

The Role of the Nurse in the Use of Intraosseous Vascular Access Devices

Description

The first documented use of intraosseous (IO) vascular access devices (VADs) in the clinical setting occurred in the 1940's, nearly 20 years after the device was pioneered by Drinker and colleagues in 1922 (Arbeiter & Greengard, 1944; Petitpas et al., 2016). The use of IO VADs for critically ill or injured pediatric patients was re-introduced in the mid-1980s subsequent to publications prompting its use and the simplicity of the procedure (Iserson & Criss, 1986; Spivey, 1987). Intraosseous access was included in the recommendations of the American Heart Association (AHA) Guidelines for the first time in 2005 and began to be more commonly used for pediatric cardiac arrest in pre-hospital and emergency department settings (Petitpas et al., 2016; Rhythms, 2005). Technological advances now allow the insertion of IO VADs in patients of all ages and sizes. Intraosseous vascular access is widely recognized as safe, fast, and effective in both the pediatric and adult populations (AHA, 2020a; AHA, 2020b; Gräsner et al., 2021; Petitpas et al., 2016; Nickel et al., 2024; Phillips et al., 2010). However, IO access is underused due to lack of knowledge, training, healthcare policies and protocols, and availability of equipment (Petitpas et al., 2016; Iskrzycki et al., 2017; Cicolini et al., 2023).

The Emergency Nurses Association (ENA), Infusion Nurses Society (INS), AHA, American College of Emergency Physicians (ACEP), the American College of Surgeons, the European Resuscitation Council, the National Association of Emergency Medical Services Physicians, the American Association of Critical-Care Nurses, and many other authoritative bodies recommend IO VADs as an option to reduce the time to first drug and fluid administration in resuscitation situations (ACS, 2018; AHA, 2020a; AHA, 2020b; ACEP, 2021; ENA, 2023; Phillips et al., 2010; Gräsner et al., 2021). While peripheral veins remain the preferred route for vascular access in emergency care, the insertion of IO vascular access devices is considered a core skill for emergency nurses (ENA, 2018).

The Advanced Cardiac Life Support (ACLS) and Pediatric Advanced Life Support (PALS) guidelines state that IO cannulation is appropriate for providing access to the non-collapsible venous plexus found in the bone marrow space, thus enabling drug delivery in cardiac arrest (AHA, 2020a; AHA, 2020b). The PALS curriculum supports the use of IO access first in pediatric cardiac arrest if IV access is not already present and cannot be established immediately (AHA, 2020b). Beyond its utility in the resuscitative setting, initiation of IO vascular access is considered appropriate in urgent or nonemergent situations when IV access cannot be obtained and the patient could be compromised without the medications or solutions prescribed (Phillips et al., 2010; ACS, 2018; AHA, 2020b; ENA, 2023; Gräsner et al., 2021; Nickel et al., 2024).

ENA Position and Infusion Nurses Society

It is the position of the Emergency Nurses Association (ENA) and the Infusion Nurses Society (INS) that:

1. A nurse trained in proper techniques may insert, access, maintain, assess, manage complications, and remove all types of IO access devices.
2. IO access is considered appropriate when a definitive vascular access device (VAD) cannot be obtained in a timely manner to provide medically necessary treatment in emergent situations.

- 39 • IV access is not easily obtained or will delay therapy in all critical situations for any patient
- 40 • IV access is not already present and cannot be established immediately for cardiac arrest,
- 41 • there are no visible/palpable veins appropriate for cannulation and initial attempts fail causing
- 42 potential deterioration in patient condition,
- 43 3. Organizational policies and procedures, in accordance with state nurse practice acts, allow the
- 44 establishment of IO access by properly trained nurses.
- 45 4. Individual facilities maintain organizational policies and procedures for initial and ongoing
- 46 competency validation for nurses in the use of IO access devices including.
- 47 5. Standardized training programs and availability of equipment are needed to increase appropriate IO
- 48 utilization.

49 **Background**

50 Intraosseous vascular access requires either drilling or puncturing through the bone cortex and placing a

51 hollow needle in the marrow cavity, wherein an abundant network of marrow vasculature enables rapid

52 transport of fluids, medications, and blood products into the vascular system (AHA, 2020a; AHA, 2020b).

53 The IO space refers to the spongy, cancellous bone of the epiphysis and the medullary cavity of the

54 diaphysis (Patton & Thibodeau, 2019). Vessels within the IO space link to the central circulation through

55 a series of canals connecting the IO vasculature with other major arteries and veins (Patton & Thibodeau,

56 2019).

57 Peripheral IV catheter use has significant failure rates leading to decreased reliability and delays in care,

58 throughput, and poor patient outcomes including increased morbidity and mortality (Nickel et al., 2024;

59 Alexandrou et al., 2018; Kache et al., 2020). Because IO access has higher first attempt success rates,

60 faster insertion times, and lower complication rates compared to peripheral IV catheters, the IO may be an

61 appropriate first-line attempt in patients with known difficult vascular access in a resuscitation situation,

62 acting as a bridge to more definitive vascular access (AHA, 2020b; Chreiman et al., 2018; Nickel et al.,

63 2024).

64 It is essential to conduct initial education and ongoing validation of competency that focuses on safe

65 insertion, maintenance, ability to recognize complications, and removal of the IO device. (Nickel et al.,

66 2024). It is important that nurses demonstrate the ability to provide appropriate, current, and evidence-

67 based care of the IO device (Campos, 2024).

68 Emergent and urgent clinical situations require quick and reliable vascular access. Delays in vascular

69 access can have life-threatening consequences for patients. Intraosseous access is a rapid and effective

70 route for fluid, blood products, and medications. In the setting where immediate vascular access is

71 necessary, it is essential that IO access be considered as first alternative access when peripheral access

72 cannot rapidly be obtained or insertion attempts fail (AHA, 2020b; Petitpas et al., 2016). Nurses trained in

73 the insertion, care, and maintenance of IO devices contribute to life-sustaining outcomes in patient

74 populations.

75 **Resources**

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