Welcome to the fifth edition of Knowledge Notes!

The Franciscan Northwest Physicians Health Network (FNPHN) is bringing Knowledge Notes to you as an educational resource. Each edition will provide a variety of short articles on a particular clinical topic. This Summer Edition, we are looking at Peripheral and Central Line Management.

Knowledge Notes is produced by the CHI Franciscan Health Education Services Department, with guidance from the CCN Clinical Education Ad Hoc Subcommittee, and is intended to support our partner organizations in the delivery of excellent patient care in the post-acute care setting.

Over time, the FNPHN website (www.fnphn.com) will become a convenient repository of information and learning that you and your fellow employees can freely access 24/7/365. We are always looking for feedback about how we are doing, so please give us feedback at zenafuhrmann@chifranciscan.org

Once again, welcome to the fifth edition of Knowledge Notes.

Zena' Fuhrmann MN, RN, CCRN, Clinical Nurse Educator, Education Services, CHI-FH

John Mueller MHA, RN, Division Director, Clinical Education, CHI Franciscan Health

Knowledge Notes

Table of Contents

Peripheral and Central Intravenous Management

Intravenous (IV) catheters and central line catheters or Central Venous Access Devices (CVAD) are commonly ordered for in-hospital settings, they are less likely to be routinely ordered and placed in the post-acute setting. For this reason a review of the highlights of each modality will be presented. First let's review the peripherally placed IV catheter.

Peripheral Intravenous Site Management

Peripheral venous access is an intervention that most nurses have been taught/learned at some point in their career and therefore is most likely to be more common in the post-acute setting. It is, however, less common than in the in-patient setting. Hands on training will never be replaced by a hand out and therefore this document shall serve only as a refresher or reference for a skill that one has already been introduced to. When an IV has been ordered by the provider there are basic considerations and steps that should be taken. The following are lists to consider in the event an IV is to be placed on your patient.

Vein and site selection*:

- Use veins located on the dorsal (back) and ventral (belly) surfaces of upper extremities (cephalic, basilic, or median veins)
- Start with the most distal site in the non-dominant arm, when possible
    - Do not shave site with a razor, rather clip arm hair with scissors, if needed
- Avoid the following due to risk of complication:
    - Areas with pain, infection, or wound
    - Areas previous affected by stroke, mastectomy, or paralysis
    - Areas that are below previous venipuncture sites
    - Veins in the antecubital fossa or inner wrist
    - Sclerosed veins or veins that feel hard upon palpation
    - Infiltrated site or phlebotic vessels
    - Bruised areas

*Adopted from Elsevier, Clinical Skills

Cephalic, basilic, and median cubital veins are best for IV placement in adults.

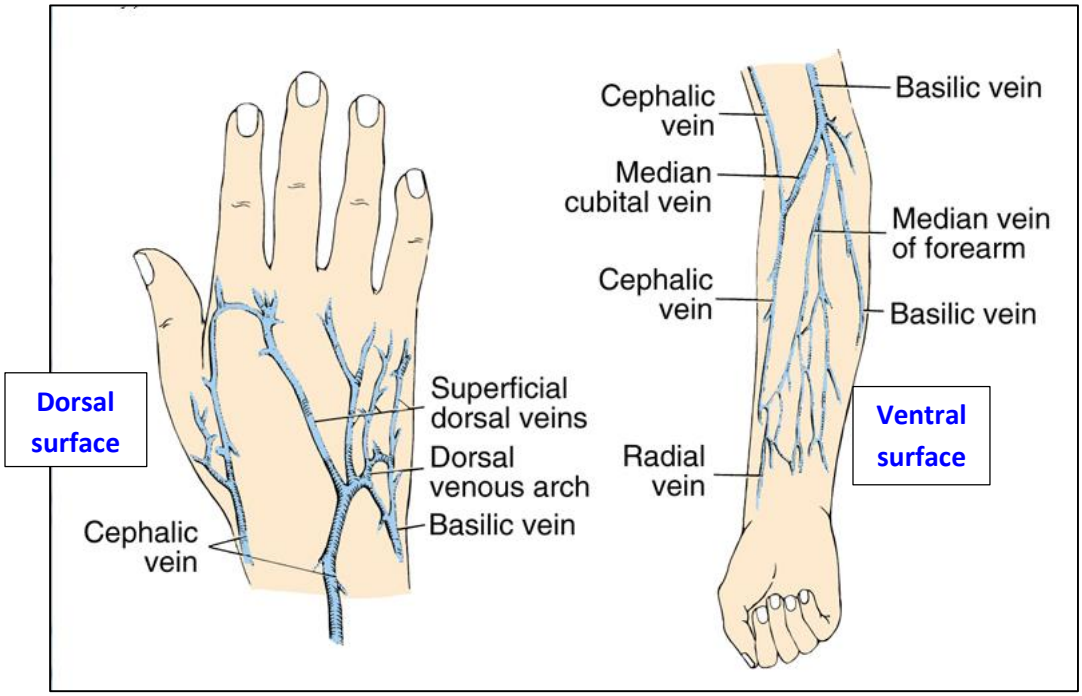


Figure 1. Courtesy of Perry, Potter, and Ostendorf (2014)

Successful intravenous (IV) starts are accomplished more easily when the vessel is fully dilated. There are several techniques for assuring that the vessel is fully dilated. A common technique is to apply a warm pack or washcloth to the general area, heat causes vasodilation and the vessel thereby enlarges. Another common technique is to lower the extremity into a dependent position, gravity will fill the vessels and again provide a larger target for an IV start.

Knowing which IV catheter to choose is as important as knowing physically how to start an IV. Select a catheter of the smallest gauge and length possible that will meet the demands of the therapy. For example, will the IV be used for administering blood products? Is the patient severely dehydrated and needing rapid fluid administration? Does the patient have small fragile veins?

Knowing the best placements sites and areas to avoid is essential. Contraindications for insertion:

- Dialysis access sites, if future dialysis site to be placed – avoid that arm entirely
- History of mastectomy

- History of trauma or impaired venous drainage to extremity
- Prior history of IV complications

Other things to consider:

- Is the patient is likely to try to discontinue the IV
- Hand dominance (right or left handed)

Starting a peripheral IV*:

- Check for presence of radial pulse
- Open all sterile packaging using sterile technique
- Apply flat tourniquet around arm above antecubital fossa and above proposed insertion site, positioned over a thin layer of clothing such as a gown sleeve to protect fragile skin
    - Apply tourniquet in a manner that prevents circulation impairment
    - If a patient bruises easily, is at risk for bleeding, or has compromised circulation, avoid using a tourniquet or apply one loosely
    - To avoid injuring or bruising the skin, do not apply the tourniquet too tightly
- Reposition the tourniquet lower down the arm to access a vein in the hand or lower arm.
- Option: If using a blood pressure cuff instead of tourniquet, inflate cuff to a level just below patient's normal diastolic pressure (less than 50 m Hg). Maintain inflation at that pressure until venipuncture is completed

Cleaning the site prior to insertion

1. If the skin is dirty – use soap and water, allow to dry
2. Use an antiseptic to prepare the site for insertion. (Apply all of the following solutions for 30 seconds and allow the solution to dry completely):
    a. Chlorhexidine-based antiseptic is "the standard of care for infection prevention because of its efficacy, safety, and long duration." A concentration of greater than 0.5% Chlorhexidine (CHG) skin preparation with alcohol is a category 1A recommendation. (ChlorhexidineFacts.com)

i. Chlorhexidine gluconate works by destroying the bacterial cell membrane and precipitating cell contents.
ii. It has an effective bactericidal action against a wide range of gram positive and gram negative bacteria. Organic material (blood and pus) have little effect on the CHG. There is an insignificant effect on tubercle bacilli/ it is less active against fungi, however is active against many viruses.

b. Tincture of iodine in some studies was shown to have a lower contamination rate than Chlorhexidine, however, not at a statistically significant rate.
   i. In most cases Chlorhexidine was found to be safer (due to the potential of toxicity in repeated use), less expensive, and preferred by staff.
   ii. To be effective it must remain on the skin for at least 2 minutes

c. 70% alcohol as an antiseptic is known to inhibit bacteria growth on the skin, it serves as a fat solvent, and it denatures protein
   i. It is effective against most of the "gram negative and gram positive organisms, tubercle bacilli, and many fungi and viruses (including HIV). But it is not effective against spores." (INS)
   ii. Kills bacteria within 2 minutes

d. Povidone-iodine 1% to 2% - which is iodine mixed with other substrates that act as carriers to produce a substantial release of iodine thereby allowing for longer germicidal action.
   i. Contact of 2 minutes is required due to its weaker nature than tincture of iodine
   ii. The effects of Povidone-iodine are neutralized by biologic materials such as blood and pus

Securement of the catheter

Securing the IV catheter in place is important for many reasons. The health of the vessel that has been cannulated depends on maximal stabilization of the catheter preventing movement and therefore interruption of the intima causing phlebitis. Phlebitis is an

inflammation of the intimal lining of the vessel. Additionally, patients may forget that they have an IV catheter in their arm and attempt to remove the irritant, causing the need for another IV start.

Options for securement:

- Manufactured catheter stabilization device
    - Use skin protectant wipe and allow to dry
    - Slide device on to the hub, holding catheter in place, peel off first one half of the liner and then the next half
    - Cover IV site with transparent or gauze dressing

- Sterile transparent dressing
    - Avoid taping over the transparent dressing to prevent accidental discontinuation if dressing needs to be replaced
- Sterile gauze dressing
    - Place (narrow) piece of sterile tape over the catheter hub
    - Use 2 x 2 inch sterile gauze pad to cover insertion site, tape around all four edges of dressing
    - Do not place tape over the insertion site, observation of insertion site is necessary
    - Do not tape or wrap around the arm

Pictures Courtesv of Perrv & Potter

Regardless of type of securement, a taped loop of tubing will help to secure the device even more and prevent unnecessary pulling on the IV site.

Before considering the bedside procedure as completed, label the dressing with the information defined by individual organization standards. Commonly used label information includes: insertion date, size and length of IV catheter, and initials of the person starting the IV.

Finally, document in the medical record.

Dressing changes

The Infusion Nurses Society (INS) suggests that site care frequency is defined by the type of dressing:

- Transparent dressings should be changed every 5-7 days
    - Outperforms gauze dressings at 72 hour mark
- Gauze dressings should be changed every 2 days.

Common Complications of Peripheral IV sites

Infiltration – occurs when the IV fluids or medications leak into the surrounding tissues. This can occur because of poor insertion technique, not realizing that the catheter is not in the vessel, or because of fragility of the vessel over time. Prevention may be possible by choosing sites that avoid areas of flexion, frequent observation, and patient education.

Observe the site for:

- Discomfort, swelling around the site,
- Coolness at the site
- Blanching
- Diminished IV flow rate or IV Pump alarm due to increased pressure sensing

Management:

- Stop the infusion, restart in the other extremity, and then discontinue the device
- Warm or cool compress, dependent on what has infiltrated
- Check the patient's circulation for compromise
- Elevation to decrease swelling, realizing that the fluid will move to a more dependent position
- Document findings and actions

Extravasation – occurs when vesicant drugs are leaked into the tissue. This can lead to severe damage to the tissue: tissue necrosis, loss of function, infection, delayed healing, and potential need for amputation. Prevention is key. Avoid small fragile vessels for known vesicant drugs. Vesicant drugs include, but are not limited to: digoxin, dopamine, promethazine, hydroxyzine,

and antineoplastic drugs. Use of central lines decrease the adverse outcomes associated with these medications.

Observe the site for:

- Blanching, burning, and pain at the site
- Blistering may occur at the site and follow the vein up the extremity
- Cool skin at the site

Management:

- Stop the IV
- Before discontinuing the IV, determine if treatment will include injection through the catheter. If not needed, discontinue
- Administer designated antidote that may provide a benefit (per order or policy)
- Continue frequent observation to observe for increasing adverse effects, including: sensation, motor function, and circulation
- Apply warm or cool compresses per manufactures recommendation and provider agreement
- Document findings and actions. Include site identification with size of observed blanching, discoloring, and/or swelling. Be sure to identify the presumed vesicant drug name.

Phlebitis – inflammation of the vein. This is frequently the cause of administration of drugs that have pH values above or below the normal blood pH. Phlebitis can also be caused by vessel trauma during insertion, prolonged use of the vessel, and too large of IV catheter for the size of the vessel. Prevention is accomplished by using proper insertion technique, being familiar (or looking up in a reference) with administration instructions, and frequent monitoring of IV site.

Observe the site for:

- Swelling around the site
- Redness, tenderness, or warmth

Management:

- Stop the infusion
- Apply a warm compress to the site
- Restart in a different location, if signs and symptoms do not quickly dissipate
- Document in the medical record

Infection – any time there is a break in the integrity of the skin, a point of entry for unwanted bacteria is created. The IV site allows for the potential of local or even systemic infection. Prevention can be facilitated by all who have come into contact with the site to actively participate in hand hygiene practices, the use of gloves, and of course aseptic technique during insertion or dressing changes. As already discussed appropriate site preparation with some form of antiseptic within the guidelines outlined for use encourages bactericidal activities. Finally, any time an injection port will be accessed, ports **must** be cleaned.

Observe the site for:

- Redness or discharge from the IV site
- Temperature elevation may also be an indication for those with intact immune systems

Management:

- Stop the infusion and notify the provider
- Remove the IV catheter and culture both the IV site and the catheter, if ordered
- Administer medications ordered by the provider
- Continue to monitor vital signs with a critical eye

How often should the IV site be rotated?

As of 2011 the INS has recommended that peripheral IV site rotation be based on *clinical indications*, effectively eliminating the previous recommendation for time specific rotation. Routine assessment of the IV site should include patient condition, skin and vein integrity, assessment of need (length and type of prescribed therapy), and specific indicators of infiltration, phlebitis, extravasation or infection (as described above).

General Information for Peripheral and Central Lines

Safety Considerations

- Assess vascular access device patency prior to any parenteral medication.
- Use a new IV catheter for each insertion attempt in order to maintain sterility
- Limit attempts to 2 per nurse, request another nurse for further attempts
- Do not reinsert the stylet into the catheter once it has been loosened and pulled back
- Maintain sterility at the end of the catheter by not touching the point of entry at the connection of the catheter and tubing or T-connector
- Determine pH of medications:
    - Normal blood pH is 7.35 – 7.45
    - Alkaline pH is 7.0 – 14.0
    - Acidic pH is 0.0 -7.0
    - Common drug pH levels:
        - Dilantin pH = 10.0 – 12.3
        - Heparin pH = 5.0 – 7.5
        - Potassium chloride pH = 4.0 – 8.0
        - IV solutions = 3.5 – 6.2
- Safe nursing practice must always include verification that the provider orders match:
    - Right patient
    - Right IV medication/solution
    - Right rate that the medication/solution will run
        - Is the medication/solution ordered as a “Bolus” or Push”
        - Verify that the solution is dripping at the ordered rate if by gravity
        - Verify that the medication/solution is programmed to run at the ordered rate
        - If more than one medication/solution is running - follow all tubing from bag to insertion site to verify appropriate connections (not loose) and compatibilities if running together
    - Right documentation

Hand Hygiene

Hand hygiene is, without a doubt, the one thing that is recommended as beneficial in all arenas. Can you think of a time when hand hygiene in a general sense is without merit? After using the restroom (what about before using the restroom?), when doing a sterile procedure, when picking up a newborn baby, before putting in your contacts, before starting/caring for a peripheral IV site? Obviously, the indications for hand hygiene list would fill this page and many more. The point is that there is a huge need to do hand hygiene to decrease the spread of pathogens. The video below (follow the blue link) demonstrates the World Health Organizations (WHO) approved "Hand Washing Technique". Start the video by pointing at the words and following the directions.

Hand Hygiene video

Many excuses for not doing hand hygiene can be used. However, infection rates within healthcare organizations point to the fact that we, as a whole, do not take hand hygiene seriously enough. What if it was someone we loved – would we be more concerned with people doing hand hygiene and doing it effectively? To view video, push the Ctrl button and click.

Patient and Family Education

It goes without saying that the more education we provide to our patients, the more involved in their care they can be. Clear and learner-level (rather than medical jargon) education can facilitate the interventions and treatments that have been prescribed and initiated. Refer to Knowledge Notes - Summer 2015 for a refresher on "Teach Back", recall that this is an important part of assuring that your patient/significant others understand the education that you have been presented.

1. Offer the patient and family an explanation of the procedure and the equipment to be used
2. Always use language that is understandable by the patient population that you are educating

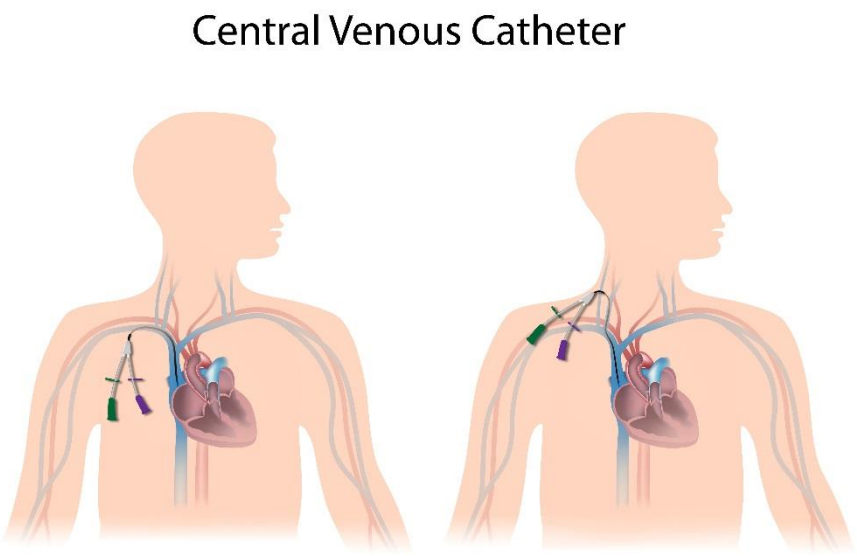
3. Explain to the patient and family why the IV or central line is needed and the IV fluids and/or medications that will be infused through it
4. Provide them with the expectations that they should expect from the staff
    a. Hand hygiene at every approach to the peripheral or central device
    b. Expected site care – dressing changes, site rotation, etc.
    c. Signs and symptoms of complications
5. Educate the patient and family on their role in prevented infections
    a. Hand hygiene
    b. Leave the site of the central line untouched
6. Instruct the patient and family to notify staff if they become aware of potential complications or adverse reactions
7. Offer assistance/call bell for when the patient desires to get out of bed or ambulates to prevent accidental discontinuation of IV site or accidental falls
8. Encourage the patient and family to ask questions as they arise – there is no such thing as a "dumb question"

Central Line (CVAD) Management

One may have patients with Central Venous Access Devices (CVAD) within their care. It is important to understand the benefits, functions, and care of these catheters. Many different entry sites can be used for insertion, but the end point is always the same. Where the catheter tip ends, when appropriately placed, is the benefit of your patient having this device.

In the picture below one can identify that the end of the catheter is just outside of the right side of the heart in the Superior Vena Cava (SVC). Some references indicate that the tip can end in the right atrium, however this is likely to cause irritation to the atrium and produce atrial arrhythmias and should be avoided. If the patient is new or there is cause to think the catheter may have been pulled out some for any reason, catheter tip verification should be confirmed prior to infusion of toxic or vesicant medications. This verification can be easily accomplished by review of the Chest X-ray report, confirmation should only be confirmed by a

provider or radiologist. As an example, Total Parenteral Nutrition (TPN) can **only** be given if the tip of the catheter is located in the SVC.



Insertion sites can vary between the internal jugular vein in the neck, subclavian vein located under the clavicle, femoral vein in the groin (not a preferred site), or in the arm above the antecubital area for a Peripherally Inserted Central Catheter (PICC). Remember that regardless of the insertion site the catheter tip should end in the SVC.

Prior to each use of the CVAD the RN should assess for:

- Resistance to flushing by attempting to flush with a 10 ml syringe of saline (requires effort to push the flush solution into the catheter)
- Absence of vein distention, edema, and/or pain in the head, neck, or arms
- Absence of redness, tenderness, drainage, warmth, or swelling at the entry site
- Dry and intact dressing

Central venous catheters have the potential to allow harmful bacteria to enter into the circulatory system, as well as, influence a local infective process. For this reason, caregivers must consider a daily review of need – Do we continue to need the catheter for any of the following reasons:

- Long-term antibiotic therapy
- Total Parenteral Nutrition
- Long-term medications
- Chemotherapy
- Caustic drugs, prone to cause phlebitis in peripheral veins, (vancomycin, zosyn, meds with pH <5 or >9, or osmolality >600)
- Other reasons that peripheral access is realistic

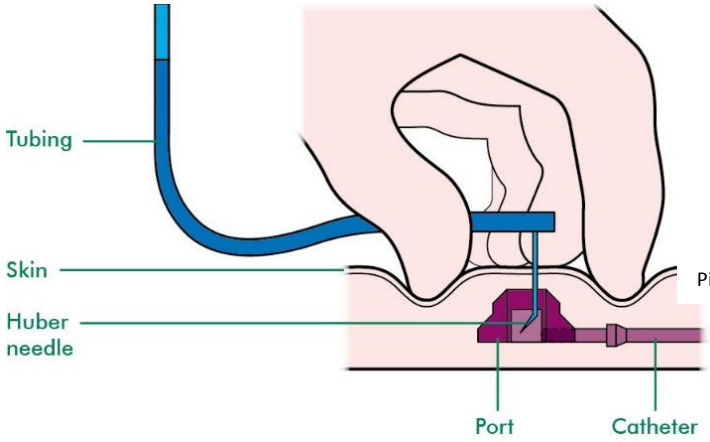
Administration of Medications

Medications can be administered through the needleless access ports on the tubing:

- After confirming initial tip location
- After confirming that the catheter flushes without resistance (using a 10ml or greater syringe of saline)
- After the access port on the tubing has been cleansed with an antiseptic
    - Minimize contamination risk by scrubbing the access port with an appropriate antiseptic (Chlorhexidine, 70% alcohol, povidone iodine, or an iodophor)
    - Vigorously scrub the needleless connector or hub for **15 seconds** every time you make or break a connection
    - Give medication within the recommended administration delivery time
    - Flush with saline 10 ml (exception is the BARD Hickman catheter that may require flushing with heparin – check orders)

Implanted Ports

Implanted ports (IP) are a CVAD that have a small reservoir under the skin and are accessed when needed with a non-coring needle. Infection control practices are the same as for any vascular access device, but in this case the access point is through the skin covering the implanted port.

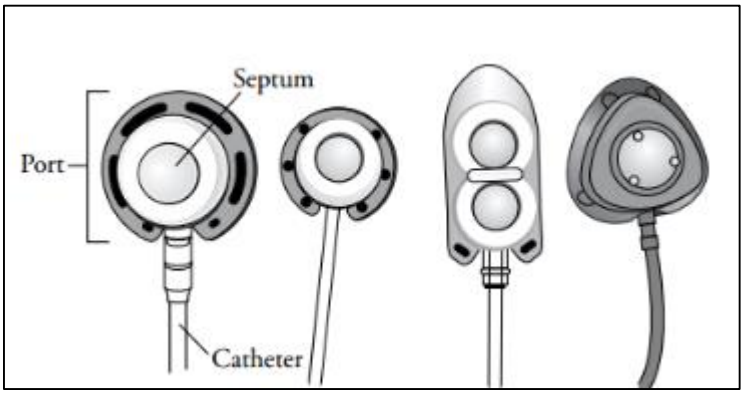


Picture courtesy of Macmillan

Dressing changes for CVADs are routinely done:

- Any time the dressing is not intact
- Every 2 days for gauze dressing
- Every 7 days for intact transparent dressings

After training has occurred for accessing, management, and de-accessing the IP, the trained nurse will typically de-accessed and re-accessed the port every 7 days or when it is no longer needed. Individual facility policies should always be referenced for guidance in the management of IP. Depending on the type of port and whether it is valved or non-valved heparin may be used to "block" the port. Blocking may be routinely done every month so that the port does not clot and become unusable. If Heparin is used, it is routinely aspirated **prior** to injecting or flushing the port.



Picture courtesy of Sloan Kettering

Implanted ports come in various sizes and shapes. The pictures above illustrate the basic components of the IP, a dual lumen IP, and on the right side a PowerPort. The Power Port can be used to inject contrast media for imaging studies, with pounds per square inch (PSI) up to 300. Notice that the outside shape (triangular) of the IP varies from the typical round shape and is used to distinguish it as a power injectable port.

Chlorhexidine dressing/patch to decrease infections

Catheter related blood stream infections (CRBSI) are one of the major concerns when a patient has a central line. These infections, when they occur, can result in increased costs, increased lengths of stay, and in increased risk of death. One of the means by which healthcare organizations are attempting to combat the infection rate is through the use of a Chlorhexidine impregnated dressing. Several products are available for use, as well as, a variety of sizes.

BioPatch

Picture from 3M Tegaderm CHG Gluconate dressing

Total Parenteral Nutrition (TPN)

Total parenteral nutrition may be provided to a patient that for some reason is unable to be fed via the gastrointestinal route, by oral intake, feeding tube, percutaneous endoscopic gastrostomy tube (PEG) or jejunostomy tube. In years past this nutrition, consisting of a high content glucose, amino acids, lipids, vitamins, and trace elements, was called *hyperalimentation*. TPN can ONLY be given through a central line due to its pH and high osmolality, and is avoided if possible due to the markedly increased risk of infection. It should not be confused with PPN which is peripheral parenteral nutrition and has a lower concentration of glucose and amino acids. “Any solution with a final glucose concentration

exceeding 10% and an osmolality of greater than 600 mOsm" must be delivered through a central line.

Key elements of TPN:

- Vein sclerosis if not delivered into a large central vein
- Inspect solution for particulate matter – do not infuse if it does not disappear with inverting the bag several times
- Dedicate an IV line exclusively to the TPN
    - Do not draw blood samples
    - Do not piggyback other solutions or medications
- Do NOT Interrupt the TPN infusion for any reason
    - High concentration of glucose
        - May have insulin in bag
        - Stopping the infusion may cause a serious drop in the patients' Blood Glucose
- Monitor patient Blood Glucose at least every 6 hours
- Use strict aseptic technique when changing tubing or filters
    - Change IV tubing every 72 hours for TPN
    - Change every 24 hours for lipid emulsions
    - Change immediately for suspected contamination
- Monitor and report any fever, elevated white blood count, or signs of infection
- Routine patient monitoring should include fluid balance assessment every 8 hours, weights

Conclusion

This document serves only as a guide and cannot replace your facility policies. Feel free to use the information and references to further your understanding of peripheral and central catheters, but do not forget the stuff in the middle that gives sound guidance for providing safe care to all of your patients.

Addendum A

VOCABULARY for Central Lines*

Central Venous Access Device (CVAD): A catheter whose tip is located in the superior or inferior vena cava. These devices may be used for blood draws and infusion and solutions such as TPN, chemotherapy, blood and blood products, antibiotics, and other medications.

Tunneled CVAD: Central line that is surgically inserted into a patient's chest. It is tunneled under the chest tissue after it exits from the vein so that the exit site at the skin is a distance from its exit from the vein. Near the exit site, the catheter is surrounded by a Dacron cuff, which allows tissue to grow into the material forming a seal against microbes and anchoring the catheter to minimize the risk of dislodgement. Due to scarring that anchors the cuff, removal of the tunneled catheter is generally a procedure performed by a physician, PA, or ARNP.

Non-tunneled Catheters: Non-tunneled CVAD's are large-bore catheters inserted in the subclavian, jugular or femoral vein. From 6-8 inches long, they can have from one to four lumens. Because they can be inserted quickly and can handle any kind of I.V. therapy, as well as blood collection, non-tunneled CVAD's are especially useful in an emergency.

Valved Catheters: a valved catheter has a specially designed valve that when fluid is introduced, positive pressure pushes the valve open to allow fluid to flow into the blood stream. The tip can also be opened with negative pressure created by a syringe. When negative pressure is applied the valve opens inward thus allowing the catheter to be used for drawing blood. When no pressure is applied the valve remains closed, this keeps blood from entering the end and forming a clot. The patient is protected from air emboli because the tip does not transfer the negative pressure in the chest to the catheter's lumen. Valved catheters do not require clamps.

Non-valved catheters (open-ended catheters): catheters that do not have a valve and therefore must have a clamp. These catheters have a greater risk of embolism if the end cap or tubing is opened.

PICC – Peripherally Inserted Central Catheter: A catheter used for lone term intravenous access and inserted into the basilic or cephalic vein just above or below the antecubital space with the tip of the catheter resting in the superior vena cava.

Implanted Ports: CVAD reservoirs implanted beneath the skin and accessed with a special non-coring needle for infusion or blood sampling.

Power Injectable Central Venous Access Device: Catheters that can be used for power injection of contrast media; they are designed to accommodate a higher PSI (pounds per square inch). Some examples of these types of CVADs are Power Ports, Power PICCs, and BARD Trialysis catheter with a power injectable third lumen. The catheter must be correctly identified as

power injectable to be used as a power injectable catheter, quite often the lumen is purple and states “Power” on it, 5ml/sec max.

Central Line Associated Blood Stream Infection (CLABSI): A laboratory confirmed bloodstream infection (BSI) in a patient who had a central line within the 48 hours period before the development of the BSI and that is not related to an infection at another site.

*Obtained from CHI FH Policy 910.00

References

BD. (2015). Layers of the Vein: Better Care, Better Outcomes. https://www.bd.com/infusion/products/ivcatheters/clinical_expertise/pdfs/clinical_brochure2.pdf

Bernatchez, S. (2014). Care of peripheral venous catheter sites: advantages of transparent of film dressing over tape and gauze. Journal of the Association for Vascular Access. Vol 19, Issue 4,doi: 10.1016/j.java.201.09.001

Catholic Health Initiative. (2016). Central Venous Access Device (CVAD) Tunneled and Non-Tunneled Management Policy. Policy 910.00 restricted access

Clinical Microbiology. (2004). Comparison of chlorhexidine and tincture of iodine for skin antisepsis in preparation for blood sample collection. May; 42(5): 2216–2217. doi: 10.1128/JCM.42.5.2216-2217.2004

Healthline. (2013). Intravenous medication administration. http://www.healthline.com/health/intravenous-medication-administration#Definition1

Infusion Nursing Standards of Practice http://www.ins1.org/i4a/pages/index.cfm?pageid=3310

Josephson, D.L. (2004). Intravenous Infusion Therapy for Nurses. https://books.google.com/books?id=E0fA9G-meIkC&pg=PA79&lpg=PA79&dq=Tincture+of+iodine+or+70%25+alcohol+for+IV+sites&source=bl&ots=quPfV28wMl&sig=BH0EHjfNDBdPaQLGJeae49nMH98&hl=en&sa=X&ved=0ahUKEwjU6quE__DMAhVk6oMKHWf-DPEQ6AEIIzAD#v=onepage&q=Tincture%20of%20iodine%20or%2070%25%20alcohol%20for%20IV%20sites&f=false

Lippincott Nursing Center. http://www.nursingcenter.com/ncblog/february-2015-(1)/complications-of-peripheral-i-v-therapy

Memorial Sloan Kettering Cancer Center. (2016). Your implanted port. https://www.mskcc.org/cancer-care/patient-education/your-implanted-port

Pedagogy. (2014). Total Parenteral Nutrition or TPN administration and education. http://www.pedagogyeducation.com/Main-Campus/Student-Union/Campus-Blog/February-2014/Total-Parenteral-Nutrition-or-TPN-Administration-a.aspx

Perry, A.G., Potter, P.A., Ostendorf, W.R. [2014]. *Clinical nursing skills & techniques* [8th ed.]. St. Louis: Mosby.)

pH of various things http://sjheducation.weebly.com/uploads/8/0/5/5/8055457/piv_rn_education_webpage_version.pdf

Knowledge Notes

Certificate of Completion

My signature on this Certification of Completion confirms that I have completed reading the 5th edition of Knowledge Notes and have identified how this information may be applied and/or can be used in the care of my patients.

Print Name _____

Signature _____

Date _____