

# Clamping: Required sequence or patient safety?

## Introduction

All centrally placed catheters, with the exception of some valved catheters, are sold with clamps placed on each catheter lumen. Most peripheral IV extension sets also come with clamps, particularly those used for intermittent therapy. Clamps are provided so the line can be clamped off when not in use as a safety precaution. This is a common nursing practice, which dates back nearly 50 years.

## Why clamp?

Patients and personnel are placed at risk when catheter ports are not properly sealed, such as when sites are left uncapped (*open port systems*), unclamped or possibly when connectors are inadvertently removed or loosened during use. The consequences of a catheter port being left open, especially one connected to a central venous catheter, are potentially fatal. An open port could result in the following:

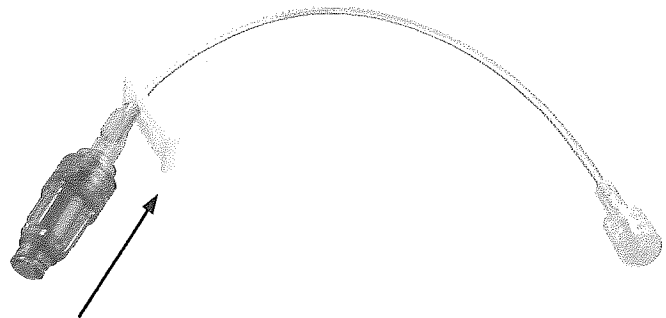
- Air embolism
- Blood loss—exsanguation
- Contamination

An air embolism is caused by the entry of a bolus of air into the vascular system. Forceful contractions cause small air bubbles to break loose from the air pocket and they are pumped into the pulmonary circulation. This creates an obstruction to forward blood flow, resulting in tissue hypoxia and diminished cardiac output, which can lead to shock and death.

Blood loss can occur when a connector is: inadvertently disconnected from the catheter lumen, cracked or broken during use and/or failed during use and the catheter lumen is not clamped. Depending on the patient's venous

pressure, the location/vein chosen for catheterization and the catheter size, the resulting blood loss can be mild to severe.

Contamination can occur when the blood loss described above spills on the patient, patient's bedding and floor. Healthcare workers will be exposed to potential blood-borne pathogens.



Clamps are provided for patient safety

## The following are some of the nursing practice standards that recommend clamping:

- "Manual clamping of the set between the injection site and the catheter or clamping of the catheter itself will prevent both gas embolism and blood loss."<sup>1</sup>
- "Open-ended PICCs are also in wide use. Open-ended PICCs must be clamped when not in use."<sup>2</sup>
- "Many institutions and agencies believe that clamping the catheter provides protection from venous air emboli if the needleless connector were to become loosened or completely removed. Positive and neutral displacement connectors can be clamped after syringe disconnection to enhance patient safety."<sup>3</sup>

- "Care of a neutral connector does not require a clamping sequence, so the nurse should simply clamp when not in use for patient safety."<sup>4</sup>
- "The use of CVCs are common in intensive care; however, there are occasions where a CVC lumen or section of a multiflow adapter may not be in use. This can create opportunities for problems to develop such as: 1) air embolism if disconnection occurs; 2) reflux of blood that can contribute to blockage of the lumen and 3) admixture or reflux of intravenous fluids. For these reasons, it is important that the clamps on the not-in-use CVC lumens and multi-flow adapters are used."<sup>5</sup>
- After flushing, "Engage the clamping mechanism on the central line."<sup>6</sup>
- "Catheter clamping is a critical component of patient safety. Vascular air emboli happens far too easily and one of the frequent times is when the tubing or needleless connector becomes loosened from the catheter hub. A clamped catheter will protect against air getting into the line. Remember air emboli can cause devastating effects on your patient and the treatment, which could mean a nursing home for the remainder of their life, which is not reimbursed to the hospital. Needleless connectors (NC) can be clamped, but it depends upon the function of that NC as to when it is clamped. Negative displacement NC should be clamped before syringe disconnection. Positive displacement NC should be clamped after syringe disconnection."<sup>7</sup>

### Today's controversy

Manufacturers of some needleless connector devices recommend a manual positive pressure flush, including clamping before disconnect with their products. This recommendation is provided because these particular needleless access connectors exhibit significant negative reflux of blood at disconnect, which can lead to catheter occlusions. Positive displacement connectors do not have negative reflux at disconnection, so they do not require the clinician to clamp the catheter prior to disconnect while applying pressure on the syringe plunger. With a positive displacement connector, you simply disconnect and then clamp for purposes of patient safety, not product function. Recently, manufacturers of neutral displacement connectors claim there is no clamping sequence required with their product. This has created confusion for clinical end users, making some believe that a clamping sequence is required with every other connector except neutral connectors. The truth is that any connector that exhibits any negative displacement (reflux) at disconnect including neutral connectors should recommend clamping the catheter before disconnect. This is a clamping sequence. Connectors that do not exhibit negative displacement do not require clamping to prevent reflux. With positive displacement connectors, clamping recommendations are for patient safety purposes only.

MaxPlus® clear and MaxGuard® positive displacement connectors do not require the line to be clamped in order for the product to function. The product functions whether the line is clamped or not. We recommended in our Directions for Use "to clamp after disconnect" when not in use for patient safety.

#### References

- 1 ECRI Hazard Report, Health Devices. December, 1995; 24(12):515.
- 2 Central Venous Access Devices. Radiologic Technology, March 2006.
- 3 Infusion Nursing Society. Accessed from [http://inst1.org/files/public/QA\\_session\\_1\\_webinar.pdf](http://inst1.org/files/public/QA_session_1_webinar.pdf).
- 4 Chernecky, Macklin, et al. Oncology Nursing 101, Caring for Patients with Cancer Nursing—Knowledge of IV Connectors, December 2009.
- 5 Intensive Care Collaborative, Nursing Care of Central Venous Catheters in Adult Intensive Care, 2008.
- 6 Textbook: IV Therapy Made Incredibly Easy, Lippincott Williams & Wilkins, 2006.
- 7 Hadaway L. Post from February 16, 2010 at <http://www.iv-therapy.net>.

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