Impact and Safety Associated with Accidental Dislodgement of Vascular Access Devices: A Survey of Professions, Settings, and Devices

Nancy Moureau, RN, PhD, CRNI®, CPUI, VA-BC™
PICC Excellence Inc., Hartwell, GA

Abstract

Background: *Dislodgement rates with intravenous catheters are reported at 1.8%-24% events per year resulting in failed access, interrupted treatment, and greater resource consumption with catheter replacement. The purpose of this study was to quantitatively evaluate the perceptions of frequency, impact, contributing factors, and safety issues from accidental dislodgement affecting intravenous (IV) devices as reported by healthcare clinicians.*

Methodology: *A cross-sectional descriptive survey was conducted via a voluntary online web-based survey of clinicians. Subjects were divided as those actively working in a clinical healthcare setting and those no longer active. Analysis of data was performed quantifying responses of clinicians on question of dislodgement.*

Results: *Survey results indicate clinicians routinely observe a significant percentage of accidental dislodgement, with 68% of the 1561 respondents reporting often, daily, or multiple times daily occurrence and 96.5% identifying peripheral intravenous catheters as most common device experiencing accidental dislodgement. Respondents prioritized 10 contributing factors, with confused patient (80%), patient physically removes catheter (74%), and IV catheter tape or securement loose (65%) as the top 3 causes. Over 95% of respondents consider IV dislodgement a safety risk to patients.*

Conclusions: *This study reports perceptions and impact of accidental dislodgement with IV devices. Inconsistencies exist with use, application, and management of catheter securement and dressings for IV catheters. Risk of additional complications and complete device failure are increased when dislodgement occurs. Given possible complications, along with necessitating replacement of the IV device in many cases, IV catheter dislodgement was considered a safety risk to patients by nearly all respondents.*

Keywords: *accidental dislodgement, dislodgement, catheter, central venous catheter, peripheral intravenous catheter, securement, complications*

Background

Peripheral intravenous (PIV) and central venous access devices (CVADs) are catheters inserted in the venous system, with central catheters having the tip residing in the lower one-third of the superior vena cava, or above the level of the diaphragm in the inferior vena cava.[1] Intravenous (IV) access is established and maintained in more than 70%-90% of acute care patients in the United States.[2] Each IV access device poses a risk to the patient. Dislodgement rates have been estimated at 1.8%-24.5% of all IV catheters, with events per year estimated at greater than 5 million dislodged catheters.[3-9] While these IV devices have become a staple in administration of infusion therapy in acute care and home care settings, complications, such as accidental dislodgement of catheter or attached tubing, can potentially increase the risk of morbidity and mortality.[10,11]

Complications associated with vascular access devices (VAD) are common, including catheter failure, accidental dislodgement, phlebitis, occlusion, and infection, all of which may be influenced by management and device securement.[12-15] These myriad complications may lead to delays in treatment and

Correspondence concerning this article should be directed to nancy@piccexcellence.com
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wastage of medications, which may require additional VAD insertions, and thus prolong hospitalization and increase costs.[16-18]

Complications, such as accidental dislodgement, that interrupt treatment and cause failure of devices, all have an economic impact on the healthcare system, as well as on vessel health and preservation. The average cost of an uncomplicated PIV insertion in the United States is estimated at $28 to $35.[2] Based on US usage volume, mean number of device attempts (2.18),[19,20] and conservative estimates of 151 million devices placed at $28 per placement, VAD usage equates to $4.2 billion per year in device and placement costs.[2,21] A significant savings could be realized if even a small percentage of catheter dislodgement is reduced through effective use of securement, dressings, and other devices.

A wealth of evidence-based guidelines from around the globe (eg, EPIC3 2014, CDC 2011, INS 2016, RCN 2017, RNAO 2008) direct the care of PIVs and CVADs to prevent complications and are used as comparators to evaluate the adoption of best practices.[1,22-28] However, research indicates global inconsistencies in the application and use of the best practice recommendations.[22,29-31] An Australian study of CVAD-related intensive care unit (ICU) practices revealed inconsistencies in frequency of use of stabilization devices, dressing replacement, and device management practices.[31] In a survey of pediatric ICU nurses' knowledge and securement practices, a wide variation of PIV and CVAD practices was reported, along with a mean knowledge score of 5.5 out of a possible 10.[29] A Yemeni study confirmed diversity in practice and revealed only 44% of ICUs had written policies for PIV and CVAD management.[32] Furthermore, there is a lack of research results establishing methods to protect patients and guide management of VAD sites to prevent accidental dislodgement.

Research surveys are performed to gain insights from groups of participants on a particular subject and to potentially identify gaps in care pinpointing issues that require attention. The purpose of this study was to measure the perceptions of clinicians for the frequency, impact, and factors influencing accidental dislodgement of IV devices. A secondary objective was to identify safety issues associated with accidental dislodgement.

Methods

A cross-sectional descriptive study was conducted using a questionnaire that gathered data of practices related to accidental dislodgement. The survey, targeted to clinicians actively working in a clinical healthcare setting, was conducted using a 15-item electronic format, distributed via e-mail. The voluntary self-administered questionnaire was constructed and distributed through Survey Monkey web-based program via e-mail link. The tool contained 15 multiple-choice questions with option of free text comment for each question. Two of the 15 questions allowed selection of multiple answers. Content areas of the tool included: demographics, experience, responses regarding occurrence of accidental dislodgement, frequency, results, possible impact on activities and safety based on prior research parameters for demographics and topics.[33-35]

The survey was validated for content and face validity. First, 3nurse experts, selected for their research expertise and clinical practice, reviewed the survey using a structured semi-quantitative tool, evaluated the relevance of the questions, and appropriateness of responses. The survey was then evaluated by a pilot group of 10 nurses with clinical experience, using a structured questionnaire that evaluated the clarity, readability, and time to complete. The survey was fine-tuned to improve the instrument's content and face validity based on the feedback. Time to complete the survey was established at 5 minutes.

Data was transferred into Stata® V15 (StataCorp, LLC, College Station, Texas) for management and analysis. Variables were re-categorized for analysis as necessary. Descriptive statistics (frequencies, proportions, means, and standard deviations) were calculated. Pearson's chi-squared and the Kruskal-Wallis tests were used. *P* values less than .001 were considered statistically significant. Missing data were not imputed.

Ethics approval was received with waiver and exemption of consent based on survey structure. A convenience e-mail sample cohort was established with the survey web-link sent to 18,895 e-mails of the combined professional membership and educational databases of the Association for Vascular Access and PICC Excellence, Inc. Study participants for the research were healthcare professionals actively providing patient care or who provided education on/managed provision of care. Non–healthcare professionals or those not active in clinical practice were excluded from study participation based on self-reported survey responses.

Results

There were 1561 survey respondents: 1426 met inclusion criteria (119 removed as not meeting criteria as active clinicians); there was a 12.5% response rate and 85% of those completed the survey in its entirety. Demographics are detailed in the Table, indicating 92% of respondents were nurses. The remaining 8% were physician assistants/nurse practitioners (PA/NP), physicians, and other clinicians. The majority designated their practice setting as a vascular access team (VAT, 53%) or hospital/bedside (29%). Half of the cohort (50%) had 21 years or more of experience. Specialty practice settings (multiple answers allowed) were evenly distributed except for the VA/IV/peripherally inserted central catheter (PICC) team at 71%.

Frequency of Dislodgement

Accidental dislodgement is seen in every setting, in every device, and by every type of provider. Frequencies of accidental dislodgement of often, daily, and multiple times per day were reported by 68% of respondents (daily and often by 58% of respondents). There was no significant difference in observed frequency of accidental dislodgement by health professional group or between genders (Figure 1A-B) in how often accidental dislodgement occurred. Respondents in all healthcare settings see dislodgement of an IV catheter often, daily, or multiple times per day, with the exception of outpatient settings. This difference was statistically significant. Dislodgement was reported as occurring rarely/never in the outpatient setting, which was higher than in other care settings (67% vs 33%, $P < .001$; Figure 1C).

PIVs were identified by 96.5% of respondents as the most commonly dislodged device (Figure 2). PIVs were statistically more likely to be reported as often dislodging (38%) compared

Table. Respondent Characteristics

Item	Number (Percent)
Profession	
Nurse	1304 (92)
Physician's Assistant/ Nurse Practitioner	42 (3)
Physician	16 (1)
Radiology Technologist	8 (1)
Respiratory Therapist	37 (3)
Other	37 (3)
Primary Patient Setting	
Vascular Access Team	756 (53)
Hospital/Bedside	416 (29)
Outpatient[a]	77 (5)
Administration/Management	51 (4)
Research/Education	36 (3)
Other	87 (6)
Years of Experience in Profession	
1 to 5 years	134 (9)
6 to 10 years	227 (16)
11 to 20 years	349 (25)
21 years or longer	702 (50)
Age Group	
20 to 30	72 (5)
31 to 40	230 (16)
41 to 50	370 (26)
51 to 60	513 (36)
61 to 70	226 (16)
71 years or older	3 (0)
Area of Specialty (multiple choice)	
VA/IV Team/PICC	1003 (71)
Critical Care	424 (30)
Medical/Surgical	267 (19)
Pediatrics	234 (17)
Oncology	181 (13)
Education	162 (11)
Cardiology	149 (11)
Administration/Management/Supervision	124 (9)
Neurology	55 (4)
Other	271 (19)
Gender	
Female	1202 (85)
Male	212 (15)

IV, intravenous; PICC, peripherally inserted central catheter; VA, vascular access.
[a]Category created from text responses.

to all other device types where rarely dislodging was most common ($P < .001$; Figure 3). PICC and midline dislodgement was reported as very often or often in well over one-third of the responses (44%, 45%, respectively). Central venous catheters fell more into the sometimes or rarely categories (81%). Pheresis catheters held the lowest percentile of dislodgement with 95% of respondents ranking this event as occurring rarely or never.

Many types of VADs have securement devices applied at the time of insertion. Despite securement/stabilization devices, most respondents in all care settings reported dislodgement occurred sometimes (38%-57%), except in the outpatient setting, where it was reported to occur rarely (50%); this difference was statistically significant ($P < .001$; Figure 4A). There was no statistically significant difference between the ratings given by respondents in different specialties ($P = .117$; Figure 4B).

Impact of Dislodgement

Accidental dislodgement has a wide range of impact on staff time and patient risk (Figure 5). There was no statistical difference in the reported consequences of dislodgement among respondents from different care settings, except: a relatively smaller proportion of respondents from outpatient selected need to perform IV restart (another invasive procedure) as a consequence; a

- relatively smaller proportion of respondents from outpatient and hospital/bedside selected additional supplies and cost as a consequence;
- a relatively smaller proportion of respondents from outpatient and other selected bleeding as a consequence; and
- a relatively higher proportion of respondents from VAT and administration/management selected skin tearing as a consequence.

These differences were statistically significant (Figure 5A). There was no difference in the reported consequences of dislodgement among respondents of different specialties with the exception of air emboli and a relatively smaller proportion of respondents from pediatrics selected bleeding and skin tearing. These differences were statistically significant (Figure 5B).

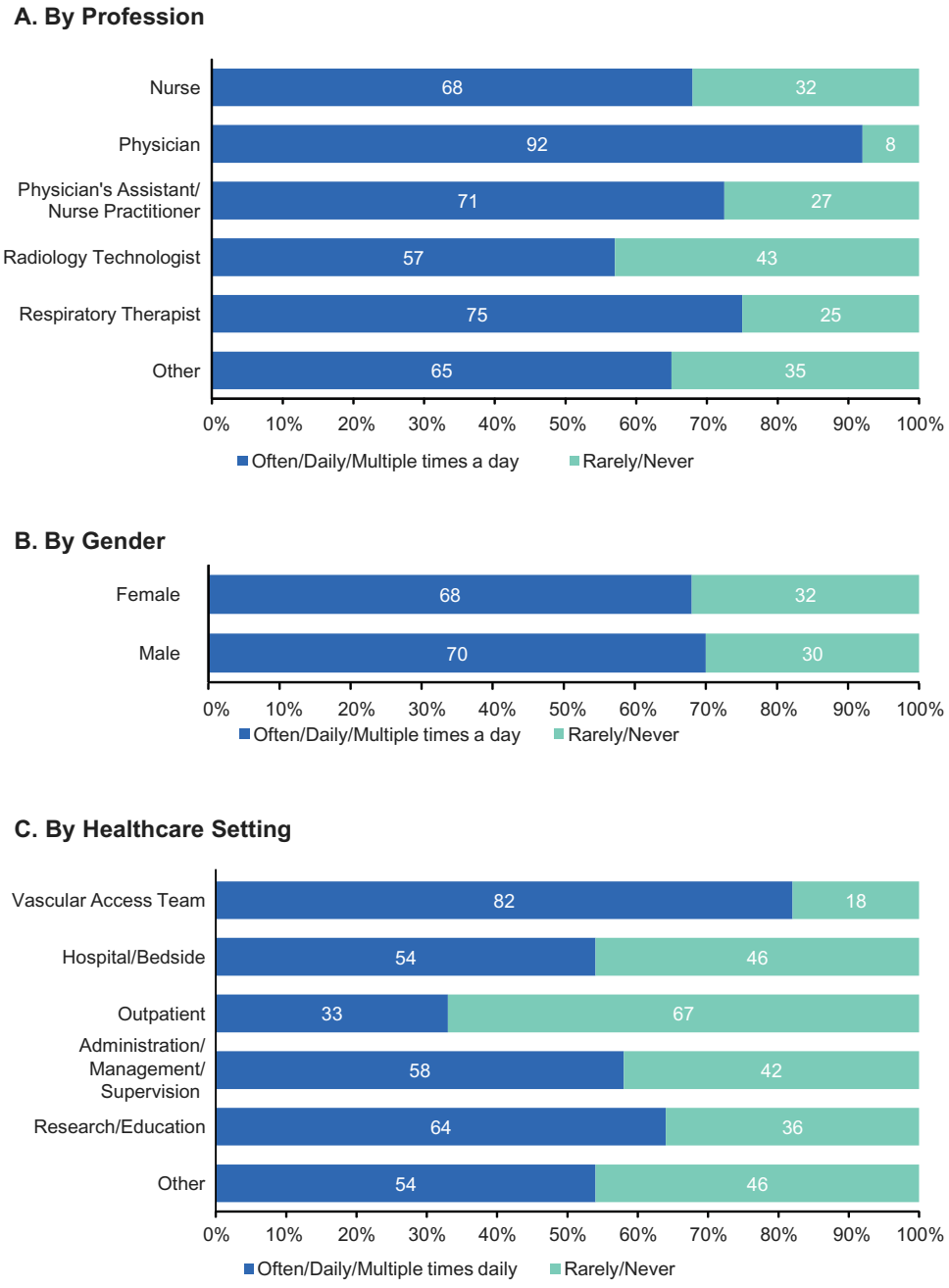

Figure 1. **How often do you see accidental dislodgement of any IV catheter?**

Dislodged catheters often require device replacement, meaning a time investment from staff. In most care settings (Figure 6A), the majority of respondents said time to replace dislodged short PIVs was 11-20 minutes, except in outpatient, where 6-10 minutes was selected by 41% of respondents, and in research/education, where 21-30 minutes was selected by 30% of respondents; these differences were statistically significant ($P = .003$). Among all specialty areas (Figure 6B), respondents reported 6-20 minutes as the time needed to re-site a short PIV, except in education, where the time was 11-30 minutes in most responses; this difference was statistically significant ($P < .001$).

Factors Influencing Dislodgement

Multiple factors (Figure 7) were identified as contributing to the incidence of dislodgement. The most common contributors to dislodgement were from confused patients (80%), those who physically remove their IV device (74%), and when tape or securement on the IV catheter was loose dislodgement was reported as more likely (65%). Other factors contributing to IV catheter dislodgement were patient activities in bed, moving around the room, transfers from bed, walking, and staff assistance with activities (23%-60%). Even when securement was present on the IV catheter, 49% of respondents reported

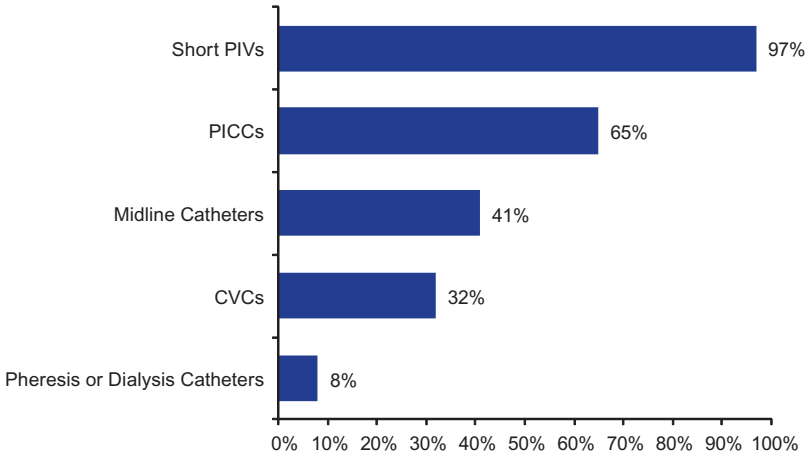

Figure 2. **Which types of catheters have you seen accidentally dislodge? (multiple answers allowed). CVC, central venous catheter; PICC, peripherally inserted central catheter; PIV, peripheral intravenous.**

dislodgement occurred sometimes, 20% stating more frequently and 31% rarely or never.

Dislodgement as a Safety Risk

Dislodgement was considered a safety risk across all settings, by all specialties, and occurred among all device types (Figure 8). Dislodgement was most commonly considered always a safety risk for patients, with the majority of respondents (39%-49%) in agreement for all settings (Figure 8A) and across specialties, except in neurology, where 32% selected always but 40% selected sometimes (Figure 8B).

Half of all respondents either agreed or strongly agreed that dislodgement was a significant, unaddressed problem in their facility in providing continuous care for patients with short PIVs. For patients with midlines, 27% either agreed or strongly agreed it was an unaddressed issue; for those with PICCs, 33% agreed; and for those with central venous catheters, 23% agreed ($P < .001$; Figure 9). With safety concern paramount, this represented an issue that should be commonly addressed in hospitals, yet 20%-30% of respondents neither agreed nor disagreed with its recognition as an unaddressed issue in their facility for any of the catheters.

Discussion

In the literature no surveys were found seeking to identify clinician perceptions of frequency, impact, influencing factors, and consequences of VAD dislodgement. Accidental dislodgement of VADs can result from many causes: movement of the

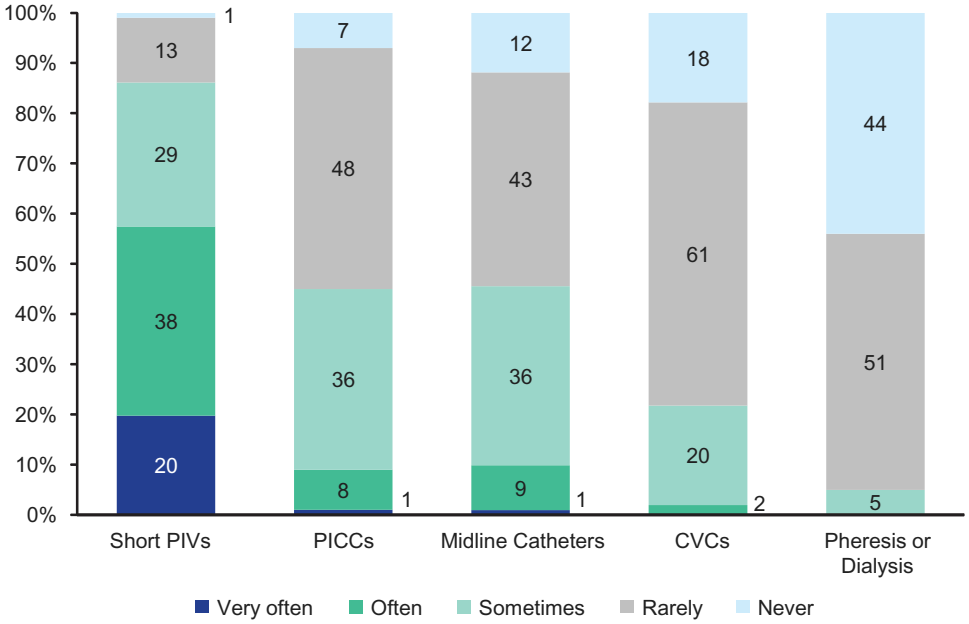

Figure 3. **How often does an accidental dislodgement occur (by catheter type)? CVC, central venous catheter; PICC, peripherally inserted central catheter; PIV, peripheral intravenous.**

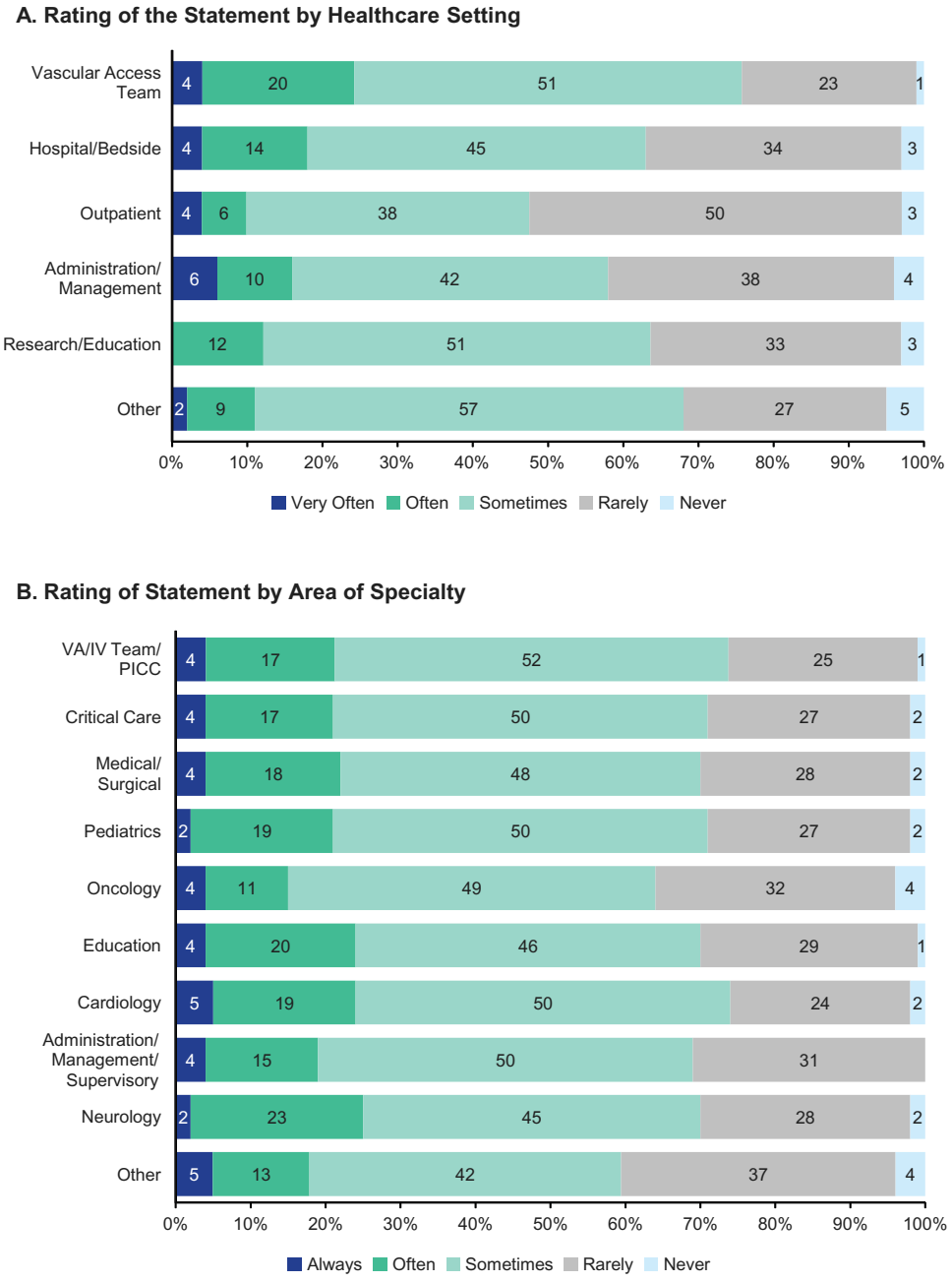

Figure 4. **In your experience or research, are IV catheters accidentally dislodged even when securement/ stabilization devices are used? IV, intravenous; PICC, peripherally inserted central catheter; VA, vascular access.**

catheter under a loose dressing, tape, or securement device; external pressure on the catheter; tubing pulled or forced removal, either accidental or intentional.[36] The aim of this survey was to evaluate the perceptions of clinicians for frequency, impact, influencing factors, and safety risk of accidental dislodgement for IV catheters. According to the survey, 92% of physicians and 82% of VAT clinicians report daily occurrence, reflecting a perception that dislodgement occurs frequently with VADs, with the main impact in PIVs.

A conservative projection of accidental dislodgement incidence is 19 million events per year in the United States. This VAD complication is underrecognized and represents a significant problem affecting medication administration, clinician time allocation, cost, and patient risk. Survey results align with a recent observational study of PIV outcomes in 1000 patients by Marsh and associates: PIVs failed in 69% of patients prior to completion of treatment.[37] This high level of failure is attributable to many factors, including dislodgement. Based on survey results, most respondents agreed that dislodgement is a common occurrence, especially with short PIVs, and one that constitutes a safety hazard. Accidental dislodgement incidence is likely even more frequent in occurrence due to underreporting and failure

Consequence	Treatment Interruption, %	Need to perform IV restart, %	Loss of access site, %	Extra time needed by staff, %	Patient distress re restart, %	Additional supplies or cost, %	Bleeding, %	Skin tearing, %	Air emboli, %
By Healthcare Setting									
Vascular Access Team	96	98	94	91	90	88	82	64*	33
Hospital/Bedside	98	97	95	94	89	76*	85	54	27
Outpatient	96	90*	88	92	88	74*	74*	50	33
Admin/Mgmt	98	94	88	96	94	88	88	64*	24
Research/Ed	100	94	94	94	94	91	91	61	36
Other	96	99	92	94	93	82	72*	47	33
Chi-squared test *P*-value	*P=0.679*	*P=0.010**	*P=0.077*	*P=0.387*	*P=0.646*	*P<0.001**	*P=0.018**	*P=0.002**	*P=0.378*
By Area of Specialty									
VA/IV Team	97	97	95	92	91	88*	82	62	32
Critical Care	98	98	95	95	90	85*	85	61	29
Medical/Surgical	98	97	96	95	91	86*	82	64	31
Pediatrics	97	96	91	90	91	79*	70*	43*	20
Oncology	95	95	90	90	91	85*	80	58	28
Education	96	96	94	92	92	88*	81	64	36
Cardiology	99	99	96	91	93	80*	84	59	24
Admin/Mgmt	94	93	92	92	91	89*	83	60	30
Neurology	100	96	91	94	91	85*	83	62	26
Other	96	97	91	91	89	80*	80	55	30
Chi-squared test *P*-value	*P=0.299*	*P=0.355*	*P=0.072*	*P=0.351*	*P=0.989*	*P=0.014**	*P=0.004**	*P<0.001**	*P=0.029*

Figure 5. **What are the consequences of accidental catheter dislodgement? (multiple choices allowed). IV, intravenous; VA, vascular access.**

to document reasons behind replacement of IV devices. Each failed PIV impacts the patient, care facility, and staff in several ways.

The impact of dislodgement creates delays in treatment administration, uses extra staff time replacing devices, and increases patient risk owing to difficulties in inserting catheters. Survey respondents' considerations for consequences of dislodgement focused on staff priorities: need to place a new device (97%), interruption of treatment (97%), and loss of access site (94%). These concerns, and the actions required to manage the consequences of dislodgement, require the clinicians to notify medical providers and pharmacy, and undergo other related activities that take the time of the bedside nurse and are difficult to quantify. Re-siting VADs is time consuming for clinicians. For PIV replacement most clinicians responding to the survey estimated a range of 6-30 minutes. In addition, patients experience anxiety with anticipation of pain before and during the procedure of PIV insertion with 53%, in another study, stating they were afraid of needle pain.[38] Acute care hospitals in the United States are incentivized to manage patient medication administration processes efficiently, leading to completion of treatment and discharge. Delays in treatment from accidental dislodgement block this flow to discharge and may increase unreimbursed hospital costs. The impact of accidental dislodgement highlights the need to identify factors associated with VAD failure to increase awareness and reduce incidence.

Factors affecting the incidence of dislodgement were listed by respondents (Figure 7). Patients were often a contributing factor to dislodgement, whether from conscious removal of the IV or from unconscious removal, as in the case of confused patients. Normal activities of daily living, ie, when the patient is moving in and out of bed, going to the bathroom, bathing, and having staff assisting them with activities, all contribute to device dislodgement. When dressings and securement become loose due to hair, skin, and effects of perspiration releasing adhesives, IV catheters fall out, leaving the patient without venous access. Current hospital policies to disconnect or not disconnect intravenous tubing prior to bathroom visits are factors that also impact incidence of dislodgement and may increase the potential for contamination. Despite policies, education, and securement of devices, some types of dislodgement are unavoidable.

Other factors associated with dislodgement risk in the Marsh study were paramedic insertion, number of accesses per day, and securement procedures.[37] Insertions performed in an emergency setting and/or during transport of a patient often fail to include adequate securement. Ideally, these insertions would be re-sited to avoid complications associated with possible poor disinfection of skin prior to insertion and lack of securement. Various securement and stabilization devices have been introduced to the market to reduce or eliminate accidental dislodgement. Current securement and dressings are designed to prevent VAD dislodgement or fallout with differing levels of success. In the Marsh study, securement products were associated with less dislodgement.[37] Yet, despite the use of securement devices, tape, and dressings, more than half of respondents in

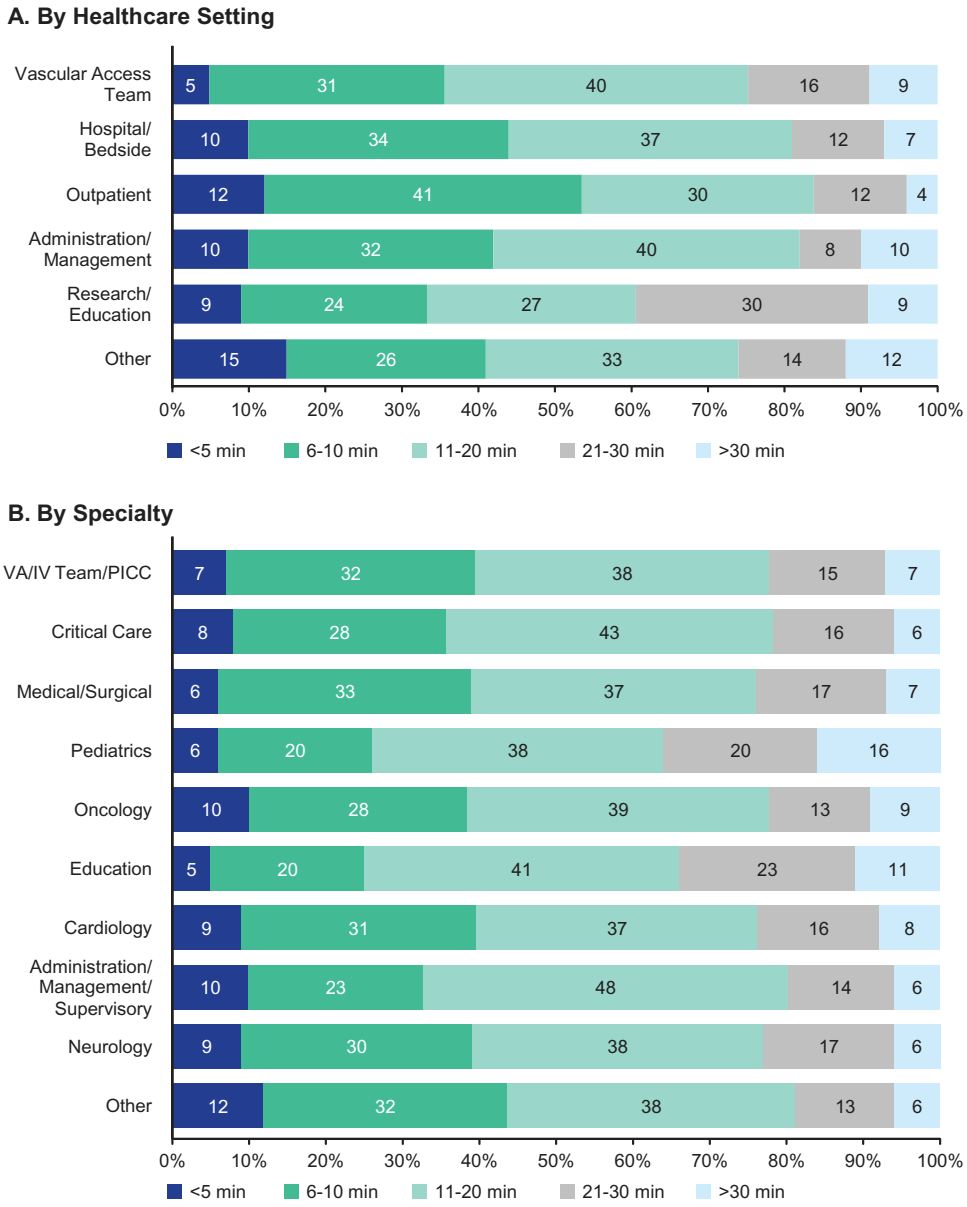

Figure 6. **On average, how much time is spent replacing a short peripheral catheter that was accidentally dislodged? IV, intravenous; PICC, peripherally inserted central catheter; VA, vascular access.**

the survey reported dislodgement of catheters very frequently, often, or sometimes, except for in the outpatient setting. The Infusion Nurses Society (INS) position paper on PIVs noted that stabilization of catheters is often inadequate or not done, resulting in a higher risk of complications.[39] In a 2012 survey of PIV practices only 46% of respondents reported use of securement practices for PIVs.[39] Even in the presence of adequate securement, dislodgement remains a problem.

Outpatient settings provide treatment with fewer acute patients and differing levels of observation. These differences from the hospital setting were reflected in the survey responses in terms of lower frequency of dislodgement and less time to replace the VAD. Patients on long-term therapy often have fewer peripheral VADs and more reliable intravenous devices, such as midlines, PICCs, or other central venous devices with lower incidence of complications.[9,40] Outpatient clinicians in this survey were less likely to report dislodgement consequences when securement was present and time to re-site an IV device was less than in other care settings.

Cost associated with dislodgement and re-siting PIVs may be considerable based on the sheer number of PIVs used per patient on insertion and attempts. Conservatively estimating 340 million PIVs purchased and 150 million PIVs actually placed in patients each year at a dislodgement rate of 12.9%, a projected 19 million catheters may require replacement.[21,41] If only half of those 19 million catheters (9.5 million) are replaced, with a conservative cost per replacement of $28 per attempt, and assuming just 1 attempt (mean number of attempts 2.18), the cost

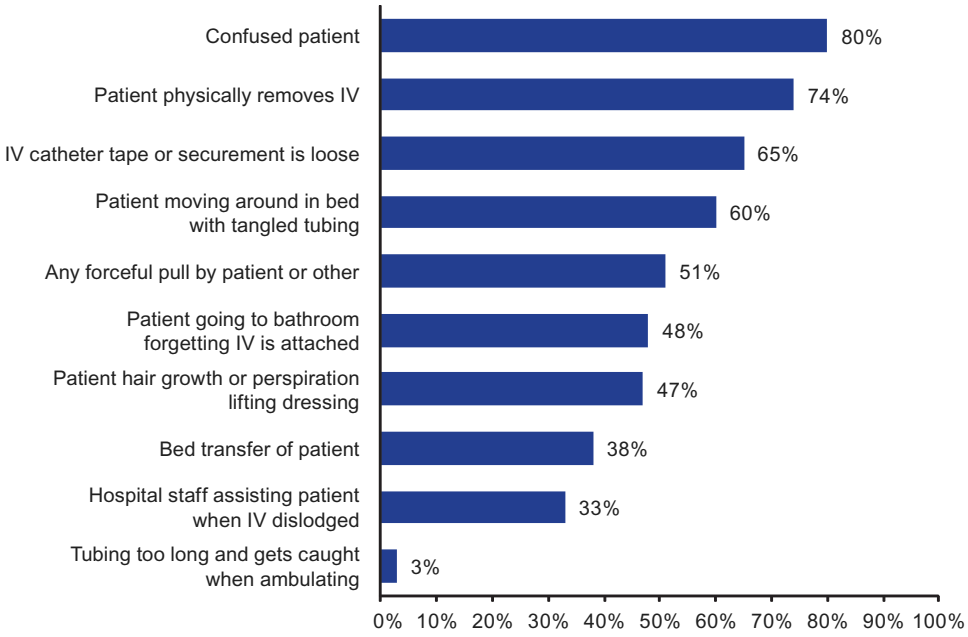

Figure 7. **What are the most common contributors of accidental dislodgement? (multiple choices allowed). IV, intravenous.**

of accidental dislodgement could be estimated at more than $266 million.[2,19,20,42] Results from this survey reflect an opportunity to realize significant savings by controlling the complication of accidental dislodgement. Greater attention to this issue could also result in increased patient safety with reduction of complications and skin punctures.

Complications of dislodgement affect dwell time and catheter function. In the guidelines for extending dwell times of PIVs with clinically indicated removal, there is more incentive for promoting safety with optimal insertion and management.[43] In the survey, respondents felt dislodgement was a safety issue always or often and more than 90% responded that sometimes, often, or always it was a concern. When more than half of PIVs fail before end of treatment, then failure represents a significant event that should be improved. The move to elimination of scheduled PIV replacement sets up the facility to always be alert to complications and only replace when dislodgement or other complications occur. Clinically indicated removal (ie, removal when a complication occurs, is suspected, or when therapy is complete), although not statistically significant, results in a higher frequency of dislodgement.[44] The impact of dislodgement may also result in other complications that affect patient safety and may put them at risk for more serious complications, such as bleeding, hematoma, infection, infiltration, or local site trauma, especially if in association with CVADs.

The INS position paper on safety practices with PIVs stated lack of standardization and knowledge directly affects patient safety and risk associated with PIVs.[39] Education and training on insertion, management, and reduction of complications is lacking according to the position paper. Awareness of accidental dislodgement complications with outcome monitoring, documentation, and auditing of medical records would provide the necessary focus to address the dislodgement issue, increase dwell time, and reduce this complication and the impact on patient safety. Continued research attention to this complication in terms of frequency, impact, and factors affecting or reducing the complication is necessary to improve efficiency and safety provided within the medical treatment regime.

Numerous strengths are represented in this research. This survey, one of the first of its kind on accidental dislodgement, highlights the incidence of dislodgement as a daily occurrence, need for greater understanding, and quantification of this complication. The diverse sample size, specialties, and care settings denoted in the survey responses, including the wealth of information received from the free text comments, provided a window into the challenges and risks associated with maintaining vascular access. This survey achieved the goal of measuring and reporting the perceptions of clinicians for frequency, impact, and factors influencing and identified some safety issues associated with VAD dislodgement to promote better understanding of this complication. The next step is to develop and implement strategies, education, and/or products to prevent the complication, safely extending the dwell of VADs and safeguarding patients during the treatment process.

Limitations

Research conducted via survey inherently has limitations. In this study, limitations are represented in the volunteer bias, content derived from perceptions and observations of clinicians caring for patients, and recall bias. Self-reporting and estimations of patient outcomes are anecdotal and validated only within the strength of numbers and consistency of respondents. Most respondents in the survey were nurses (92%). While this

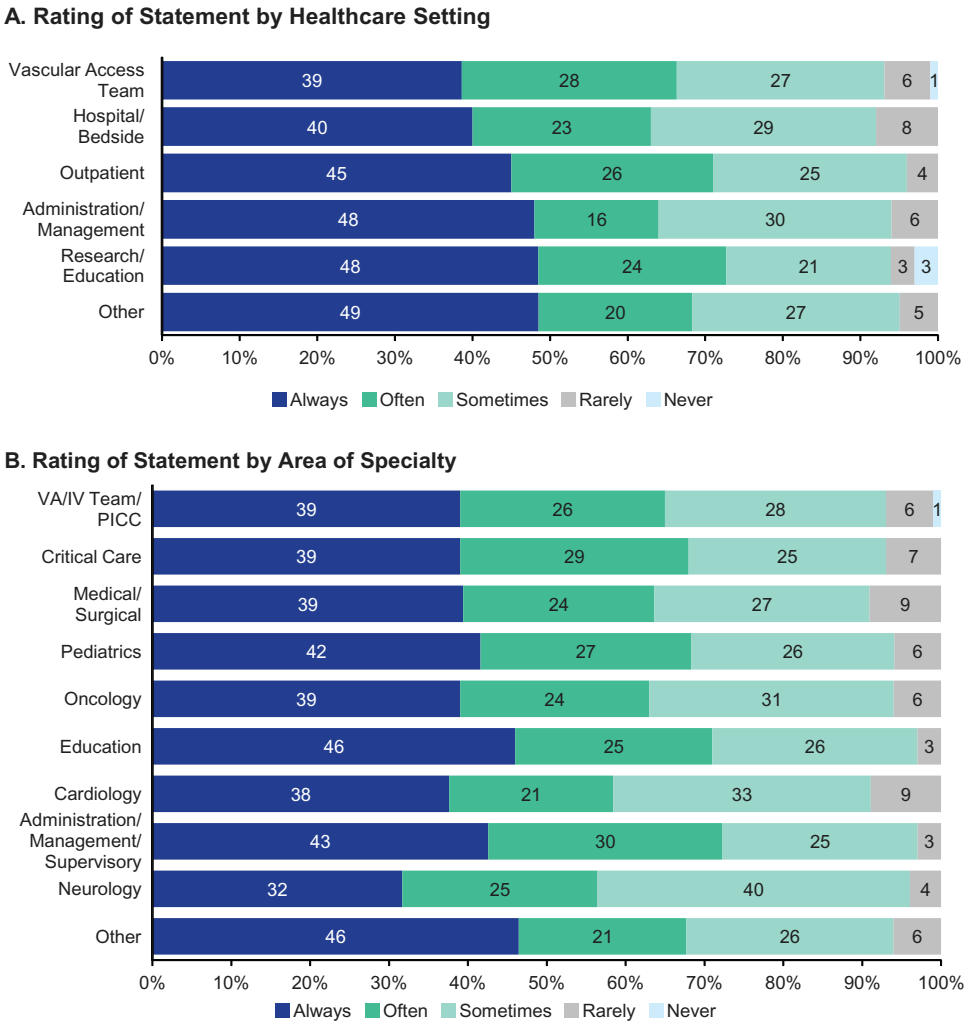

Figure 8. **Rate the following statement: "Accidental dislodgement is considered a safety risk for patients experiencing sudden (partial or complete) removal of a catheter." IV, intravenous; PICC, peripherally inserted central catheter; VA, vascular access.**

homogeneity is reflective of healthcare bedside staff responsible for the performance, assessment, and insertion of IV devices, it could be considered a limitation and bias. Within the areas of specialty, greater heterogeneity is represented in the 9 specialty practice categories reported by respondents. Limitation is also present in disclosure of bias from a sponsored study and author.

Conclusion

Based on the results of this survey, accidental dislodgement in clinical practice is observed far more often than previously reported in the literature. Various factors affect the risk of dislodgement and are often underreported. This survey provided a clinician view of frequency of dislodgement and perceptions of the impact on the treatment process. Improvements in device securement have reduced the incidence of CVAD dislodgement in some facilities, but according to survey responses, this suggests a widespread continuing problem. This research endeavors to shed light on the issue of accidental dislodgement with assessment of front-line clinicians and promote further research of this complication and the implications for staff and patients.

Recommendations for Practice

Based on survey results, accidental dislodgement of VADs, especially PIVs, is a common occurrence that warrants increased awareness of the need for outcome monitoring, documentation, and auditing of medical records to provide the necessary focus to address the issue, educate, and reduce this complication and its impact on patient safety.

Disclosures

Financial support for this survey was received from Linear Health Sciences in the form of a project fee to conduct the literature search, survey of healthcare professional and manuscript development. Although Linear Health Sciences, Inc, funded the

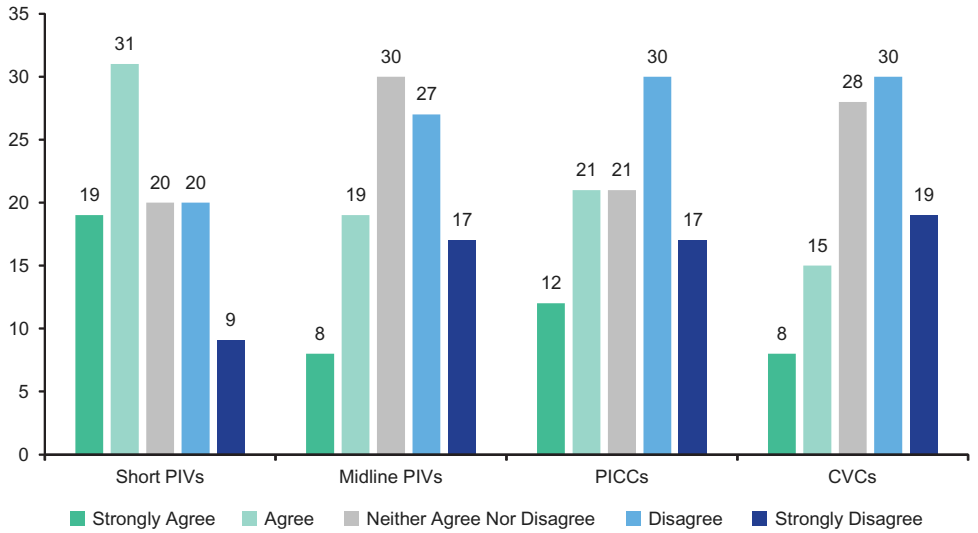

Figure 9. **Accidental dislodgement is a significant, unaddressed problem at my facility in providing continuous care for patients for the following catheter: CVC, central venous catheter; PICC, peripherally inserted central catheter; PIV, peripheral intravenous.**

work, the organization had no involvement with the content of the article and Dr. Moureau retained full control of the data. The author works as a consultant for multiple companies as the owner and employee of PICC Excellence.

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Author's Note

The author is willing to share full raw data with others who have similar research interests and activities (nancy@piccexcellence.com).

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