Taping of dialysis needles and securing of lines for patients on haemodialysis — a quality project

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Abstract

Background
Venous needle dislodgement (VND) is a serious and potentially fatal complication of haemodialysis. We identified that patients in our dialysis unit were potentially at risk from VND due to inconsistent clinical practice of taping needles and securing lines. Taping technique did not always meet recommended best practice. Furthermore, there was no protocol which new staff could follow, causing confusion and potentially leading to compromised practice.

Aims
After a literature search, using current best practice recommendations, we aimed to develop a protocol for taping of dialysis needles and securing of dialysis lines. We followed a quality improvement framework.

Methods
To clearly understand current practices, photographs of techniques used for taping needles and securing dialysis lines were taken across all shifts and staff mix. Patients and staff were not identified.

Using current best practice recommendations, we developed a protocol using the chevron technique for taping dialysis needles. Recommendations were made for securing dialysis lines. Information and education was provided for staff and patients. Our protocol uses both written explanation and visual representation at each step of the securing process.

Results
After extensive staff education, the protocol was successfully introduced. All patients were supportive and comfortable with the technique. A staff evaluation survey was carried out with positive results.

Conclusion
By following a quality framework, this policy has been successfully introduced in our unit and within two other dialysis units of this renal service, minimising the risk of VND in our HD patients.

Keywords
Haemodialysis, venous needle dislodgement.

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Introduction

Venous needle dislodgement (VND) can be a potentially fatal incident for haemodialysis (HD) patients, with consequences ranging from minor blood loss, to catastrophic blood loss, leading to death or permanent impairment (Axley et al., 2012). Standardised practices based on recommendations by multiple guiding organisations such as the Australian and New Zealand Society of Nephrology (ANZSN) need to be considered for implementation in the HD setting.

VND occurs when “… the venous fistula needle becomes dislodged out of the vascular access resulting in blood loss” (Axley, et al., 2012, p. 435). When the venous needle is dislodged from the fistula during dialysis it creates significant risk to the patient. Consider a patient with a blood flow rate (BFR) of 300 mL/min. Sixty seconds after a VND, the patient will have lost 300 mL. If unidentified, within 5 minutes the patient can lose 1.5 L of blood. According to Hurst (2009) patients who lose more than 40% of their blood volume are more likely to suffer from serious adverse events such as stroke and permanent disability. In an average adult male, this can be in as little as 7½ minutes or 5 minutes for a female.

The risks associated with VND are costly to the patient but also to the health service. Associated costs include interventions such as ICU or emergency department admissions, increased erythropoietin use, pathology testing and blood transfusions (Morales & Padilla-Kastenberg, 2013; Hurst, 2010).

Literature review

The Australian and New Zealand Society of Nephrology (ANZSN) surveyed dialysis units in Australia and New Zealand about blood leak experiences in individual units. There were reports of 10 significant leaks and two fatalities over a period of two years. Although there were a number of reasons reported, including blood lines disconnecting from the dialyser and luer lock connection failure, VND was the most common cause for blood leaks (ANZSN, 2012).

In the United States of America (USA), estimated rates of VND are much higher with reported rates from between 40 and 136 annually (Renal Physicians Association, 2015). Other estimates put the VND rate at 414 episodes annually in the USA (Hurst, 2009). Of greater concern are the reported instances of VND without a venous pressure alarm. Relying on the venous pressure alarm to sound will not save a patient from a serious adverse event. Sandroni (2005) reported multiple deaths caused by VND and a lack of venous pressure alarm during the event. In fact, it is unlikely that blood loss-associated fatalities would occur, if the venous pressure alarm sounded consistently when there was a VND episode. Furthermore, the ANZSN also highlighted that the venous pressure alarm cannot be relied on as the alarm is unreliable in the detection of a blood leak such as VND (ANZSN, 2012).

A review of the pitfalls of venous pressure monitoring identified the pressure within the individual patient’s access as only one factor that contributes to the venous pressure. Other aspects which contribute to the readable venous pressure include the diameter and length of the needle, the blood flow rate, the viscosity of blood, resistance in the extracorporeal circuit and level of the needle relative to the venous chamber (Polaschegg, 2010). If the venous needle should become dislodged, the only parameter that has been altered is the pressure within the patient’s access. Furthermore, if the needle should become entangled in a blanket or remains underneath the tape, there will not be enough of a change in pressure to cause the venous pressure alarm to sound. This is also the case when the venous needle remains at the same height after dislodgement (Polaschegg, 2010). This highlights the importance of employing other strategies, such as the taping of dialysis needles and securing blood lines to prevent VND.

In 2012, and in response to reports in the literature of widespread VND occurrences, the American Nephrology Nurses Association (ANNA) undertook a special working group to review VND rates. The working group aimed to assess the consequences of VND and recommend strategies for prevention. A survey involving 1173 nephrology nurses was undertaken. In this group, 70% worked in the chronic HD setting and 43% in acute dialysis, with some crossover. Of the respondents, 76.6% reported seeing a VND in the past five years and 8% had seen five or more events over the past five years (Axley et al., 2012). This survey result clearly establishes VND as a dialysis complication that occurs frequently enough to necessitate practice review.

Of particular value in this survey was the identification of at-risk patients. Being aware of high-risk patients will assist nurses to assess their risk and monitor accordingly. Patients considered to be high risk are shown in Table 1 (Axley et al., 2012).

Recommendations to minimise the risk of VND were made in 2008 by the European Dialysis and Transplant Nurses Association (EDTNA) and the European Renal Care Association (ERCA) jointly. These recommendations were in response to reports of VND in the literature and include diagrams of recommended taping technique (Van Waeleghem et al., 2008). The recommendations are similar to those made by ANNA and the ANZSN and focus on minimising all factors that increase the risk of VND. A summary of the main recommendations made by all three bodies is as follows:

1. Educate staff and patients about the risks of VND.
2. Standardise needle taping and develop clear policies and procedures around this process.
3. Nurses are to be trained in the standardised taping procedure.
4. All needle sites are to remain uncovered and visible at all times.
5. If the needle needs to be readjusted, apply new tape.
6. Blood lines need to be secured in a way that allows for movement of the patient but does not pull on the needles.
7. Educate staff that venous pressure alarms will not consistently detect VND.
8. For home HD and nocturnal HD patients, consider the use of a blood detection device or moisture monitor.
9. Set the venous pressure alarm limit as close as possible to the current venous pressure. (ANZSN, 2012; Axley et al., 2012; Van Waelegem et al., 2008).

Setting the venous pressure alarm limits as close as possible to the current venous pressure is generally agreed upon as in recommendation 9 in the summary of recommendations. However, Polaschegg (2010) states that this is unrealistic due to the increased number of false alarms. This can result in frequent false alarms becoming a nuisance and lead to complacency. ‘As close as possible’ is not defined in any of the recommendations. Instead, ensuring that the alarm parameters are not > 20–30 mmHg beyond the current venous pressure is a more functional option given that the venous pressure can vary by 30 or 40 mmHg within a session (Polaschegg, 2010).

A treatment plan pathway for patients who have a VND has been outlined by Morales and Padilla-Kastenberg (2013), which involves the following: stopping the blood pump; donning personal protective equipment (PPE); calling for help; locating the dislodged needle and securing; covering the site and applying pressure; returning blood if able; treating symptoms; drawing blood and documenting event. This pathway can easily be incorporated into any unit-specific policy.

### Background

There was a perceived problem with current practice in the taping of dialysis needles and securing of lines in this unit. While we did not have an actual VND incident, there had been some near-miss situations where dialysis needles were found to be close to dislodging, either due to poor taping practice or lines being poorly secured.

A clinical audit was undertaken, which identified:

1. Inconsistent clinical practice of taping dialysis needles/ securing of dialysis lines by staff according to their previous experiences or personal preference.
2. Practices of taping needles and securing lines did not always meet recommended best practice recommendations.
3. There was potential trauma to needle sites or prolonged bleeding times due to poorly secured dialysis needles.

<table>
<thead>
<tr>
<th>Patients who keep their blood lines covered, despite being asked to uncover them</th>
<th>Nephrology nurses identified these patients at higher risk of an unidentified VND and reported the ability to easily view the patients access as essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with hypotension or muscle cramps</td>
<td>Patients in this category may be prone to sudden movements leading to VND or become diaphoretic, leading to moist skin, which may loosen tapes</td>
</tr>
<tr>
<td>Patients with inadequately taped cannulae</td>
<td>Adequate taping was reported as critical in the prevention of VND, particularly in fistulas which are in a challenging location (less likely to have secure taping) Nurses mention that training is an essential part of correct taping</td>
</tr>
<tr>
<td>Confused, restless, agitated or neurologically impaired patients</td>
<td>Reported significantly higher risk of VND due to movement or barriers in educating patients about VND. Much higher risk in acute dialysis setting</td>
</tr>
<tr>
<td>Staffing levels and staff observation</td>
<td>Survey respondents reported that surveillance requires adequate staffing ratios and levels of observation intradialytic</td>
</tr>
<tr>
<td>Patients on nocturnal or home haemodialysis</td>
<td>Home or nocturnal patients require higher levels of education about the pitfalls of relying on the venous pressure alarm. They also require an extra level of protection such as enuresis alarms or blood detectors</td>
</tr>
</tbody>
</table>
4. Current inconsistent clinical practices may cause confusion, leading to poor practice for new staff — essentially putting patients at risk of VND.

5. There were numerous taping products available in the unit so it was considered an opportune time to limit the selection.

Results from the audit identified that patients in our dialysis unit were potentially at risk of VND and its consequences due to inconsistent clinical practice of taping needles and securing dialysis lines. Furthermore, there was no unit-specific or renal service recommendation/protocol which new staff could follow, causing confusion and potentially leading to compromised practice.

It was clear from these audit results that a practice change was required. While we had not had an occasion of VND, there was certainly the potential for this to occur, resulting in a risk for patients.

**Aim**

Using a quality improvement model of plan-do-check-act (Wick, 2009), this project aimed to assess current practice in taping and securing of dialysis lines, identify and clarify where problems were, and change practice where required in alignment with best practice recommendations.

**Method**

To highlight the potential risk and to facilitate staff education, photographs of current practices of taping needles and securing of HD lines across all shifts and staff mix were taken. Photographs did not identify either patient or staff. Patients gave verbal consent for their access, once cannulated and taped, to be photographed. Each photograph was then viewed by the patient to confirm non-identification.

**Change process**

For this project to be successful it was important to ensure staff were well informed and included in the change process. One of the comments we wanted to avoid was “we have always done it this way” (Hain & Kear, 2015, p. 12). We formed a small team of nurses as leaders in the change process. This small group was responsible for formulating a policy for taping and securing of dialysis lines.

The main points of the policy included:

1. A three-point instruction on how to apply tape to the dialysis needles using the chevron technique — written and picture instructions were provided (Figure 3).
2. Dialysis lines to be secured loosely to the patient not the furniture. Lines could also be supported by a clamp attached to the patient (Figure 4).
3. If dialysis needles require adjusting then tape to be replaced not reapplied.
4. Dialysis access to be visible at all times and to be checked hourly as part of the current routine round.
5. The range of taping products was limited, ensuring alternative products were available for patients with skin sensitivities or allergies and products were financially appropriate.

Information for staff was provided at staff meetings and shift handover and feedback was sought. Staff were provided with a copy of the protocol and education was organised in group sessions followed by individual assessment.

Patients were involved in the process from the beginning. They were informed of the project and the rationale. Patient feedback was encouraged.

**Implementation**

A date was set for implementation of the protocol, which gave ample opportunity for all staff to complete education and competency. There had been ample opportunity for discussion of any concerns or foreseeable barriers. All patients were informed and any individual issues discussed.
Taping of dialysis needles and securing of lines for patients on haemodialysis — a quality project

Evaluation process
After 12 weeks of implementation, the project was evaluated by the following process:

1. Audit practice of taping and securing of dialysis lines by:
   a. Photographing current practices of taping needles and securing of HD lines across all shifts and staff mix. The same practice in relation to photographs was carried out as in the pre-implementation stage, ensuring pictures were non-identifying of either the patient or staff member.
2. Identify any practice outside the protocol. This would be followed up by the nurse in charge and addressed at handover meetings to ascertain reason for deviation from protocol.
3. Any practice out of current protocol that was unavoidable should be clearly documented in the patient care plan and clinical notes.
4. Evaluate performance of selected tape.
5. Ensure discussion at ward meeting and handover.
6. Staff evaluation survey.

Evaluation result
The photographs taken for our audit showed that the new protocol for taping needles and securing lines was being strictly adhered to. There were minimal variations to the protocol. Slight variations for an individual patient were clearly identified in the patient care plan. The audit identified that selected taping products were adequate. Staff feedback from the evaluation survey was positive overall.

Discussion
The introduction of this protocol into our unit was relatively problem-free. This contributed to the change process we followed, in particular by having committed leaders, keeping staff and patients involved, ensuring continued communication of the process and following best practice recommendations. These issues have been identified by Wick (2009) as elements essential to make a quality project successful.

Using photographs as part of our audit provided an objective method of identifying problems with taping of needles and securing lines, which were then easily communicated to staff.

The chevron technique for taping was chosen as it was already identified and recommended by expert organisations such as EDTNA/ERCA and ANNA (Van Waegheghem et al., 2008; Axley et al., 2012).

Prior to implementation, all staff had been educated and were confident with the new taping procedure. Patients were informed of the rationale to ensure understanding and acceptance. The main issue discovered was the request to leave the access visible. We found that many patients complained of being cold during the winter months. In order to address this, some clothing was able to be manipulated to cover part of the exposed arm or a towel was placed over the hand, depending on the area of cannulation.

During the implementation of this policy a VND event occurred in a HD unit attached to this service. As a result, this policy was introduced service-wide.

Conclusion
It has been shown in the literature that VND carries significant risk to the patient. Using current best practice recommendations a taping of needles and securing of dialysis lines protocol was developed ensuring there was written explanation and visual representation of each step.

By following a quality framework, this policy has been successfully introduced across all areas within this renal service. Positive aspects of this process have been the ability to sustain changes made. The key to the positive aspects of this project has been having key drivers or champions and the involvement of staff and patients throughout the process. A relatively small change in practice has minimised the risk of VND in our HD patients and raised awareness for staff and patients of this potential problem. To further re-evaluate the taping procedure, an audit will be carried out one year after the implementation of the policy.

References

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