systematic review and meta-analysis of 4 studies including 2,652 patients with cancer that evaluated whether saline solution could replace heparin solution in adult cancer patients with totally implantable venous access ports (TIVAPs). The study found that saline solution can replace 50 or 100 U/ml of heparin as a safe and effective flush solution for TIVAPs.
- Xiong, ZY. et al. [Prolonged Flushing and Locking Interval for Totally Implantable Vascular Access Device: A Systematic Review and Meta-Analysis](#). *J Vasc Access* 2021.
 - A systematic review and meta-analysis of 14 studies including 2,488 patients with cancer who retained a port after the completion of chemotherapy or during the intermission of chemotherapy. The study compares flushing duration of ports (every four weeks vs. more than four weeks). The study found that longer flushing intervals for ports are safe.

Acute Leukemia/Aggressive Lymphoma

- Qian, H. et al. [Predisposing Factors and Effect of Bundle Nursing in PICC-Related Upper Extremity Deep Venous Thrombosis in Patients with Non-Hodgkin's Lymphoma Undergoing Chemotherapy](#). *Am J Transl Res* 2021.
 - 370 non-Hodgkin's Lymphoma patients undergoing chemotherapy randomized into two groups; those that received bundle nursing (observation group) and those that received routine nursing (control group). The incidence of PICC-UEDVT was lower in the observation group (18 patients, 9.73%) than that of the control group (35 patients, 18.92%; $P < 0.05$); the satisfaction rate towards nursing was higher in the observation group than the control group ($P < 0.05$).

Solid Tumor Malignancy

- Lang, T. et al. Is [There a Relationship Between Frequency of Port-Care Maintenance and Related Complications in Patients with Cancer](#). *JCO Oncol Pract* 2022.
 - 1,059 patients oncology and hematology patients were enrolled. No difference was observed in the overall percentage of ports removed because of physician-reported complications across all cohorts (25% - 30%). No change in the incidence of port-related complications including suspected infection and malfunction was observed between cohorts 1 and 2 (flushes every 4 to 8 weeks) and cohort 3 (flushes every 12 weeks) (8% and 5% respectively).