Vascular Access in Hospitalized Patients

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KEYWORDS

• Vascular access • Peripheral IV • Central venous catheter • Intraosseous catheter • Tunneled catheter • Vascular access complications

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Vascular access is the placement of a plastic cannula into a vein for infusion of fluids, medication, blood product, or nutrition.
2. There are several different types of vascular access, designed to last a few days to years, depending on the indication for their use.
3. Peripheral access refers to access placed in the vasculature of the arm, below the axilla, lasting for up to 5 days, and with limitations on the medications that may be infused.
4. Central access refers to the cannulation of a vein with the tip of the catheter threaded to the cavoatrial junction.
5. Tunneled lines are placed by interventional radiology or in the operating room, have a lower incidence of infection, and are meant for long-term usage.
6. Implanted ports are central venous catheters with a hub implanted subcutaneously and accessed when needed, generally used for infusion of chemotherapy. These types of lines have the lowest associated infection rates.
7. Complications of central venous access can be life threatening (hemothorax, pneumothorax, vascular injury, central line–associated bloodstream infection [CLABSI]).
8. Adherence to CLABSI safety bundles is recommended for prevention of life-threatening bacteremia and sepsis.

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DEFINITIONS

What is vascular access?

Vascular access can be defined as the placement of a catheter into the vein of a patient to allow for the infusion of fluids, medication, blood products, nutrition, chemotherapy, or for use in hemodialysis. Indications for vascular access determine the type of device used. Vascular access can be obtained peripherally (in the hand, forearm, antecubital fossa, or upper arm) or centrally (catheter tip terminating just proximal to the right atrium).

EPIDEMIOLOGY

Why is vascular access important to hospitalists?

In the United States, it is estimated that more than 200 million peripheral intravenous (IV) catheters (PIVs) and approximately 5 million central venous catheters (CVCs) are inserted each year.[1,2] Most patients end up with some type of IV access device during their hospitalization. As hospitalists, it is important to know the indications, contraindications, and safe use of the various types of devices. In addition, central line placement is one of 9 core competencies for hospitalists delineated by the Society of Hospital Medicine, accompanied by lumbar puncture, electrocardiogram and chest radiograph interpretation, arthrocentesis thoracocentesis, and abdominal paracentesis, intubation, and ventilator management.[3]

PERIPHERAL INTRAVENOUS ACCESS

What are the different types of peripheral access?

Peripheral Intravenous Catheters

Peripheral IV catheters (PIVs) are small plastic catheters that are introduced into the venous vasculature of the hand, forearm, or upper arm of the patient. The catheter is usually approximately 5.0 to 7.5 cm (2 to 3 inches) in length and can vary in gauge size from 14 gauge to 24 gauge, with the smaller number indicating larger catheter size. When referring to large-bore PIV, the size is generally 18 gauge or larger. Smaller bore access does not allow for rapid infusion of fluids.[4] A PIV placed in the external jugular vein can be considered a peripheral line in that it terminates distal to the central vasculature. These types of IV lines are used as temporary access when it is difficult to obtain access in the upper extremities. Often these patients require central access should duration of treatment be longer than a few days.

Midline Catheters

A midline catheter is considered a peripheral catheter, in that it is not introduced into the central vasculature, but is inserted percutaneously into a larger vein in the arm, either the basilic or cephalic vein.[5] These lines are generally able remain in place for longer periods of time than shorter PIVs, and are generally longer (up to 20 cm), but do not enter the central vasculature. These types of IV catheters are inserted under ultrasonography guidance (**Fig. 1**).