

# Success of intraosseous access procedure in simulated adult resuscitation

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**TO THE EDITOR:** In the out-of-hospital emergency setting, rapid vascular access is often required to administer drugs and/or fluids to critically ill patients.<sup>1</sup> Gaining access to the circulation out of hospital can often be problematic for medical staff. Clinical factors such as peripheral vasoconstriction in shocked or cold patients, previous or ongoing intravenous drug misuse or morbid obesity can make venous cannulation challenging.<sup>2</sup> As an effective alternative to peripheral intravenous (IV) cannulation, intraosseous (IO) access is increasingly recognised. IO access is recommended by the European Resuscitation Council (ERC) and the American Heart Association (AHA) as the preferred method to obtain vascular access rapidly when IV attempts have failed.<sup>3,4</sup> The IO route has been routinely used to administer fluids, medications and blood, especially in children, and a new, semi-automatic IO device with a spring-loaded mechanism needle has become available (New Intraosseous [NIO], WaisMed) for use in adults. The manufacturer recommends using the humeral head and proximal tibia for IO access in adults. Correct IO needle placement has traditionally been confirmed by aspirating blood or bone marrow and infusing fluid easily without extravasation or swelling. Clinical studies have shown that IO access is safe, simple and effective and is associated with a low rate of complications.<sup>5</sup>

Our aim was to compare the times and success rates of first intravascular injection, using an IV cannula and the NIO device for IO access during simulation resuscitation by specialists in internal medicine. So that we could ascertain subjective opinions about the difficulty of the procedure, participants were asked to rate it on a visual analogue scale with a score from 1 (extremely easy) to 10 (extremely difficult).

Our study was approved by the Institutional Review Board of the Foundation International Institute of Rescue Research and Education (approval 08.2015.03.17) and was designed as an open, prospective, randomised crossover trial. Forty-

three specialists in internal medicine gave voluntary written, informed consent and participated. Our study ran from 1 September to 4 November 2015.

We used the STAT Adult ALS Manikin with IO Leg Adult STAT Simulator (Simulaids), the NIO access device and an 18G IV catheter (B Braun Medical). Continuous chest compression was applied using the LUCAS-2 Chest Compression System (Physio Control). Participants completed a 10-minute training session led by an anaesthetist with extensive experience in intravascular access. Participants were shown the IV and IO access procedures once, after which they had a 10-minute practice session with the study devices. They were then asked to perform IO access to the tibia and IV access to the median elbow vein in a random order.

In this simulated chest-compression scenario, the results with the NIO device were significantly better than those with the IV catheter ( $P < 0.001$ ) for success of first attempt, time to cannulation and ease of intravascular access scores (Table 1).

In summary, using a simulation manikin after a short training session, specialists in internal medicine were able to perform IO access. The success rate and time to completion favour the use of IO access over IV cannulation.

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**Table 1. Success rate, time and ease of intravascular access, by access type**

Parameter	IV access	IO access	P
Success of first attempt (%)	48.9%	83.7%	< 0.001
Mean time to cannulation, s (SD)	190 (87)	31 (19)	< 0.001
Mean ease of procedure* (SD)	5.8 (2.9)	3.7 (1.5)	< 0.001

IV = intravenous. IO = intraosseous. \* 1 = extremely easy, 10 = extremely difficult.