

Can We Improve the Assessment of Discharge Readiness? A Comparative Study of Observational and Objective Measures of Depth of Sedation in Children.

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Abstract Synopsis: The authors point out that current recommended discharge criteria might not be rigorous enough to detect residual sedation. This study evaluated the use of the Bispectral Index (BIS® monitor), the University of Michigan Sedation Scale (UMSS; i.e., 0-4 observational scale), and a Modified Maintenance of Wakefulness Test (MMWT; visual observation of the time the child is able to stay awake) in assessing return to baseline status. Twenty-nine children sedated for echocardiographic examination were studied. Nurses administered sedatives and monitored and discharged children according to institutional guidelines. Children were monitored with the BIS® throughout the study. Trained observers assigned UMSS scores every 10-15 min until revised discharge criteria were met (i.e., UMSS score of 0 or 1, MMWT duration = 20 min). The MMWT value was recorded at each observation following the procedure. Subsequently, blinded observers recorded average BIS values for the 5 min before each UMSS observation.

Results showed that there were moderate correlations between the BIS, MMWT, and UMSS scores ($r = 0.68-0.78$; $P < 0.01$). Revised criteria correctly identified children who were awake and alert (BIS value = 90) in 88% of the cases. Only 55% of the children had returned to baseline BIS values when discharged by the nurse, compared with 92% when revised criteria were met ($P < 0.05$). It took longer to meet revised criteria compared with standard criteria (75.3 ± 76.2 min vs. 16.4 ± 13.1 min; $P = 0.001$). The authors concluded that the incorporation of specific, objective discharge criteria (i.e., UMSS score of 0 or 1, MMWT duration = 20 min) may ensure a status closer to baseline (BIS value = 90) compared with nursing judgment using standard criteria. However, such assurance may delay the discharge of sedated children.

Commentary:

Not sure what the implications are for our phone call question (above). We complement this effort to put a more scientific framework on discharge criteria - which have previously been described in “fuzzy” terminology concerning return to baseline status. There is no doubt that an institution of more standardized and objective criteria for discharge results in the patients would more closely approximate their baseline status at the time of discharge. The question still to be raised after a study such as this is whether or not outcomes are changed. On face value alone, one would assume the answer to that question is “yes”, however that data is still lacking. Would the institution of these criteria help us avoid any future incidents of children being discharged after sedation with airway reflexes still significantly impaired - only to slump over and suffocate in their car seats on the way home? (Coté et. al. *Pediatrics* 105 805-14, 2000) On the other hand does keeping children (on average) for an extra hour after meeting the nursing standard, in order to pass much more rigorous criteria, result in prevention of significant problems? Such a follow-up study would be welcome.

This study is also interesting for its use of the BIS monitor as a standard against which to measure patients and their level of sedation. For those who are not familiar with it, the BIS

stands for Bispectral Index Score and essentially is a processed EEG that can be derived from 3 electrodes placed on the forehead. The output of this monitor reads from 0 to 100 and gives a rough evaluation of the depth of sedation or anesthesia for a given patient at that moment. The producers of this instrument have been fairly aggressive in their marketing for its use in all areas of anesthesia for many years now. Although we have not used it extensively during pediatric sedation ourselves, we are seeing increasing use of this instrument in sedation research. While it may not, as of yet, have a role in day to day sedation work, there seems to be an evolving niche for this monitor in clinical investigation and perhaps the ICU.

This article was accompanied by an editorial by Charles Coté in the same issue of *Anesthesiology* entitled *Discharge Criteria for Children Sedated by Nonanesthesiologists: Is "Safe" Really Safe Enough?*. *Anesthesiology* 2004 100 (2) 207-9. This paper traces the evolution of guidelines for sedation and their role in helping to improve safety in the sedation practice. Dr. Coté points out the adverse events that have accompanied inappropriate discharge of patients while still sedated. He points out that parents themselves may be helpful in the prolonged observation process that may result when more strict discharge criteria are employed. He calls for more research (like that of Malviya and colleagues) where objective scientific methods are used to establish the safest possible discharge criteria.

Two studies, along with an editorial, appeared in *Annals of Emergency Medicine* this winter. I apologize ahead of time for those who are tired of hearing about propofol.....