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I-DECIDED® – A decision tool for assessment and management of invasive devices in the hospital setting

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I-DECIDED® – Un outil d'aide à la décision pour l'évaluation et la prise en charge des dispositifs effractifs en milieu hospitalier

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Abstract

Indwelling medical devices, including vascular access and urinary catheters, pose a risk for infection, and therefore daily assessment and consideration of their continued need is a patient safety priority. The I-DECIDED® device assessment and decision tool is an evidence-based checklist, designed to improve the assessment, care, and timely removal of invasive devices in acute hospitalized patients. This paper explains each step of the tool, with rationale for inclusion.

Résumé

Les dispositifs médicaux à demeure, notamment les accès vasculaires et les sondes urinaires, comportent un risque d'infection; c'est pourquoi l'évaluation et la prise en considération quotidiennes du besoin continu de ces dispositifs constituent une priorité en matière de sécurité du patient. L'outil d'évaluation des dispositifs et d'aide à la décision I-DECIDED® est une liste de vérification fondée sur des données probantes, conçue pour améliorer l'évaluation, l'entretien et le retrait en temps opportun des dispositifs effractifs chez les patients hospitalisés en soins de courte durée. Cet article explique chaque étape de l'utilisation de l'outil et le bien-fondé de son intégration aux soins.

Keywords: intravenous catheter, urethral catheter, guidelines, education, infection prevention, patient safety

Background

Approximately 420 million patients annually are admitted to hospital (World Health Organization, 2019). A US prevalence study identified 91% of hospitalized adults had at least one invasive device, such as central venous access device (CVAD), peripheral intravenous catheter (PIVC), or indwelling urethral catheter (IUC), with many patients requiring multiple devices concurrently (Chen et al., 2021). Despite the high prevalence of devices, this practice is not risk-free. Invasive devices breach the normal protective mechanisms of the body (e.g., skin, mucous membranes) and pose a risk for introduction of microorganisms, potentially leading to local or bloodstream infection (Schreiber et al., 2018). Furthermore, many devices are left in when no longer medically indicated, placing patients at risk of healthcare-associated complications and infection, increased morbidity and mortality, extended hospital stay and financial burden for the healthcare system, and personal and economic consequences for the patient (Becerra et al., 2016; Meddings et al., 2014; Patel et al., 2018; Xiong & Chen, 2018).

Daily assessment of invasive devices for continued need and early detection of complications enhances patient safety. Implementation studies of multimodal bundles, including daily prompts of device necessity, have achieved reduction

in utilization of IUCs (Gazarin et al., 2020; Giles et al., 2020; Kuriyama et al., 2019; Niederhauser et al., 2019; Schweiger et al., 2020), CVADs (Kara et al., 2016; Kleinman Sween et al., 2021; Walz et al., 2015; Xiong & Chen, 2018), CVADs and IUCs (Chandramohan et al., 2018; Kaminski et al., 2021; Mena Lora et al., 2020), IUCs and PIVCs (Laan et al., 2020), and PIVCs (Egerton-Warburton et al., 2019; Mestre et al., 2013; Yagnik et al., 2017). Interventions that employ education, daily reminders, and automated stop-orders demonstrate greater clinician awareness of device use and prompt removal of unnecessary devices, with subsequent reductions in complications and infections (Kleinman Sween et al., 2021; Meddings et al., 2020; Mitchell et al., 2019; Yu et al., 2020), but continued vigilance is crucial (Chandramohan et al., 2018).

As nurses provide the bulk of device assessment and care, they are expected to identify when complications arise, take appropriate action, and notify medical staff accordingly. However, many nurses receive little training in device assessment other than in the undergraduate nursing curriculum, and knowledge and skills can vary among clinicians (Massey et al., 2020; Vandenhouten et al., 2020). A recent scoping review noted significant gaps in nurses' knowledge on the care and maintenance of vascular access devices and recommended improved educational preparation and workplace training (Raynak et al., 2020).

I-DECIDED®

The I-DECIDED® device assessment and decision tool is an evidence-based checklist (see Figure 1). This tool packages international clinical guidelines for invasive devices into a mnemonic algorithm for point-of-care decision making (Ray-Barruel et al., 2018a). Taking a step-by-step approach, I-DECIDED® prompts clinicians to assess key components of device care and promotes accountability for actions based on the assessment. A clinimetric study concluded that I-DECIDED® was valid and reliable for PIVC assessment and decision-making in medical-surgical settings (mean content validity 0.91 among experts and 0.93 among clinicians; inter-rater reliability 87.1% from 34 paired assessments) (Ray-Barruel et al., 2020). Pilot study results showed a 4.4% reduction in idle catheters (not in use or no plans for use within 24 hours) and increased nurses' awareness of the importance of prompt removal (Ray-Barruel et al., 2018b).

In addition to providing a checklist for invasive devices assessment each shift, I-DECIDED® can be used for device education purposes. For instance, the tool has been adapted as a checklist for nursing management of peripherally inserted central catheters and included in the Michigan Hospital Medicine Safety Consortium PICC toolkit (https://mi-hms.org/sites/default/files/I-DECIDED%20PICC.pdf). In my hospital, we are now teaching all nurses to apply the principles of I-DECIDED® to every short-term invasive device: *Every day, every patient, every device: Is it needed? Is it working? Any complications? Can it come out?* We are currently updating our hospital infection prevention and invasive devices policies to reflect this.

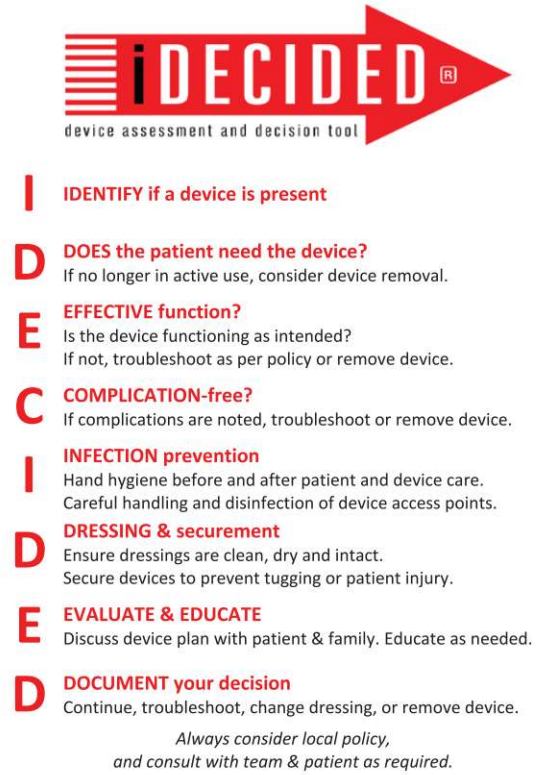
The following section explains the steps of the I-DECIDED® tool, with supporting rationale, and implications for clinical practice.

1. IDENTIFY if the patient has a device

Device assessment begins with identifying the presence of all devices every shift. If the device is not documented in the patient's chart, the healthcare provider should ask the patient or their family/carer if they have any catheters or lines in situ. Prior research has identified clinicians may lack awareness of indwelling devices among their own patients, particularly when devices are tucked under the patient's sleeves or bedding (Chopra et al., 2014; Quinn et al., 2020; Saint et al., 2000). Peripheral intravenous catheters being left in inadvertently after patient discharge have also been reported (Allnurses.com, 2018; Bingham, 2019; Gerwing, 2021; Orton, 2019; Render, 2012) putting patients at risk of bloodstream infection and the hospital at risk of negligence.

Figure 1

I-DECIDED® tool



2. DOES the patient need this device?

Many devices are not promptly removed when no longer needed, with reports that up to 50% of PIVCs (Becerra et al., 2016), 32% of CVADs (Kara et al., 2016), and between 31%–45% of IUCs (Corral-Gudino et al., 2019; Kuriyama et al., 2019; Laan et al., 2020) are left in place without medical indication, increasing risk of infection. Reasons for leaving devices in situ unnecessarily include inaccurate documentation; perceptions of patient comfort; lack of priority for device removal; lack of agreement on indications for removal; and confusion regarding staff authority to remove unneeded devices (Bourgault et al., 2021; Castro-Sanchez et al., 2014; Quinn et al., 2020). The clinical need for a device should be reassessed daily, and it should be removed when no longer required (Canadian Vascular Access Association, 2019; Gorski et al., 2021; Gould et al., 2010; O'Grady et al., 2011).

Avoiding device insertion in the first place is often a reasonable and prudent strategy. For instance, if a patient can take oral medications and fluids, they may not need a vascular access device (Egerton-Warburton et al., 2019; Wald-Dickler et al., 2021).

Appropriate indications for an IUC include: acute urinary retention or bladder outlet obstruction; accurate urine measurement in critically ill patients; some surgical procedures; open sacral or perineal wounds in incontinent patients; prolonged immobilization, such as spinal or pelvic fractures; and end of life comfort care (Gould et al., 2010). An IUC inserted for a surgical procedure should be removed "as soon as possible postoperatively (preferably within 24 hours, unless there are appropriate indications for continued use)" (Gould et al., 2010, p.10). Urinary incontinence is not an appropriate reason for an IUC; alternatives are available and seeking continence specialist support and advice is strongly recommended (Nurses Specialized in Wound Ostomy and Continence Canada, 2021).

3. EFFECTIVE function?

The patient's nurse should assess the function and patency of indwelling devices each shift. Intravascular devices should be checked for blood return and flushed with 3 mL of 0.9% sodium chloride in a 10 mL syringe (Gorski et al., 2021). Resistance or failure to flush indicates that the catheter might be kinked or blocked or could have migrated out of the vessel (Goossens, 2015).

Urinary catheters should be free-flowing and not kinked or obstructed, with the drainage bag positioned below the level of the bladder and off the floor (Gould et al., 2010). Troubleshoot any problems as per hospital policy and remove the device if patency cannot be re-established. Resite as required.

4. COMPLICATION-free?

Each shift, the nurse should assess for device complications, prompting early identification and correction of issues, and if necessary, removal and insertion of a new device. Unfortunately, device-associated complications are common; up to two-thirds of PIVCs (Marsh et al., 2021; Marsh et al., 2018) and one-fourth of CVADs (Takashima et al., 2018) cease to function before treatment is complete, resulting in painful and time-consuming additional insertion procedures, which also increases hospital costs (Lim et al., 2019).

The Canadian Vascular Access and Infusion Therapy Guidelines recommend that if a peripherally administered non-vesicant solution is infusing, the nurse should check the insertion site every four hours; if the patient is critically ill or otherwise unable to self-report pain, hourly site checks are required; and if a vesicant infusion is in progress, the PIVC insertion site should be checked at least every 30 minutes (Canadian Vascular Access Association, 2019). Phlebitis scores are often used to assess the PIVC insertion site for pain/tenderness, warmth, redness, swelling, hardness or palpable cord (indicating thrombosis/clot), or purulence (Canadian Vascular Access Association, 2019; Gorski et al., 2021). If the insertion site develops signs of phlebitis or infiltration, or if the device becomes dislodged, it should be removed (Gorski et al., 2021). Follow local hospital policy for troubleshooting blocked CVADs.

Complications associated with IUCs may include mechanical trauma, hematuria, urethral stricture, and urinary tract infection (Schweiger et al., 2020). In one study, 57% of patients had IUC complications, and many had persistent discomfort even after catheter removal (Saint et al., 2018). Therefore, the nurse should be aware of possible complications and troubleshoot to ensure the urinary drainage bag is unobstructed, as above. If obstruction occurs, the IUC should be changed (Gould et al., 2010).

5. INFECTION prevention and awareness

Unfortunately, healthcare providers may not always take stringent infection prevention measures when handling invasive devices (Snyder et al., 2021). Therefore, I-DECIDED® contains a prompt for infection prevention and awareness. Unnecessary manipulation of invasive lines should be minimized, where possible (Septimus & Moody, 2016). Rigorous hand hygiene before and aseptic non-touch technique during the connecting and disconnecting of lines and devices are essential to prevent infection (Canadian Vascular Access Association, 2019; Gorski et al., 2021). Needle-free connectors attached to vascular access devices must be scrubbed with a compatible disinfectant (e.g., chlorhexidine in alcohol or 70% alcohol wipes) for at least 5–15 seconds and allowed to dry thoroughly

before each access, including between multiple accesses (Canadian Vascular Access Association, 2019; Gorski et al., 2021). If disinfectant caps are in use, they must be discarded once removed. If an administration set or urinary catheter bag is accidentally disconnected from the indwelling device, it must be discarded, with a new sterile line prepared (Canadian Vascular Access Association, 2019; Gorski et al., 2021).

If the patient has signs of systemic infection (including low or high temperature, elevated heart rate, elevated respiratory rate, low or high white blood cell count), any invasive device is a possible cause (Shah et al., 2013). Intravascular catheter insertion sites should be examined for inflammation or purulence, and urine should be assessed for cloudiness or odour. If no obvious source of infection is detected, diagnostic investigations (blood and/or urine samples) should be undertaken and device removal should be considered (Shah et al., 2013).

6. DRESSING and securement

Routine care for any invasive device includes cleaning the site, as per hospital policy, and ensuring appropriate securement to prevent dislodgement and the need for repeated insertions. Vascular access device insertion sites require a clean, dry, and occlusive sterile dressing to protect the site and prevent microbial entry (Canadian Vascular Access Association, 2019; Gorski et al., 2021). Each shift, the nurse should inspect all dressings to ensure hygiene and integrity are maintained. If the dressing becomes loose or moist, it must be removed and replaced, and skin integrity should be assessed during the dressing change (Canadian Vascular Access Association, 2019; Gorski et al., 2021). A poorly secured vascular access device encourages infection, as catheter movement in the vein can allow migration of organisms along the catheter and into the bloodstream (Corley et al., 2019). The integrity of the securement device should also be assessed routinely and replaced if no longer effective (Canadian Vascular Access Association, 2019).

Urethral hygiene is imperative, and the patient with an IUC should be instructed to cleanse the perineal area during daily bathing or showering (Gould et al., 2010). Securement of an IUC can prevent urethral trauma and erosion, as well as inadvertent removal (Shum et al., 2017).

7. EVALUATE and EDUCATE

The nurse should evaluate the patient's understanding of the reason for each device and prescribed therapy (Canadian Vascular Access Association, 2019; Gorski et al., 2021). Engaging the patient and family, where possible, has a beneficial effect on patient safety by empowering them to voice their concerns and prompt action to address device complications and remove redundant devices (Scott et al., 2021; Seale et al., 2015). Explanations and education should be provided according to the patient's age, developmental and cognitive level, health literacy, readiness to learn, cultural influences, and language preferences (Canadian Vascular Access Association, 2019).

Previous studies have identified that patients do not receive adequate information and education about their indwelling devices (Cooke et al., 2018; Laan et al., 2020; Seale et al., 2015), but most would prefer to be informed and given the opportunity to participate in their own care (Park & Giap, 2020). A prevalence study in Ireland found that the patient's lack of awareness of the reason for their PIVC was significantly associated with the cannula being redundant (McHugh et al., 2011). A US study found patients' perceptions of their indwelling device (IUC or CVAD) were largely negative, due to catheter malfunction, pain or discomfort, irritation, interference with activities of daily living, or provider error (Trautner et al., 2019).

8. DOCUMENT your decision

At the completion of the assessment, the nurse decides (in consultation with the treating team and patient, as relevant) to continue, troubleshoot, or remove the device. The device assessment and plan should be documented in the patient's medical record. Documentation should include, at a minimum: insertion date and time; assessment and action each shift; and, removal date and time (Canadian Vascular Access Association, 2019; Gorski et al., 2021). The continued need for the device should also be recorded. If the device is not documented, this increases the likelihood that it will be forgotten, increasing the risk of complications and infection (Zingg & Pittet, 2009). In a global prevalence study, documentation of PIVC insertion was missing in 49% of charts and daily assessment was not recorded in 36% of patient records (Alexandrou et al., 2018). Including device checklists and templates in electronic records has demonstrated marked improvements in prompt vascular access and urinary catheter removal in several studies (Aufricht et al., 2019; Shadle et al., 2021; Tarrago et al., 2014). Documentation of device decisions should be incorporated into electronic medical records, with automated stop orders, as appropriate (Yu et al., 2020).

Limitations

To date, the I-DECIDED® tool has only been validated and tested for patients with PIVCs in the acute adult hospital setting in Australia. Further trials are invited to evaluate the impact of the tool for other invasive devices, in other populations and settings.

Conclusion

Nurses caring for patients with indwelling devices must be aware of the associated patient safety and infection risks. The I-DECIDED® tool packages the clinical practice guidelines into an evidence-based checklist to ensure clinicians address the principles of device assessment and care. In pilot research, implementation of the tool increased nurses' awareness of PIVCs and prompted timely removal of unneeded cannulas in adult medical and surgical patients. Further trials are needed to assess the efficacy for improving device care for other invasive devices and diverse populations and settings. Fewer redundant devices would have positive consequences for hospital patients, healthcare providers, and healthcare systems.

I-DECIDED® is a registered trademark of Griffith University. It may be freely downloaded from the AVATAR® website (https://www.avatargroup.org.au/i-decided.html) and used for non-profit clinical and education purposes. Permission to use the tool for commercial purposes must be obtained in writing from Griffith University.

About the author

Gillian Ray-Barruel, RN, PhD, is an experienced nurse researcher and Director of Education with the Alliance for Vascular Access Teaching and Research (AVATAR). Her internationally respected research focuses on improving assessment and decision-making by bedside clinicians to prevent indwelling device-related patient complications and improve healthcare outcomes. Besides AVATAR, her other affiliations are Menzies Health Institute Queensland, School of Nursing and Midwifery, Griffith University, Brisbane, Australia, and Queen Elizabeth II Jubilee Hospital, Brisbane, Australia

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Gillian Ray-Barruel, inf. aut., Ph. D., infirmière-chercheuse chevronnée, est directrice de l'enseignement à l'Alliance for Vascular Access Teaching and Research (AVATAR). Sa recherche saluée à l'échelle internationale porte sur l'amélioration de l'évaluation et de la prise de décision par les soignants au chevet des patients, en vue de réduire les complications liées aux dispositifs installés à demeure et d'améliorer l'issue des soins de santé. Outre AVATAR, ses autres affiliations sont les suivantes : Menzies Health Institute Queensland, School of Nursing and Midwifery de l'université Griffith, Brisbane, Australie, et Queen Elizabeth II Jubilee Hospital, Brisbane, Australie.

Disclosures

Gillian Ray-Barruel reports consultancy payments provided to Griffith University by product manufacturers (3M, Becton Dickinson) and education providers (Ausmed, Wolters Kluwer), unrelated to this work.

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