



# Tolerating the procedure well:

bronchoscopy using patient-controlled sedation with propofol

## THE CLINICAL QUESTION



Does patient-controlled sedation (PCS) with propofol as compared to nurse-controlled sedation (NCS) with midazolam during flexible bronchoscopy enable shortened recovery time with similar bronchoscopist and patient satisfaction?

## STUDY CONCLUSION

Compared to NCS with midazolam, PCS with propofol during flexible bronchoscopy enables faster recovery time without affecting patient satisfaction or ease of the procedure as reported by bronchoscopists.

## BACKGROUND



Flexible bronchoscopy is a common outpatient procedure, and sedation is utilized to facilitate the procedure and to maintain patient comfort. Fast recovery from sedation is important, as it facilitates faster turnover and takes up less of patients' time.

Patient controlled sedation (PCS) has been increasingly used for endoscopic procedures as it is safe and allows for faster patient recovery. However, it has primarily been limited to outpatient endoscopic gastroenterology procedures. At the time of this study's publication, the authors had found only one prior study of PCS during flexible bronchoscopy.

## CURRENT PRACTICE / GUIDELINES

Current British Thoracic Society guidelines for bronchoscopy recommend midazolam as the preferred sedative agent due to its rapid onset of action, titratability, and reversibility.<sup>1</sup> However, midazolam can present challenges for post-procedure recovery. Because its adverse effects are not necessarily dose-dependent, they can be difficult to anticipate and prevent. As a result, it is not uncommon for effects such as drug-related confusion to prompt overnight admissions for observation after otherwise uncomplicated procedures.

Propofol is an alternative sedating medication that has been associated with a faster post-bronchoscopy recovery time compared to midazolam. However, propofol has a narrow therapeutic window, and therefore requires caution to avoid oversedation (i.e., general anesthesia). It is a reasonable sedative choice for PCS, which has a built-in barrier against oversedation – that is, an unconscious patient cannot administer additional sedative.

## STUDY DESIGN



**Type of trial:** Randomized controlled trial

**Randomization, blinding, controls:**

Patients were randomized consecutively 1:1:1 using opaque envelopes. The bronchoscopist was blinded to premedication but not the administration

(nurse-controlled versus patient-controlled) or choice of sedation medication.

**N:** 185 assessed for eligibility, 150 randomized.

**Study groups:** Adult patients scheduled for outpatient flexible bronchoscopy procedures

**Settings:** Department of Pulmonary Medicine, Linköping University Hospital (Linköping, Sweden)

**Enrollment:** April 2016 to May 2017

**Treatment period:** (Day of flexible bronchoscopy)

**Follow up:**

- 8pm day of discharge: 12-item questionnaire assessing health status and activity after discharge
- Day after procedure: Questionnaire assessing emotional state, physical comfort, and physical independence

**Primary outcome:** Proportion of patients ready for discharge at 2 hours after flexible bronchoscopy, based on a modified Post Anaesthetic Discharge Scoring System (PADSS) score of 10.

## POPULATION

### Inclusion criteria:

Inclusion criteria: Adult patients scheduled for outpatient flexible bronchoscopy procedures including transbronchial biopsy, transbronchial needle aspiration, cryotherapy/biopsy, and/or multi-station endobronchial ultrasound

### Exclusion criteria:

Positive pregnancy test, contraindication for the study drugs, functional disability, and cognitive impairment or language difficulties affecting PCS device operation

### Baseline Characteristics:

150 patients

Median age (y): 70 (control), 68 (PCS)

Sex: 52% male/48% female

BMI: 26

ASA 3: 52%

Procedures performed:

Bronchoscopy (including TBNA, TBB, and cryotherapy/biopsy) = 51%

Bronchoscopy + EBUS = 45%

Only EBUS = 4%

Median procedure duration: 41 minutes



# INTERVENTIONS

**Control group:** Premedication with subcutaneous morphine-scopolamine, followed by nurse-controlled sedation with intravenous midazolam (1.25mg initial dose followed by additional doses as needed for sedation goal or bronchoscopist request)

**PCS-MS:** Premedication with subcutaneous morphine-scopolamine, followed by patient-controlled sedation with intravenous propofol (self-administered 5mg over the course of 8 seconds with no lockout period, leading to maximum of about 35 mg/min propofol if pressed continuously)

**PCS-G:** Premedication with intramuscular glycopyrronium, followed by patient-controlled sedation with intravenous propofol (self-administered 5mg over the course of 8 seconds with no lockout period, leading to maximum of about 35 mg/min propofol if pressed continuously)

**All groups:** Ipratropium and lidocaine nebulized inhaled solution was administered starting 30 minutes prior to procedure.

# OUTCOMES

## Primary outcome:

- 81% of patients in the PCS groups, compared to 40% of those in the control group, were ready for discharge at 2 hours post-flexible bronchoscopy, based on a modified PADSS score of 10.
- There was a difference between PCS groups as well: 96% of those in the PCS-G group were ready for discharge at 2 hours, compared to 65% of those in the PCS-MS group.

## Secondary outcomes:

- Ease of procedure, based on bronchoscopists' scores of patient cough, bronchial secretion, feasibility, and patient movement, did not differ among groups.
- There were no significant differences in patient satisfaction scores, post-discharge surgical recovery scores, or quality of recovery scores among groups.

### Secondary outcomes (continued)

- Depth of sedation was greater in the patient-controlled sedation group (median score 2 on the Observer's Assessment of Alertness/Sedation (OAA/S) scale) than in the control group (median score 3).
- Patient-controlled sedation groups had more frequent desaturations and obstructed airways, most occurring when rescue propofol was administered by the nurse anesthetist.

### Adverse events:

- Six adverse events in the control group: procedure-related (1), confusion after sedation requiring overnight monitoring (4), epigastric pain (1)
- Six adverse events in the PCS-MS group: headache (1), overnight admission due to multiple comorbidity (1) postprocedural fever (2), report of chest pressure lasting 5 min (1), pronounced vasovagal reaction (1)
- Three adverse events in the PCS-G group: bronchoscopic findings prompting overnight stay (1), overnight admission for weakness attributed to concurrent UTI (1), suspected postprocedural allergic reaction (1)

## FUNDING



### FUNDING

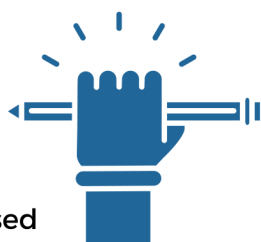
Supported by internal grants from Region of Östergötland, Sweden.

*Disclosure: There is no conflict of interest or other disclosures.*

## ARTICLE CRITIQUE

### Study Strengths:

- Randomized design
- Similar baseline characteristics among three study groups
- Licensed, independent study monitor used
- Inclusion of advanced bronchoscopy procedures and ASA-class III patients



- Assessment of meaningful outcomes: readiness for discharge at two hours post-procedure, patient satisfaction, and bronchoscopists' reported ease of procedure



### Study Limitations:

- It was not possible to blind patients and personnel to the NCS/PCS intervention.
- The small size of the study meant that it was not powered to assess safety.
- The study was performed at a single center with an experienced pulmonary and anesthesia staff. Results may not be generalizable to centers with different periprocedural management, staffing models, and patient populations.
- Sedation depth was measured by bronchoscopy nurses in the control group and by nurse anesthetists in the PCS groups.
- The control (nurse-controlled sedation) group used midazolam, while both PCS groups used propofol – making it unclear whether early recovery in the PCS groups was driven by sedative difference, administration difference, or both.
- All groups were premedicated with anticholinergic medications (scopolamine, glycopyrronium), which is not routinely recommended by British Thoracic Society guidelines for bronchoscopy.<sup>1</sup> The study authors noted that there was no difference in secretions noted between scopolamine and glycopyrronium in this study and question whether these medications should be used in flexible bronchoscopy.
- Local regulations regarding use of propofol may limit generalizability of findings.

## RESEARCH QUESTION

Does patient-controlled sedation with propofol as compared to nurse-controlled sedation with midazolam during flexible bronchoscopy enable shortened recovery time with similar bronchoscopist and patient satisfaction?

# TAKE HOME MESSAGE

Patient-controlled sedation with propofol is a feasible alternative to nurse-controlled sedation with midazolam for bronchoscopy that may lead to shorter recovery times and comparable patient and bronchoscopist satisfaction.



## ARTICLE CITATION

Grossmann B, Nilsson A, Sjöberg F, Nilsson L. Patient-controlled Sedation During Flexible Bronchoscopy: A Randomized Controlled Trial. *J Bronchology Interv Pulmonol*. 2020 Apr;27(2):77-85. doi: 10.1097/LBR.0000000000000610. PMID: 31478938.



## SUGGESTED READING



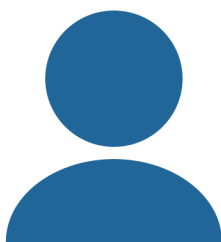
1. Du Rand IA, Blaikley J, Booton R, Chaudhuri N, Gupta V, Khalid S, Mandal S, Martin J, Mills J, Navani N, Rahman NM, Wrightson JM, Munavvar M; British Thoracic Society Bronchoscopy Guideline Group. British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults: accredited by NICE. *Thorax*. 2013 Aug;68 Suppl 1:i1-i44. doi: 10.1136/thoraxjnl-2013-203618. PMID: 23860341.

2. Strohleit D, Galetin T, Kosse N, Lopez-Pastorini A, Stoelben E. Guidelines on analgosedation, monitoring, and recovery time for flexible bronchoscopy: a systematic review. *BMC Pulm Med*. 2021 Jun 10;21(1):198. doi: 10.1186/s12890-021-01532-4. PMID: 34112130; PMCID: PMC8193886.

3. Hui RW, Leung CM. Patient-Controlled Sedation Versus Clinician-Administered Sedation for Endoscopic Retrograde Cholangiopancreatography: A Systematic Review. *Anesth Analg*. 2022 Apr 1;134(4):765-772. doi: 10.1213/ANE.00000000000005766. PMID: 34543253.

4. Wahidi MM, Jain P, Jantz M, Lee P, Mackensen GB, Barbour SY, Lamb C, Silvestri GA. American College of Chest Physicians consensus statement on the use of topical anesthesia, analgesia, and sedation during flexible bronchoscopy in adult patients. *Chest*. 2011 Nov;140(5):1342-1350. doi: 10.1378/chest.10-3361. PMID: 22045879.

## CONTRIBUTORS



### AUTHOR

Megan Opatrny, MD

University of Michigan  
mopatrny@med.umich.edu

## REVIEWERS

Max Wayne, MD

Washington University in St. Louis  
mtwayne@wustl.edu

Sameer Kaushik Avasarala, MD

University Hospitals, Case Western Reserve University  
School of Medicine  
sameer.avasarala@uhhospitals.org  
@SKAvasarala



If you would like to become a reviewer  
for the “AABIP Journal Club,”  
Please contact **Christian Ghattas** at  
[christian.ghattas@osumc.edu](mailto:christian.ghattas@osumc.edu)

