

# Forget IV vs. IO in Cardiac Arrest

Decreasing delays to CPR and shortening the time to defibrillation are what really matters

By Blake Briggs, MD

Death rates from out-of-hospital sudden cardiac arrest (OHCA) remain high despite more than 20 years of measuring outcomes. The statistics are disheartening.

One analysis of 12,000 patients treated by EMS in Seattle over 24 years found that survival to hospital discharge was no better in 2001 than in 1981. (*Circulation*. 2003;107[22]:2780; <https://bit.ly/3Pqt6ZM>.)

Another study evaluating 547,153 patients in Japan from 2005 to 2009 found improved survival to hospital discharge but still less than 10 percent survival overall. (*Circulation*. 2012;126[24]:2834; <https://bit.ly/43UViIO>.)

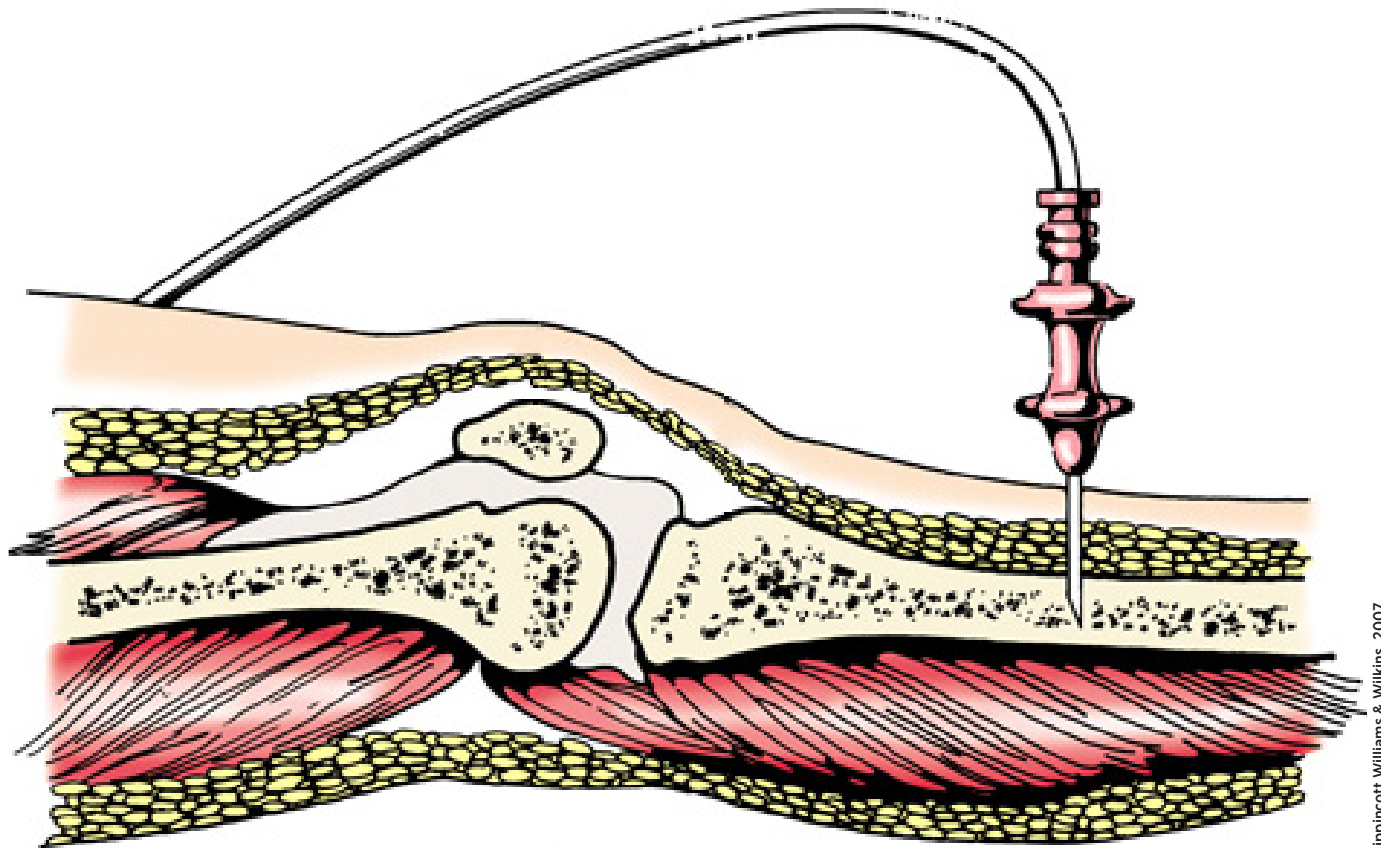
Recent studies from the United States and Canada, each with more than 20,000 patients, had about 10 percent survival to discharge. (*Circulation*. 2014;130[21]:1876; <https://bit.ly/3ClaMng>; *Circulation*. 2014;130[21]:1883; <https://bit.ly/3NhEnZL>.)

## Does Route Matter?

A multitude of reasons accounts for this poor survivability, including a recent study that attempted to address whether epinephrine via the intraosseous route had any advantage over the intravenous route. (*Am J Emerg Med*. 2023;67:63; <https://bit.ly/46jz9Fq>.)

The retrospective study conducted in Taiwan included 112 adult patients with OHCA who received on-scene resuscitation. Patients were excluded if they had return of spontaneous circulation before access was obtained or a cardiac arrest en route to the hospital. Their outcome measurements were based on a per-patient success rate of route establishment (success/attempt) and the rate of epinephrine administered per case/enrolled OHCA.

The average age of patients in the study was 67, with 90 IV cases and 22 IO ones. They found that the median success rate of route establishment was much higher in the IO group (33% vs. 100%,  $p < 0.001$ ), along with the rate of epinephrine administered (52% vs. 100%,  $p < 0.001$ ). Unfortunately, this



Lippincott Williams & Wilkins, 2007

study had many limitations, including its small sample size, and the researchers did not analyze the differences in ROSC or survival.

The results from this study are interesting, though, because they seem contrary to previous research that IV is more effective than IO. One previous

group had more favorable adjusted odds ratios for ROSC and survival with favorable neurologic outcomes. (*Resuscitation*. 2020;149:209.)

This begs the question: Does it even matter if the IO route results in higher rates of administered epinephrine? Given that the IV route is associated

(*JAMA*. 2008;300[12]:1423; <https://bit.ly/44clmxC>.) Other related factors, such as time to bystander CPR, transport time to medical centers, and even a patient's race play a role. (*Resuscitation*. 2017;115:185; *N Engl J Med*. 2022;387[17]:1569; <https://bit.ly/42MBYfi>.)

We must concentrate on the only two variables that have the greatest impact on survival rates with good functional neurologic outcomes: decreasing delays to CPR and shortening the time to defibrillation. (*Circulation*. 2003;107[22]:2780; <https://bit.ly/3Pqt6ZM>.)

Everything else is dubious at best, including the IV versus IO route, ACLS medications, and even intubation, with the latter two being potentially harmful. They have minimal effect on increasing meaningful survival and distract from what truly matters. Public education on the importance of bystander CPR and AEDs remains paramount, for which multiple studies have found favorable improvement in functional survival. (*Circulation*. 2019 Apr 1. <https://bit.ly/3pfSDdA>; *JAMA*. 2015;314[3]:247; <https://bit.ly/3NGWSYU>; *JAMA*. 2015;314[3]:255; <https://bit.ly/3PsBesh>.) EMN

## Access route, ACLS meds, and even intubation have minimal effect on increasing meaningful survival and distract from what is important

study of 1800 OHCA adults (1525 with IV access, 275 with IO) found that the IO group had a lower likelihood of ROSC, though this was not independently associated with survival to discharge. (*Resuscitation*. 2017;117:91.) Another study of 35,733 patients (27,758 with IV; 7975 patients with IO) found that the IV

with a higher rate of ROSC, is any of the discussion about IO versus IV significant? One could also argue that the IO route is being used because the patient is so critically ill that IV access could not be obtained. This may also account for why so many patients in the IO group didn't achieve ROSC as frequently: They are sicker and have a higher likelihood of mortality, perhaps due to prolonged downtime. Unfortunately, like so many other OHCA studies, we are left with conjecture and more questions.

## CPR and AEDs Paramount

But the devil is in the details when it comes to these studies. Measuring small variables in OHCA and seeing if they affect downstream care is fraught with difficulty. There are so many confounding variables when measuring survival rates in OHCA, and most of them are out of our control in the ED.

Marked regional differences exist within the United States, and prognosis may drastically change depending where in the country one resides.

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