

'Are we waiting long enough?' Study raises questions on timing of intracranial pressure measurements

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Careful monitoring of pressure within the skull (intracranial pressure, or ICP) is crucial for some neurocritical care patients. But current procedures for measuring ICP via an external ventricular drain (EVD) may not leave enough time for accurate ICP readings, reports a study in the *Journal of Neuroscience Nursing (JNN)*, official journal of the American Association of Neuroscience Nurses.

In patients with an EVD to drain excess fluid from around the brain, current practice in terms of temporarily clamping the drain does not provide sufficient time to reach the true ICP level in most cases, according to the new research by Xiuyun Liu, Ph.D., and colleagues of University of California, San Francisco.

Three-Fourths of EVD Closures Don't Leave Enough Time to Reach Stable ICP

The researchers evaluated procedures for ICP measurement via EVD in patients with [subarachnoid hemorrhage](#) (SAH). Subarachnoid hemorrhage is a severe type of stroke in which there is bleeding into the brain, most commonly caused by a ruptured aneurysm. Patients with SAH, [traumatic brain injury](#), and certain other conditions are at risk of developing excessive pressure within the skull, which can cause secondary brain injury.

For these patients, surgical placement of an EVD within the ventricle is a lifesaving procedure, allowing drainage of cerebrospinal fluid (CSF) to control pressure within the skull. Regular and precise measurement of ICP is essential for clinicians to make decisions promptly to protect the brain. To perform these measurements, the EVD system must be temporarily clamped. This stops CSF drainage, allowing the true level of ICP within the brain to be reached.

A [2017 study in JNN](#) suggested that a minimum 5-minute period without drainage is required to reach equilibrium, or a stable level of ICP. "This [clinical practice](#) still faces great challenges," the researchers write. "[R]ecent studies have revealed wide practice variations associated with monitoring, treating, and documenting ICP values using EVD."

Is the 5-minute waiting period long enough to reach a stable ICP level? To find out, Dr. Liu and colleagues analyzed high-resolution continuous ICP values recorded via EVD in 107 patients with SAH. The analysis included data from every clamping procedure performed throughout the patients' hospital stay: a total of nearly 33,000 episodes of EVD closure. The researchers developed an automated algorithm to determine whether EVD clamping times allowed enough time for ICP to reach a new equilibrium.

About 66 percent of EVD closures were less than one minute, while 16 percent were more than five minutes. Some closures were performed to test whether the patient was ready to be weaned off their EVD -whether their ICP remained under control without CSF drainage. In about 30 percent of tests, the patient was not yet ready for weaning.

Overall, just 23 percent of closures met study criteria for equilibrium, including a stable ICP level with an EVD closure time of longer than one minute. This suggested that more than three-fourths of EVD closures may not have left adequate time for accurate ICP measurement.

"The result is crucial, and it raises great concerns about the [current practice](#) of clamping EVD to measure ICP and obtain accurate readings," Dr. Liu and coauthors write. "A standard guideline and proper training to nurses are needed for ICP intermittent checking." The researchers also call for

continued innovations in monitoring technology that can quickly and accurately show ICP trends at a "proper time scale," alongside other critical vital signs.

More information: Xiuyun Liu et al. Intracranial Pressure Monitoring via External Ventricular Drain, *Journal of Neuroscience Nursing* (2020). [DOI: 10.1097/JNN.0000000000000487](https://doi.org/10.1097/JNN.0000000000000487)

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