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Venous Needle Dislodgement and Access-Bloodline Separation

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The issue of blood loss during hemodialysis due to venous needle dislodgement (VND) or access-bloodline separation (ABLS) is a serious, potentially life-threatening, and under-reported treatment complication. VND occurs when the venous needle moves out of the vascular access, while an ABLS occurs when the central venous catheter (CVC) or fistula needle becomes disconnected from the hemodialysis bloodline utilized for treatment.

All patients on hemodialysis are at risk for VND and ABLS. Blood flow rates of 300 to 500 mL/minute during a hemodialysis procedure can result in significant blood loss if not discovered quickly. The average adult has a total blood volume of about 5 liters (4,500 to 5,500 mL) (Sharma & Sharma, 2018), and at these blood flow/rates a patient can lose 600 to 1,000 mL of blood within minutes and develop hemorrhagic shock (Saha & Allon, 2017). Hemorrhagic shock due to blood loss results when tissue demand for oxygen is not able to be met (Hooper & Armstrong, 2020). Although hypovolemic shock due to blood loss during hemodialysis does not happen frequently, it is underreported (e.g., one episode per 1,000 patient years [Jose et al., 2017], one episode per 60,000 hemodialysis sessions [Saha & Allon, 2017]).

Almost 500,000 people in the United States receive hemodialysis as their kidney replacement therapy (KRT) (United States Renal Data System [USRDS], 2020). The fre-

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Serious hemodialysis therapy complications are venous needle dislodgement and access-bloodline separation. In 2020, the American Nephrology Nurses Association (ANNA) brought together a task force to update the information and resources developed by the 2012 ANNA Venous Needle Dislodgement Task Force along with the development of additional resources, if needed. The 2020-2021 ANNA Venous Needle Dislodgement Task Force conducted a literature review, requested information from ANNA members, and tested taping techniques. This article discusses the results of the literature review, information requests, and taping technique testing, and provides resources on venous needle dislodgement and access-bloodline dislodgement, along with practice recommendations.

Key Words:
Venous needle dislodgement, access-bloodline separation, hemodialysis, blood loss, taping techniques.

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quent use of a vascular access for hemodialysis exposes the patient to repeated risk of blood loss from a variety of causes, such as blood adherence to the extracorporeal circuit, post-dialysis bleeding following needle removal, and access-needle separation (Evans, 2017). In a study of 732,941 hemodialysis treatments in a one-year period (4,700 patients, 37 facilities), Matos and colleagues (2018) observed 136 needle dislodgement events. Blood-loss events were defined as small (less than 100 mL blood loss) or serious (greater than 100 mL blood loss). Of the 136 events, 19% (25 events) were categorized as serious. A review of 14 years of death records from Australia and New Zealand by Jose and colleagues (2017), with hemodialysis access hemorrhage as the cause of death, identified 79 patients (a range of 2 to 10 per year) as having fatal VND.

ANNA VND Task Forces

The American Nephrology Nurses Association (ANNA) created a VND Task Force in 2012 to investigate the topic, gather evidence, and make practice recommendations. The results of their work, described by Axley and colleagues (2012) in the *Nephrology Nursing Journal* article titled, "Venous Needle Dislodgement in Patients on Hemodialysis," provided information on the identified frequency of VND occurrence, staff concerns, benefits of risk assessment, and benefits of patient and staff education. In response, the Task Force developed educational materials and risk assessment tools, suggested interventions, and created a poster that was widely distributed. The poster has been cited and used by many since its publication in 2012.

Subsequently, there have been new techniques to create arteriovenous accesses, such as endovascular arteriovenous fistulae (AVF), and sensor devices for venous bloodlines are more readily commercially available for use. In 2020, the ANNA Board of Directors identified the need to revisit this topic and update the materials, and appointed the 2020-2021 ANNA VND Task Force to review the current literature and determine if the practice recommendations from 2012 needed to be updated, with ABLS added to the VND review.

The literature review was extensive, and new evidence-based data were found. When possible, the 2020-2021 ANNA VND Task Force recommendations were based on the peer-reviewed literature; when that was not available, the recommendations were based on expert opinion. In May 2020, VND Task Force members posted questions related to VND and ABLS on the ANNA Forum, an online discussion group for ANNA members. Respondents were from various settings and countries. There were three responses to the VND query and 13 responses to the ABLS query, which were grouped into three themes: patient characteristics (confusion, excessive movement, and blankets covering the access), back pressure within the AVF and arteriovenous graft (AVG) due to access problems (infection, stenosis), and successful interventions, such as the use of devices. The literature review validated each of these observations of the respondents.

Table 1
Risk Factors Associated with Venous Needle Dislodgement and Access-Bloodline Separation

- Altered mental states: Confused, restless, agitated patients; patients with cognitive impairment; patients with dementia; patients not fully conscious.
- Patients who experience treatment complications: Hypotension, muscle cramps; diaphoresis.
- Patients who refuse to keep access and bloodlines uncovered.
- Patients with difficult cannulation due to access location, angle of cannulation.
- Taping technique; bloodline securement.
- Patients dialyzing at home, patients dialyzing alone, nocturnal dialysis.
- Staffing levels, staff observation.

This article and supplemental materials focus on the risks of blood loss related to VND and ABLS, and provide updated evidence-based information and practice recommendations.

Practices in Various Countries

As we have been reminded from the ANNA Forum responses, our international colleagues look to the ANNA Forum and the *Nephrology Nursing Journal* as resources. In light of this, some clarification is needed to delineate practice in the United States compared to elsewhere. In the United States, metal needles are utilized for access cannulation while colleagues in other countries may use metal needles or plastic cannulating catheters to access an AVF/AVG. The majority of literature describing VND is based on traditional, surgically created AVFs and surgically inserted AVGs. Based on these factors, when reviewing the literature, the authors assumed the literature referred to the traditional AVF/AVG and metal fistula needles, unless otherwise stated. There is the potential that differences in occurrence and interventions for metal versus plastic needles or cannulas may exist. Endovascular accesses have not been included in this literature review.

Risk Characteristics and Prevention

Patients with certain risk characteristics are at higher jeopardy for this complication (see Table 1). In addition to identifying prevalence of VND, Matos and colleagues (2018) identified the characteristics associated with VND and actions to prevent this complication, including patient restlessness, confusion, noncompliance, limb movement, and taping methods. This study found careful monitoring and patient education to be effective interventions in the prevention of VND. Several recommendations to reduce the number of fatal VND events have been categorized as:

- Vascular access related,
- Patient-related (including education),

- Dialysis/equipment related, and
- Facility/clinical governance related (Jose et al., 2017).

Altered mental states continue to be the risk factor most associated with VND (Matos et al., 2018). Patient movement; pulling at the tape, bloodline, or fistula needle; and inability to alert staff to a problem contribute to VND (Axley et al., 2012; Lee et al., 2016; The Truax Group, 2019). Patients experiencing muscle cramping often have excessive movement while trying to find relief, which can result in needle dislodgement. Hypotension can cause excessive sweating, resulting in tape loosening from the skin (Axley et al., 2012; Lee et al., 2016).

Patient assessment for risk factors using a risk factor rating system is recommended for all patients receiving hemodialysis (Axley et al., 2012; Lee et al., 2016; Saha & Allon, 2017; Van Waeleghem et al., 2008). The 2012 ANNA VND Task Force developed a risk assessment tool titled, "Assessment of the Risk for a Serious Venous Needle Dislodgement Incident," and an updated assessment tool is included in this article.

Failure to visualize the patient access and bloodlines has been identified as a cause of patient harm in multiple publications. Saibu and colleagues (2011) listed this as part of a root cause analysis leading to a patient's death. Blankets obscuring an access is another risk factor identified as a cause of needle dislodgement occurring when the needle becomes entangled with the blanket or tape becomes adhered to the blanket and is loosened with movement (Axley et al., 2012; Lee et al., 2016; The Truax Group, 2019; Van Waeleghem et al., 2008). Intentional needle dislodgement by patients is also a risk (Axley et al., 2012).

Inadequate patient observation by staff has been noted as a risk factor by multiple authors (Axley et al., 2012; Lee et al., 2016; The Truax Group, 2019; Van Waeleghem et al., 2008). The need for constant observation of patient access and bloodlines is so vital it was included in the Centers for Medicare and Medicaid Services (CMS) Conditions of Coverage (V407 tag) under which hemodialysis units are surveyed (CMS, 2008). CMS V407 tag states, "Patients must be in view of staff during hemodialysis treatment to ensure patient safety (video surveillance will not meet this requirement)" (CMS, 2008, p. 168). Interpretive guidance for this tag further clarifies that each patient must have their face, vascular access site, and bloodline connections visible by a staff member throughout the hemodialysis treatment to prevent accidental needle dislodgement or line separation (CMS, 2008). A list of CMS V-tags addressing patient safety in relation to VND is found in the VND and ABLS Toolkit included in this article.

Adequate staff to patient staffing ratios was a recommendation of the 2012 ANNA VND Survey (Axley et al., 2012), the European Dialysis and Transplant Nurses Association/European Renal Care Association in "Venous Needle Dislodgement: How to Minimize the Risks" poster (Van Waeleghem et al., 2008), and supported by Lee and colleagues (2016). Van Waeleghem and colleagues (2008) noted there should be sufficient staff on duty to ensure routine assessments of the vascular access are completed throughout treatment.

Practice during the COVID-19 pandemic has made following this guideline a challenge. Mokrzycki and Coco (2020) suggested nursing staff caring for patients in critical care units who are COVID-19-positive observe the patient from afar through a glass partition to protect staff. The Centers for Disease Control and Prevention (CDC) and CMS have not specifically addressed how the nurse can visualize the access while distancing from the patient receiving hemodialysis who is COVID-19-positive. The literature review did not find information related to patient proning, leading to an increase in VND.

Patients receiving hemodialysis at home or in a nocturnal program may be at a higher risk for VND and ABLS, requiring a greater understanding of the issue and need for observation. Hemodialysis machine alarms cannot be relied upon as the sole way to detect this problem (Axley et al., 2012; Van Waeleghem et al., 2008). Many facilities use blood or moisture alarm devices as secondary notifications of VND for home and nocturnal patient treatments. Needle sites and bloodline connections should be visible at all times, similar to in-center patient requirements. Taping remains an important component of fistula needle use and should follow documented policies and procedures for the program.

Staff and patients cannot rely upon hemodialysis machine alarms to alert them to these complications due to the small pressure changes associated with VND and ABLS (Jose et al., 2017; Ribitsch et al., 2014; Van Waeleghem et al., 2008). Hemodialysis systems have different monitoring and alarm mechanisms built into them and can indicate dialysis system malfunction utilizing pressure (pump pull and push), blood leak, pump flow, and temperature monitors. These systems also have the ability to measure venous pressure to monitor for VND with specific alarm ranges (-30 mmHg/+70 mmHg) during the hemodialysis treatment (Ribitsch et al., 2014). When a VND occurs, the pressure drop is used to detect blood loss and stop the blood pump immediately. However, patient movement, height changes, needle cannula size, blood flow rates, hemodialysis access (AVG/AVF) type, flow resistances, and blood viscosity affect static pressures (30 to 40 mmHg) during hemodialysis. "The effect of height changes can be predicated in HD patients, others may add 5 to 10 mmHg variations" (Lin et al., 2015, p. 149).

Ribitsch and colleagues (2014) measured intra-access pressure in 99 patients on chronic hemodialysis (65 with AVFs and 34 with AVGs) and found that 94.1% of the AVGs, but only 29.2% of AVFs, had an intra-access pressure high enough to trigger a low venous pressure alarm. Anecdotally, there have been reports of VND without alarms due to the needle lumen continuing to meet resistance against other objects (e.g., a pillow) (Lin et al., 2015). In addition, if the patient has the vascular access covered by a blanket, the 'visual alarm' of red blood is lost.

Table 2
Risk Assessment – One-Minute Check

Step	'Stop' Findings from One-Minute Check for Increased Risk of Venous Needle Dislodgement (VND)	Rationale of How the Finding Could Increase the Risk of VND
Look	Redness, swelling, or drainage. Skin bulges with shiny, bleeding, or peeling skin.	Non-intact skin can interfere with adhesiveness of the tape to remain on the skin. The thinning skin can be torn by the tape or pressure of the needle, and taping could cause the skin to tear and trigger a significant vascular access bleeding.
Listen (Bruit)	No sound, decreased sound, or a change in sound. Sound is different from what a normal bruit should sound like.	An increase in the bruit pitch or volume is associated with the development of stenosis. Depending on the location of stenosis, the venous pressure can increase. The increased pressure can increase the pressure on the needle tip inside the vascular access. The pressure may cause the needle to back out of the needle track and increase the risk of needle dislodgement.
Feel (Thrill)	Pulsatile: The beat is stronger than a normal pulse. Fingers placed lightly on the access will rise and fall with each beat.	An increase in the thrill is associated with the development of stenosis. Depending on the location of stenosis, the venous pressure can increase. The increased pressure can increase the pressure on the needle tip inside the vascular access. The pressure may cause the needle to back out of the needle track and increase the risk of needle dislodgement.
Arm Elevation Test	**Upper Arm AVF** The AVF outflow vein does not partially collapse or become 'flabby' after being raised above the level of the heart. **Lower Arm AVF** The AVF outflow vein does not collapse after being raised above the level of the heart.	Failure of the arteriovenous fistula outflow vein to collapse with the Arm Elevation Test is associated with the development of stenosis. Depending on the location of stenosis, the venous pressure can increase. The increased pressure can increase the pressure on the needle tip inside the vascular access. The pressure may cause the needle to back out of the needle track and increase the risk of needle dislodgement.

Source: Compiled from the ESRD National Coordinating Center, 2020.

Alarm fatigue, which is the syndrome of overriding the alarm without a thorough assessment of the cause of the alarm, also increases the risk. Alarms are a common occurrence in a dialysis facility and frequently reflect slight movement by the patient. These frequent alarms are described as nuisance alarms (Ribitsch et al., 2014), and alarm fatigue is a known patient safety issue (Horkan, 2014). In "Dialysis and Alarm Fatigue: Patient Safety Tip of the Week" (The Truax Group, 2017), the authors described a situation in California in which a patient with a femoral central venous catheter (CVC) experienced a disconnection between the CVC and venous bloodline. Reviews of this event indicated that several alarms were silenced, as well as blood loss being unobserved due to a blanket placed over the access site. In 2018, The Joint Commission (TJC) issued a Sentinel Event Alert, *Medical Device Alarm Safety in Hospitals*, detailing issues with medical device alarm safety in hospitals (TJC, 2018). The Joint Commission 2021 National Patient Safety Goals include a goal of using alarms safely (NPSG.06.01.01), "making improvements to ensure that alarms on medical equipment are heard and responded to on time" (TJC, 2021, p. 7).

AVF/AVG Issues

Patients may experience changes in the access related to stenosis, infection, and pseudoaneurysm formation that could increase the risk for VND. The One-Minute Check (ESRD National Coordinating Center [NCC], 2020) (see Table 2) can help identify an AVF or AVG that has findings related to access dysfunction, including stenosis. If new 'Stop' findings are noted with the look, listen, and feel steps

of the One-Minute Check, the changes may indicate an increase in the risk of VND. The 'Stop' findings should be reported to an expert clinician for additional clinical assessment.

Correct taping technique is consistently identified as a factor to reduce the risk of VND (Axley et al., 2012; Lee et al., 2016; Polaschegg, 2010; Van Waeleghem et al., 2008). Skin preparation, use of correct taping techniques, and replacement of tape whenever needles are repositioned are important measures in the prevention of VND. Protective systems have been designed to alert staff and patients to potential blood loss related to VND or ABLS. Skin preparation, cannulation, and taping technique are addressed by Ball (2020) in the *ANNA Core Curriculum for Nephrology Nursing* (7th ed.). Blood and moisture monitors are utilized in some dialysis environments to alert staff to a problem. Moisture monitors, such as enuresis pads, have been utilized off-label but have not been found to be capable of sensing low levels of moisture required to alert staff and patients in a timely manner (Axley et al., 2012; Ribitsch et al., 2014; Van Waeleghem et al., 2008).

Currently, the only U.S. Food and Drug Administration (FDA)-approved device designed to detect blood loss, Redsense, has been cited as a product for use with high-risk patients (Axley et al., 2012; Ploaschegg et al., 2010; Saha & Allon, 2017; Van Waeleghem et al., 2008). Clip devices, such as the HemaClip and SecureClip, are currently available in the United States and designed to keep connections between the bloodlines and access lines secure and prevent ABLS.

Education and Awareness

The prevention of VND or ABLS requires education of both the dialysis care team and of patients. The need for visibility of the vascular access at all times during hemodialysis can cause conflict between the dialysis care team and the patient. One form of conflict can be linked to the room temperature of the dialysis treatment area. Dialysis care team members are in motion while in personal protective equipment (PPE) and frequently experience an increase in body temperature. Patients are stationary in the chair and experience heat loss from the hemodialysis procedure. The use of coverings, such as blankets or warm clothing, is frequently utilized by patients to remain at a stable, comfortable body temperature. The importance of vascular access visibility needs to be clearly articulated to the patient, who may require frequent reminders.

Resources included in this article are intended to provide education to the dialysis care team and can help identify patient risk and mitigations to reduce the risk of a VND or ABLS. For example, the patient tool, *Help Us Keep You Safe*, can be used by the dialysis care team members to articulate the risk and educate patients and family/friends in risk reduction. These tools can be utilized for initial and ongoing education as needed. The poster allows for easy public display of the information in frequently used areas, such as patient waiting rooms or check-in areas.

The resources/tools can be utilized as part of the ongoing quality improvement process to mitigate risk or respond to an occurrence of VND or ABLS. The recommendations can also be reviewed and compared to facility-specific policy and procedures that directly link to the risk or mitigation of VND or ABLS.

Practice Recommendations

Practice recommendations to prevent VND and ABLS include:

- Pre-dialysis assessment of patient risk factors,
- Preparing for cannulation and CVC connection,
- Taping needles and securing CVC connections,
- Securing bloodlines,
- Replacing tape following intradialytic intervention,
- Understanding safety alarm capabilities,
- Setting/responding to alarms, and
- Intradialytic monitoring and interventions.

Recommendations also include a broader awareness of diverse access types, such as endovascular accesses, devices to aid in detection of disconnections/separations, types of needles used (particularly when reading other journal articles from places where plastic cannulas and not metal needles may be the standard), as well as consideration of the self-cannulator, such as a home patient who uses a one-handed technique to self-cannulate with different taping methods.

Assessing a patient for VND and ABLS risk factors is an ongoing process that starts before the initiation of hemodialysis and is monitored throughout treatment until hemostasis of the AVF/AVG or successful disconnect of the CVC from the hemodialysis bloodlines is achieved. Patient-related risk factors have been identified in the literature review and are listed in Table 1. These risk factors include patient mental status, treatment-related complications (such as cramping during treatment), patients who refuse to keep dialysis access/bloodlines visible, difficult cannulation, taping technique, and bloodline securement.

Cannulation Preparation/Plan

Hand hygiene and access site disinfection with antibacterial soap are the first recommended practice steps in preparing for cannulation by the dialysis care team and patient receiving hemodialysis (Ball, 2020; CDC, 2020; Lok et al., 2019). This step can be completed by the dialysis care team members if the patient is unable to perform it on their own. The use of a disposable moist washcloth soaked with antibacterial soap or ready-to-use antibacterial towel or prep pad would be an acceptable method to cleanse the dialysis access (Brouwer, 2011). Cleaning the AVF/AVG with antibacterial soap and water is critical for the prevention of vascular access site infections related to *Staph aureus*, especially in patients with poor hygiene (Polkinghorne et al., 2013). After the access is initially disinfected, it must be dried thoroughly using a dry clean towel or air drying. A wet or moist access arm can impair the tape used to secure the needles to the access arm from adhering to the skin properly.

Special care needs to take place during the cannulation process. Based on the 2019 *KDOQI Clinical Practice Guideline for Vascular Access* update, it is recommended to conduct an assessment prior to each hemodialysis session to assess the AVF/AVG for adequate bruit and thrill, signs of infection, shiny or thinning skin, and areas of possible stenosis, and to identify where the needles will be placed (Lok et al., 2019). This is also known as the "One-Minute" access check and can be used for AVF/AVG access or hemodialysis CVCs (ESRD National Coordinating Center, 2020).

Skin preparation of access sites should follow facility guidelines and include washing the access, utilizing the appropriate antimicrobial product following manufacturer's guidelines for application along with the use of facility approved PPE following standard precautions (Ball, 2020). The technique for applying the disinfectant should start in the center of the cannulation site and work outward in concentric circles, thus moving any skin debris and bacteria outward from the cannulation site (Kallanback, 2020).

The hemodialysis care team should be able to use clinical judgment to successfully place the hemodialysis needles in maximal position for dialysis to take place, specifically placing the needles 2.5 cm apart and following the rope ladder cannulation technique. This distance reduces the chance of recirculation between the dialysis needles (Rothera et al., 2011). Jose and colleagues (2017) made recommendations specific to cannulation rotation and a cannulation plan based on a review of multiple sources. Specifically, they recommended a plan be developed and sites rotated. Needle angle is also important to avoid infiltrations caused by angle over-estimating. The angle of needle insertion is determined by the minimum angle needed to allow the needle tip to sit in the middle or center of the vessel (Ball, 2017).

Taping Technique

Taping and securing of hemodialysis lines has proven to be of much value to keep dialysis needles in place. Various methods for taping have been identified on a recent ANNA Forum shared by dialysis nurses around the globe (Cruz, 2020). Historically, the chevron style technique of taping hemodialysis needles to a patient's access has proven to be safe and effective (see Figure 2) (Chan et al., 2020). There are two chevron techniques widely used: the chevron-V and chevron-U. After the needle is inserted, using one-inch paper tape, carefully place one strip of tape over the wings of the needle, keeping the needle insertion site visible. Next, place a strip of tape below the butterfly wings of the needle adhesion side up, then cross one piece diagonally from left to right or vice versa to form the chevron or 'V' shape. If your dialysis center policy calls for the chevron-U technique, the second piece of tape would be placed below the butterfly wings adhesion side down, securing the ends of the tape up on the side of the access insertion site in a 'U' shape. The chevron part of the taping technique holds the dialysis needle in the vessel. Next, place one sterile gauze over the needle insertion site and secure it in place with one strip of tape. Literature is scarce when it comes to searching different ways to secure dialysis needles in place. Some other methods shared on the ANNA Forum using one-inch paper tape include 'X' shape technique, 'H' shape technique, and '2' tape technique (consists of two pieces of tape placed horizontally across the fistula needle and wings).

Simulation testing performed by the 2020-2021 ANNA VND Task Force was completed using one-inch paper tape and a digital Heeta fish scale to compare the hemodialysis taping techniques mentioned on the ANNA Forum. The chevron-U technique using one-inch paper tape to 5 inches in length held the hemodialysis needle in place longer against the most pressure measured in kilograms, averaging 2.80 kg of pressure. This was identified by using the digital Heeta fish scale attached to the distal end of the tubing to measure the amount of pressure needed to dislodge the dialysis needle in a pulling motion away from the insertion site. The chevron-V technique was the next, measuring at 2.39 kg of pressure. This information informs us the chevron-U and chevron-V techniques of taping are sufficient to hold the needles in place compared to other methods, and should be taught to and used by nurses and technicians.

The techniques described above were based on two-handed cannulation, which is generally not possible for self-cannulators with an arm access. A team of engineering experts and a renal dialysis clinical nurse specialist in Australia tested three common needle taping techniques (Chan et al., 2021). The techniques included the chevron, butterfly, and overlapping taping techniques. The testing methods simulated forces from blood flow and movement on the fistula needle to determine the taping technique that could withstand common movement that can lead to needle dislodgement. The testing found the overlapping taping technique to be the lowest holding capacity and shortest time for the needle to dislodge. The chevron and butterfly taping methods demonstrated superior holding capability and elongation of needle dislodgement. The elongation of the needle dislodgement (longer time) was theorized as a means to improve the detection of moisture by the leak-detection device. The testing results determined the chevron style may be better suited to lateral movements from all directions due to the taping direction. The butterfly may be better suited to home dialysis (where monitors may be used) (Chan et al., 2021).

Repositioning/Troubleshooting Needle Placement

"If the dialysis needles need to be adjusted, then tape should be replaced and not reapplied" (Lee et al., 2016, p. 85). This statement is important due to reapplied tape losing some of its adhesive capability. "Once the needle has been inserted, the needle should not be routinely rotated. This should be avoided if possible, as this can lead to damage to the vessel wall known as 'coring'" (Fielding et al., 2018, p.5). Additionally, further repositioning of the dialysis needles can

result in wider insertion sites, leading to blood leakage around the hub of the needle. This could also cause tape malfunction, leading to needle dislodgement.

CVC Assessment

Central venous catheter assessment, much like AVF/AVG assessment, begins with thorough inspection for signs and symptoms of infection to the area surrounding the CVC exit site and tunnel, including but not limited to redness and drainage (Lok et al., 2019). Inspection of the CVC for dysfunction, including visible cuff, cracks along tubing or cap ends, and worn threads on catheter lumens are all causes for pause that warrant intervention and notification of the nephrologist or advance practice registered nurses (APRNs) versus initiating dialysis.

Securing Bloodlines

Hemodialysis bloodlines should be secured properly to the patient and not to an object, such as the dialysis chair or chair side table. Securement to the patient is the most optimal placement by allowing the patient to move or reposition in the dialysis chair without putting pressure on the bloodlines causing them to be pulled taunt, thus leading to needle dislodgement. Securement can be done by taping the lines to the patient's forearm or by using line clamps to attach to patient's shirt on the shoulder nearest to the access (Lee et al., 2016). Ideally, hemodialysis machine placement would be on the same side of the AVF/AVG/CVC, allowing for more dialysis bloodline available for line securement to the patient. This placement avoids bloodlines crossing over the patient, which can restrict the bloodline length, causing the line to be pulled taunt, pulling on the dialysis needles, and possibly leading to needle dislodgement. Hemodialysis catheter connections can be secured to the dialysis lines with the only FDA-approved connection-securing devices Fresenius Hema-clips (Saibu et al., 2011) and Medisystems SecureClip.

Special Considerations

Self-cannulator taping. The CMS (2008) Programs Conditions for Coverage for ESRD Facilities V-Tag 456 details the patient's right to participate in their care, including self-cannulation. This V-Tag covers patients on in-center hemodialysis. The patient is to receive appropriate training and demonstrate competence before utilizing self-cannulation in-center.

The cannulation procedures used by a staff member or care partner must be adapted to accommodate the single-handed cannulation for patients with a vascular access in the arm. Typically, home hemodialysis training locations have modified needle cannulation and needle removal policies and procedures to support single-handed self-cannulators. The taping technique must accommodate the tape applications using a single hand while crossing one's own body to reach the vascular access cannulation zone. The tape is typically prepared before the needle insertion by tearing into strips and tabbed at the ends for an easier tape removal process. The tape must be applied after the first needle is inserted to secure the needle before the second needle is inserted. The simplest method is applying tape with a small gauze pad directly over the needle wings and exit site. Additional taping is done after the second needle is inserted. Adhesive bandages can also be utilized to cover the needle insertion site if the patient can easily remove the adhesive bandage post-dialysis with a single-handed method.

The most utilized needle removal method is the patient single-handed method. The needle tubing end is held by the fingers/hand on the access side arm. The single-hand fingers must peel off the tape without pulling out the needle. Once the needle is freed from all tape, the patient will pull the needle out of the vascular access with the needle tubing using the access arm hand. The free hand is then used to apply the gauze dressing to the needle site to achieve hemostasis. The procedure is repeated with the second needle.

The general overall goal of self-cannulation needle securement is to prevent accidental needle dislodgement. The taping method modifications for a self-cannulator must still ensure the goal of preventing unintentional needle dislodgement. The taping method should be reviewed regularly, such as part of the annual nursing policy and procedure review, and if any needle dislodgement events occur, revised if necessary.

Clothing to Enhance Direct Observation of Connections

Direct observation of the connections is mandated by CMS. Patients may complain of feeling cold. To address this issue, specialized clothing companies design and sell products to support patients undergoing treatments, such as chemotherapy and hemodialysis. The clothing items are designed to provide access to the vascular access without removing clothing. The designs vary by manufacturer and can include zippers, buttons, snaps, or other closure methods. Patients, family members, or friends can tailor clothing to allow easy access and visualization of the vascular access (see Table 3).

Plastic Cannulas

Currently, the FDA has not cleared any hemodialysis plastic cannula products in the United States. Outside of the United States, plastic cannula devices are available for use for hemodialysis. Japan has led the development and utilization of the hemodialysis plastic cannula by Medikit since 1981 (Medikit, 2021). The plastic cannula is preferred over metal needles for AVF cannulation due to a lower risk of infiltration (Parisotto et al., 2016). Parisotto and colleagues (2016) concluded, "The main advantage of plastic cannulae versus metal needles for AVF cannulation seems to be the reduced risk of internal vessel wall damage or needle infiltration during the hemodialysis sessions, during taping, or removing of the tapes" (p. 378). Japan has historically maintained a greater than 90% AVF usage, and thus, the need for the plastic cannula (Pisoni et al., 2015). Plastic cannula availability has spread to most countries in the European Union, Asia, Australasia, and Canada. The

Table 3
Clothing Websites

Company	Website
Hemowear	www.hemowear.com
Ivye Wear	www.ivye.com
Medical Dignity Clothing Corporation	www.medicaldignity.com
Medical Rehab Wear Inc.	www.medicalrehabwearinc.com
RonWear Port-able Clothing	www.ronwear.com

introduction of the endovascular AVF, sometimes called percutaneous AVF (pAVF) technology, outside of the United States has led to increased utilization of the plastic cannula because the cannulation zones are near the antecubital area. As the number of pAVF creations continues to grow in the United States, the request for a company to market an FDA-cleared plastic cannula is increasing.

The plastic cannula differs from the standard metal AVF needle in several key ways that can impact the needle securement process. The plastic cannula has a metal insert that is used to puncture the tissues, including the AVF vessel wall. Once the cannula is fully introduced into the vessel, the sharp metal insert is removed. The cannula has no wings to hold or use in the post-insertion securement process. The cannula cannot be secured until the metal insert is fully removed. The cannula is short and lacks a clamp on the tubing, and depending on the design, the cannula may include a valve to prevent blood loss when the end is open to the air. The hemodialysis plastic cannula closely resembles an IV catheter available in the United States. The lack of cannula wings and the short cannula tubing length requires an adjustment of the standard metal needle taping technique described in the body of this article. The described taping technique will need to be adapted for the plastic cannula design. A reader outside of the United States needs to defer to the manufacturer's instructions for use and the local clinical practice for the plastic cannula securement process.

Nalesso and colleagues (2018) compared the standard metal needle to the plastic cannula to identify key innovations that plastic cannula use may provide in clinical utilization. They found the plastic cannula was safer, including reducing the risk of accidental needle stick, infiltration due to patient movement, infiltration due to repositioning, and metal-related allergic reactions. The authors identified the lack of wings for fixation with tape as a notable difference in the cannulation process. \

A recent comparison of plastic cannula and metal needles conducted by Choi and colleagues (2020) (see Table 4) compared arterial pressure (AP) and venous pressure (VP) measurements at the same blood flow rates. The results showed the plastic cannula ran with less negative AP and lowered VP than the metal needle at the same blood flow rate (Choi et al., 2020). The study utilized the Super Clampcath by Togo Medikit Co, Ltd. and the lower VP observed with the use of the plastic cannula may have increased the risk of venous cannula dislodgement by not triggering a VP alarm.

Hemodialysis Machine Safety Devices for VND

Hemodialysis and hemodiafiltration (HDF) machines available outside the United States include an integrated technology to detect VND. The technology methods uti-

Table 4
Plastic AVF Cannula or Needle Resources

Product Name	Lengths	Gauges	Special Considerations for Use
Medtronic Argyle™ Safety Fistula Cannula with Anti-reflux Valve (Medtronic, 2021). https://www.medtronic.com/covidien/en-us/products/dialysis-access/chronic-vascular/argyle-fistula-cannula.html	25 to 38 mm 0.98 to 1.50 inches 20 to 38 mm 0.70 to 1.50 inches	17, 16, and 15 gauge	Cannulation use for initial AVF utilization, endovascular created fistulae, and home hemodialysis to reduce infiltration with access movement.
Safetouch™ AVF Catheter Needle (Nipro, 2021). https://www.nipro-group.com/en-en/products/safetouchtm-avf-catheter-needle	25 and 33 mm	17, 16, 15, and 14 gauge	
Supercath CLS and Supercath NEO Safety Fistula Catheter (Medikit, 2017). https://www.medikit.co.jp/english/product/pdf/SupercathNeo_201709.pdf		18, 17, and 16 gauge	

lize both VP and AP changes to detect sudden or small changes in pressure that would not trigger an alarm to stop the blood pump. An external wireless detector is also available on machines outside of the United States as an integrated optional feature. The technology is intended to augment the user's observation and monitoring for any venous line disconnect.

The Fresenius 2008K@home™ Machine WetAlert™ Wireless Wetness Detector is FDA-cleared for sales in the United States. The indication for use lists the optional disposable accessory to aid in the detection of blood or water leaks during hemodialysis (Fresenius Medical, 2012-2014). The WetAlert™ utilizes radio signals to link the detector to the hemodialysis machine. If the WetAlert™ detects conductive fluids, such as blood, a radio signal is sent to the hemodialysis machine to trigger an audiovisual alarm, as well as stopping the blood pump and closing the venous line clamp. The WetAlert™ Wireless Wetness Detector is for use only with the Fresenius 2008K@home™ machine.

The Redsense™ device is FDA-cleared and compliant with CE Mark and the new European Union Medical Device Regulations (EU MDR). The indications for use of the Redsense device is to monitor and detect potential blood loss from the venous needle access or venous catheter bloodline connection (Redsense Medical, 2019). The Redsense device is an independent audio and visual alarm that triggers if blood leakage is detected by a sensor positioned at the venous access. The device is also designed to connect to the hemodialysis machine and pause a treatment if an alarm occurs. The technology has been available on some dialysis machines in Europe since 2019. At this time, dialysis machines in the United States have not adopted this standard. The device utilizes a light signal that is transmitted from the alarm unit, through the fiber optic extension, and into either a venous needle sensor patch or catheter sensor patch. The venous needle sensor is placed directly over the venous needle access, and catheter sensors are positioned at the catheter-bloodline connection. If blood loss is detected in the sensor, an alarm is immediately triggered. The alarm unit and fiber optic extension are reusable, and they require proper disinfection in between treatments. The venous needle sensor patch and catheter sensor patches are single-use disposables (see Step 12 in the *VND Minimize Risk* poster).

Outside of the United States, the HEMOdialert™ alarm and HEMOsensor™ is a reusable device with an independent audio alarm that triggers if blood is detected at the site of the sensor. The alarm does not stop the hemodialysis blood pump or close the venous clamp. The device will trigger the alarm with 1 mL of blood detected within 1 to 2 seconds.

Resources/Tools

ANNA published several VND resources/tools in 2012. These resources/tools have been reviewed and updated to include ABLS. Resources include the *VND and ABLS Toolkit*, the *Assessment of the Risk for a Serious VND Incident*, the *Sample Taping Techniques* handout, the *Help Us Keep You Safe* poster, and the *VND How to Minimize Risks* poster.

Future Research

There is a need for additional research related to hemodialysis vascular access and nursing care. Certainly, the simulation testing performed for this project is a great starting point for a future validation study. Specific examples for future research include, but are not limited to:

- Taping: What is the correlation between taping techniques and occurrence of VND?
- Wetness/blood detection devices: What is the frequency of VND when using a detection device compared to not using a detection device?
- Education: Is there a correlation between staff education (or awareness) of VND and occurrence of VND?

Conclusion

Venous needle dislodgement and ABLS are uncommon but serious patient safety risks for the hemodialysis population. The literature review and ANNA Forum responses to questions regarding this topic validate the ongoing issues with this complication of the hemodialysis treatment. Resources to minimize the risk of VND and ABLS have been developed and updated for use by the dialysis care team to minimize the risk of VND and ABLS. Utilization of all available tools and resources to prevent this complication increases patient safety during hemodialysis therapy.

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VENOUS NEEDLE DISLODGEMENT (VND)
HOW TO MINIMIZE RISKS
Recommendations for Nephrology Nurses

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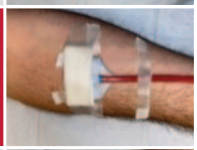
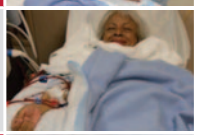
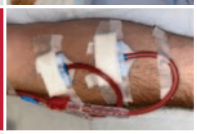
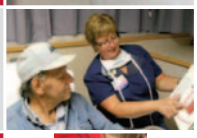
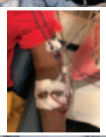
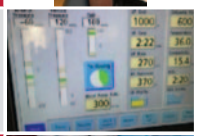
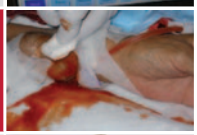
1	**AWARENESS**	Education materials for staff, patients, and care providers.
2		An area around the arteriovenous vascular access large enough for taping should be cleaned and allowed to dry before cannulation.
3		Hemodialysis units should follow their organization's policy and procedure for: 1. Taping needles and bloodlines. The ANNA *Core Curriculum for Nephrology Nursing,* 7th edition, is a resource for information on the secure taping of access needles. 2. Securing CVC connections.
4		Bloodlines should be looped loosely to allow movement of the patient but prevent bloodlines from pulling on the needles.
5		If it is necessary to reposition a needle or flush a CVC, all taping should be replaced and needles secured with fresh/new/clean tape.
6		Vascular access and needles/connections should be visible at all times during hemodialysis.
7		Checking the vascular access and connections should be part of the monitoring routine during the hemodialysis treatment.
8		All patients should be assessed for the level of risk of VND following the "Assessment of the Risk for a Serious Venous Needle Dislodgement Incident." If indicated, an alarm device intended for monitoring a VND (wetness/blood) may be used.
9		When the venous pressure alarm is activated, the vascular access, needle sites, access-bloodline connection, and bloodline positions should always be inspected prior to resetting the alarm and/or alarm limits.
10		The lower limit of the venous pressure alarm should be set as close as possible to the current venous pressure, as allowed by the dialysis equipment.
11		Staff members, patients, and care partners should be aware that the venous pressure monitoring system of the hemodialysis machine can often fail to detect VND and access-bloodline separation.
12		Additional protection can be provided by devices intended to detect blood loss from the needle site to the environment.

Note: This poster was developed by the European Dialysis and Transplant Nurses Association/European Renal Care Association and adapted with permission by the American Nephrology Nurses Association.

Additional information available at the ANNA Venous Needle Dislodgement Project site at: **https://www.annanurse.org/resources/vnd**

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Assessment of the Risk for a Serious Venous Needle Dislodgement Incident

The risk for a serious venous needle dislodgement (VND) or access/bloodline separation (ABLS) incident depends on the likelihood of the needle becoming dislodged and the access/bloodline becoming separated, and the likelihood that the action necessary to stop the blood loss will not be taken in time to prevent serious harm. The likelihood could be:

VERY LOW	The event is very unlikely. It will probably never happen.
LOW	The event is unlikely, but it could happen.
MEDIUM	The event is likely to occur.
HIGH	The event is very likely. It is almost certain to occur.

1 What is the likelihood that the staff (or caregiver) will fail to observe an actual or potential VND/ABLS for this patient?

The likelihood of the staff (or caregiver) failing to detect VND/ABLS or condition that could lead to VND/ABLS if not corrected, will be **very low/low** if staff can observe the patient and access easily. The likelihood will increase to **medium** or **high** if there are too few staff to make regular checks of the needles and bloodline connections, and if the staff are unable to see the access clearly due to the patient's location, covers, poor lighting, etc. Using a device that alarms when a VND/ABLS occurs reduces this score to 0.

0 POINT VERY LOW or LOW | **1 POINT** MEDIUM | **2 POINTS** HIGH

SCORE

2 What is the likelihood that the patient will fail to raise the alarm if they experience a VND/ABLS?

The likelihood of the patient failing to raise the alarm is **very low/low** if the patient understands the implications of a VND/ABLS and is sufficiently alert to take action if a VND/ABLS, or a problem that could lead to a VND/ABLS occurs. The likelihood will increase to **medium** or **high** if the patient sleeps during dialysis, especially if the patient is hard to wake up. It will also increase if the patient has impairments that could affect their ability to notice a VND/ABLS (such as lowered skin sensitivity or poor eyesight) or has communication difficulties. Using a device that alarms when a VND occurs reduces this score to 0.

0 POINT VERY LOW or LOW | **1 POINT** MEDIUM | **2 POINTS** HIGH

SCORE

3 What is the likelihood of the patient behaving in a way that could lead to a VND/ABLS?

(Note: Do not consider the security of taping here; that is covered in question 4)

Ideally, the likelihood that a patient's actions during dialysis will lead to VND/ABLS will be **very low**. The likelihood will increase to **low** or **medium/high** if the patient suffers side effects (e.g., hypotension, hypoglycemia, cramps, itching) that could lead to unpredictable movement, if the patient is restless, is not fully aware of being on dialysis, or is known to tamper with the tape, needles, and/or bloodlines. Patients who have had more than one unexplained VND should score 2.

0 POINT VERY LOW or LOW | **1 POINT** MEDIUM | **2 POINTS** HIGH

SCORE

4 What is the likelihood of the taping failing to ensure that the needle is secure throughout dialysis?

(Note: Do not consider tampering by the patient here; that is covered in question 1)

Ideally, the likelihood that a patient's actions during dialysis will lead to VND/ABLS will be **very low**. The likelihood will increase to **low** or **medium/high** if the patient suffers side effects (e.g., hypotension, hypoglycemia, cramps, itching) that could lead to unpredictable movement, if the patient is restless, is not fully aware of being on dialysis, or is known to tamper with the tape, needles, and/or bloodlines. Patients who have had more than one unexplained VND should score 2.

0 POINT VERY LOW or LOW | **1 POINT** MEDIUM | **2 POINTS** HIGH

SCORE

Total Risk Score

Overall Risk for a Serious Venous Needle Dislodgement Incident

Add up the scores for questions 1 to 4 to obtain the overall risk.

SCORE 0-2 — **The patient is at Low Risk for a serious VND incident.**

- Continue with secure taping and maintain awareness of VND/ABLS.
- Ensure access and bloodline connections are uncovered.
- No further action is needed unless there is a change in the patient's condition.

SCORE 3-4 — **The patient is at Medium Risk for a serious VND incident.**

Apply the ANNA recommendations to minimize the risks as indicated for SCORE 0-2 and in addition:

- Ensure the taping technique is secure.
- Consider adding a documented check of taping security after starting hemodialysis.
- If the patient is not fully aware of the risk of VND/ABLS, provide or reinforce education.
- Make it as easy as possible to observe the patient and their access and bloodline connections.
- Increase the frequency at which staff check the security of the needles and the bloodline connections.
- If appropriate, consider use of a device approved for detecting a VND.

SCORE 5-8 — **The patient is at High Risk for a serious VND incident..**

Apply the ANNA recommendations to minimize the risks as indicated for SCORE 0-4 and in addition:

- Consider stabilizing the access limb.
- Consider one-to-one monitoring; if available, utilize family member, significant other, or care partner per facility policy
- Provide staff education on risk level and monitoring steps.
- Consider use of a device approved for detecting a VND.

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Additional information available at the ANNA Venous Needle Dislodgement Project site at:
https://www.annanurse.org/resources/vnd

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Help Us Keep You Safe!

Keep your access and bloodline connections in plain sight!

Don´t hide your access or bloodline connections under a blanket!

Your needles/catheter must be taped well to keep them from coming out.

Your needles/catheter must be connected securely and taped well to keep them from separating. If you move around a lot or if you fall asleep and forget where you are,

1. Your venous needle can accidentally get pulled out of the vein without making the dialysis machine alarm.
2. Your catheter could be pulled on and separate from the bloodlines without making the dialysis machine alarm.

You can lose a lot of blood very quickly if your venous needle or catheter comes out or your catheter separates from the bloodline.

Your nurses and technicians need to be able to see your access at all times to help protect you from danger–the loss of a large amount of blood.

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Additional information available at the ANNA Venous Needle Dislodgement Project site at: **https://www.annanurse.org/resources/vnd**

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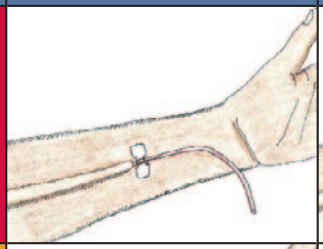
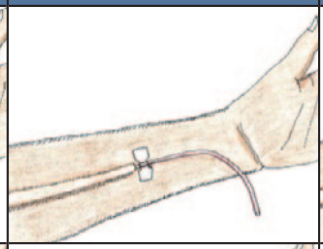
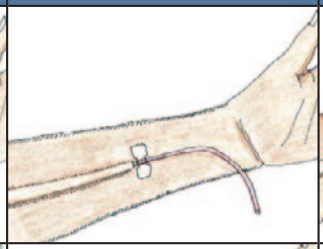
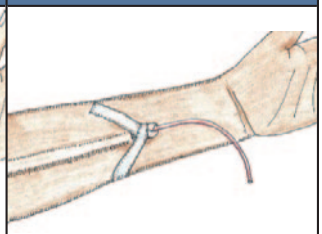
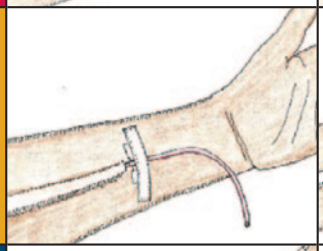
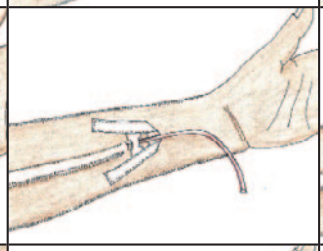
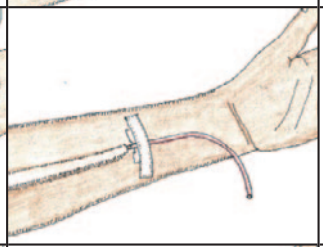
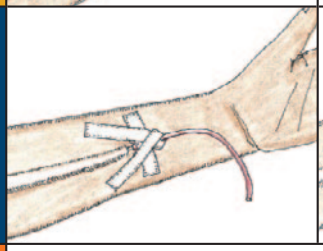
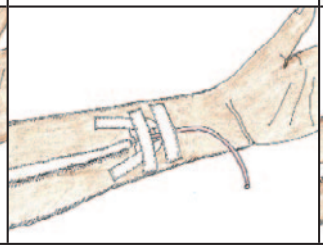
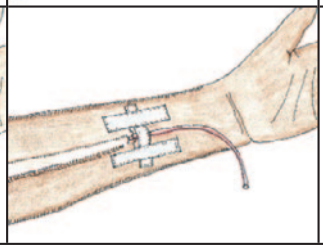
Sample Taping Techniques

Steps	Chevron	U Method	H Method	Single-handed
1				
2				
3				
4	Place adhesive bandage, gauze, or transparent dressing over needle insertion site. Do not tape directly over needle entry site. Do not overtape/overdress to allow easy access to site. Do not place tape completely around the limb which may interfere with blood flow.			

Note: Illustrations by John C. Inglese, MSCE, PE, B.Arch, AIA. Used with permission..

Taping References

Ball, L.K. (2020). The arteriovenous fistula: Safe needle taping (Figure 23-15). In C.S. Counts (Ed.), *Core curriculum for nephrology nursing* (7th ed., p. 1092). American Nephrology Nurses Association .

British Renal Society Vascular Access Special Interest Group. (2018). *Clinical practice recommendations for needling of arteriovenous fistulae and grafts for haemodialysis*. https://vo2k0qci4747qecahf07gktt-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/Clinical-Practice-Recommendations-for-Needling-of-Arteriovenous-Fistulae-and-Grafts-for-Haemodialysis.pdf

deVilliers, A. (2018, October 4). *Single-handed cannulation and chevron taping for solo home HD.* https://homedialysis.org/news-and-research/blog/277-single-handed-touch-cannulation-and-chevron-taping-for-solo-home-hd

Lok, E., Huber, T., Lee, T., Shenoy, S., Yevzlin, A., Abreo, K., Allon, M., Asif, A., Astor, B., Glickman, M., Graham, J., Moist, L., Rajan, D., Roberts, C., Vachharajani, T., & Valentini, R. (2019). KDOQI Vascular Access Guideline Work Group. KDOQI clinical practice guideline for vascular access: 2019 update. *American Journal of Kidney Diseases, 75*(4, Suppl. 2), S1-S164. https://doi.org/10.1053/j.ajkd.2019.12.001

National Kidney Foundation (NKF). (2006). *KDOQI clinical practice guidelines and clinical practice recommendations for 2006 – Updates: Hemodialysis adequacy, peritoneal dialysis adequacy and vascular access.* https://www.kidney.org/sites/default/files/docs/12-50-0210_jag_dcp_guidelines-va_oct06_sectionc_ofc.pdf

Van Waeleghem, J.P., Chamney, M.J., Lindley, E., & Pancírová, J. (2008). Venous needle dislodgement: How to minimize the risks. *Journal of Renal Care*, *34*(4), 163-168. https://doi.org/10.1111/j.1755-6686.2008.00047.x

ANNA Learning Leading Connecting
American Nephrology Nurses Association

Venous Needle Dislodgement and Access-Bloodline Separation

TOOLKIT

Recommended Bibliography

Regulations/Conditions for Coverage access language:

Centers for Medicare and Medicaid (CMS). (2008). Conditions for coverage for end-stage renal disease facilities; final rule, 70. *Federal Register,* 20370. https://www.cms.gov/Regulations-and-Guidance/Legislation/CFCsAndCoPs/Downloads/ESRDfinalrule0415.pdf

"The intent of the new requirement is to have facilities arrive at a middle ground so that the room temperature is at least marginally acceptable to both patients and staff. Patients who continue to feel cold could use coverings or blankets. Regardless of the room temperature, patients should not be deprived of the ability to use covers or blankets. The dialysis facility may allow patients to bring their own blanket or may opt to provide a cover. In either case, adequate infection control precautions must be taken considering the risk of blood spatter. **Additionally, the access sites and line connections should remain uncovered to allow staff to visually monitor these areas to ensure patient safety.** In response to comments, we have revised § 494.60(c)(2)(i) by removing the phrase "that is comfortable for the majority of its patients" and inserted the word "comfortable" earlier in the sentence. Section § 494.60(c)(2)(i) and § 494.60(c)(2)(ii) now requires a facility to maintain a comfortable temperature within the facility; and make reasonable accommodations for the patients who are not comfortable at this temperature" (p. 20384).

Excerpts of Regulations and Guidance That Apply to VND

TAG NUMBER	REGULATION	INTERPRETIVE GUIDANCE
V148	**CDC RR-10 Requirements as Adopted by Reference 42 CFR 494.30 (a)(2) Central Venous Catheters, Including PICCs, Hemodialysis, and Pulmonary Artery Catheters in Adult and Pediatric Patients.** I. Surveillance. A. Conduct surveillance…to determine CRBSI rates, monitor trends in those rates, and assist in identifying lapses in infection-control practices. C. Investigate events leading to unexpected life-threatening, or fatal outcomes. This includes any process variation for which a recurrence would likely present an adverse outcome. *End CDC Requirements*	Non-compliance with this requirement should be considered if there is lack of evidence of surveillance for catheter-related infections. A log or another tracking mechanism, such as the Dialysis Module of the National Healthcare Safety Network (NHSN), should be used. Both the surveillance log/database and the patient's individual medical records should contain detailed information on catheter infections **and other adverse events, such as, but not limited to, prolonged bleeding, stenosis/clotting, allergic reactions, pyrogenic reactions, cardiac arrests, hospitalizations, and deaths.** Refer to V637 under the Condition: Quality assessment and performance improvement (QAPI).
V405	**§ 494.60 Condition: Physical environment.** *(c) Standard: Patient care environment:* (2) The dialysis facility must: (i) Maintain a comfortable temperature within the facility; and (ii) Make reasonable accommodations for the patients who are not comfortable at this temperature.	The facility must make reasonable efforts to provide a comfortable environment for patients and staff despite conflicting perceptions of "comfortable." When cold, some patients find it helpful to use a glove for the hand on their access arm; others find wearing a cap helpful. **If patients choose to use a blanket or other covering, their vascular access site, bloodline connections, and face must be visible throughout the treatment.** A head covering on a patient is acceptable, as are gloves. If you note a problem in this area, refer to V407.

continued on next page

TOOLKIT (continued)

TAG NUMBER	REGULATION	INTERPRETIVE GUIDANCE
V407	(4) Patients must be in view of staff during hemodialysis treatment to ensure patient safety (video surveillance will not meet this requirement).	Each patient, including their face, **vascular access site, and bloodline connections, must be able to be seen by a staff member throughout the dialysis treatment.** Allowing patients to cover access sites and bloodline connections provides an opportunity for accidental needle dislodgement or a line disconnection to go undetected. This dislodgement or disconnection could result in exsanguination and death in minutes.
V456	(5) Be informed about and participate, if desired, in all aspects of his or her care, and be informed of the right to refuse treatment, to discontinue treatment, and to refuse to participate in experimental research.	Patients have the right to know about and participate in their care and treatment to the extent they desire. Self-cannulation may be performed by the patient in any facility upon receiving appropriate training and demonstrating competence, should they so choose. The facility must encourage patient participation in care planning. Examples of ways to promote this participation include, but are not limited to, offering the patient the option to participate in interdisciplinary team care planning or to attend a planning meeting in-person or by teleconference from home. "Chair-side" review of the plan of care is also acceptable, if sufficient privacy can be provided. Patients also have the right to accept or decline to participate in their care. Patients must be notified of changes to their dialysis prescription and the reason for those changes. Patients should be encouraged to disclose any concerns they have with the proposed changes. Patients have the right to refuse the change without fear of discharge. Patients have the right to refuse any aspect of treatment, to refuse to participate in experimental research, and to discontinue their dialysis treatments completely. The facility must have an ongoing program for vascular access monitoring and surveillance for early detection of failure and to allow timely referral of patients for intervention when indications of significant stenosis are present. Patient education should address self-monitoring of the vascular access.
V551	**§ 494.80 Condition: Patient assessment.** The patient's vascular access must be monitored to prevent access failure, including monitoring of arteriovenous grafts and fistulae for symptoms of stenosis.	"Monitoring" strategies may include physical examination of the vascular access; observance of changes in adequacy or in pressures measured during dialysis; difficulties in cannulation; or in achieving hemostasis. Precipitating events should also be noted, such as hypotension or hypovolemia. Surveillance strategies include device-based methods, such as access flow measurements, direct or derived static venous pressure ratios, duplex ultrasound, etc. For patients with grafts and fistulae, the medical record should show evidence of periodic monitoring and **surveillance of the vascular access for stenosis** and signs of impending failure. The documentation of this may be on the dialysis treatment record, progress notes, or on a separate log. A member of the facility staff must review the vascular access monitoring/surveillance documentation to identify adverse trends and take action if indicated. Refer to the Condition for Infection Control at V147 and V148 and the Condition for QAPI at V633, which also cover monitoring and surveillance of vascular accesses.

continued on next page

TOOLKIT (continued)

TAG NUMBER	REGULATION	INTERPRETIVE GUIDANCE
V585 (Home Dialysis)	**§ 494.100 Condition: Care at home.** **The training must:** (3) Be conducted for each home dialysis patient and address the specific needs of the patient in the following areas. (iii) How to detect, report, and manage potential dialysis complications, including water treatment problems.	This Condition applies to those facilities that provide training and support services for any type of home dialysis. This Condition focuses on items that are unique to the home dialysis modality. All of the ESRD Conditions must be met regardless of whether the setting is in-center or at home. Patients on home hemodialysis must be taught to recognize, manage and report such potential complications as vascular access problems (e.g., **difficulty with cannulation**, a change in bruit or thrill, **bleeding**), **infections**, hypertension or hypotension, hyperkalemia, etc. The facility training program should include instruction aimed at enabling patients/helpers to detect, prioritize, and report problems and to ensure they are prepared to recognize and promptly act upon those situations, which could present hazards to patient safety. Training patients on home dialysis and helpers to "handle" medical emergencies that may be anticipated (e.g., syncope, **significant blood loss**, cardiac events) includes immediate responses/actions and methods for contacting emergency medical systems. Refer to V768. Training for home patients to monitor their own health status should include the use of equipment to monitor heart rate, blood pressure, temperature, and weight; **assessment of vascular** or peritoneal dialysis access; recognizing adverse signs and symptoms; and when, how, and who to contact if they experience problems with their health or treatment.

Online Resources

VND-Related Guidelines

From Europe:

European Dialysis and Transplant Nurses Association/ European Renal Care Association (EDTNA/ERCA). (2016). *Venous needle dislodgement (VND): How to minimize the risks.* https://vo2k0qci4747qecahf07gktt-wpengine.netdna-ssl.com/wp-content/uploads/2016/10/Edtna_poster_UK-1.pdf

From Australia:

Jose, M.D., Marshall, M.R., Read, G., Lioufas, N., Ling, J., Snelling, P., & Polkinghorne, K.R. (2017). Fatal dialysis vascular access hemorrhage. *American Journal of Kidney Diseases, 70*(4), 570-575

Taping Resources

Clinical Practice Recommendations for Needling of Arteriovenous Fistulae and Grafts for Haemodialysis

British Renal Society Vascular Access Group. (2018). *Clinical practice recommendations for needling of arteriovenous fistulae and grafts for haemodialysis.* https://vo2k0qci4747qecahf07gktt-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/Clinical-Practice-Recommendations-for-Needling-of-Arteriovenous-Fistulae-and-Grafts-for-Haemodialysis.pdf

"Tape that covers the needle insertion site needs to be clean, which can be achieved through a number of methods:

a. Sterile tape as part of the dressing pack used for needle insertion.
b. Single use rolls of tape for individual patients.

Alternatively, gauze can be used over the needle insertionsite or the needle insertion site can be left exposed to avoid taping directly over this.

Rolls of tape should always be stored in a designated clean area and not in staff members' pockets.

TOOLKIT (continued)

Following insertion, the needle should be taped either using the chevron method or H technique to prevent needle dislodgement" (British Renal Society, 2018, p. 6, "Recommendation C: Procedural Principles for Good Needle Insertion").

Image of taping using gauze (British Renal Society, 2018, p. 26).

Image of taping using V method and image of taping using H method (British Renal Society, 2018, p. 27).

deVilliers, A. (2018, October 4). *Single-handed cannulation and chevron taping for solo home HD [blog post].* https://homedialysis.org/news-and-research/blog/277-single-handed-touch-cannulation-and-chevron-taping-for-solo-home-hd

Single-handed cannulation and chevron taping.

Van Waeleghem, J.P., Chamney, M.J., Lindley, E., & Pancírová, J. (2008). Venous needle dislodgement: How to minimize the risks. *Journal of Renal Care, 34*(4), 163-168. https://doi.org/10.1111/j.1755-6686.2008.00047.x

Chevron taping technique (p. 165)

National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (KDOQI)

National Kidney Foundation. (2006). *2006 updates: Clinical practice guidelines and recommendations* (taping image, p. 269). https://www.kidney.org/sites/default/files/docs/12-50-0210_jag_dcp_guidelines-hd_oct06_sectiona_ofc.pdf

Taping image (p. 269).

Lok, C.E., Huber, T.S., Lee, T., Shenoy, S., Yevzlin, A.S., Abreo, K., Allon, M., Asif, A., Astor, B.C., Glickman, M.H., Graham, J., Moist, L.M., Rajan, D.K., Roberts, C., Vachharajani, T.J., Valentini, R.P., the National Kidney Foundation. (2020). KDOQI clinical practice guideline for vascular access: 2019 update. *American Journal of Kidney Disease, 75*(4, Suppl. 2), S1-S164. https://doi.org/10.1053/j.ajkd.2019.12.001

Taping recommendations are the same as 2006.

continued from page 356

The Truax Group. (2019, December 10). *Dialysis line dislodgements.* https://www.patientsafetysolutions.com/docs/December_10_2019_Dialysis_Line_Dislodgements.htm

United States Renal Data System (USRDS). (2020). *USRDS annual data report.* National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. https://adr.usrds.org/2020/end-stage-renal-disease

Van Waeleghem, J.P., Chamney, M., Lindley, E.J., & Pancirova, J. (2008). Venous needle dislodgement: How to minimise the risks. *Journal of Renal Care, 34*(4), 163-168.

Instructions for NCPD Contact Hours

NNJ 2121

Nursing continuing professional development (NCPD) contact hours can be earned for completing the learning activity associated with this article. Instructions are available at **annanurse.org/library**

Deadline for submission: **August 31, 2023**