



Technology Innovations in Vascular Access

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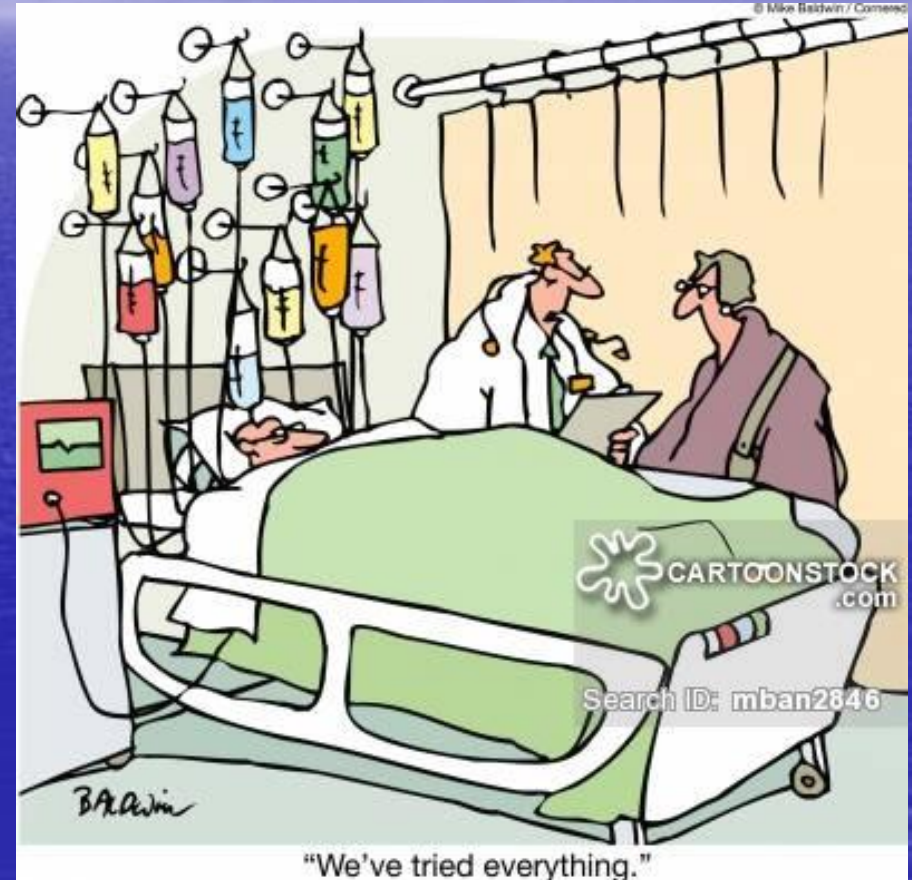
Introduction



- ❖ My experience
 - RN for 35 years
 - PICC Instructor and inserter 26 years
- ❖ As a trainer and active PICC preceptor I represent:
 - Nurses
 - Physicians
 - Radiological technologists/assistants
 - Respiratory therapists
 - Nurse practitioners/physician assistants

Expansion of VADs in USA

- ❖ Early adopters of new technology
- ❖ Per capita healthcare dollar over \$9,000/person/yr
- ❖ 90% of peripheral cannulas placed by nurses



VAD Usage in USA

- ❖ Approx 330 million peripheral catheters/yr
- ❖ Almost 3 million PICCs per year
- ❖ 70% PICCs placed by nurses
- ❖ 10% of CVCs now placed by RNs
- ❖ VAD Placement by Registered Nurses, Physicians, Nurse Practitioners, Physician Assistants, Radiology Technologists, Respiratory Therapists

Inserters of PICCs

- ❖ US Market
- ❖ 70% inserted by nurses
- ❖ 30% by MDs, Radiology Department and others
- ❖ 60% using Ultrasound and Modified Seldinger Technique and rising!



Placement in the USA

- ❖ Cost Effective Tiered Practice
- ❖ Hospital bedside first choice
- ❖ Interventional Radiology second in volume
- ❖ Goal is for multidisciplinary teams



MAGIC Michigan

Appropriateness Guide

Evidence and expert consensus through systematic RAND Appropriateness Method

CVAD Indications

1. Clinical instability of the patient
2. Chemotherapy for more than 3 months
3. Continuous infusion therapy or long term intermittent therapy
4. Delivery of non-peripherally compatible infusates (irritating or vesicant medications)
5. Frequent phlebotomy every 8 hours or more
6. Intermittent infusion, infrequent phlebotomy or difficult intravenous access (DIVA) with duration of 6 days or more; nursing homes or home care 15 days or more



Technology Improvements

- ❖ Specialty teams are still the ideal and present in the bigger better hospitals
- ❖ Ultrasound guided peripheral cannulas make up as much as 40/50% of PIV placements



Patient Factor Influence on Technology



Technology Improvements

- ❖ Old PICC insertion techniques
 - Antecubital access
 - Over the needle peel-way sheath
 - Direct Access and breakaway needles
- ❖ Improvements
 - Modified Seldinger Technique
 - Upper arm placement with ultrasound
 - C21g needle and wire access
 - Improved materials and valves
 - VP measurement



Current Issues for PICCs



- ❖ Improving successful access without malpositioning using ECG
- ❖ Ultrasound guided insertion is the standard for PICCs and CVCs
- ❖ Focus on selection and indications

MAGIC Michigan Appropriateness Guide

PICC Indications

1. Patient requires intravenous access for greater than 14 days. For proposed treatment of 6 or more days ultrasound guided or midline catheter preferred over PICC
2. Clinically stable patient requiring intravenous therapy with peripherally incompatible solutions. Hemodynamically unstable patients where cardiac monitoring or use of vasopressors is necessary in cases less than 14 days and greater than 15 days (CVCs favored over PICCs)
3. PICC is preferred CVAD for critically ill patients with coagulopathies for 14 or fewer days and those requiring 15 or more days of treatment
4. For use with continuous infusions of vesicant, parenteral nutrition, chemically irritating or non-peripherally compatible solutions for any duration. For cyclic chemotherapy with active cancer where treatment is greater than 3 months. Consideration given to discontinuation of PICC when each cycle complete (peripheral catheter preferred when less than 3 months)
5. Use with patients receiving frequent phlebotomy of every eight hours or more with duration of 6 or more days
6. For burn patients where early implementation of PICC decreases risk of bacteremia
7. For use with chronic or lifelong access populations (Sickle Cell, Cystic Fibrosis, Short Gut) or those hospitalized more frequently than 6 times per year (tunneled catheter preferred)
8. For use in patients in palliative treatment, actively dying or on hospice requiring intravenous solutions
9. For skilled nursing facilities when duration of treatment greater than 14 days
10. Prior nephrology approval if GFR less than 30 or creatinine greater than 2.0
11. Single lumen PICCs preferred unless specific indication for additional lumen. Use smaller gauge PICC with fewer lumen to reduce risk of deep vein thrombosis (DVT) (Evans 2013, Grove and Pevac 2000). Measure vein size to establish appropriate catheter size of less than 45% of diameter (Sharp 2014). Position of terminal tip of PICC in lower third of



Inappropriate PICC Placement

Inappropriate PICC

1. Placement of PICC for any non-central indication or use with any infusion other than non-peripherally compatible infusates
2. Placement with confirmed CLABSI without clearance of infection (line free interval 48-72 hours and negative blood culture)
3. Urgent or "STAT" request for PICC for a hemodynamically unstable or critical patient
4. Avoid PICC for inappropriate indications, or for patients with history of thrombosis, hypercoagulability or decreased venous flow to extremities; consider alternative devices and remove PICC when no longer needed
5. For renal failure stage 3b or greater chronic kidney disease with GFR of less than 44mL/min or for patients currently receiving any renal replacement therapy
6. Insertion for infrequent phlebotomy, less than 3 times daily
7. Insertion of a PICC primarily to establishing intravenous access when the duration of treatment is unknown
8. Poor vascular access is no longer an acceptable indication



Technology Improvements

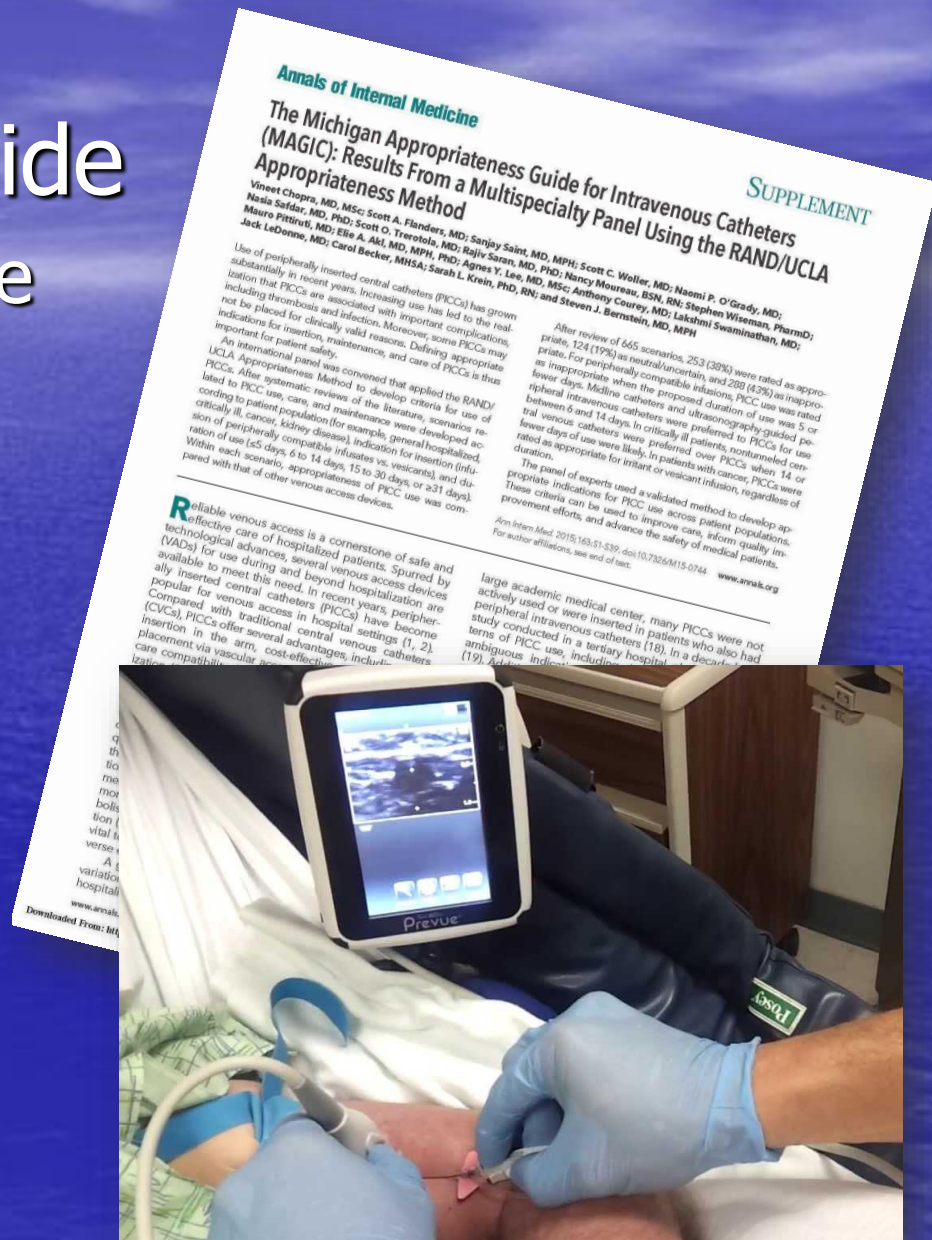
- ❖ Ultrasound guidance for needle access
 - Smaller devices, even USB probes
 - Allows consistent upper arm access for better outcomes
 - Integration with tip location



MAGIC Michigan Appropriateness Guide Evidence to guide practice

Ultrasound Guided Peripheral Catheter Indications

1. Use visualization technology to establish peripheral access using longer catheters for the purpose of intravenous treatment less than 5 days or greater than 15 days (with transition to midline or PICC)
2. For patients with one or more failed attempts, inability to identify veins visually or those identified as difficult intravenous access (DIVA)
3. For contrast based radiological studies requiring upper extremity access in larger veins with 20, 18 or 16 gauge catheter (where visible veins to accommodate catheter size are not present)



MAGIC Michigan Appropriateness Guide Evidence to guide practice

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Midline Catheter Indications

1. Treatment involves peripherally appropriate solutions that will likely exceed 6 days
2. Preferred for patients requiring infusions of up to 14 days
3. Patients with difficult access (DIVA) despite ultrasound guided peripheral catheter attempts
4. Single lumen midline is placed unless specific indication for dual lumen with compatible infusions
5. The administration of Vancomycin 6 days was considered safe in one study



Current Issues for PICCs

- ❖ Tip location devices changing over to ECG
- ❖ Reducing Infection
 - Longer insertions higher risk
 - Technology and aseptic tech



Technology Advances

❖ Tip Location Devices

- Avoids jugular, cross chest placement
- Indicates direction
- Precision with tip location on the forefront
 - Unable to differentiate position in SVC
 - Particular challenges are Azygos, alternate veins, and arterial access
- ECG/EKG is the up and coming technique that provides accurate location in CAJ

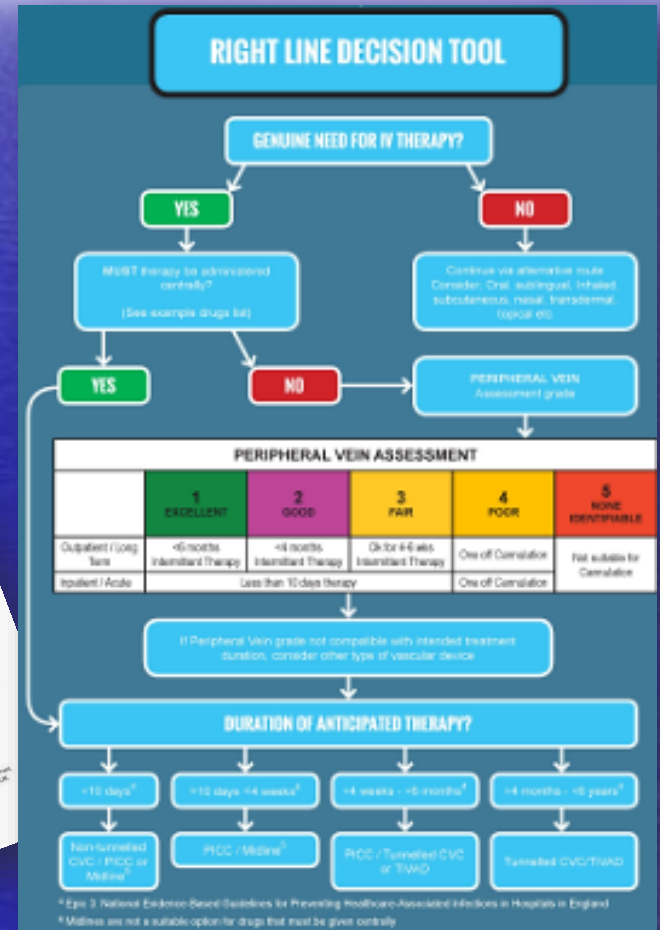


Current Issues for PICCs

- ❖ Clinical Pathways for vessel health and preservation reduces length of stay and cost



Reference: Hallam 2016 Journal of Infection Prevention, Moureau JVA 2012



¹ Epic 3 National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in Hospitals in England
² Midlines are not a suitable option for drugs that must be given centrally

Trends and Techniques for Placement

- ❖ Power Injection for PICCs and Ports
- ❖ Fluoroscopy
- ❖ Improvements for prevention of complications at insertion site
 - CHG impregnated drsg
 - Antimicrobial catheters



Evidence to Support Antimicrobial

❖ One catheter fits all?

❖ Indications for Anti-Infective CVAD Selection

1. Expected duration of 5 days or more
2. CLABSI remains high despite application of infection prevention measures
3. Patients at higher risk of infection
4. Emergency insertions
5. Catheter exchange (higher risk of infection)

Annals of Internal Medicine

SUPPLEMENT

The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): Results From a Multispecialty Panel Using the RAND/UCLA Appropriateness Method

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Use of peripherally inserted central catheters (PICCs) has grown substantially in recent years, increasing use has led to the realization that PICCs are associated with important complications, including thrombosis and infection. Moreover, some PICCs may not be ideal for clinically well patients. Defining appropriate indications for insertion, maintenance, and care of PICCs is thus important for patient safety.

An international panel was convened that applied the RAND/UCLA Appropriateness Method to develop criteria for use of PICCs. After systematic review of the literature, scenarios related to PICC use, care, and maintenance were developed according to patient population (for example, general hospitalized, critically ill, cancer, kidney disease), indication for insertion (duration of use [0-5 days, 6 to 14 days, 15 to 30 days, or >31 days]), and the site of use (outpatient or inpatient). PICC use was compared with that of other venous access devices.

After review of 665 scenarios, 253 (38%) were rated as appropriate, 242 (36%) as inappropriate, and 170 (26%) as inappropriate. For generally comparable situations, PICC use was rated as inappropriate when the proposed duration of use was 5 or fewer days. Midline catheters and ultrasonography-guided peripheral intravenous catheters were preferred to PICCs for use between 6 and 14 days. In critically ill patients with extended central venous catheters were preferred over PICCs when 14 or fewer days of use were likely. In patients with cancer, PICCs were rated as appropriate for inpatient or outpatient infusion, regardless of duration.

The panel of experts used a validated method to develop appropriate indications for PICC use across patient populations. These criteria can be used to improve care, inform quality improvement efforts, and advance the safety of medical catheters.

DOI: 10.1213/01213000-201509000-00001 www.annals.org

Reliable venous access is a cornerstone of safe and effective care of hospitalized patients. Spurred by new technologies, several venous access devices have been developed, beyond hospitalization are used in the home setting, among patients with large academic medical centers, many PICCs are not actively used or even inserted in patients who also had peripheral intravenous catheters (PIVs). In a decade-long study conducted in a tertiary hospital, changes in patterns of PICC use, including shorter dwell times and analgesic indications for insertion, were reported (1). Additional cause for concern comes from a recent study that found that 1 in 5 inpatient providers did not use PICCs in patients with CVAs, despite a lack of evidence-based knowledge (2).

Abstract
 PICCs are associated with a significant risk of thrombosis and infection. Economic analysis of PICCs and other venous access devices is needed to inform decisions about their use. The purpose of this study was to evaluate the clinical and economic impact of PICCs in a tertiary care hospital.

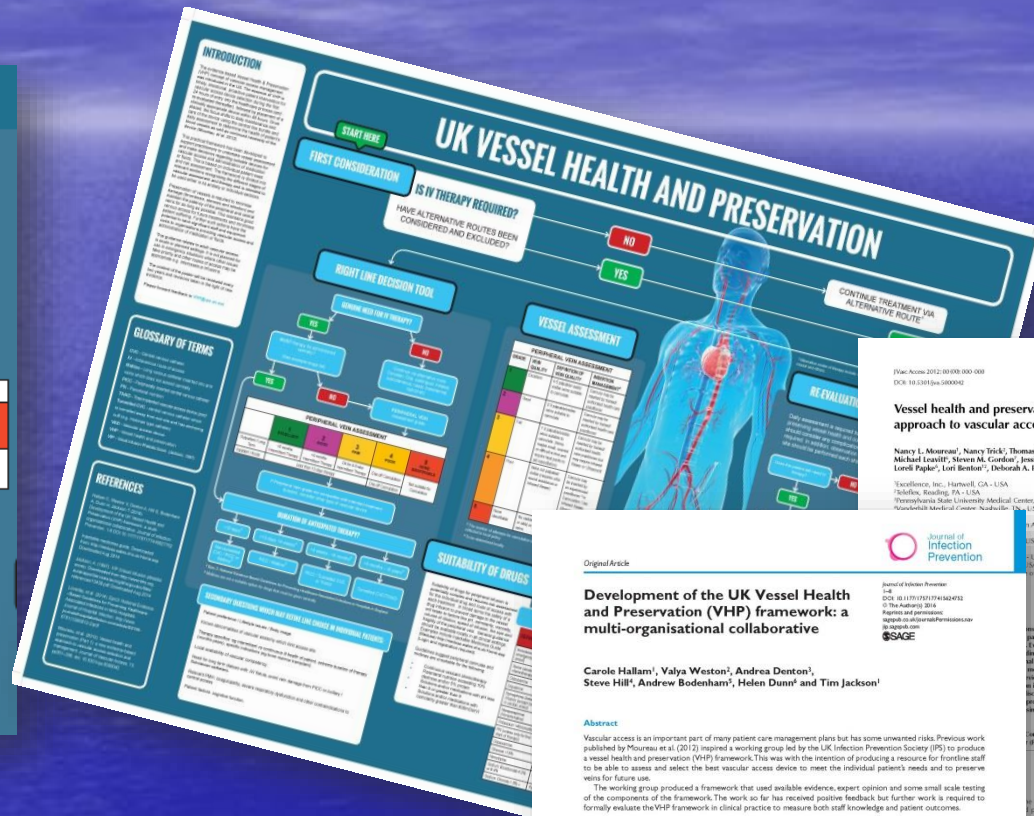
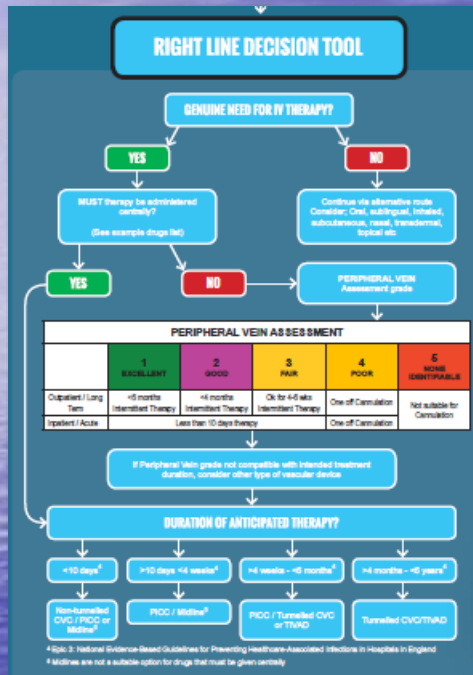
Results and Findings
 The most common complication associated with PICCs was thrombosis, followed by infection. The economic burden of these complications was significant. PICCs were associated with higher costs compared to other venous access devices.

Materials, Methods and Aims
 A retrospective cohort study was conducted in a tertiary care hospital. Data were collected on PICC use, complications, and costs. The study aimed to evaluate the clinical and economic impact of PICCs.

Conclusions
 PICCs are associated with a significant risk of thrombosis and infection, which can have a substantial economic burden. Further research is needed to optimize PICC use and reduce complications.

References: Chopra MAGIC 2015, SHEA 2014, CDC 2011, Moureau 2015 Poster AVA, McCoy 2011 Am J Perinatol, Lee et al 2008 ICHE

Vessel Health and Preservation in Action



17 June 2016, 20:00:00
DOI: 10.1093/infdis/jiv292

ORIGINAL ARTICLE

Vessel health and preservation (Part 1): A new evidence-based approach to vascular access selection and management

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Journal of Infection Prevention

Development of the UK Vessel Health and Preservation (VHP) framework: a multi-organisational collaborative

Carole Hallam¹, Vajya Weston¹, Andrea Denton¹, Steve Hill¹, Andrew Bodenham¹, Helen Dunn¹ and Tim Jackson¹

Abstract

Vascular access is an important part of many patient care management plans but has some associated risks. Previous work published by Moureau et al. (2012) inspired a working group led by the UK Infection Prevention Society (IPS) to produce a vessel health and preservation (VHP) framework. This was with the intention of producing a resource for frontline staff to be able to assess and select the best vascular access device to meet the individual patient's needs and to preserve veins for future use.

The working group produced a framework that used available evidence, expert opinion and some small scale testing of the components of the framework. The work so far has received positive feedback but further work is required to formally evaluate the VHP framework in clinical practice to measure both staff knowledge and patient outcomes.

Keywords

Vessel health, vessel health and preservation, vascular access device selection, vascular access evaluation, vein assessment

Date received: 1 October 2015; Accepted: December 3, 2015

Introduction

Vascular access along with the administration of intravenous drugs and fluids is common practice in healthcare today and plays an important part in the care and management of many patients (Gibson, 2013; Jackson et al., 2013). Vascular access can be life-saving for patients; however, it can also result in a range of both minor and life-threatening complications including phlebitis, thrombosis, infection and damage to the vessel (Moureau et al., 2012). Blood stream infections associated with vascular access devices are potentially among the most dangerous complications associated with healthcare (Lovelock et al., 2014).

Poor decision-making combined with poor adherence has been identified as resulting in the default choice for administering intravenous (IV) therapy via peripheral venous catheter (PVC) routes (Jackson et al., 2013). In addition, those inserting peripheral catheters may not necessarily appreciate fully the implications and associated complications (Jackson et al., 2013). There have also been concerns from staff about patients being cannulated numerous times using small fragile veins which fall quickly due to the inadequate blood flow (Olive, 2015). The implications for patients of failed cannulation include pain and delayed IV fluids, antibiotics and analgesia resulting in increased length of hospital stay (Alexandrov, 2014). A personal account of where numerous PVCs over a few weeks were inserted into veins that were inadequate to support therapy resulted in, among other negative impacts, a needle phobia, phlebitis and an overall poor patient experience (Hendricks, 2013).

Conclusion

The UK Vessel Health and Preservation (VHP) framework is a multi-organisational collaborative effort to improve patient care and preserve veins for future use.

Declaration of interest

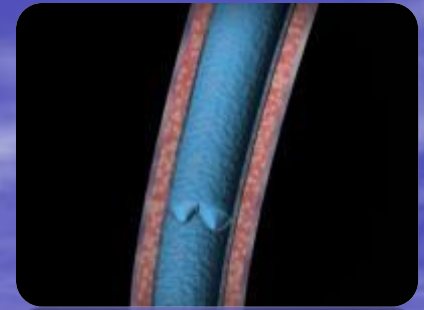
None declared.

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Reaching for Perfection



The Perfect Vascular Access Device

- Durable
- Easy to insert
- Power injectable
- Low complication rate
- Anti-thrombotic
- Anti-infective

Reaching for Perfection

The Perfect VAD Access Device

- Durable
- Easy to use
- Easy to maintain
- Low complication rate
- Anti-thrombotic
- Anti-infective

What is the ideal VAD for you?

Best Practice Initiatives

- ❖ AVA – SAVE THAT LINE
- ❖ S – Scrupulous hand washing
- ❖ A – Aseptic technique
- ❖ V – Vigorous friction to cap/hub
- ❖ E – Ensure patency by flushing
- ❖ Other – Central Line Bundle and checklist– Institute of Healthcare Improvement www.IHI.org



Factors Driving Practice

- ❖ Economics
- ❖ Nurses take on greater role with vascular access
- ❖ Physicians opt for other procedures
 - PICCs time consuming
 - Takes time to learn ultrasound
- ❖ Hospitals promote Specialty Teams for improved outcomes and best practice

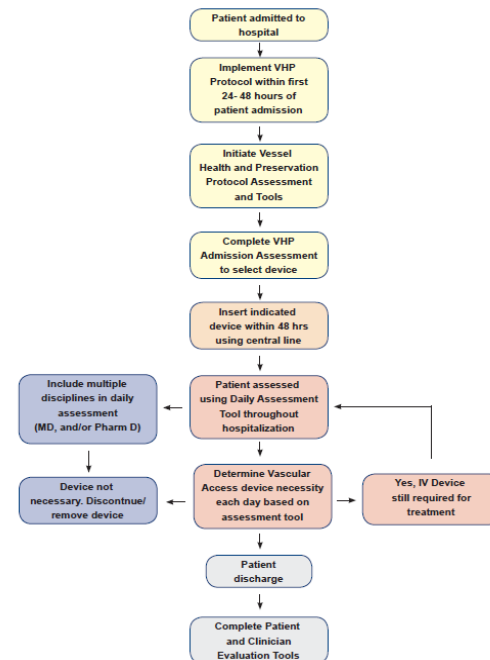


The Future

- ❖ Handheld ultrasound
- ❖ Smaller PICCs and CVCs
- ❖ Easy ECG navigation
- ❖ More USGPIV and Midlines used
- ❖ Intentional clinical pathway for VAD selection and use



How to use the Vessel Health and Preservation Protocol



Resources

- ❖ Guidelines, position papers and standards available on the web www.ins1.org , www.avainfo.org , www.rnao.org
- ❖ MAGIC www.improvepicc.com
- ❖ nancy@piccexellence.com





Thank you for the opportunity to
speak with you.

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