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ORIGINAL ARTICLE

## An open-access endoscopy screen correctly and safely identifies patients for conscious sedation

Darshan Kothari<sup>1,\*</sup>, Joseph D. Feuerstein<sup>1</sup>, Laureen Moss<sup>2</sup>, Julie D'Souza<sup>2</sup>, Kerri Montanaro<sup>2</sup>, Daniel A. Leffler<sup>1</sup> and Sunil G. Sheth<sup>1</sup>

<sup>1</sup>Department of Medicine and Division of Gastroenterology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA and <sup>2</sup>Department of Nursing, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA

\*Corresponding author. Beth Israel Deaconess Medical Center, 330 Brookline Ave., Boston, MA 2215, USA; Tel: +1-617-667-2136, Fax: +1-617-667-5826. Email: dkothari@bidmc.harvard.edu

### Abstract

**Background and aims:** Open-access scheduling is highly utilized for facilitating generally low-risk endoscopies. Preprocedural screening addresses sedation requirements; however, procedural safety may be compromised if screening is inaccurate. We sought to determine the reliability of our open-access scheduling system for appropriate use of conscious sedation.

**Methods:** We prospectively and consecutively enrolled outpatient procedures booked at an academic center by open-access using screening after in-office gastroenterology (GI) consultation. We collected the cases inappropriately booked for conscious sedation and compared the characteristics for significant differences.

**Results:** A total of 8063 outpatients were scheduled for procedures with conscious sedation, and 5959 were booked with open-access. Only 78 patients (0.97%, 78/8063) were identified as subsequently needing anesthesiologist-assisted sedation; 44 (56.4%, 44/78) were booked through open-access, of which chronic opioid (47.7%, 21/44) or benzodiazepine use (34.1%, 15/44) were the most common reasons for needing anesthesiologist-assisted sedation. Patients on chronic benzodiazepines required more midazolam than those not on chronic benzodiazepines ( $P = .03$ ) of those patients who underwent conscious sedation. Similarly, patients with chronic opioid use required more fentanyl than those without chronic opioid use ( $P = .04$ ). Advanced liver disease and alcohol use were common reasons for patients being booked after in-office consultation and were significantly higher than those booked with open-access (both  $P < .01$ ).

**Conclusions:** We observed that the majority of patients can be triaged for conscious sedation using a multi-tiered screening process. Importantly, few patients (<1.0%) were inappropriately booked for conscious sedation. The most common reasons for considering anesthesiologist-assisted sedation were chronic opioid, benzodiazepine and/or alcohol use and advanced liver disease. This suggests that these entities could be included in screening processes for open-access scheduling.

**Key words:** open-access endoscopy; sedation; screen

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## Introduction

Colon cancer is the second leading cause of cancer deaths in the United States with a case-fatality rate of roughly one in three [1]. Fortunately, colonoscopy is a well-established measure for colorectal cancer screening and is recommended for all patients aged  $\geq 50$  years [2–4]. Traditionally, in-office consultation preceded colonoscopy to determine if it was indicated. With growing demand for colonoscopy, open-access scheduling is now utilized to facilitate endoscopy for common indications including colon cancer screening, thereby removing potential access barriers for these common and generally low-risk tests [5].

A recent guideline by the American Society for Gastrointestinal Endoscopy (ASGE) on open-access endoscopy highlights several safety issues regarding open-access scheduling. Specifically, the authors raise concerns regarding the appropriateness of referral, suggesting that in-office consultation should be obtained if either indication or safety is in question [5]. In a recent review, authors outlined four common preprocedural safety considerations in open-access scheduling including management of anticoagulation and platelet agents, indications for prophylactic antibiotic drug use, management of poor bowel preparation, and need for anesthesiology-assisted sedation [6]. Many open-access centers use a screening questionnaire to ensure that these issues are adequately addressed. Despite these screening practices, inaccuracies still remain at the time of endoscopy that could impact the safety of the procedure regarding the appropriate sedation needed [7].

The American Society of Anesthesiology (ASA) defines conscious or moderate sedation as providing anxiolysis and analgesia while maintaining a patent airway, spontaneous ventilation and cardiac function [8]. This type of sedation is an important component of endoscopic evaluation as it may be administered by non-anesthesiologists. A nationwide survey demonstrated that 98% of endoscopists in the United States regularly use conscious sedation during their procedures [9]. While sedation improves both endoscopic examination and overall patient satisfaction, appropriate anesthesia remains problematic as it increases procedural costs and, importantly, has inherent risks to patient safety if not used appropriately [10,11]. The ASGE, ASA and American Gastroenterology Association have developed sedation practice guidelines to highlight the importance of optimizing patient safety. These guidelines outline preprocedural evaluation that emphasizes close review of medical history, medications, overall comorbidity risk assessment (i.e. ASA classification) and completing a focused physical exam including airway classification using the Mallampati scoring system [8]. Patients deemed to be low-risk can typically receive conscious sedation; otherwise, they will require anesthesiologist-assisted sedation or monitored anesthesia care (MAC) [8,12,13]. When a patient is not appropriately identified as requiring anesthesiologist-assisted sedation prior to a procedure, a long wait time may occur while anesthesia service is being coordinated, or the procedure may have to be cancelled, thus generating patient dissatisfaction.

We perform >23 000 procedures a year at our institution, and we use an open-access scheduling system that is available to those in our network. We currently utilize a multi-tiered screening process that includes a web-based requisition form, telephone interview by a trained scheduler, and educational patient material to identify patients who may need anesthesiology-assisted sedation. We completed a prospective study aimed to audit the safety of our scheduling practices and

determine the reliability of our open-access triage system for conscious sedation versus anesthesiologist-assisted sedation.

## Methods

We prospectively and consecutively enrolled all outpatient procedures booked at the general gastrointestinal (GI) endoscopy suite at Beth Israel Deaconess Medical Center (BIDMC) in Boston between March 2014 and September 2014. Institutional Review Board approval at BIDMC was obtained prior to initiation of this study.

Our procedure log was obtained from our online medical system and clinical booking software available at BIDMC. All procedures were completed by attending staff gastroenterologists or accredited training fellows supervised by staff gastroenterologists. At BIDMC, advanced procedures (including but not limited to endoscopic retrograde cholangiopancreatography and endoscopic ultrasound) are performed in a separate unit and were therefore excluded from this study. Conscious sedation, consisting of intravenous doses of fentanyl for analgesia and midazolam for anxiolysis, was administered by a trained registered nurse under the supervision of a staff attending gastroenterologist. Anesthesiologist-assisted sedation required the presence of a staff attending anesthesiologist.

Procedures were split into two categories: (1) patients booked through open-access scheduling and (2) patients booked after in-office consultation with an attending staff gastroenterologist. Open-access scheduling at BIDMC occurs either via an online requisition form through our web-based portal or via a brief phone interview with the patient by a trained scheduler (as determined by the referring physician). Samples of the web-based requisition form and questionnaire used by our schedulers are supplied in Figure 1 and Table 1, respectively. Using this system, the patient's medical history is reviewed and includes obstructive sleep apnea, chronic kidney disease and morbid obesity as well as medication lists (particularly anticoagulants and antiplatelet agents). Patients who pass the screen are then booked for an endoscopic procedure with conscious sedation with a staff gastroenterologist. Patients also receive preparation instructions, which also outline screening questions, to ensure that they are given appropriate bowel preparation and are booked for the appropriate level of sedation. Sample instructions are provided in Figure 2.

Upon arrival at the BIDMC endoscopy suite, the final screening occurs for appropriateness of conscious sedation. Specifically, patients are interviewed and admitted by nursing staff, who review the patient's full past medical, social and family histories along with medications and medication allergies with consideration of the ASGE guidelines for anesthesiologist-assisted sedation (Table 2). When available, previous procedures are also reviewed with a focus on the amount of medications given during the last procedure and if there were any procedural complications or difficulties.

After the above assessment, if the nursing staff is concerned about a patient's suitability for conscious sedation, the staff gastroenterologist is then notified and assesses the patient. When appropriate, an anesthesia consult is obtained for patients needing to be upgraded to anesthesiologist-assisted sedation. If available, the procedure is completed the same day; otherwise, it is rescheduled for a different day.

We collected patient characteristics from the nursing assessment as well as the patient's online medical record including age, sex, body mass index (BMI), co-morbidities as listed under their medical history, opioid and benzodiazepine use,

**Procedure:**

EGD  Colonoscopy

Small bowel enteroscopy  Flexible sigmoidoscopy

Capsule endoscopy  Rectal EUS

ERCP

EUS

Single Balloon Enteroscopy

PEG Tube

**Procedure Diagnosis (ICD-10):**

**Common diagnoses:**

Iron deficiency anemia, unspecified (D50.9)  Ulcerative colitis, unspecified with rectal bleeding (K51.911)

Gastrointestinal hemorrhage, unspecified (K92.2)  Melena (K92.1)

Dysphagia, Unspecified (R13.10)  Personal history of colonic polyps (Z86.010)

Gastro-esophageal reflux disease without esophagitis (K21.9)  Family history of malignant neoplasm of digestive organs (Z80.0)

Generalized abdominal pain (R10.84)  Encounter for screening for malignant neoplasm of colon (Z12.11)

Family history of malignant neoplasm of digestive organs (Z80.0)  Diverticulosis of large intestine without perforation or abscess without bleeding (K57.30)

Barrett's esophagus without dysplasia (K22.70)  Generalized abdominal pain (R10.84)

Iron deficiency anemia, unspecified (D50.9)

Gastrointestinal hemorrhage, unspecified (K92.2)

**Other:**

**Patient has been instructed to use CPAP machine for sleep apnea:**  Yes  No

**Patient has kidney problems:**  Yes  No

**Patient on anticoagulation medications:**  Yes  No

**Patient is over 300 pounds:**  Yes  No

**Clinical information, notes, comments:**

Figure 1. Open-access endoscopy Gastrointestinal Order Form

Table 1. Sample questions asked by a trained telephone scheduler

Have you been diagnosed with sleep apnea with the recommendation to use a CPAP/BIPAP machine at home?  
 Are you taking any blood thinning medications?  
 Is your current weight over 300 pounds?  
 Do you have any kidney-related problems?

CPAP: continuous positive airway pressure; BIPAP: Bi-level positive airway pressure

information on prior procedures and ASA classification on patients thought to be incorrectly assigned for conscious sedation. The approximate delay in the scheduled procedure for these patients was calculated by taking the difference between the scheduled procedure time and the start time of the delayed procedure as noted in the nursing notes. Patients were listed as using benzodiazepines and/or opioids chronically if there was daily use for >6 months and/or if these medications were listed on intake medication lists at the time of the procedure. Similarly, patients who drank alcohol daily for >6 months and/or had “alcoholism,” “alcohol abuse,” “alcohol withdrawal,” or “alcoholic cirrhosis” recorded in their past medical history were listed as using alcohol chronically.

We used Fisher’s test to determine if there were statistically significant differences in patient characteristics between patients booked by open-access scheduling and those seen in consultation prior to procedure. A t test was used to compare medication doses given during conscious sedation in patients with and without chronic opioid and/or benzodiazepines use.

## Results

During the study period, 8063 outpatient procedures were scheduled with conscious sedation, of which 5102 (63.3%) were colonoscopies, 2620 (32.5%) were upper endoscopies, 332 (4.1%) were sigmoidoscopies, and the remainder (0.1%) were small bowel enteroscopies. In addition, 434 patients who failed the

screening tools during this period were also scheduled with anesthesiologist-assisted sedation. These patients failed the initial screening due to advanced ASA class (III-IV), presence of obstructive sleep apnea, high risk for obstructive sleep apnea (BMI > 40), and/or presence of chronic kidney disease. Of the 8063 outpatient procedures, 5959 procedures (73.9%) were booked for conscious sedation using our open-access scheduling system (Figure 3).

After intake nursing assessment, 78 patients (0.97%, 78/8063) were identified as potentially needing anesthesiologist-assisted sedation. Of these 78 patients, 44 patients (56.4%) were booked through open-access-scheduling and made up a small percentage of all patients booked using open-access scheduling (0.74%, 44/5959) (Figure 3). Females made up 52% (41/78) of the population, and the mean age was 60.4 years (range: 22–94 years). The median BMI of the 78 patients was 27 kg/m<sup>2</sup> (range: 20.0–57.4 kg/m<sup>2</sup>).

The most common reasons cited by our intake nurses for needing anesthesiologist-assisted sedation were chronic opioid use (47.7%, 21/44) and chronic benzodiazepine use (34.1%, 15/44). Other reasons for anesthesiologist-assisted sedation are listed in Table 3. The majority of these patients felt to be inappropriately scheduled for conscious sedation were ASA classification II. Nine (20.5%) patients had an ASA classification ≥ III, 5 of the 9 patients had congestive heart failure and/or chronic pulmonary disease requiring oxygen supplementation.

After secondary review by the staff gastroenterologist, almost all (42) of the 44 patients completed their indicated procedure on the same day (95.5%). However, two patients had their procedures cancelled because anesthesiologist-assisted sedation was not available on the given day. Of the remaining 42 patients, 27 received anesthesiologist-assisted sedation, while 15 patients received conscious sedation because they had refused to reschedule their procedures with anesthesia and an anesthesiologist was not available. On further review, seven of the 15 patients (46.7%) who received conscious sedation used opioids chronically and required significantly more fentanyl during the procedure than those without opioid use ( $n = 8$ ) (median fentanyl use: 250 vs 75 micrograms,  $P = 0.04$ ). Moreover, 4



**Special concerns and Information**

For some patients, special instructions may apply:

- ❖ **Diabetes** – Preparing for a procedure may involve some temporary changes in your diet. Please contact the doctor who manages your diabetes for advice regarding any changes that are needed in your diabetes medicine the day before and the day of your test. If you have an insulin pump, please discuss management with your diabetes doctor prior to your procedure.
- ❖ **Renal (kidney) failure** – For COLONOSCOPIES: If you have kidney (renal) failure or heart failure (congestive heart failure), please check with your own doctor about using the magnesium citrate prep discussed in this packet (see “Bowel prep”) to find out if this is okay for you. The prep contains sodium (salt). For most patients with kidney or heart failure, the magnesium citrate is not a problem. But please check with your own doctor to be sure.
- ❖ **Weight** – If your weight is over 300 lbs, please contact us at 617-667-xxxx.
- ❖ **Blood Thinning Medications** - If you are taking a blood thinner or anticoagulant and did not discuss this at the time of procedure scheduling, please call our office at 617-667-xxxx to discuss.

Figure 2. Sample patient information provided on the preparation packet

Table 2. Considerations for anesthesiologist-assisted sedation

ASA class III or higher
History of intolerance or with allergies/adverse reaction to standard sedatives
Patients undergoing prolonged procedure requiring deep sedation such as endoscopic mucosal resection or dilatations
Patients at increased risk for airway obstruction (i.e. Mallampati grade III or IV or history of obstructive sleep apnea requiring nocturnal positive airway pressure ventilation)
Acutely agitated or uncooperative patients
Patients on opioids, hypnotics or sedatives
Patients with dementia, sleep apnea, morbid obesity (BMI > 40 without medical problems or BMI >35 with medical problems)

ASA: American Society of Anesthesiology; BMI: body mass index

patients (26.7%) with chronic benzodiazepine use received conscious sedation and required significantly more midazolam than those without chronic benzodiazepine use (n = 11) (median midazolam use: 7 vs 2.5 milligrams, P = 0.03). In patients requiring anesthesiologist-assisted sedation, the average wait time was 123 minutes (range: 14–362 minutes).

There were 34 patients (43.6%, 34/78) booked for procedures, after an in-office GI consultation, who were felt to be inappropriate for conscious sedation at the time of their procedure. This group represented 1.6% of the patients (34/2104) booked after in-office consultation. Of these, 15 patients used opioids chronically (44.1%), and 16 patients used benzodiazepines chronically (47.1%). There was no statistical significance when comparing these subgroups with those booked using open-access scheduling with chronic opioid and benzodiazepine use (Table 3). Additionally, 12 patients had advanced liver disease (35.2%), and 11 patients used alcohol chronically (32.3%), which was significantly higher than patients booked by open-access (P < 0.01). Upon review of the in-office consultation notes, there was no documentation about the type of sedation the patient might have required for the procedure.

In two patients, the procedure was aborted after attempting conscious sedation. Both of these patients were seen by a GI provider prior to their procedure. One of the two patients was undergoing upper endoscopy and became combative after receiving 6 milligrams of midazolam and 200 micrograms of fentanyl. She carried a diagnosis of alcoholic cirrhosis and used opioids chronically. The other patient had a colonoscopy, which was aborted because of increased pain despite receiving 10 milligrams of midazolam and 300 micrograms of fentanyl. The patient had chronic anxiety requiring use of benzodiazepines.

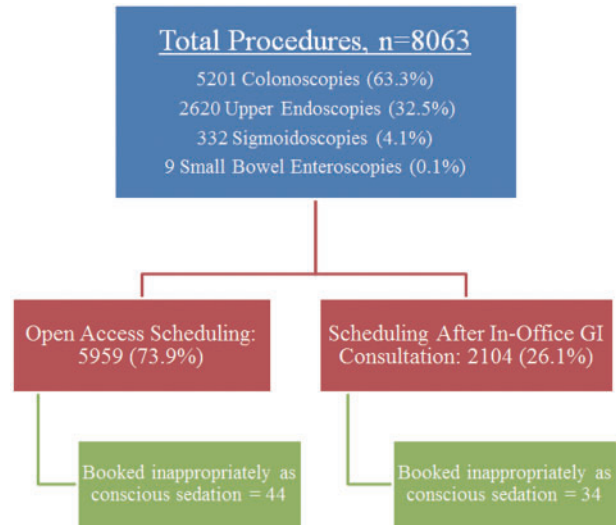


Figure 3. Flowchart of procedural scheduling between March and September 2014

**Discussion**

In this prospective study, we observed that the vast majority of patients can be safely and efficiently triaged for conscious sedation in a high-volume, tertiary care center using a multi-tiered screening process. Importantly, very few patients (< 1.0%) were inappropriately booked for conscious sedation, and this proportion does not appear to be different from booking with open-access scheduling or after GI office consultation. While the majority of patients thought to be unsuitable for conscious sedation underwent anesthesiologist-assisted sedation on the same day, these patients suffered longer wait times, and two patients needed to be rescheduled to a different day.

An additional important finding was that the most common reasons for patients being identified as requiring anesthesiologist-assisted sedation were chronic opioid and benzodiazepine and/or chronic alcohol use and a history of advanced liver disease. Moreover, those patients on chronic opioids or benzodiazepines who received conscious sedation required significantly higher doses of medication than those without chronic use. Also, in the group of patients booked after in-office consultation, there were more patients identified as requiring anesthesiologist-assisted sedation with chronic alcohol use and advanced liver disease, many of whom were referred from our large hepatology and transplant practices and by gastroenterologists who do not perform procedures.

**Table 3.** Reasons cited for needing anesthesiologist-assisted sedation

Patient characteristics	Open-access scheduling (n = 44)	Booked after gastrointestinal evaluation (n = 34)	P value
Chronic opioid use, n (%)	21 (47.7)	15 (44.1)	0.82
Chronic benzodiazepine use, n (%)	15 (34.1)	16 (47.1)	0.35
Chronic opioid and benzodiazepine use, n (%)	11 (25.0)	9 (26.5)	1.00
Advanced liver disease, n (%)	4 (9.1)	12 (35.3)	< 0.01
Chronic alcohol use, n (%)	3 (6.8)	11 (32.4)	< 0.01
Congestive heart failure, n (%)	12 (27.3)	3 (8.8)	0.05
Chronic pulmonary disease requiring supplemental oxygen, n (%)	2 (4.5)	1 (2.9)	1.00

### Special concerns and information

For some patients, special instructions may apply:

- ❖ **Diabetes** – Preparing for a procedure may involve some temporary changes in your diet. Please contact the doctor who manages your diabetes for advice regarding any changes that are needed in your diabetes medicine the day before and the day of your test. If you have an insulin pump, please discuss management with your diabetes doctor prior to your procedure.
- ❖ **Renal (kidney) failure** – For COLONOSCOPIES: If you have kidney (renal) failure or heart failure (congestive heart failure), please check with your own doctor about using the magnesium citrate prep discussed in this packet (see “Bowel prep”) to find out if this is okay for you. The prep contains sodium (salt). For most patients with kidney or heart failure, the magnesium citrate is not a problem. But please check with your own doctor to be sure.
- ❖ **Weight** – If your weight is over 300 lbs, please contact us at 617-667-xxxx.
- ❖ **Blood Thinning Medications** - If you are taking a blood thinner or anticoagulant and did not discuss this at the time of procedure scheduling, please call our office at 617-667-xxxx to discuss.
- ❖ **Sedation Issues** – If you have had problems with sedation in the past including an allergy or intolerance to benzodiazepines (such as versed or clonapin) or to narcotics (such as fentanyl), are on chronic narcotics for pain, or have severe liver disease followed by a liver doctor, please call the office at 617-667-xxxx to discuss with us as soon as possible.

Figure 4. Amended screening questionnaire

Expert opinion suggests that patients who habitually use opioids, benzodiazepines and alcohol may not be appropriate candidates for conscious sedation [6]. Therefore, the screening forms for patients with chronic use of benzodiazepines, opioids and heavy alcohol use may need modification to better alert providers considering anesthesiologist-assisted sedation. Adding advanced liver disease to the preprocedure screening may also further limit inappropriately booked conscious-sedation cases. Studies like the one presented focus on improving patient safety and remain a cornerstone in healthcare quality [14]. In response to our findings, we adjusted our open-access initial screening tools to capture patients on chronic opioids and benzodiazepines (Figure 4).

Limitations of our study include the descriptive nature and single-center study design. Additionally, while the identification process was robust and fully integrated into the workflow of the endoscopy unit, it is possible to have missed cases that would have underestimated the number of inappropriately booked cases. Moreover, we do not have data on alcohol, benzodiazepine and opioid use on all patients who had procedures during the study period as a comparison group. Lastly, we did not assess intra-procedure patient comfort to assess the validity of our nursing intake screen in cases completed with conscious sedation despite concern for inappropriate booking.

In conclusion, we found that the rates of cases booked inappropriately for conscious sedation are exceedingly low in a high-volume, tertiary-care endoscopy center using a multi-tiered screening process. Moreover, this descriptive study further asserts that open-access endoscopy remains a safe practice

when robust and thorough screening tools are used at the time of booking.

### Author contributions

- Darshan Kothari: study concept, design, data analysis, writing and revision of manuscript
- Joseph D. Feuerstein: data analysis, writing and revision of manuscript
- Laureen Moss: data acquisition
- Julie D'Souza: data acquisition
- Kerri Montanaro: data acquisition
- Daniel A. Leffler: study concept, design, data analysis, writing and revision of manuscript
- Sunil G. Sheth: study concept, design, data analysis, writing and revision of manuscript

Conflict of interest statement: none declared.

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