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SPECIAL REPORT

Venous Needle Dislodgement in Dialysis Clinic Settings

A Compilation of Best Practices and Prevention

Venous needle dislodgement (VND) occurs when a venous needle dislodges from a patient's vascular access during hemodialysis treatment. It causes significant problems for the patient and can cost a facility a lot of money. This report discusses best practices and solutions to overcome this important issue.

By Michael Morales, CHT, CCHT-A, CCNT, CBNT, and Grace Padilla-Kastenberg, MPH

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Abstract

Venous needle dislodgement (VND) occurs when a venous needle dislodges from a patients vascular access during hemodialysis treatment. VND has the potential to cause significant blood loss in a short period of time. Consequently, it is responsible for serious injury and mortality to dialysis patients and can thus, negatively affect the entire hemodialysis spectrum of care. This paper presents and discusses the severity of VND and its ramifications to patients, health care workers and clinic facilities. Additionally, the paper presents a compilation of best practices and other solutions to mitigate morbidity and mortality associated with VND among hemodialysis patients in clinic settings.

Background

According to the latest data available from the U.S. Renal Data System (USRDS)[i], 593,086 persons in the United States are affected by end-stage renal disease (ESRD) (U.S. Renal Data System, 2012).[ii] This number includes patients on hemodialysis and peritoneal dialysis (PD), in addition to patients with functioning kidney transplants.

Over the past twenty years this number has nearly tripled, (230,000 in 1991), (U.S. Renal Data System, 1994). Specifically, the hemodialysis patient population totaled 383,992 in 2010 (U.S. Renal Data System, 2012). This number has similarly tripled in the last 20 years, (118,000 in 1991), as obesity and diabetes have reached epidemic proportions (U.S. Renal Data System, 1994). Patients predominantly receive dialysis for ESRD; however, a small number of patients receive dialysis for other acute conditions, and for shorter durations.

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Among the many risks associated with dialysis—including machine malfunctions and medication errors—VND stands out as causing significant adverse health consequences unique to hemodialysis patients (Pennsylvania Patient Safety Authority, 2010). VND results from the partial or total displacement of the venous needle from the vascular access site that supplies cleansed blood back into the patient from the dialysis machine. Blood, intended for recirculation into the patient's bloodstream, instead flows onto the bed, chair or floor, and in some cases unbeknownst to the patient or dialysis care provider (Hurst, 2011). VND can lead to minor blood loss up to fatal exsanguination (Renal Physicians Association, 2012). VND can take place at anytime when hemodialysis is administered through an arteriovenous (AV) fistula or AV graft.

Though past research has indicated VND as a rare occurrence, more recent studies have revealed that it is more common than once believed. These studies indicate that more than two patients each day experience a serious adverse health outcome as a result of VND (Hurst, 2011). These incidents typically require hospitalization and intensive care (Veterans Health Administration, 2008). Additionally, more than two patients die every week as a result of VND, and more than 200 venous needles dislodge every day (Hurst, 2011). Further research shows that about 414 episodes of serious VND occur annually with an estimated mortality between 10 to 33 percent; equivalent to 136 annual deaths linked to fatal VND in the United States (Sandroni, 2008).

Of the almost 240,000 deaths reported to Medicare during 2006-2008, nearly 700 deaths were attributed to hemorrhages from vascular access (Fields, 2010). To date, only five states require that dialysis units report incidents resulting in unexpected patients deaths or injuries (Fields, 2010). The U.S. Food and Drug Administration (FDA) medical device adverse event reporting data set (MAUDE, Manufacturer and Facility Device Experience) also demonstrates that VND is of significant concern.[iii] Data from the past decade shows over 50 incidents of dialysis patient injury and death due to VND (U.S. Department of Health and Human Services). It is important to note that the body of research reveals no exact figures with respect to VND, and underreporting is likely common with VND events (Sandroni, 2008).

Consequences

PATIENT INJURY

VND causes significant negative health consequences for hemodialysis patients. High blood flow rates experienced during dialysis treatments can produce significant blood loss in a short period of time. In less than 7.5 minutes, an average-sized man receiving dialysis treatment can lose more than 50 percent of his blood volume from an undetected VND. Similarly an average sized woman can lose more than 40 percent of her blood volume in less than five minutes. VND is considered a Class IV hemorrhage—the most severe classification—and it can be fatal without a rapid response (Renal Physicians Association, 2012).

Patients who lose more than 40 percent of their blood are more likely to suffer from permanent life-altering consequences such as strokes and other permanent disabilities (Hurst, 2011).

Treatment for VND typically includes emergency room visits for blood transfusions in cases of minor VND; more serious cases require hospitalization and ICU care, depending upon the amount of blood loss. Severe cases of VND can result in death from exsanguination.

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Cost

As described, VND poses significant and detrimental health effects. Recent research and analysis has also uncovered significant economic costs associated with VND.

COST OF MEDICAL CARE

Costs associated with even minor cases of VND can exceed $1,500 per event, according to latest cost analyses surrounding blood transfusions (Shandler, 2010). These interventions include the cost of units of blood—ranging from $522 to $1,183 per unit—(Shandler, 2010), and Epogen—approximately $520 per dose (Hurst, 2011). Epogen is used to treat anemia caused by chronic kidney disease (CKD) in patients on dialysis to lessen the need for red blood cell transfusions (Amgen, 2011).

For serious cases of VND, costs escalate upwards of $150,000 when hospitalization, blood transfusions, additional medications and other intensive care costs are accounted for (Hurst, 2011).

COST OF LOST CLINIC INCOME

Clinics experience lost income from patients absent from regular dialysis treatments because of VND. Dialysis facilities operate under an extremely cost-sensitive environment, and lost income can pose significant negative financial impact on individual facilities. On Jan. 1, 2011, the Centers for Medicare & Medicaid Services (CMS) instituted a bundled payment system that provides standardized reimbursement rates for dialysis treatment. This base rate is equivalent to $229.63 per patient per dialysis treatment (CMS, 2012). This rate does not include additional outlier payments for high-risk or pediatric patients. Additionally, significantly higher reimbursements are lost from privately insured patients.

COST OF LIABILITY CLAIMS

Costs associated with malpractice and wrongful death claims linked to VND can be very high. Though most of these cases settle out of court for undisclosed amounts, some research indicates these claims can exceed millions of dollars (Fields, 2010; Kampinski, C).

COST OF BRAND IMAGE DAMAGE

Though difficult to account for in monetary terms, damage to brand image can prove detrimental to individual facilities and dialysis providers. Dialysis patients have many clinics to choose from for their treatment, and patients may decide to terminate their care at dialysis clinics with poor safety records and seek out those with better records. Programs such as the Dialysis Facility Compare website[iv] sponsored by Medicare, allow patients to review clinics based upon health indicators and other quality indicators. VND is currently not a quality indicator employed in this program, but may be forthcoming, given current momentum towards improved quality of care and patient satisfaction.

OTHER COSTS

Other notable costs associated with VND include lost work productivity faced by patients, as well as pain and suffering experienced by those affected patients. Additionally, though largely unstudied, the costs associated with lower employee morale and stress associated with VND events is important to mention.

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VND Risk Factors, Best Practices

Many risk factors associated with VND have been well established and increase the probability of a VND event. However, universal strategies to decrease these risk factors and mitigate VND are not always employed in the hemodialysis sector.

1 Insufficient Staff Ratios

Inadequate staff ratios can lead to the insufficient monitoring of patient vascular access sites. As a result, VND is more likely to remain undetected and result in life-threatening complications. High blood flow rates create a risk of exsanguination if staff members do not detect the dislodgement and intervene immediately. Insufficient patient to staff ratios are also likely to burden clinicians and decrease quality of care in every aspect of care.

Best Practice

- Encourage lower patient to staff ratios of 4-to-1 to facilitate regular patient monitoring. Promote discussion with facility administrators and other stakeholders of risks associated with higher ratios.

Though several studies and common clinic practice suggest that a ratio of 4-to-1 patients per nurse is optimal, (Van Waeleghem, 2008), a recent study conducted by the Cleveland Clinic's hospital-based dialysis center, suggests a more aggressive ratio of 2-to-1, with the addition of a quality-control nurse to allow routine monitoring during treatments for high risk patients (see Best Practice 8), (Lascano, 2011). This and other studies have shown that lower staff ratios contribute significantly to the reduction of VND in dialysis clinic settings.

> Although achieving these ratios may prove to be fiscally challenging, improved patient to staff ratios have been proven to be successful and can effectively minimize the risk of VND.

NOTE: Although achieving these ratios may prove to be fiscally challenging, improved patient-to-staff ratios have been proven to be successful and can effectively minimize the risk of VND. Alternatively, costs associated with VND can be crippling for dialysis centers and can far outweigh upfront costs for increased staffing.

2 Lack of Effective Preparation of the Vascular Access Site

Ineffective preparation of patient access sites place dialysis patients at an increased risk to VND due to factors that may compromise effective taping and needle fixation.

Best Practices

- Schedule sufficient time to prepare the vascular access site to achieve optimal cannulation and taping. Thoroughly inspect access for abnormalities such as sores, thinning and protrusions. Carefully wash, dry and remove tape residue from prior dialysis treatments. Prepare access site with Betadine, alcohol, or chlorhexadine and ensure preparation solution is completely dry prior to needle securement. Consider shaving the access area for patients with excessive hair as excessive hair may compromise adhesive fixation. Encourage patients to practice good hygiene and maintain clean access sites.

3 Patients with Difficult Access

Deep angles of cannulation or difficult location of access sites—such as the elbow—compromise effective needle fixation and place patients at higher risk for VND. Deep accesses require deeper cannulation angles that present dangerous excessive movement of the venous needle during dialysis treatment.

Best Practices

- The use of longer needles (30-35mm) for patients with elbow or upper arm fistulas with deep arterial veins may allow more effective fistula access at an angle that makes taping and securing needles easier (Van Waeleghem, 2008). Always ensure proper taping of the needle to ensure optimal fixation. This includes using high quality medical tape (e.g., 3M Tegaderm, 3M Transpore, 3M Micropore, NeedleTape), in conjunction with consistent taping protocols and employing the Chevron technique.[vi] This technique provides protection against tugging or excessive straining of bloodlines and maintaining stable placement of the venous needle.

4 Inadequate Attention to Taping

Poor attention to taping is a precursor to inadequate fixation of the venous needle and can lead to VND. Patient allergies to tape, skin conditions, excessive sweating, and inadequate taping protocols, place patients at heightened risks for VND.

> Poor attention to taping is a precursor to inadequate fixation of the venous needle and can lead to VND.

Best Practices

- Identify patient history or current allergies to medical tape used to secure needles. Consider the use of more gentle tapes, including paper, or a silicon-based adhesive for patients with compromised and sensitive skin. Always test tape on patient's skin—at another site other than the venous access—prior to use as needle securement.
- Several taping methods used in dialysis settings along with different tape types can provide adequate fixation. Ensure facility employs consistent taping protocols to secure the venous needle. The utilization of tape strips around the needles hub fashioned in a chevron configuration (Chevron technique), and anchored with additional tape strips provides strong needle fixation (Van Waeleghem, 2008). Additionally, larger die-cut units of tape or window dressings can cover the entire access site with successful fixation without requiring an additional chevron.
- Discourage the use of tape tabs. Though tabs can facilitate tape removal, (Hurst,2012), it is not recommended because an exposed adhesive side can catch on other objects inadvertently dislodging the venous needle.
- For patients who experience excessive sweating, determine if additional taping or re-taping is necessary to ensure proper needle fixation.

5 Inadequate Securement of Bloodlines

Lines placed without sufficient slack, or placing lines across the body, present significant risks to VND, as any movements have the potential to dislodge the venous needle.

Best Practices

- Always anchor bloodlines to the patient and not to the chair or bed. Employ clips that snap into bloodlines to prevent loosening during treatment (Renal Physicians Association, 2010). Loop bloodlines loosely to enable movement, but not so loose that bloodlines may catch on an object and dislodge the venous needle (Van Waeleghem, 2008). Placing the dialysis machine on the same side as the vascular access site helps to eliminate bloodline entanglement.

6 Obstructed View of Vascular Access

Limited visibility of a patient's vascular access site remains one of the most significant risk factors associated with VND. A recent VA study found that in 50 percent of severe VNDs, access sites were not visible (Veterans Health Administration, 2008). Many patients prefer to cover up during treatment for warmth and privacy, making access visibility difficult. Though many clinics maintain protocols that do not permit patients to cover the access site, they are not always enforced.

Best Practices

- The vascular access area should remain uncovered at all times. This allows staff to make routine checks without disturbing patients or the access site itself (Renal Physicians Association, 2010). Alarms or monitors should also not obstruct the access site, and documented access checks should take place frequently. Educate patients regarding the importance of access visibility to encourage compliance.

7 Mechanical Detection

Expanded alarm windows on dialysis machines make it difficult to detect VND. Dialysis machines can measure pressure in the extracorporeal circuit and have built in pressure limits that alarm when these limits are exceeded. These pressure limits are adjustable during treatment and staff often set higher-pressure limits to keep machines from experiencing false alarms. The venous pressure readings include the combination of the pressures required to push the dialyzed blood through the extracorporeal circuit and back into the vascular access. If a venous needle dislodges, the pressure alarm will activate if the monitored venous pressure drops under the lower limit of the alarm window. A larger window will make the detection of a needle dislodgment less likely risking extreme blood loss as the machine continues to pump (Van Waeleghem, 2008).

The pressure in the access itself will be the resulting drop in pressure when a venous needle dislodges. A low pressure in the access is highly desirable but can be a contributing factor in the failure to detect changes in pressure as a venous needle dislodges. An asymmetric alarm window of 100 mm/hg would close the lower limit within 20-35mm/hg of the venous pressure. Notably, low fistula pressure may be present in 50 percent of dialysis patient's accesses, and too low for a machine to detect.

Though smaller gauge needles limit discomfort in patients with low blood flow rates or during fistula maturation, they create a problem with venous pressure. Smaller gauge needles provide significant resistance in flow—particularly at higher blood flow rates—resulting in backpressures exceeding a patient's venous pressure. This produces a risky scenario where with partial dislodgement, the venous pressure monitor may still detect the pressure created by the needles flow resistance and miss smaller drops in pressure caused by VND (Polaschegg, 2010; Hurst, 2011).

Notably, the ECRI Institute has included "Alarm Hazards" in their Top 10 Health Technology Hazards since the publication's inception in 2008 (ECRI, 2008-2012). The ECRI publications have specifically cited hazards from dialysis machine alarms due to the dangers associated with alarm fatigue and the modification of alarm windows.

Best Practices

- Set the lower limit of the venous pressure alarm as close to the current venous pressure as the machine will allow. This will minimize false alarms related to movement and will reduce the number of false high venous pressure alarms from movement and other factors. Machines should have the option to set an asymmetric alarm window (Van Waeleghem, 2008).
- Measure access pressure prior to each treatment and use other methods of detection for patients with access pressure below 30mm/hg (Polaschegg, 2010).
- Establish policies to control alarm silencing, modification, and disabling of alarms (ECRI, 2012).
- Establish alarm-notification and response protocols that ensure that alarms are recognized and promptly addressed (ECRI, 2012).
- Employ other methods of detection for patients using smaller bore needles, including blood detection monitors such as Redsense[vii] and enuresis monitors[viii] (ECRI, 2012).
- Educate medical staff surrounding the limitations of dialysis machine alarms to effectively detect VND.

8 Patients Requiring Close Monitoring

Many patients have underlying conditions or intra-dialytic complications that require constant observation. Insufficient staff ratios can limit the ability of medical staff to maintain continuous visual contact with the patient and their access site.

Patients who experience frequent side effects during hemodialysis such as hypotension, muscle cramps and hypoglycemia are at high risk for VND as these medical complications may cause the patient to become restless move, spasm, or seize.

Other high-risk patients include:

- Patients with an altered state of consciousness.
- Patients who are very quiet and/or patients who do not speak up when adverse events take place.
- Patients who fail to comply with access visibility policies, e.g., covering access with blanket.
- Patients with blood exuding along the venous needle (this could be a result of stenosis, a high dose of heparin, anemia or hemophilia).
- Patients with difficult access (e.g., deep angles of cannulation, difficult locations of access).
- Patients with excessive hair and patients prone to sweat (such as diabetics in case of hypoglycemia).
- Patients who have allergic reactions to medical tape.
- Patients who perform home dialysis alone or overnight.

Best Practices

- Provide sufficient oversight through enhanced patient-to-staff ratio.
- Employ consistent taping and bloodline securing procedures.
- Consider the use of blood loss monitors, such as Redsense and enuresis monitors, for high VND risk patient population.
- Employ additional precautions for patients with mental, cognitive, and neurologic impairments, and those with dementia that are at particularly high risk for VND. This might include additional staffing, blood loss monitors and other best practices mentioned throughout this paper.

OTHER BEST PRACTICES AND PREVENTIVE MEASURES

- **Employ the use of warning indicators.** Warning indicators placed directly on the vascular access site can help raise awareness for both patients and health care workers about the presence of the venous needle and help to mitigate the risk of VND. Warning indicators are present throughout medical care, from biohazard labels on sharps containers, to drug warning labels. Both written and graphic presentations are widely used and have proven effective in mitigating risks, when these warnings are appropriately designed for the specified audience (Andrews, 2011). Products such as NeedleTape, (die-cut medical tape that provides enhanced visual awareness to the presence of needles), provide this type of warning indicator for both the dialysis patient and health care worker.

- **Employ a VND risk assessment tool.** The utilization of a VND risk assessment tool can provide valuable information to dialysis technicians and nursing staff to help avoid VND (EDTNA ERCA, 2010).
- **Report VND events.** Medicare requires reporting of VND incidents internally to analyze them for purposes of quality improvement. However, VND events are often not reported, particularly if the staff does not deem them severe enough. Mandatory reporting of all VND events provides critical data for improving outcomes and quality of care.
- **Ensure policies and procedures are in place in response to VND events.** Review and update policies and procedures on a regular basis to ensure best practices are incorporated into clinic protocols. Implementation of clinic protocols and procedures are an important step in preventing VND. Though clinic protocols typically include VND prevention and response practices, a lack of consistency and standardization exists among these protocols.
- **Provide ongoing education and awareness for health care workers surrounding VND.**

Clinic Staff Education

One of the single most important ways in which to prevent the incidence of VND is to provide up-to-date, comprehensive education and risk factor mitigation to clinic staff.

Education must be conducted for all clinic staff including dialysis technicians, nursing staff, physicians and clinic administrators on an ongoing basis. Suggested education intervals include upon the date of hire and bi-annually in conjunction with other clinic safety training education. Ensure clinic educational protocols are in place to support education on an ongoing basis. Continuing education opportunities provided by relevant dialysis societies and other organizations can also serve as catalysts for acquiring information and reaching out to new and tenured clinic staff.

Patient Education

Patients play an important role and provide an additional safety mechanism to help prevent VND during hemodialysis. Involve each patient with relevant education and use his or her feedback as advice to prevent VND. Discuss risks and risk mitigation with patients and their families.

Encourage patients to always inform non-ESRD caregivers about the presence of his or her access site. Patient awareness can help avoid unintended grabbing or other action that may sacrifice the integrity of the taping procedure. This is especially important with personnel shift changes during treatment.

If the patient notices that his or her AV fistula or AV access starts to bleed, patients need to alert staff immediately. Educate patients to notify staff and request re-taping to support optimal fixation when repositioned or displaced needles are observed.

Treatment

Upon the determination of a VND, employ first response procedures.

1 Stop blood pump and clamp the venous line

The patient loses a high volume of blood every second that the blood pumps continuously. Stop the blood pump immediately to minimize the amount of blood loss. Additionally, clamping the venous line will further prepare the lines to return the blood remaining in the extracorporeal circuit.

2 Call for help and don Personal Protective Equipment (PPE)

Before approaching the patient, first employ PPE and call for available and emergency help. A dislodged venous needle will continue to pump blood at typical flow rates of 300 to 500 milliliters per minute and will result in significant blood loss. Always employ universal precautions when responding to a VND.

3 Locate and secure dislodged needle

Carefully locate and disconnect the dislodged needle from the venous line. Discard the needle in available sharps container with caution. This is important to perform prior to applying pressure or attempting to clean excess blood.

4 Cover site of dislodged needle and apply pressure

Immediately apply light pressure over the dislodged needle site with sterile dressing, with care not to overexert pressure and avoid occluding the access flow and return of blood.

5 Return blood through arterial needle at low blood flow rate

Follow clinical protocol for returning blood, but use the arterial needle as the return with a reduced blood flow rate.

6 Treat symptoms and replace volume if necessary

Treat patient for blood loss symptoms by placing the patient in the Trendelenburg position (placing the patient head down and elevating the feet) and infusing appropriate amounts of saline. This approach will treat a hypotensive episode and tachycardia; whereas a cardiac arrest requires cardio pulmonary resuscitation (CPR) and the use of automated external defibrillators (AED).

7 Draw labs and assess blood loss

After stabilizing the patient, draw labs to assess the effects of blood loss on hemoglobin.

8 Report and document event

Reporting and documentation is essential in order to create a better understanding of the problem and how best to prevent VND. Health care worker and patient experience is vital in developing the best solutions to address this serious malady.

Promoting a Safety Culture

The Agency for Health Care Research and Quality (AHRQ) defines a safety culture as the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to the proficiency of an organization's health and safety management. The active promotion and creation of a culture of safety in dialysis facilities is an essential step in mitigating VND.

Across the health care spectrum there are basic elements that help to promote this culture as outlined by the AHRQ, they include:

- Acknowledgment of the high-risk nature of an organization's activities and the determination to achieve consistently safe operations.
- A blame-free environment in which individuals can report errors or near misses without fear of reprimand or punishment.
- Encouragement of collaboration across ranks and disciplines to seek solutions to patient safety problems.
- Organizational commitment of resources to address safety concerns.

Establishing a meaningful safety culture will help to build effective safety mechanisms to improve patient safety outcomes including VND. The Five Diamond Patient Safety Program[ix], established by the ESRD Networks provides modules that can help clinics achieve an effective and meaningful safety culture. Additionally, Keeping Kidney Patients Safe[x], a website resource established by the Renal Physician's Association provides important resources as well.

Conclusion

VND can produce significant adverse events for hemodialysis patients in clinic settings. Incorporating best practices, such as improving staff ratios, improving needle securement and taping protocols, and effective management of available mechanical detection devices, can significantly reduce the incidence of VND. Awareness and education to both patients and health care workers on an ongoing basis are also essential components to ensure the safety of dialysis patients, in addition to an industry-wide standard comprehensive protocol on VND prevention.

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Footnotes

i. The United States Renal Data System (USRDS), funded by the National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, is the national data registry that collects, analyzes, and distributes information on the end-stage renal disease (ESRD) population in the U.S., including treatments and outcomes. USRDS staff collaborates with members of Centers for Medicare & Medicaid Services (CMS), the United Network for Organ Sharing (UNOS), and the ESRD networks.

ii. The data reported here have been supplied by the United States Renal Data System (USRDS). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S. government.

iii. The data set is made up of voluntary reports. Presentation of this data is not intended as representative of entire VND occurrence rates.

iv. Medicare: Dialysis Facility Compare http://www.medicare.gov/Dialysis/Include/DataSection/Questions/SearchCriteria.asp?version=default&browser=Safari%7C6%7CMacOSX&language=English&defaultstatus=0&pagelist=Home

v. 3M Tegaderm, 3M Transpore, 3M Micropore are registered trademarks of 3M. NeedleTape is a registered trademark of Marea Enterprises Inc.

vi. The Chevron technique refers to a widely used needle fixation technique in dialysis settings. First, the needle is fixed in place by a rectangle of tape; subsequently a thinner, longer strip is used to make the Chevron positioned directly under the needle tubing close to the adhesive fabric with the adhesive side facing up. These strips are then folded diagonally across the dressing to create a "V" shape on the dressing. An additional strip is used across the base of the Chevron to stabilize and limit tugging.

vii. Redsense http://www.redsensemedical.com is a device developed to detect blood loss during hemodialysis and other procedures. The device incorporates a blood sensor into an adhesive sensor patch. The sensor monitors potential blood leakage from the venous needle access site via infared light and alarms if blood leakage detects absorption onto the device's sensor. Redsense is a registered trademark of Redsense Medical.

viii. Though not tested nor indicated for use in dialysis and or with venous needle dislodgement, enuresis (bed-wetting) monitors have been employed in the past with some success, particularly with nocturnal hemodialysis.

ix. Five Diamond Safety Program, http://www.5diamondpatientsafety.org/Home.aspx

x. Keeping Kidney Patients Safe, http://www.kidneypatientsafety.org