

# Non-anesthesiologist-administered propofol: where do we stand?



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DOI <https://doi.org/10.1055/a-0832-1967> |

Endoscopy International Open 2019; 07: E630–E632

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ISSN 2364-3722

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The safety and efficacy of propofol administered by trained non-anesthesiologists to low-risk patients has been demonstrated ad nauseum. Most recently, a prospective study assessed all consecutive endoscopic procedures performed in 39 German centers, 314,190 and 40,280 procedures with and without sedation, respectively [1]. An anesthesiologist was present in 0.2% of the cases. Minor sedation-related adverse events (AE) (0.3%) and deaths (0.005%) were rare. Interestingly, sedation-related AEs were less frequent with propofol vs. midazolam (odds ratio, 0.75; 95% confidence interval, 0.58–0.97). Safety and efficacy have been suggested to be similar if propofol is administered by anesthesiologists vs. non-anesthesiologists for upper or lower gastrointestinal endoscopy in patients with an American Society of Anesthesiologists (ASA) classification of I or II according to a meta-analysis (5 studies, 21,054 patients) [2]. Non-anesthesiologist-administered propofol (NAAP) is also cost-effective: for colorectal cancer screening, it has been calculated that the mortality rate of NAAP would have to increase by 31-fold or the costs of anesthesia be reduced by 17-fold for anesthesiologist-assisted procedures to be as cost-effective as NAAP [3].

In this issue of Endoscopy International Open, Patel et al. report on the safety and outcomes of NAAP for upper gastrointestinal endoscopy in a riskier group of patients: those admitted to the intensive care unit (ICU) for management of gastrointestinal bleeding [4]. Procedures were successfully completed in 91% of patients; blood oxygen desaturation (<90%) was reported in a proportion of patients similar to previous studies (7.5% vs. 5.4%–11.0%) while hypotension (systolic blood pressure <90 mm Hg) was much more frequent (23.0% vs. 2.8%–12.5% of patients), likely reflecting the underlying volume depletion in gastrointestinal bleeders. Performance of endoscopic treatment in the ICU is desirable for critically ill pa-

tients as intrahospital patient transportation remains associated with a very high incidence of AEs [5]. Therefore, an adequately equipped mobile endoscopy cart is available in most hospitals and, as safety conditions in the ICU are ideal, performing endoscopic therapy there under NAAP is very welcome.

Apart from its retrospective design, the study is limited by the absence of follow-up and of a modern score specific to upper gastrointestinal bleeding. Patient admission to the ICU does not attest to bleeding severity; an endoscopic intervention was performed in only 11% of patients and endoscopy duration was relatively short at  $16 \pm 11$  minutes, both criteria suggesting that not all patients were severely ill. On the other hand, scores like the AIMS65 and the Glasgow-Blatchford score perform well to predict relevant outcomes, including in-hospital mortality [6].

As experience with NAAP continues to expand, further studies are expected in selected risky patient groups (e.g., ASA class  $\geq 3$ ) as well as for complex and long procedures. Other points that need to be addressed in future studies include the necessity to have a person dedicated exclusively to NAAP during the procedure, monitoring devices, training, new modes of propofol administration, and use of other drugs.

The necessity or not of an additional person solely dedicated to NAAP is key because of cost issues. It was amply debated in 2015 during the update of the Guideline about NAAP by the European Society of Gastrointestinal Endoscopy [7]. After a tie vote, safety was privileged and presence of an additional person dedicated to NAAP was recommended. However, in the large study mentioned above, no additional person dedicated to NAAP was present in approximately half of the cases and there were fewer complications when no additional person was present [1]. Until studies specifically analyze this issue, it will remain unresolved.

Capnography allows detection of respiratory compromise earlier than does pulse oximetry but no clinically relevant benefits for patients have been demonstrated. Furthermore, it is costly and it may be impractical because of false-positive alarms that cause fatigue to relevant alarms [8]. For these reasons, capnography's use has been suggested by endoscopy societies only in selected situations [7]. Various manufacturer-supported publications have recently tried to promote its universal use, including during moderate sedation. Using a model, Saunders et al. calculated that routine use of capnography indeed reduces costs, even for moderate sedation [9]. However, the model was flawed. For example, for moderate sedation in ASA class I and II patients, blood oxygen desaturation was assumed to develop in 25.2% of patients not monitored with capnography. Then, one-third of these patients would require positive pressure ventilation at a cost of \$ 604 USD. The 25.2% figure was inexplicably extracted from a low-quality retrospective study, not of endoscopy but of enteroclysis [10]. In that study, sedation depth was not reported, basal oxygen was not administered, sedated patients were transported to other rooms and, to treat oxygen desaturation, no positive pressure ventilation was used (oxygen was administered). Capnography is a valuable tool but the issues of costs, including that of disposable material, and practicality should be addressed by manufacturers.

The quality of endoscopic sedation has recently been questioned in various surveys [11]: in Europe, only one-third of individuals administering sedation would have followed theoretical and practical sedation courses and a data registration system for AEs would be absent in 60% of the centers. These results were collected from only 33 representatives of anesthesiologists and nurse anesthetists but they are backed by other surveys: in the UK, 51% of 78 gastroenterology trainees had not received a structured training in sedation [12] while in Korea 27% of 1332 endoscopists were performing sedation (mostly using propofol) with no specific training [13]. Curricula have been published to help design sedation training courses; they suggest, apart from didactic courses, the use of simulators, observation and finally performance of sedation under supervision [14]. Such training programs are effective [15] and tools for assessing competence in NAAP have been validated [16] but structured sedation courses must be made available more widely.

A mode of propofol administration that has attracted little interest up to now is patient-controlled sedation (PCS). With PCS, a pump delivers drugs intravenously when the patient presses a button. Propofol-based PCS was associated with a lower risk of rescue interventions to treat sedation-related AEs and it provided similar operator and patient satisfaction compared with clinician-controlled sedation in a meta-analysis (13 randomized controlled trials [RCTs], 1103 patients) [17]. The acceptability of the technique by patients, who must be willing to take the responsibility of sedation, has limited its adoption up to now but technological developments may further improve the safety and acceptability of PCS.

Finally, propofol is unlikely to be dethroned but other drugs with a supposed better security profile may be useful, particularly in high-risk patients.

- Etomidate, a short-acting hypnotic drug commercialized 15 years before propofol, is being rediscovered. This drug is mostly used by anesthesiologists for rapid sequence intubation and it is known for its minimal effect on cardiovascular parameters. Etomidate-based sedation was associated with a lower risk of hypoxemia and apnea, similar recovery time and similar patient satisfaction compared with propofol-based regimens for endoscopy in a meta-analysis (6 RCTs, 1115 patients) [18].
- Dexmedetomidine, a mild sedative with analgesic properties and few cardiorespiratory effects, has recently been approved for endoscopic sedation in some countries. It is commonly used in the ICU but, for endoscopy, a meta-analysis (6 RCTs, 361 patients) reported lower patient satisfaction compared with propofol [19]. The high cost and the requirement for a lengthy initial infusion are other drawbacks of dexmedetomidine.

Endoscopic sedation has come a long way since an audit in England has shown high complication rates associated with poor sedation practices that were common in the 1990s [20]. Introduction of NAAP, and the resistance it has generated in some anesthesiology communities, has indeed contributed to this improvement. With the help of anesthesiologists, we will build on the current momentum to improve quality and continue to find creative solutions to better serve our patients in a world of limited resources.

## Competing interests

None

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