

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

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ABSTRACT

Vascular access for the infusion of medications and solutions requires timely assessment, planning, insertion, and assessment. Traditional vascular access is reactive, painful, and ineffective, often resulting in the exhaustion of peripheral veins prior to consideration of other access options. Evidence suggests clinical pathways improve outcomes by reducing variations and establishing processes to assess and coordinate care, minimizing fragmentation and cost. Implementation of a vascular access clinical pathway leads to the intentional selection of the best vascular access device for the patient specific to the individual diagnosis, treatment plan, current medical condition, and the patient's vessel health (1). The Vessel Health and Preservation (VHP) programme incorporates evidence-based practices focused on timely, intentional proactive device selection implemented within 24 hours of admission into any acute facility. VHP is an all-inclusive clinical pathway, guiding clinicians from device selection through patient discharge, including daily assessment. Initiation of the VHP programme within a facility provides a systematic pathway to improve vascular access selection and patient care, allowing for the reduction of variations and roadblocks in care while increasing positive patient outcomes and satisfaction. Patient safety and preservation of vessel health is the ultimate goal.

Key words: Central Venous Catheter, Clinical Competence – Economics and Standards, Infection Control - Standards, Length of Stay, Peripherally Inserted Central Catheter (PICC), Vessel Health and Preservation

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INTRODUCTION

Venous access for infusion therapy is the most common invasive experience of all hospitalized patients (2). Without venous access, few current treatment plans could be administered. Given the high prevalence and significance of intravenous device placement, reliable access is necessary to ensure the delivery of the prescribed treatment plan. In spite of emphasis on evidenced-based practice from various regulatory agencies including the most

recent Joint Commission 2012 National Patient Safety Goals (3) supported by the Centers for Disease Control (CDC) (4) and other professional associations (5, 6), a passive or reactive nature is the predominant culture and approach used for vascular access device selection and management. Given the volume, complexity, and irritating properties of infusion treatments along with potential hazards, it is necessary to ensure for each patient the most appropriate device placement with safe management of that device from hospital admission right up to discharge.

In August 2008, a multidisciplinary summit sponsored by Teleflex, Inc. convened to assess current clinical practices and create a proactive model for acute care management of vascular access designed to change the current culture. The summit participants, including physicians, physician assistants, nurses, nurse practitioners, and vascular access experts, formulated a problems list. They then developed solutions to each of these vascular access problems supported by recommendations and evidence-based practices from varying agencies. This multi-disciplinary group of experts reached a consensus which has culminated in the development of a clinical pathway known as the Vessel Health and Preservation Programme (VHP). The predicted outcomes to this newly developed protocol are timely appropriate care, reduced complications, lower patient and facility risk, reduced delays in treatment and a financially viable, high quality vascular care process. Vessel health and preservation is accomplished by using the VHP clinical pathway protocol throughout the entire dwell time of the device, from selecting the most appropriate vascular access device upon hospital admission, to performing daily assessments and determining when to remove the device. Vascular access using the VHP protocol promotes and applies the best known practices of today providing for the safest possible patient outcomes.

Background

In 1989, Marcia Ryder introduced the concept of a vascular access device algorithm (7). The algorithm for vascular access device selection was widely supported by the medical community. Throughout the 1990s and continuing into this decade, the decision tool has expanded into programmes designed for the placement of vascular access devices by promoting the "IV/PICC Team" concept. Dedicated teams were developed specifically for the purpose of placing intravenous devices and peripherally inserted central catheters (PICCs) at the bedside based upon certain clinical indicators such as infusion type, diagnosis or chronic conditions. The use of vascular access specialists demonstrated benefits to both the patient and the facility (5,8).

Research of outcomes from early intervention programmes and the advantages of a team of dedicated vascular access professionals led to an increase in knowledge including the following concepts:

- Large variations in vascular access applications exist from one facility to another;
- Planning for early vascular access placement reduces complications, improves patient comfort, and saves money (8-10);
- The use of dedicated vascular access professionals for insertion and management reduces the risk of infection (4);

- Consistent use of smaller catheter sizes results in fewer complications for the patient (11);
- Selecting the fewest number of lumen helps to minimize risk (12);
- Assessment, planning, and intervention within 24-48 hours of admission promotes reliability and consistency of access (13,14);
- Performing daily assessment results in early identification of problems and the opportunity to assess for device replacement or discontinuation (4).

Additionally, the incorporation of new technology and new evidence-based practices has resulted in changes to the structure of vascular access teams. In 2002 (updated in 2011), the CDC published Guidelines on Management of Intravascular Catheters to Reduce Catheter-Related Bloodstream Infections (CRBSIs) (5). This well referenced document is the basis for many protocols, policies, and products related to central access device insertion and care. Furthermore, extensions and reinforcement of the CDC guidelines came from the Infusion Nurses Society (INS) (15), Association for Vascular Access (AVA) (16), Society for Healthcare Epidemiology of America (SHEA) (17), Institute of Healthcare Improvement (IHI) (18), Agency for Healthcare Research and Quality (AHRQ) (19), the Registered Nurses Association of Ontario (RNAO) (20), the Association of Practitioners in Infection Control (APIC) (21), and others. These recommendations represent the culmination of current core knowledge, establishing the need for a new comprehensive approach to vascular access care.

Evidence points to these specific approaches:

- The use of specialized vascular access teams demonstrates increased safety for patients (22-25);
- Education of staff and patients is vital to any vascular access infection prevention programme (26-30);
- Positive results are maximized by means of systematic application of current guidelines and recommendations (5,11,18, 31-34);
- Incorporation of evidence-based bundles provides the greatest impact on increasing positive outcomes including the reduction of catheter-associated bloodstream infections (25,35,36);
- Application of intentional processes mitigates risk and reduces liability (1,8,9,37-43).

Additionally, the Centers for Medicaid/Medicare Services (CMS) instituted reimbursement changes driving the paradigm shift towards improvement of vascular access device selection, insertion, and management. CMS no longer reimburses hospitals for any expenses associated with preventable catheter-related bloodstream infections. Pay for performance means vascular access care must improve. Full multidisciplinary teams are needed to maximize performance, results, and benefits of any vascular access programme. Physicians, pharmacists, administrators, and the vascular access team must work in unison

to approach vascular care from all avenues. With this multidisciplinary approach, patients are served according to their rights, outcomes are improved, clinicians have enhanced communication, and administrators have a financially viable quality programme that performs at peak levels.

Subject and Goals

The primary goal of this VHP programme is to drive vascular access care, regardless of point of entry into a healthcare facility, based on a system of standardized evidence-based practices, standards, and guidelines by means of collaborative agreement by all disciplines/care providers. A standardized approach to care provides the timely and reliable vascular access demanded by contemporary medical practices. A clinical pathway approach includes device selection, insertion, and management specific to the patient's medical condition (9). When a patient requires a central venous device, they deserve the Right Line at the Right Time with oversight and management throughout the entire treatment period. Because of the complicated and diverse nature of vascular access, a clinical pathway is required to effectively select and manage vascular access devices (VADs) while promoting vessel preservation.

METHODS

Development of the Vessel Health and Preservation Programme

The experts at the August 2008 summit investigated current IV practices, complications with peripheral IV access and maintenance, identification of barriers to vascular access selection including clinician knowledge, defining the role of clinicians pertaining to vascular access, vessel preservation, daily assessment requirements, catheter usage and care, computer integration, and multidisciplinary educational needs. They wanted to create a reliable, consistent pathway to address all the issues. A literature review was performed using key terms applicable to vascular access and evidence related to pathways, complications, management, guidelines, Standards, recommendations, patient safety, patient satisfaction, risk reduction, and outcomes.

With the ideal programme in mind and by incorporating current guidelines and evidence, the team created a programme that comprehensively addresses the issues of education, assessment, placement, and daily assessment of patient condition to determine device necessity. The Teleflex™ Vessel Health and Preservation programme delivers a consistent message to all clinicians caring for

patients at the bedside, from the emergency department to patient discharge. The message is one of proactive, intentional device selection and patient assessment. The model incorporates concepts from infection prevention and control, nephrology, vascular access and radiology, and includes comprehensive guidelines from various regulatory organizations aimed at vessel health and preservation. It represents the pinnacle of evidence-based knowledge development as a risk reduction strategy that complies with Joint Commission, (44) Oncology Nurses Society (ONS), (45) Intravenous Nursing Society (INS), (11) Association for Vascular Access (AVA), (16) Agency for Healthcare Research and Quality (AHRQ), (19) Centers for Disease Control (CDC,) (4) Registered Nurses Association of Ontario (RNAO), (46) Association for Professionals in Infection Control and Epidemiology, Inc. (APIC), (21) the Society for Healthcare Epidemiology of America (SHEA) (17) and the Institute for Healthcare Improvement (IHI) (18) Central Line Bundle initiatives. The Vessel Health and Preservation programme provides:

- Effective administration of the treatment plan by means of a vascular access risk assessment model;

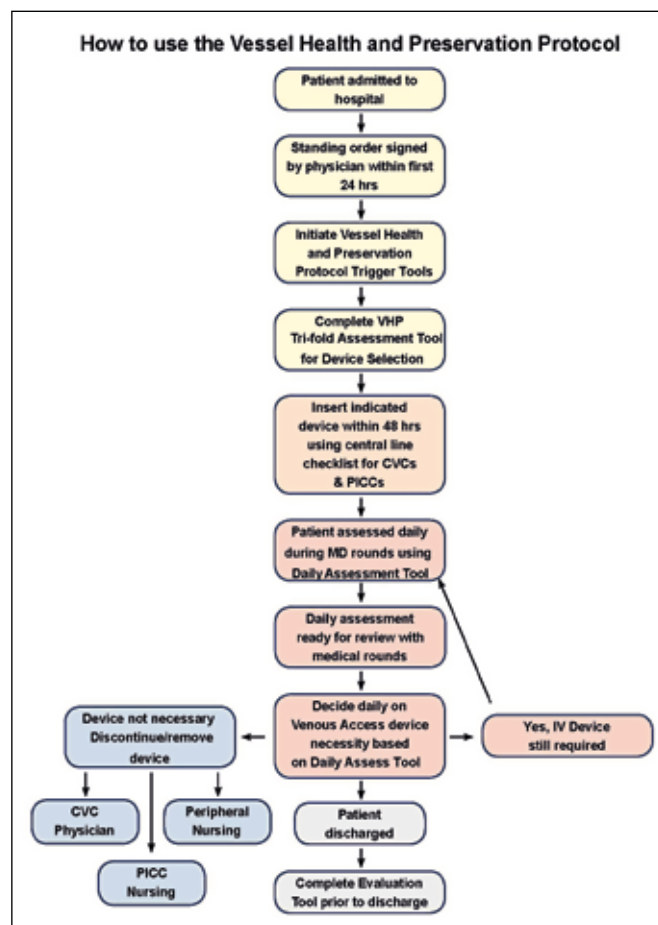


Fig. 1 - Vessel Health and Preservation Flowchart.

- Vessel health assessment at admission;
- Daily assessment of device suitability and requirement;
- Discontinuation of any intravenous catheter when treatment is complete;
- Reduced lengths of stay (LOS) related to continuous treatment;
- Risk reduction initiatives associated with the use of the correct vascular access device through the length of stay;
- Reduced risk related to avoidance of medication delays in administration;
- Compliance with all mandated Central Line Bundles and programmes for infection prevention;
- Compliance with CMS Performance Indicators (e.g. CLABSI);
- Assessment of patient satisfaction.

The key to the programme is that physician, pharmacy, and/or administrative approval is built into the pathway programme; this process reduces barriers to timely assessment and correct device placement for each patient admitted to the facility.

The VHP programme is the most well-defined and comprehensive approach ever taken to assess vessel health, identify risks, and authorize placement of the appropriate device based on specific patient factors.

RESULTS

How the Vessel Health and Preservation Programme Works

The Vessel Health and Preservation programme begins with device selection based on the treatment plan and continues throughout patient treatment and into discharge planning. The VHP tools provide for individual patient assessment on a daily basis to assess the patient based on goals and outcomes, and then reviews compliance and results in all areas upon patient discharge.

When selecting a vascular access device, matching the patient's current state of health with the need for intravenous access prevents unnecessary IV restarts, reduces medication delays, and provides for optimal outcomes. The recommendations presented here are from the Joint Commission, National Patient Safety Goals (NPSG) (31) and The Society for Healthcare Epidemiology of America (SHEA) (17). When selecting a vascular access device (VAD), outcomes are improved and patient safety is promoted when you:

- Minimize the size of the catheter; select the smallest catheter possible to achieve the goal;
- Reduce the number of lumen; fewer lumen means less risk of infection;
- Select the largest vessel possible in order to maximize

dilution;

- Select the healthiest and least damaged location and/or extremity;
- Plan by selecting the least invasive but most appropriate device given the patient's vascular access needs;
- Seek to accomplish appropriate device placement within 24-48 hours from admission;
- Consult your IV or Vascular Access Team to assist with patient assessment;
- Reassess patient's condition and need for the same or different type of vascular access device if an IV complication occurs;
- Consider using antimicrobial catheters if infection rates are higher than average in the facility or if your goals for infection are not met;
- Perform risk assessment and planning to achieve better outcomes.

Each of these recommendations is built into the VHP programme as part of the evidence-based best practices and recommendations used to develop the programme. The VHP programme directs the selection of the most appropriate vascular access device individualized for each patient based on diagnosis, acuity, therapy, and duration of therapy. Reducing risk and unnecessary harm in the hospital setting begins with assessment of the patient's condition, history, and relative vessel health. Selection requires knowledge of whether or not medications are considered irritants, understanding the impact the duration of therapy has on the selection of the device and whether the patient is acute or chronic. The VHP programme uses an easy to follow algorithm to direct the clinician to the most appropriate device based on these factors.

Once the best vascular access device has been indicated based on the diagnosis, required therapies, and duration of therapy, the patient is assessed to determine whether there are any additional risk factors that contraindicate that device. There are specific patient conditions that may increase the risk of complications or require special treatment or knowledge when placing vascular access devices. Knowing these risk triggers in advance and planning for specialized treatment for placement of devices when these risks are present provides for safer vascular access and better outcomes for the patient. The following are evidence-based recommendations from the following institutions: (NPSG), (44) (CDC,) (4) (IHI), (18) (INS), (11) (ASDIN), (47) (ONS), (45) (SHEA) (17).

Consider the risk associated with insertion of a particular device and patient condition given the patient's vascular access needs to determine risk/benefit ratio.

- Assess for renal dysfunction (Creatinine greater than 2.0 or GFR <59 mL/min/1.73 m²).
- Seek to assess and accomplish required device placement within 24-48 hours of admission.
- Use multidisciplinary approach when performing patient assessment.

Based on the above recommendations, the VHP programme directs the clinician through a closer assessment of the patient to ensure conditions do not exist that would contraindicate the indicated device or that require specialized placement procedures. Performing risk assessment prior to placement of an indicated device enables the clinician to verify risk factors, critical conditions, acuity, contraindications, and infusion needs confirming that this patient is indeed the right patient for the specified access device. Performing a risk assessment also determines whether the clinician can initiate the vascular access device or if the patient should be referred to a vascular access specialist, physician or radiology for placement of the selected device or for further assessment.

Once device and site selection have been completed, the vascular access device has been placed and the tip confirmed, the VHP programme guides the clinician through assessments performed daily in an effort to preserve the health of patient vasculature as well and to confirm continued device necessity. Part II of this article reviews the daily assessment and compliance/results portions of the VHP programme.

CONCLUSION

More than five million central venous catheters (CVCs), two million PICCs, and 310 million peripheral IVs are sold annually in the United States (48). According to the CDC, selection of the right device inserted into the right location is paramount to reducing complications, specifically infection (5). Fast, well-directed treatment following diagnosis is the hallmark of an efficiently managed

hospital system. Clinical pathway protocols, care systems, multi-disciplinary teams, and organized standards lead to vascular access care that yields consistently positive results. The Vessel Health and Preservation protocol, created using the most current clinical evidence, guidelines, regulations, and performance standards available, provides a clinical pathway to drive a decision for the Right Line for the Right Patient at the Right Time™. It provides an intentional process for venous access device selection and management based on the most current recommendations, guidelines, and evidence available for the safe and effective treatment of patients requiring vascular access. Developing an organized approach to vascular access provides the educational, regulatory, and clinical outcomes necessary for establishing and maintaining reliable access for delivery of the treatment plan. The goal is to make the vascular access device decision-making process easier and more standardized thereby reducing variations in care, avoiding delays in treatment and increasing patient satisfaction. The time is right for facilities to commence a vessel health and preservation protocol. Timely planning today helps take care of patients tomorrow.

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