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# Resuscitation

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## Editorial

# Cheap, fast, or reliable: Picking two in prognostication after out of hospital cardiac arrest (OHCA)



Engineers have an adage that products can possess only two of three desirable qualities: cheap, fast or reliable. Medicine, as it seems, is not immune to managing the opposing forces of quality, speed, and cost. In this issue of *Resuscitation*, Hong et al.<sup>1</sup> examine the relationship between gray:white ratio (GWR) on ultra-early head computed tomography (CT) (<2 h from return of spontaneous circulation or ROSC) and outcome after cardiac arrest. The present study adds to our growing knowledge base on post-OHCA prognostication for comatose survivors in a number of ways. While it has long been recognized that early ischemic changes on head CT could portend poor prognosis, the timing of the head CT and the threshold for meaningful ischemic changes has been uncertain.

Ultra-early Head CT for prognostication has been examined before. Prior to the advent of GWR, Inamasu et al.<sup>2</sup> observed “loss of boundary” between gray and white matter on CTs performed immediately after ROSC when patients resuscitation exceeded 20 min, indicating more lengthy resuscitations associated with more evidence of neurologic injury. Loss of boundary was codified more objectively with the GWR, and a threshold for poor prognosis retrospectively defined (e.g.  $GWR < 1.2$ ) on scans within 24 h<sup>3</sup>. Despite these strides forward, studies in this area have been hampered by non-standard protocols regarding the timing of imaging, and the inclusion of both patients undergoing therapeutic hypothermia and those that did not. In large part, investigators have retrospectively analyzed convenience imaging when it was obtained for clinical purposes<sup>4</sup> and/or relied on outcomes at hospital discharge<sup>5</sup>.

The present study improves on the existing literature with its prospective collection of GWR on standardized imaging (Head CT within 2 h of arrest) and a longer term follow up (e.g. 6-month cerebral performance category scores). Additionally, images were reviewed by multiple, blinded readers and an interclass correlation coefficient calculated, raising the rigor and reproducibility of the results. Finally, a sample size was calculated to detect a minimum sensitivity and specificity for GWR, ensuring the results would not be underpowered. The authors found that CTs obtained in this time frame were not adequate to accurately prognosticate 6-month outcomes based on GWR, though GWR was statistically significantly lower in patients with a poor outcome. This finding

provides valuable guidance to clinicians in that 2 h post-ROSC is too early for prognostication assistance from Head CT. However, the optimal timing is still undefined. Conventional wisdom from other arenas of acute brain injury, such as ischemic stroke, would dictate CTs obtained in the first 6 h may under-report ischemic changes but improve over the intervening hours<sup>6</sup>. GWR on delayed Head CT is likely of use, but future carefully controlled prospective trials must establish the “when”. Until that time, clinicians possess an inexpensive, fast test in the Head CT with an undefined reliability for prognostication—the curse of the triple constraint.

## Conflict of interest

The author confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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