Patient Safety Tip of the Week

February 26, 2019

Vascular Access Device Dislodgements

It's staring us right in the face. It's so common, we never think about it as a patient safety issue. But the latest under-the-radar patient safety topic: dislodgement of catheters and vascular access devices! But it really shouldn't be a surprise. Dislodgement of vascular access devices and other devices is important for "**the 3 C's**": comfort, complications, and cost.

When vascular access devices are dislodged, delays in treatment occur. Intravenous fluid replacement falls behind and intravenous medication administration is delayed. And, in some cases where peripheral sites are scarce, the need for vascular access may result in the patient getting a more invasive procedure (central line, subclavian line, etc.). **Complications** include bleeding, skin tears, air embolism, hematoma, phlebitis, thrombus formation, infiltration, extravasation, and infection.

Patient **comfort** is impacted, both by the above mentioned complications and by pain and anxiety during restarts or need for a more invasive procedure for vascular access.

Very few hospitals even know the impact of catheter/device dislodgement. They seldom record a reason when such devices are changed or discontinued. But maybe if they break out spending on such devices, the problem of dislodgement might garner some attention. And those **cost considerations** do not include the cost of additional time required for care provided by nursing and other healthcare professionals. Requirements to attend to dislodged catheters and restarts can take time away from other nursing tasks and even result in some "missed care" (see our many columns on the impact of missed care).

A web-based survey of clinicians (Moureau 2018) found that 68% of respondents reported often, daily, or multiple times daily occurrence of accidental dislodgement affecting intravenous (IV) devices. 96.5% identified peripheral intravenous catheters as most common device experiencing accidental dislodgement.

The most commonly reported contributing factors were:

80% Confused patient
74% Patient physically removes catheter
65% IV catheter tape or securement loose
60% Patient moving around in bed with tangled tubing
51% Any forceful pull by patient or other

48% Patient going to bathroom forgetting IV is attached
47% Patient hair growth or perspiration lifting dressing
38% Bed transfer of patient
33% Hospital staff assisting patient when IV dislodged
3% Tubing too long and gets caught when ambulating

Moureau gives a conservative projection of accidental dislodgement incidence at 19 million events per year in the United States.

She also notes that, regarding time for PIV replacement, most clinicians responding to the survey estimated a range of 6-30 minutes (depending on patient-related factors and type of hospital setting among other factors).

A study of peripheral intravenous catheters (PIV's) in a tertiary hospital in Australia (Marsh 2018) followed 1000 patients until catheter removal. **Catheter failure occurred in 32%** of 1578 PIV's. Phlebitis occurred in 17%. Factors associated with occlusion/infiltration risk included intravenous (IV) flucloxacillin, 22-gauge PIV's, and female patients. Phlebitis was associated with female patients, bruised insertion sites, IV flucloxacillin, and dominant side insertion. Paramedic insertion was a risk for dislodgement. Each increase by 1 in the average number of daily PIV accesses was associated with occlusion/infiltration, phlebitis and dislodgement. On the other hand, additional securement products were associated with less occlusion/infiltration, phlebitis and dislodgement.

The authors note that their findings regarding the 22-guage PIV's question international guidelines, which currently recommend the smallest gauge peripheral catheter possible. They also note that they did not have good data on the impact of multiple insertion attempts because they did not witness the insertions.

They note that their PIV failure rate of 32% is actually lower than rates in most published studies.

They used a mean cost of PIV replacement cost of US $51.92 per episode of IV treatment (Tuffaha 2014) to calculate the financial impact of PIV failures. For their hospital, which uses 200,000 PIV's per year, the current level of PIV failure suggests almost US $4.1 million in waste annually at this site alone.

Another Australian study (Wallis 2014) performed a secondary data analysis from a randomized controlled trial of PIVC (peripheral intravenous catheter) dwell time. They found these potentially modifiable risk factors for occlusion: hand, antecubital fossa, or upper arm insertion compared with forearm. Larger diameter PIVC was a risk factor for phlebitis. PIVC's inserted by the operating and radiology suite staff had lower occlusion risk than ward insertions. Modifiable risks for accidental removal included hand or antecubital fossa insertion compared with forearm, clinical staff insertion compared with intravenous service, and smaller PIVC diameter. Female sex was a nonmodifiable factor associated with an increased risk of both phlebitis and occlusion. The authors conclude

that PIVC survival is improved by preferential forearm insertion, selection of appropriate PIVC diameter, and insertion by intravenous teams and other specialists.

So how do you minimize the risk of device dislodgement and many of these other complications of peripheral IV catheters?

Czajka et al. (Czajka 2018) show that proper primary and secondary securement can reduce complications, increase patient comfort, and save money. In fact, they make a case that decisions related to securement of vascular access devices should be considered equally as important as the choice of the catheter itself.

"Primary" catheter securement directly holds the catheter in place on the skin. "Secondary" securement acts as an additional anchor for the infusion set tubing or extension set to reduce any force the primary securement receives when energy is applied to the tubing by accident or rapid patient movement. They stress that secondary securement is as important as the primary. Primary stabilization cannot withstand the forces applied, for example, when IV tubing becomes trapped in the bed rail during a patient transfer. Without the secondary securement "shock absorber," the primary stabilization can fail, resulting in a lost catheter.

They note that all lines, whether PVC's (peripheral venous catheters) or CVC's (central venous catheters), should be secured. Proper securement is particularly important when placing an infusion line in anatomic areas of greater movement (eg. antecubital veins or saphenous veins in the foot), and for patients at greater risk of unintentional dislodgment (eg., those who are confused, combative, or developmentally challenged, or have changes in mental status) and neonates, infants, and toddlers.

Multiple catheter securement choices are available, including several types of tape, transparent dressings, sutures, engineered securement devices (ESD's), subcutaneous ESD's, and medical cyanoacrylate tissue adhesives. Factors influencing choice of the most appropriate method for securement include patient age, skin turgor and integrity, previous adhesive skin reactions or injuries, and any type of drainage at the insertion site. They cite studies showing engineered securement devices (ESD's) have advantages over the old standard of suture and tape. But the ESD must be available in a wide variety of sizes for all populations. It should be gentle to the skin and should not impede vascular circulation or delivery of the prescribed therapy, damage the catheter, or be a source of needlestick injuries. Obviously, the ESD should not interfere with assessing and monitoring the access site.

Before replacing an ESD, it is important to remove all old adhesive to allow for appropriate skin antisepsis. Watch for adhesive–related injuries associated with the use of or removal of adhesive- based ESD's.

They stress that a dislodged or displaced vascular access device should never be re-advanced into a vein. Peripheral catheters that become dislodged should be removed. Dislodged central catheters should be assessed for tip position, infusion therapies, and

other influencing factors. Then stabilize that PICC at the current position; in some cases, a new catheter insertion may be warranted.

The ECRI Institute PSO (ECRI 2018) has a nice review on device dislodgement (not only vascular access devices but also devices like feeding tubes, nephrostomy tubes, and others) and includes a staff handout pointing out the importance of avoiding such dislodgements and the steps to prevent them.

So far we've been talking primarily about regular peripheral IV's rather than peripherally inserted central catheters (PICC lines). We refer you back to our multiple columns on PICC lines (listed below) that call into question the often misperceived relative safety of PICC lines. In addition, a new study (Krein 2019) analyzed PICC-related complications from the perspective of the patient, both during and after hospitalization. This included 438 consecutive patients with PICC's at four US hospitals between 2015 and 2017. During the 70-day follow-up period, 61.4% of patients reported signs of at least one complication, including potentially serious complications, such as bloodstream infection (17.6%) and deep vein thrombosis (30.6%). Correspondence of these reported events with medical record documentation of the complication was generally low. More than one-quarter (27.9%) of patients reported minor complications, such as insertion site redness, discomfort or difficult removal. While the PICC was in place, 26.0% reported restrictions in activities of daily living, 14.4% social activity restrictions and 19.2% had difficulty with flushing or operating the PICC. The exact incidence of catheter dislodgement is not clear because it was lumped together in a category "Discomfort, inadvertent removal, migration or difficulty when removed" that was seen in 8.4% of patients.

Have your fiscal analysts take a look at your supply costs for vascular access devices. Then add in an estimated cost for the time your nurses or other healthcare professionals spend dealing with dislodged vascular access sites. Now that you have everyone's attention, do an audit of peripheral IV's and PICC lines (either specified consecutive cases or a "convenience" sample) so you can determine rates of dislodgement and complications. Better yet, take one of those unused customizable fields in your EMR and use it to record a reason for every new IV insertion or change or removal. Make sure you readily identify the risk factors in the Moureau, Marsh, and Wallis papers. Then make sure you are using some of the techniques and best practices in the Czajka and ECRI papers. And make review of your vascular access device experiences a regular part of your quality improvement program.

Some of our other columns on central venous catheters and PICC lines:

January 21, 2014	"The PICC Myth"
December 2014	"Surprise Central Lines"
July 2015	"Reducing Central Venous Catheter Use"

October 2015 "Michigan Appropriateness Guide for Intravenous Catheters"
March 27, 2018 "PICC Use Persists"

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ECRI PSO staff handout on device dislodgements
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