# European Society of Gastrointestinal Endoscopy, European Society of Gastroenterology and Endoscopy Nurses and Associates, and the European Society of Anaesthesiology Guideline: Non-anesthesiologist administration of propofol for GI endoscopy

**Authors** J. M. Dumonceau[1,1], A. Riphaus[2,1], J. R. Aparicio[3], U. Beilenhoff[4], J. T. A.Knape[5], M. Ortmann[6], G. Paspatis[7], C. Y. Ponsioen[8], I. Racz[9], F. Schreiber[10], P. Vilmann[11], T. Wehrmann[12], C. Wientjes[8], B. Walder[13] and the NAAP Task Force Members[2]

**Institutions** Institutions are listed at the end of article.

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**Corresponding authors**
***J. M. Dumonceau, MD, PhD***
Division of Gastroenterology and Hepatology
Geneva University Hospitals
Micheli-du-Crest Street, 24
1205 Geneva
Switzerland
Fax: +41-22-3729366
jmdumonceau@hotmail.com

***A. Riphaus, MD***
Ruhr University Bochum
Department of Medicine
Knappschaftskrankenhaus
In der Schornau 23–25
44892 Bochum
Germany
Fax: +49-234-2993439
ariphaus@web.de

Propofol sedation by non-anesthesiologists is an upcoming sedation regimen in several countries throughout Europe. Numerous studies have shown the efficacy and safety of this sedation regimen in gastrointestinal endoscopy. Nevertheless, this issue remains highly controversial. The aim of this evidence- and consensus-based set of guideline is to provide non-anesthesiologists with a comprehensive framework for propofol sedation during digestive endoscopy. This guideline results from a collaborative effort from representatives of the European Society of Gastrointestinal Endoscopy (ESGE), the European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA) and the European Society of Anaesthesiology (ESA). These three societies have endorsed the present guideline.

The guideline is published simultaneously in the Journals *Endoscopy* and *European Journal of Anaesthesiology*.

## 1 Introduction

Although esophagogastroduodenoscopy (EGD) and colonoscopy can be performed without sedation [1,2], both procedures are better tolerated in terms of patient satisfaction and willingness to repeat the examination when sedation is administered [3]. More complex procedures are rarely performed without sedation. Benzodiazepines, either combined with opioids or not, have long been used for sedation (termed as "traditional sedation" in this guideline); however, the short-acting hypnotic agent propofol is increasingly being used [4–7]. Due to limited anesthesiology resources, propofol is being administered worldwide by trained nurses or endoscopists for endoscopic procedures in selected patients [5]. Administration of propofol by nurses or endoscopists is commonly referred to as non-anesthesiologist-administered propofol (NAAP).

The aim of this guideline is to provide medical doctors and nurses who participate in gastrointestinal endoscopy and are not anesthesiologists with a comprehensive framework on how to implement and practice NAAP. The guideline covers the care provided to any patient undergoing digestive endoscopy. They are not designed to be rigid and cannot replace clinical judgment; furthermore, their implementation may be subject to domestic regulations or local policy and should only be used with the agreement of the relevant domestic regulatory authority or local policy maker.

## 2 Methods

The European Society of Gastrointestinal Endoscopy (ESGE) commissioned and funded this guideline, which was prepared by representatives from the ESGE, the European Society of Anaesthesiology (ESA), and the European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA). In this guideline, the word "caregiver" refers to nurses or physicians who take care of patients during endoscopy and are not anesthesiologists or nurses specialized in anesthesiology.

[1] Both authors collaborated equally to this work.

[2] NAAP Task Force Members: L. Aabakken, Rikshospitalet – Radiumhospitalet Medical Center, Oslo, Norway; A. Axon, The General Infirmary, Leeds, United Kingdom; A. Axon, Parlane Plowden, Leeds, United Kingdom; G. Costamagna, Policlinico A. Gemelli, Rome, Italy; E. Giostra, Geneva University Hospitals, Geneva, Switzerland; P. Hornslet, Gentofte Hospital, Copenhagen University, Hellerup, Denmark; S. Ladas, "Attikon" University General Hospital Medical School, Athens, Greece; T. Marek, Silesian Academy of Medicine, Katowice, Poland; M. Dinis-Ribeiro, Portuguese Oncology Center Porto, CINTESIS/Porto Faculty of Medicine, Portugal.

**Table 1** Definitions of categories for evidence levels and recommendation grades used in this guideline [8].

| | |
|---|---|
| **Evidence level** | |
| 1++ | High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias |
| 1+ | Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias |
| 1– | Meta-analyses, systematic reviews, or RCTs with a high risk of bias |
| 2++ | High quality systematic reviews of case-control or cohort studies; high quality case-control studies *or* cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal |
| 2+ | Well conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal |
| 2– | Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal |
| 3 | Nonanalytic studies, e. g. case reports, case series |
| 4 | Expert opinion |
| **Recommendation grades** | |
| A | At least one meta-analysis, systematic review, or RCT rated as 1++ and directly applicable to the target population *or* a systematic review of RCTs *or* a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results |
| B | A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results *or* extrapolated evidence from studies rated as 1++ or 1+ |
| C | A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results *or* extrapolated evidence from studies rated as 2++ |
| D | Evidence level 3 or 4 *or* extrapolated evidence from studies rated as 2+ |

RCT, randomized controlled trial

The guideline process included meetings, telephone conferences, and electronic-based discussions among subgroups and members of the entire committee during July 2009 and May 2010. Subgroups were formed, each charged with a series of clearly defined key questions (see **Appendix 1**). The committee chair worked with subgroup leaders to identify pertinent search terms that always included, as a minimum, "sedation" and "gastrointestinal endoscopy" as well as words pertinent to specific key questions. Search was performed on Medline (via Pubmed), Cochrane Library, Embase, and the internet. Articles were first selected by title; their relevance was then confirmed by review of the corresponding manuscript, and publications with content that was considered irrelevant were excluded. Additional articles were identified by manually searching the reference lists of retrieved papers. A central repository of selected literature was made available to all members of the guideline development group. Evidence tables were generated for each key question, based on meta-analyses or randomized controlled trials (RCTs) if these were available; otherwise, case–control studies, retrospective analyses, and case series were included. The number of articles retrieved and selected for each task force is indicated in the Evidence Table (see **Appendix 2**).

The study populations considered varied between clinical questions. At times evidence was not available from studies that included patients sedated using propofol, and it was therefore necessary to consider studies that used traditional sedation. Evidence such as this is indicated in the comments to recommendations. For important outcomes, articles were individually assessed by using the Method for Evaluating Research and Guideline Evidence (MERGE) checklists as amended by the Scottish Intercollegiate Guidelines Network [8]. Evidence levels and recommendation grades used in this guideline were those recommended by the amended Scottish Intercollegiate Guidelines Network (**Table 1**) [8].

Subgroups agreed electronically on draft proposals that were presented to the entire group for general discussion during a meeting held in 2009 during the 18th United European Gastroenterology Week (London, UK). During the meeting and following discussion, competing proposals for wording of recommendations or assigning strength of evidence were resolved by formal voting. Where the guideline development group was unable to agree a unanimous recommendation, the difference of opinion was formally recorded and the reasons for dissent were noted. The results of that discussion were incorporated into the subsequent guideline version and again discussed using electronic mail. Searches were re-run in December 2009. Studies that were published after this date were not considered for inclusion. This time-point should be the starting point in the search for new evidence for future updates to this guideline. Recommendations were finalized during a meeting of subgroup leaders in 2010 during the 12th International Endoscopy Symposium (Düsseldorf, Germany).

The manuscript was edited for style by the corresponding authors and by a lawyer (Andrew Axon), with approval by subgroup leaders and then by all members of the guideline development group. In May 2010, the final draft was sent to all individual ESGE members. After incorporation of comments made by the individual ESGE members, the manuscript was endorsed by the ESGE Governing Board, the ESGENA, and the ESA. It was sent to the Editorial Boards of the journals *Endoscopy* and the *European Journal of Anaesthesiology*. It underwent international peer review and the final version was approved by all members of the guideline development group.

Evidence statements and recommendations are stated in italics, key evidence statements and recommendations are in bold. This guideline was issued in 2010 and will be considered for review in 2013, or sooner if new evidence becomes available. Any updates to the guideline in the interim period will be noted on the ESGE website: http://www.esge.com/esge-guidelines.html.

## 3 Summary of statements and recommendations

*Compared with traditional sedation, propofol-based sedation presents similar rates of adverse effects, provides higher postprocedure patient satisfaction for most endoscopic procedures, decreases time*

*to sedation, and decreases recovery time (and may therefore decrease discharge time compared with traditional sedation). Propofol-based sedation may also increase the quality of endoscopic examination. There are no cost-effectiveness data directly comparing specifically NAAP with traditional sedation or monitored anesthesia care for gastrointestinal endoscopy. (Evidence level 1+.)*

*Specific knowledge and skills are necessary for endoscopists and nursing staff using NAAP to ensure patient comfort and safety; none of the NAAP reports published to date used self-training to achieve competency in this technique. NAAP performed by endoscopists and endoscopy nurses should not take place without appropriate training, and self-training in NAAP is strongly discouraged. (Evidence level 2++, Recommendation grade A.)*

*Digestive endoscopists and registered nurses are adequate candidates for NAAP training courses. Previous experience in intensive care medicine is desirable for the physician who is responsible for NAAP. We recommend that training courses for NAAP include a theoretical and a practical part, each part being followed by an examination to document successful training. NAAP training courses should teach techniques of basic life support (BLS) to all participants and advanced cardiac life support (ACLS) to caregivers who will practice in locations where an ACLS provider is not immediately available. (Evidence level 4, Recommendation grade D.)*

*Simulator training using a full-scale patient simulator as an adjunct to practical NAAP courses allows improvement of trainees' skill. We recommend the use of such simulators. (Evidence Level 2–, Recommendation grade D.)*

*The first human cases of NAAP performed by a caregiver require particular attention because complications are more frequent during this period. We recommend that the first human cases of NAAP performed by an individual be supervised by an anesthesiologist or another person with previous experience of > 300 NAAP cases (Evidence level 2–, Recommendation grade D). There was dissension in the audience, with some participants recommending preceptorship during the first cases of NAAP without defining "first cases", and others preferring to state a number of cases (evidence only available for n = 30).*

*Higher categories of the American Society of Anesthesiology (ASA) physical status classification system and some endoscopic procedures are associated with a higher incidence of complications after endoscopy. Higher Mallampati's classes are associated with more difficult airway management. We recommend that these risk factors are assessed before each NAAP procedure by reviewing patient past medical history, performing a focused physical examination, and assessing type and anticipated complexity of the endoscopic procedure. (Evidence level 2+, Recommendation grade C.)*

*In the presence of patient-related risk factors for complications, the primary involvement of an anesthesiologist during endoscopy is suggested. These factors include ASA category ≥ 3, a Mallampati's class of 3 or other conditions at risk for airway obstruction (e.g. pharyngolaryngeal tumors), patients who chronically receive significant amounts of pain medications or in cases of anticipated long-lasting procedure. (Evidence level 4, Recommendation grade D.)*

*In the vast majority of NAAP studies, propofol was administered by a person who had patient sedation as his/her sole task (Evidence level 1++). It is recommended that patients be continuously monitored by a person dedicated to NAAP (Recommendation grade A).*

*There is no evidence that quick availability of a life support team is required for propofol administration. We do not recommend compulsory availability of a life support team if propofol is administered in the presence of a person trained in ACLS. (Evidence level 2+; Recommendation grade C.)*

*Intravenous access is required for sedation in gastrointestinal endoscopy and should be maintained using a catheter, not a winged steel needle, until full patient recovery (Evidence level 4, Recommendation grade D.)*

*Continuous supplemental oxygen is indicated during NAAP for endoscopy. (Evidence level 1+, Recommendation grade B.)*

*Patient monitoring is recommended in all patients using continuous pulse oximetry and automated noninvasive blood pressure measurement (at baseline and then at 3 – 5-minute intervals) during both NAAP and the recovery period; continuous electrocardiography is recommended in selected patients with a history of cardiac and/or pulmonary disease. Baseline, minimum and maximum heart rate/blood pressure, as well as baseline and minimum oxygen blood saturation should be recorded. (Evidence level 2++, Recommendation grade B.)*

*Visual assessment of respiratory activity during anticipated long endoscopy procedures is not a reliable method for detecting apnea. During NAAP, capnographic monitoring of respiratory activity may reduce episodes of hypoxemia during long endoscopic procedures or when visual assessment of patient breathing is impaired, but no clinical impact has been demonstrated. Therefore, capnography cannot be recommended as standard. (Evidence level 1+, Recommendation grade B.)*

*Electroencephalogram (EEG)-based monitoring may be used during NAAP to target a sedation level; it may help to reduce propofol consumption during complex endoscopic procedures with targeted deep sedation. No clinical impact of EEG-based monitoring has been demonstrated (Evidence level 1+), and no specific recommendation is made due to the paucity of data.*

*Simple endoscopic procedures can be performed with moderate sedation, maintaining a high degree of patient satisfaction. Prolonged or complex procedures (e.g. endoscopic ultrasonography [EUS] and endoscopic retrograde cholangiopancreatography [ERCP]) are frequently performed under deep sedation. (Evidence level 1++, Recommendation grade A.)*

*Combining propofol with an additional drug (benzodiazepine/opioid/ketamine) allows the dose of propofol administered to be decreased without reproducible effect on recovery time; there is no clear evidence that combining propofol with another drug leads to a decrease in adverse effects (Evidence level 1+). No recommendation is made about combination of propofol with other drugs.*

*Intermittent bolus administration of propofol is the current standard administration technique for NAAP. Data about propofol administration using perfusor systems during endoscopy are accumulating and show that these systems are as effective and safe as the standard technique. Patient-controlled sedation (PCS) is a valid administration technique but it is not applicable in a significant minority of patients. (Evidence level 1+.)*

*Listening to patient-selected music during colonoscopy allows the dose of propofol administered to be decreased; we recommend this for colonoscopy. (Evidence level 1–, Recommendation grade B.)*

*The role of pharyngeal anesthesia during propofol sedation for upper digestive endoscopy has not been assessed. No recommendation is made.*

*Variable stiffness colonoscopes allow the dose of propofol administered to be decreased during colonoscopy with no demonstrated clinical impact (Evidence level 1+). A single endoscope manufacturer currently offers such models and no recommendation is made.*

*Postendoscopy pain is lower when air is replaced by $CO_2$ for gut distension during long endoscopy procedures but there are no data on the doses of propofol administered (Evidence level 1+). No recommendation is made.*

*Propofol is contraindicated in patients with a known allergy to soy protein. Pain at the injection site is frequent and can be prevented by lidocaine (Evidence level 1++). Hypoxemia and hypotension are the most frequent adverse effects of propofol and develop during NAAP in 5%–10% of patients. Measures to be taken in case of complications should be established in a check-list that is updated and tested at regular intervals. If a patient proves difficult to sedate adequately for the examination purpose, endoscopy termination and referral to an anesthesiologist should be considered (Evidence level 4, Recommendation grade D).*

*A small minority of sedation-related adverse effects occur after, as opposed to during, the procedure. We recommend patient observation until discharge by a person who is aware of the adverse effects of the drugs administered. (Evidence level 2+, Recommendation grade C.)*

*Minimum discharge criteria are useful for discharging patients after sedation for digestive endoscopy. We recommend using a standardized discharge scoring form. (Evidence level 2+, Recommendation grade C.)*

*Minimum discharge criteria should be fulfilled before discharging a patient. However, psychomotor functions remain significantly impaired when standard discharge criteria are met. Upon discharge, patients should be accompanied by a responsible person and refrain from driving, operating heavy machinery or engaging in legally binding decisions for at least 12 hours if sedation with propofol alone was administered (24 hours in cases of a combined regimen). Advice should be provided verbally and in written form, including a 24-hour contact phone number. (Evidence level 1+, Recommendation grade A.)*

*Documentation should be maintained throughout all phases of patient management, including:*

- *vital signs assessed at regular intervals (oxygen saturation, heart rate, and blood pressure)*
- *drugs (name, dosage), IV fluids (type, quantity), and oxygen (flow rate) administered*
- *sedation-associated complications and their management*
- *fulfillment of discharge criteria.*

*A minority of the audience thought that it should be recommended to record, in addition to this, the level of consciousness at regular intervals. Maintaining documentation in an electronic database may help to monitor quality and will provide a record in the event of medicolegal investigation. (Evidence level 4, Recommendation grade D.)*

*The endoscopist bears the ultimate medicolegal responsibility to ensure proper personal training of the endoscopy staff involved in NAAP. (Evidence level 4.)*

*Informed consent for NAAP should be obtained from the patient or his/her legal representative according to domestic laws and regulations in a way similar to that of other endoscopy procedures. It is generally obtained during a face-to-face discussion between a physician familiar with the procedure and the patient, with information given in lay language to the patient and the opportunity for him/her to ask questions prior to the procedure. The informed consent regarding sedation issues may be incorporated into the main body of the endoscopy consent form. The procedure of informed consent should be documented. (Evidence level 4, Recommendation grade D.)*

## 4 Propofol-based vs. traditional sedation

*Compared with traditional sedation, propofol-based sedation presents similar rates of adverse effects, provides higher postprocedure patient satisfaction for most endoscopic procedures, decreases time to sedation, and decreases recovery time (and may therefore decrease discharge time compared with traditional sedation). Propofol-based sedation may also increase the quality of endoscopic examination. There are no cost-effectiveness data directly comparing specifically NAAP with traditional sedation or monitored anesthesia care for gastrointestinal endoscopy. (Evidence level 1+.)*

Higher postprocedure patient satisfaction is achieved with propofol vs. traditional sedation for colonoscopy [3], EUS [9], ERCP [10,11], but not EGD [3]. Examination quality may also be higher with propofol vs. traditional sedation, at least for EGD and ERCP [10,12]. Time to sedation and recovery time are shorter with propofol vs. traditional sedation [3,13].

With regard to adverse effects, propofol may cause hypoventilation, hypotension, and bradycardia relatively frequently, but severe adverse effects are extremely rare [5]. Therefore, the parameters "hypoxemia" and "hypotension" are most often used as surrogate markers of clinical complications; these were used for comparing propofol with traditional sedation in RCTs that were reviewed in three meta-analyses (**Table 2**) [3,13,14].

Sedation was performed by a gastroenterologist in most trials and by a registered nurse or an anesthesiologist in the remaining ones. No significant differences between propofol-based and tra-

**Table 2** Meta-analyses of randomized controlled trials that reported safety of propofol vs. traditional agents for sedation during endoscopy.

| Reference* | N | Procedure | Hypoxemia, % (95% CI) | | Hypotension, % (95% CI) | | OR for complications, % (95% CI) | |
|---|---|---|---|---|---|---|---|---|
| | | | Propofol | Trad. agents | Propofol | Trad. agents | Hypoxemia | Hypotension |
| Qadeer et al. 2005 [14] | 1161 | EGD, colonoscopy, ERCP, EUS | 8.8 (NA) | 9.9 (NA) | 2.8 (NA) | 3.0 (NA) | 0.76 (0.43–1.35) | 1.06 (0.53–2.09) |
| McQuaid & Laine 2008 [3] | 3918 | EGD, colonoscopy | 11 (7–16) | 18 (12–26); 6 (4–7)† | 5 (2–10) | 7 (5–10) | 1.11 (0.71–1.74) | 1.28 (0.51–3.26) |
| Singh et al. 2008 [13] | 1181‡ | Colonoscopy | 5.4 (NA) | 6.9 (NA) | 12.5 (NA) | 13.5 (NA) | 0.73 (0.44–1.22) | 0.84 (0.42–1.69) |

* Propofol was used as a single agent or combined with other drugs; traditional agents consisted of a benzodiazepine plus an opioid in most trials.
† Proportions stated separately for midazolam alone (18%) or midazolam associated with a narcotic (6%).
‡ The outcome "hypotension" was analyzed in 321 patients.
CI, confidence interval; EGD, esogastroduodenoscopy; ERCP, endoscopic retrograde cholangio-pancreatography; EUS, endoscopic ultrasonography; NA, not available; OR, odds ratio; RCT, randomized controlled trial.

ditional sedation were detected for hypoxemia or hypotension in these meta-analyses, except for fewer cardiopulmonary complications with propofol sedation during colonoscopy vs. traditional sedation [14].

With regard to cost, indirect calculations found that propofol was at least as cost-effective as traditional sedation for colonoscopy and EUS (due to quicker postprocedure recovery and, hence, higher daily number of procedures) [9,15]. However, these conclusions are not applicable in most settings because these calculations did not take into account the additional cost of a supplementary nurse dedicated to propofol sedation, although such a nurse exists in most studies.

## 5 Training in NAAP

*Specific knowledge and skills are necessary for endoscopists and nursing staff using NAAP to ensure patient comfort and safety; none of the NAAP reports published to date used self-training to achieve competency in this technique. NAAP performed by endoscopists and endoscopy nurses should not take place without appropriate training, and self-training in NAAP is strongly discouraged. (Evidence level 2++, Recommendation grade A.)*

*Digestive endoscopists and registered nurses are adequate candidates for NAAP training courses. Previous experience in intensive care medicine is desirable for the physician who is responsible for NAAP. We recommend that training courses for NAAP include a theoretical and a practical part, each part being followed by an examination to document successful training. NAAP training courses should teach techniques of BLS to all participants and ACLS to caregivers who will practice in locations where an ACLS provider is not immediately available. (Evidence level 4, Recommendation grade D.)*

NAAP providers should be able to manage the typical adverse effects of propofol and be trained in life support techniques [5,16–20]. In multicenter retrospective and prospective studies, all nurses and endoscopists performing NAAP were trained in ACLS [5,21–25]. The European Board of Anaesthesiology recommends that NAAP endoscopists performing patient sedation should be trained in ACLS, including endotracheal intubation, and that training of nurses should be similar to the training of medical staff but focused on BLS [18]. Our panel did not recommend training in endotracheal intubation based on the extremely low frequency of events requiring this intervention and difficulties in maintaining endotracheal intubation skills in such conditions. However, personnel providing NAAP should be familiar with an alternative method to free the airways and maintain them patent (e.g. using a laryngeal tube) while waiting for support.

Many guidelines, including those issued by the European Board of Anaesthesiologists, recommend periodic participation in structured education curricula for NAAP [16–20]. Such courses are organized in various European countries and a typical program is summarized in **Table 3** [26].

*Simulator training using a full-scale patient simulator as an adjunct to practical NAAP courses allows improvement of trainees' skill. We recommend the use of such simulators. (Evidence Level 2–, Recommendation grade D.)*

Simulator-based education is being increasingly used in endoscopy after it has become standard practice in anesthesiology [27]. It allows training on dosing, drug effects in different types of patients, management of drops in oxygen saturation, blood pressure or heart rate, cardiac arrythmias, and apnea. A study performed during a training course for sedation during endoscopy showed a significant improvement in the examination test scores of attendees after 3 hours of training that included hands-on management on a full-scale patient simulator compared with before training [27].

**Table 3** Typical program of a training course for non-anesthesiologist administration of propofol (NAAP).

| |
|---|
| **Theoretical part** |
| – Pharmacology, pharmacokinetics, and interactions of sedatives, analgesics, and respective antidotes |
| – Principles of sedation and monitoring patients including analysis of ECG monitoring |
| – Different sedation concepts |
| – Pre-, intra- and postendoscopy patient care concerning sedation, monitoring, recovery, discharge criteria, management of complications and documentation |
| – Legal aspects (e.g. delegation, informed consent) |
| **Practical part** |
| – Basic airway management (e.g. freeing of airways, jaw thrust, bag-valve mask ventilation) |
| – Use of different tubes for airway ventilation (e.g. Guedel tube, laryngeal tube) |
| – Treatment of acute respiratory problems |
| – BLS and ACLS, including the use of defibrillators |

ACLS, advanced cardiac life support; BLS, basic life support; ECG, electrocardiogram

*The first human cases of NAAP performed by a caregiver require particular attention because complications are more frequent during this period. We recommend that the first human cases of NAAP performed by an individual be supervised by an anesthesiologist or another person with previous experience of > 300 NAAP cases (Evidence level 2–, Recommendation grade D). There was dissension in the audience, with some participants recommending preceptorship during the first cases of NAAP without defining "first cases", and others preferring to state a number of cases (evidence only available for n = 30).*

Programs that pioneered NAAP involved a board-certified anesthesiologist who was personally present during the initiation period [28,29]. However, the exact role of the anesthesiologist was not reported in these studies and, more recently, fewer details have been given in the literature about the first human cases of NAAP performed by individuals. In a retrospective study, sedation-related complication rates were significantly lower with advanced experience-level nurses (≥ 100 NAAP procedures) compared with the least-experienced nurses (≤ 30 NAAP procedures) [23].

## 6 Practice of NAAP

### 6.1 Pre-procedure patient selection

*Higher categories of the ASA physical status classification system and some endoscopic procedures are associated with a higher incidence of complications after endoscopy. Higher Mallampati's classes are associated with more difficult airway management. We recommend that these risk factors are assessed before each NAAP procedure by reviewing patient past medical history, performing a focused physical examination, and assessing type and anticipated complexity of the endoscopic procedure. (Evidence level 2+, Recommendation grade C.)*

Adequate patient selection for NAAP is important because a significant proportion of complications observed after endoscopy are related to sedation and some of these may be preventable [30–32]. Impaired physical status, procedure type, older age, and possibly obesity are risk factors for the development of cardiopulmonary complications and mortality [30,32,33]. These factors should be assessed together with other useful elements (e.g. risk factors for sleep apnea, abnormal head and neck features, chronic obstructive pulmonary disease of stage 3–4, cardiac failure of stage 3–4, history of bronchoaspiration, trouble with previous anesthesia or sedation, allergies, current medications, tobacco, alcohol, and drug consumption) using a combination of standardized questionnaires and nurse-based or physician-based assessment [34]. After physical examination including vital signs, heart and lung auscultation, as well as throat examination, the patient is classified according to the ASA physical status scale and Mallampati's class [35,36].

*In the presence of patient-related risk factors for complications, the primary involvement of an anesthesiologist during endoscopy is suggested. These factors include ASA category ≥ 3, a Mallampati's class of 3 or other conditions at risk for airway obstruction (e.g. pharyngolaryngeal tumors), patients who chronically receive significant amounts of pain medications or in cases of anticipated long-lasting procedure. (Evidence level 4, Recommendation grade D.)*

The presence of some patient-related risk factors may trigger the consideration of the primary involvement of an anesthesiologist during endoscopy [37]. Such factors are, for example: a history of stridor, snoring or sleep apnea; patients with dysmorphic facial features (e.g. Pierre Robin syndrome, trisomy 21) or oral abnormalities such as small opening (< 3 cm in an adult), high arched palate, macroglossia, tonsilar hypertrophy, or a nonvisible uvula; patients with neck abnormalities, such as obesity involving the neck and facial structures, short neck, limited neck extension, neck mass, cervical spine disease or trauma, tracheal deviation, or advanced rheumatoid arthritis; patients with jaw abnormalities, such as micrognathia, retrognathia, trismus, or significant malocclusion; patients receiving significant amounts of pain medication chronically or who for other reasons may be tolerant to agents used during sedation and analgesia.

## 6.2 Performance of sedation

### 6.2.1 Personnel

*In the vast majority of NAAP studies, propofol was administered by a person who had patient sedation as his/her sole task (Evidence level 1++). It is recommended that patients be continuously monitored by a person dedicated to NAAP (Recommendation grade A).*

Recent guidelines from the USA and Germany recommend that NAAP be performed by a person who has NAAP as their sole task [16,17]. These recommendations are mostly based on expert opinions and they have recently been challenged by reports suggesting that propofol administration in the presence of the endoscopist and a single nurse is safe [29,38,39]. These reports included > 28 000 endoscopic procedures (mostly EGD and colonoscopy, 500 upper digestive EUS); no severe complications were reported except for requirement for bag mask ventilation in six patients (0.02 %). However, blood pressure was not monitored in a majority of these patients, and it is therefore unclear how often patients might have presented critical hypotension.

*There is no evidence that quick availability of a life support team is required for propofol administration. We do not recommend compulsory availability of a life support team if propofol is administered in the presence of a person trained in ACLS. (Evidence level 2+; Recommendation grade C.)*

### 6.2.2 Patient preparation and monitoring

*Intravenous access is required for sedation in gastrointestinal endoscopy and should be maintained using a catheter, not a winged steel needle until full patient recovery. (Evidence level 4, Recommendation grade D.)*

Permanent intravenous access is required for most protocols of NAAP (EGD after a single bolus injection of propofol has been reported) [40]; Teflon cannulas are as easy to insert as winged steel needles and provide more reliable intravenous access [41].

*Continuous supplemental oxygen is indicated during NAAP for endoscopy. (Evidence level 1+, Recommendation grade B.)*

Administration of oxygen is widely recommended because RCTs have shown that oxygen desaturation is frequent during endoscopy if the patient breathes room air, and that this may be prevented by supplemental oxygen administration during endoscopy under traditional sedation [42–50]. However, the potential benefit of routine prophylactic oxygen supplementation in terms of decreased cardiopulmonary complications is unclear [51].

*Patient monitoring is recommended in all patients using continuous pulse oximetry and automated noninvasive blood pressure measurement (at baseline and then at 3–5-minute intervals) during both NAAP and the recovery period; continuous electrocardiography is recommended in selected patients with a history of cardiac and/or pulmonary disease. Baseline, minimum and maximum heart rate/blood pressure, as well as baseline and minimum oxygen blood saturation should be recorded. (Evidence level 2++, Recommendation grade B.)*

Most studies that have established the safety of NAAP have used patient monitoring as stated above [5]. Clinical utility of these measures has not been demonstrated but oximeters, electrocardiographs, and devices that automatically monitor blood pressure at regular intervals are widely available, relatively reliable, cheap, and easy to use. For example, pulse oximetry was found to be used during colonoscopy in 77 % of > 6000 patients investigated in 11 European countries between 2000 and 2002 and in 97 % of all gastroscopies and colonoscopies as shown in a recent nationwide survey in Germany [7,52]. For NAAP, such monitoring has become a de facto standard.

- The utility of blood pressure monitoring during NAAP has not been studied but it is intuitively important to monitor because a decrease in blood pressure is one of the most frequent side effects of propofol, and it may require intervention.
- The utility of continuous electrocardiographic monitoring during NAAP has not been studied.
- Pulse oximetry is a noninvasive technique that allows $S_pO_2$ measurement, i.e. the percentage of hemoglobin binding sites in the bloodstream occupied by oxygen. It provides an early warning of hypoxemia but it is not an early indicator of decreased ventilation.

*Visual assessment of respiratory activity during anticipated long endoscopy procedures is not a reliable method of detecting apnea. During NAAP, capnographic monitoring of respiratory activity may reduce episodes of hypoxemia during long endoscopic procedures or when visual assessment of patient breathing is impaired, but no clinical impact has been demonstrated. Therefore, capnography cannot be recommended as standard. (Evidence level 1+, Recommendation grade B.)*

Most episodes of apnea and disordered respiration remain undetected by visual assessment of respiratory activity during antici-

**Table 4** Stages of sedation modified according to the American Society of Anesthesiologists [60].

| | Minimal (anxiolysis) | Moderate | Deep | Anesthesia |
|---|---|---|---|---|
| Reaction being addressed | Patient reaction is adequate to verbal commands | Somnolence, reaction to louder commands, if needed with additional tactile stimulation | Somnolence, hard to wake, targeted reaction to repeated tactile stimulation and pain stimulus | Patient cannot be woken, not even in response to pain stimuli |
| Spontaneous breathing | Not influenced | Adequate | Respiratory function mildly restricted | Inadequate, orotracheal intubation or larynx mask necessary |

pated long endoscopy procedures [53]. Two RCTs with a total of 426 patients have compared rapid vs. delayed signaling of respiratory abnormalities, as detected by capnography monitor, to the endoscopy team during sedation for endoscopy in adults and children [54,55]. Hypoxemia developed significantly more frequently in the capnography-blinded group vs. capnography-aware group in both studies, but no difference in clinically relevant outcomes (e.g. complication rate) was found in either study. Furthermore, in one of these RCTs, capnography erroneously displayed a flat line for at least 50 seconds in 13% of patients [54]. Clinical usefulness of capnography should be assessed in patients considered to be at high-risk for morbidity from hypoxemia (e.g. severe cardiovascular disease).

*EEG-based monitoring may be used during NAAP to target a sedation level; it may help to reduce propofol consumption during complex endoscopic procedures with targeted deep sedation. No clinical impact of EEG-based monitoring has been demonstrated (Evidence level 1+), and no specific recommendation is made due to the paucity of data.*

The bispectral index (BIS) is a variable derived from the EEG that allows the quantification of the hypnotic effects of anesthetic drugs on the central nervous system. Four RCTs assessing the usefulness of BIS during propofol sedation for endoscopy have been identified [56–59]. In these RCTs, the administration of propofol was controlled based on BIS vs. clinical parameters. Two RCTs that included patients with colonoscopy or gastric endoscopic submucosal dissection found no difference between randomization groups, in particular with regard to propofol consumption or recovery time (one study found better patient and [unblinded] endoscopist satisfaction with BIS) [56,57]. The two other RCTs included patients subjected to ERCP; both RCTs found that the propofol dose was significantly lower and the recovery time shorter in patients randomized to BIS compared with those randomized to clinical parameters for the monitoring of propofol administration [58,59]. In one of these RCTs [58], propofol was administered by an anesthesiologist; no side effect was attributed to the use of BIS.

### 6.2.3 Level of sedation

*Simple endoscopic procedures can be performed with moderate sedation, maintaining a high degree of patient satisfaction. Prolonged or complex procedures (e.g. EUS and ERCP) are frequently performed under deep sedation. (Evidence level 1++, Recommendation grade A.)*

The level of sedation can be assessed using different scales; an example is given in **Table 4** [60–62].

For EGD and colonoscopy, moderate sedation provides a high level of physician and patient satisfaction and a low risk of serious adverse events with all currently available agents [3]. For more complex procedures such as EUS and ERCP, a deep sedation level has been targeted in a majority of studies, mostly to avoid involuntary patient movements [9–11,39,63–65].

### 6.2.4 Protocols of propofol-based sedation

#### 6.2.4.1 Propofol alone or combined with other drugs

*Combining propofol with an additional drug (benzodiazepine/opioid/ketamine) allows the dose of propofol administered to be decreased without reproducible effect on recovery time; there is no clear evidence that combining propofol with another drug leads to a decrease in adverse effects (Evidence level 1+). No recommendation is made about combination of propofol with other drugs.*

Seven RCTs compared sedation with propofol administered alone vs. combined with midazolam and/or fentanyl or with a cocktail of various drugs (**Table 5**).

Different endoscopic procedures were analyzed and two RCTs were performed in children [66,67]. Most trials found that the doses of propofol were lower with combined vs. monotherapy regimens but results in terms of recovery times were contradictory. Complications were significantly less frequent with combined regimens in two RCTs that used midazolam [64,66], and were more frequent when propofol was combined with a "cocktail" including midazolam, ketamine, and pentazocine [65]. Endoscopy was rated as easier with combined regimens vs. propofol monotherapy in two RCTS [66,68]. Patient satisfaction was similar with propofol monotherapy vs. combined regimens, except for more late pain recall with a combined regimen in one trial [69].

#### 6.2.4.2 Propofol administration techniques

*Intermittent bolus administration of propofol is the current standard administration technique for NAAP. Data about propofol administration using perfusor systems during endoscopy are accumulating and show that these systems are as effective and safe as the standard technique. PCS is a valid administration technique but it is not applicable in a significant minority of patients. (Evidence level 1+.)*

Propofol may be administered intravenously as repeated bolus injections, continuous infusion or a mixture of both techniques. Most trials dealing with propofol for digestive endoscopy have used repeat bolus injections by a caregiver or continuous infusion at a fixed rate; other techniques include PCS, target-controlled infusion (TCI) and, mostly for clinical research, "computer-assisted personalized sedation" (CAPS).

*Standard techniques*

An initial bolus of propofol (dose adapted to patient weight, age or comorbidity) is administered intravenously, followed by repeated boli according to patient condition or by a continuous propofol infusion (infusion rate is chosen according to the desired

**Table 5** Main outcomes in randomized controlled trials comparing propofol used in monotherapy or in combination with other sedative drugs.

| Study | N | Drugs combined | Procedure | Mean propofol dose | | Mean recovery time, minutes | | Complications | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Monotherapy | Combined regimen | Monotherapy | Combined regimen | Monotherapy | Combined regimen |
| Disma et al. 2005 [66] | 240 | M or F | EGD | 3.5 mg/kg | 3.2 mg/kg | 51.5 | 54 | 19%* | 5–6% |
| Paspatis et al. 2006 [67] | 54 | M | EGD | 2.9 mg/kg** | 1.8 mg/kg | 7.7** | 25.9 | $O_2$ < 92%: 15.3%<br>ΔMBP > 10 mmHg: 0 | 21.4%<br>3.5% |
| VanNatta & Rex 2006 [69] | 200 | M, or F, or M+F | Colonoscopy | 215 mg** | 82.5–140 mg | 18.1** | 13.9–14.7 | ND | ND |
| Fanti et al. 2007 [70] | 270 | M | Upper EUS | 364 mg | 394 mg | 39 | 38 | 0 | 0 |
| Ong et al. 2007 [65] | 199 | M+P+K | ERCP | 192 mg*** | 131 mg | NA | NA | 4.8%* | 15.8% |
| Paspatis et al. 2008 [64] | 91 | M | ERCP | 512 mg*** | 331 mg | 30.6** | 35.5 | $O_2$ < 90%: 24.4%*<br>SBP < 90 mmHg: 4.4% | 6.5%<br>6.5% |
| Padmanabhan et al. 2009 [68] | 200 | M, or F, or M+F | Colonoscopy | 285 mg*** | 200 mg | 66 | 64 | ND | ND |

EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangio-pancreatography; EUS, endoscopic ultrasonography.
F, fentanyl; K, ketamine; M, midazolam; P, pentazocine.
NA, not available; ND, no difference between groups without more precision in the original article; ΔMBP, change in mean arterial blood pressure; SBP, systolic blood pressure.
*$P$ < 0.05; **$P$ < 0.01; ***$P$ < 0.001.

sedation depth and the patient risk profile, with additional boli administered as needed). These are the best documented and the most often used administration techniques for propofol.

*Patient-controlled sedation*

In PCS, a computerized pump is programed to deliver intravenously a predetermined amount of sedative and/or opioid when the patient presses a button. This technique has mostly been used for colonoscopy. A Cochrane meta-analysis of RCTs comparing propofol with traditional sedation for colonoscopy has shown that, with PCS, complication rates were similar, pain control was inferior (even in studies that used propofol combined with an analgesic) but patient satisfaction was higher than with traditional agents [13]. This discordance between pain and patient satisfaction likely reflects the fact that patients appreciate deciding about their appropriate sedation level.

Three RCTs have randomized patients scheduled to colonoscopy for the administration of propofol (alone or in combined regimen) via PCS vs. via continuous infusion or repeat bolus administrations by a trained nurse. Of note, 34 % of the 453 patients eligible for randomization in these trials refused inclusion. In terms of patient safety, no clinically significant difference between the administration techniques was detected. The doses of propofol were similar between randomization groups in two RCTs and lower in the PCS group in one study [71]. Patient satisfaction was significantly higher with PCS in one of three trials [72]; willingness to repeat the examination was evaluated in two trials and it was significantly higher with the PCS in one of them [71]. The advantage of PCS in terms of cost (no dedicated nurse) may be offset by the cost of different propofol formulations used for PCS [73].

*Target-controlled infusion and computer-assisted personalized sedation*

With these techniques, the infusion rate is adjusted by a computer, either in an "open-loop" system based on fixed parameters (e.g. body weight) or in a "closed-loop" system that uses feedback from a real-time measure of drug effect (e.g. patient reaction to tactile stimuli or BIS) [74,75]. These systems are called TCI and CAPS, respectively. Too few data have been reported in the endoscopy field to draw conclusions with these systems but, for TCI in adult surgical patients, no clinically significant differences were demonstrated in terms of quality of anesthesia or adverse events with TCI vs. manually controlled infusion of propofol (Cochrane meta-analysis) [76].

### 6.2.5 Non-pharmacological measures available to reduce doses of propofol

#### 6.2.5.1 Listening to music

*Listening to patient-selected music during colonoscopy allows the dose of propofol administered to be decreased; we recommend this for colonoscopy. (Evidence level 1–, Recommendation grade B.)*

Three meta-analyses have reported the effect of listening to music on sedative drug consumption during colonoscopy [77 – 79]. Differences in the amounts of drugs used between the intervention and control groups were not statistically significant in two meta-analyses [77,78], and they were marginally significant in the third one due to the inclusion of one additional RCT that used propofol for sedation (midazolam was used in the RCTs included in the two other meta-analyses) [79]. In the additional RCT [80], propofol mixed with alfentanil was self-administered via PCS in the intervention and control groups; patients with headphones and a choice of different music types (intervention group) self-injected less drug than control patients. One meta-analysis also included patients undergoing EGD and sigmoidoscopy; listening to music may also be beneficial for these interventions [78].

#### 6.2.5.2 Pharyngeal anesthesia

*The role of pharyngeal anesthesia during propofol sedation for upper digestive endoscopy has not been assessed. No recommendation is made.*

Pharyngeal anesthesia decreases patient discomfort during upper digestive endoscopy under traditional sedation but it has not been investigated for endoscopy under propofol sedation [81]. Impact on consumption of traditional agents and on recovery was not reported in available trials.

#### 6.2.5.3 Special endoscopes

*Variable stiffness colonoscopes allow the dose of propofol administered to be decreased during colonoscopy with no demonstrated clinical impact (Evidence level 1+). A single endoscope manufacturer currently offers such models and no recommendation is made.*

A meta-analysis of seven RCTs showed that sedative drugs were used in significantly lower amounts and that cecal intubation rate was higher when colonoscopy was performed using a variable stiffness colonoscope vs. a standard colonoscope [82]. One of these seven RCTs used propofol for sedation; it found that patients self-administered (via PCS) significantly lower amounts of propofol when a variable stiffness colonoscope was used but no impact on sedation-related complications (hypotension, oxygen desaturation) or recovery time was found [83].

#### 6.2.5.4 Use of $CO_2$ as air replacement for gut distension

*Postendoscopy pain is lower when air is replaced by $CO_2$ for gut distension during long endoscopy procedures but there are no data on the doses of propofol administered (Evidence level 1+). No recommendation is made.*

Two RCTs compared $CO_2$ vs. air for gut distension during ERCP and colonoscopy performed under propofol sedation [84,85]. Impact on the dose of propofol administered was not reported and recovery time was similar with both gases in one study [84]. Postendoscopy pain was significantly lower with $CO_2$ vs. air.

### 6.2.6 Precautions and management of complications

*Propofol is contraindicated in patients with a known allergy to soy protein. Pain at the injection site is frequent and can be prevented by lidocaine (Evidence level 1++). Hypoxemia and hypotension are the most frequent adverse effects of propofol and develop during NAAP in 5 % – 10 % of patients. Measures to be taken in case of complications should be established in a check-list that is updated and tested at regular intervals. If a patient proves difficult to sedate adequately for the examination purpose, endoscopy termination and referral to an anesthesiologist should be considered (Evidence level 4, Recommendation grade D).*

Strict aseptic conditions, including the use of separate propofol vials for each patient, should be maintained during manipulation of propofol, as bacterial and viral (hepatitis C) contaminations have been reported [86,87]. Recommendations about allergies to some components (e.g. eggs, peanuts, sulfites) vary depending on the propofol formulation and this should be checked according to recommendations by the manufacturer of the formulation used. A so-called "propofol infusion syndrome" (with rhabdomyolysis) has also been described (initially after long-term,

high-dose, administration of propofol in intensive care units but more recently with short administration of lower doses) [88]. Propofol is contraindicated in patients with a known allergy to soy protein. Propofol may cause pain at the injection site; this may be prevented in 60% of patients by intravenous administration of lidocaine (0.5 mg/kg) with a rubber tourniquet on the forearm [89].

Hypoxemia and hypotension, the most frequent adverse effects of propofol, are usually defined as hemoglobin oxygen saturation < 90% and systolic blood pressure < 90 mmHg, respectively. Their incidence during propofol-based sedation was, in a meta-analysis, 11% (95% confidence interval [CI], 7%–16%) and 5% (95% CI 2%–10%), respectively [3].

Measures that should be taken when hypoxemia develops include stopping the infusion of sedative drugs, increasing oxygen supply, maintaining the airway patent (by jaw-thrust maneuver, suctioning, and mask ventilation). Flumazenil/naloxone may be administered if benzodiazepines/opioids have been used. If the patient does not respond adequately to these measures, endoscopy should be stopped. If hypoxemia does not reverse, emergency call must be performed according to local protocols and ACLS must be initiated. In cases of arterial hypotension, an electrolyte solution should be administered, possibly associated with catecholamines. In cases of bradycardia, atropine should be administered intravenously.

## 6.3 Post-sedation care

### 6.3.1 Surveillance during recovery

*A small minority of sedation-related adverse effects occur after, as opposed to during, the procedure. We recommend patient observation until discharge by a person who is aware of the adverse effects of the drugs administered. (Evidence level 2+, Recommendation grade C.)*

A large prospective study showed that serious adverse effects may occur up to 30 minutes after the administration of benzodiazepines and opioids for sedation, but postprocedure adverse effects represented < 10% of per-procedure adverse effects [90]. Serious postprocedure adverse effects are less frequent with propofol compared with a combination of midazolam/meperidine [11]. During recovery, patients should be observed by a person who is aware of the side effects of the drugs administered using monitoring equipment similar to that used during the procedure. This person may perform minor interruptible tasks but should not leave the room. Although it is possible to observe patients in the examination room, we recommend a separate room for practical reasons.

### 6.3.2 Discharge

*Minimum discharge criteria are useful for discharging patients after sedation for digestive endoscopy. We recommend using a standardized discharge scoring form (e.g.* **Table 6***). (Evidence level 2+, Recommendation grade C.)*

Various scoring systems devised for the assessment of postsurgical recovery have been used after sedation for endoscopy, the most popular systems being the modified Aldrete score (for early or phase I recovery) and the postanesthetic discharge scoring system (PADSS, for intermediate or phase II recovery) [91,92]. Despite limitations of PADSS inherent to its focus on surgical procedures (e.g. one of the five criteria in this system is "surgical bleeding"), it has been documented to allow safe discharge after digestive endoscopy in a relatively small prospective study [93]. A checklist (**Table 6**) is proposed to assess home-readiness of patients after digestive endoscopy under sedation. At a minimum, criteria proposed by the ASA should be met [37]. Commonly used tests to evaluate psychomotor functions are coherent response to questions, ability to stand on one foot, and ability to walk in a straight line for 5 m without instability.

**Table 6** Example of checklist for home discharge after digestive endoscopy under sedation.

| |
|---|
| Stable vital signs for at least 1 hour |
| Alert and oriented to time, place, and person (infants and patients whose mental status was initially abnormal should have returned to their baseline status) |
| No excessive pain, bleeding, or nausea |
| Ability to dress and walk with assistance |
| Discharged home with a responsible adult who will remain with the patient overnight to report any postprocedure complications |
| Written and verbal instructions outlining diet, activity, medications, follow-up appointments, and a phone number to be called in case of emergency |
| A contact person and circumstances that warrant seeking the assistance of a health care professional clearly outlined |
| Tolerating oral fluids not mandatory, unless specified by physician (i. e. patient is diabetic, frail, and/or elderly; not able to tolerate an extended period of NPO status) |

Adapted from Ead [94].

*Minimum discharge criteria should be fulfilled before discharging a patient. However, psychomotor functions remain significantly impaired when standard discharge criteria are met. Upon discharge, patients should be accompanied by a responsible person and refrain from driving, operating heavy machinery or engaging in legally binding decisions for at least 12 hours if sedation with propofol alone was administered (24 hours in cases of combined regimen). Advice should be provided verbally and in written form, including a 24-hour contact phone number. (Evidence level 1+, Recommendation grade A.)*

Psychomotor functions remain significantly impaired when standard discharge criteria are met [95]. Therefore, patients should be informed in advance of precautions to be taken after discharge; these instructions should be repeated at the time of discharge. Precautions include the presence of an escort to ensure safe return home in cases of outpatient procedures.

Psychomotor recovery is significantly more rapid with propofol vs. traditional sedation: in two RCTs that compared propofol with midazolam/pethidine for EGD/colonoscopy, patients who had received propofol had no impairment of psychomotor functions 2 hours after sedation as measured by a driving simulator test, in contrast to those who had received midazolam/pethidine [40,96]. However, both studies employed relatively low doses of propofol. In another study, 92% of 400 patients who received low-dose propofol for EGD wanted to drive when leaving the endoscopy unit, and all did so without incident [97]. Therefore, current recommendations from various professional associations to neither drive nor use public transport without an accompanying person, nor operate heavy machinery or engage in any legal decision making for 24 hours seem too strict if propofol is used in low-dose monotherapy.

## 6.4 Procedure documentation and medicolegal issues

*Documentation should be maintained throughout all phases of patient management, including:*

- *vital signs assessed at regular intervals (oxygen saturation, heart rate, and blood pressure)*

- *drugs (name, dosage), IV fluids (type, quantity), and oxygen (flow rate) administered*
- *sedation-associated complications and their management*
- *fulfillment of discharge criteria.*

*A minority of the audience thought that it should be recommended to record, in addition to this, the level of consciousness at regular intervals. Maintaining documentation in an electronic database may help to monitor quality and will provide a record in the event of medicolegal investigation. (Evidence level 4, Recommendation grade D.)*

A structured procedural sedation record is part of a quality process and may help to improve compliance with sedation guidelines [98].

*The endoscopist bears the ultimate medicolegal responsibility to ensure proper personal training of the endoscopy staff involved in NAAP. (Evidence level 4.)*

Medicolegal issues are important when considering NAAP because (1) up to half of complications after endoscopic procedures are related to sedation, and (2) in two surveys, a majority of endoscopists cited "medicolegal issues" as the main reason for not embracing NAAP [7,99]. The fact that the label accompanying propofol packages in many countries stipulates that "propofol should be administered only by persons trained in the administration of general anesthesia" means that, in some countries, during NAAP, propofol is used "off-label". Off-label use of drugs is common in medical practice and it has been endorsed by various associations such as the Food and Drug Administration and the American Medical Association [100]. However, departure from label recommendations may in some courts shift the burden of proving that the method of use accords with recognized clinical practice to the defendant.

*Informed consent for NAAP should be obtained from the patient or his/her legal representative according to domestic laws and regulations in a way similar to that of other endoscopy procedures. It is generally obtained during a face-to-face discussion between a physician familiar with the procedure and the patient, with information given in lay language to the patient and the opportunity for him/her to ask questions prior to the procedure. The informed consent regarding sedation issues may be incorporated into the main body of the endoscopy consent form. The procedure of informed consent should be documented. (Evidence level 4, Recommendation grade D.)*

A significant proportion of complications after endoscopy are related to sedation [30,31]. In a series of 59 ERCP procedures for which malpractice was alleged, Cotton showed the importance of face-to-face communication between the endoscopist and the patient [101]. Information pertaining to sedation should be provided, including pros and cons of sedation with alternatives and the option for unsedated endoscopy, potential complications, postprocedure risks related to driving, operating equipment where psychomotor functions are essential, consuming alcohol and drugs, taking legally binding decisions, and the risk of amnesia.

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### Institutions

[1] Service of Gastroenterology and Hepatology, Geneva University Hospitals, Geneva, Switzerland
[2] Department of Medicine, Ruhr University Bochum, Bochum, Germany
[3] Endoscopy Unit, Hospital General Universitario de Alicante, Pintor Baeza s/n, Alicante, Spain
[4] President, European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA), Ulm, Germany
[5] Past-President, European Society of Anaesthesiology, University Medical Center Utrecht, Utrecht, The Netherlands
[6] Vice-President, ESGENA, Basel, Switzerland
[7] Department of Gastroenterology, Benizelion General Hospital, L. Knossou, Heraklion, Crete, Greece
[8] Department of Gastroenterology and Hepatology, Academic Medical Center, Amsterdam, The Netherlands
[9] First Department of Internal Medicine and Gastroenterology, Petz Aladar Hospital, Gyor, Vasvari, Hungary
[10] Department of Internal Medicine, Division of Gastroenterology and Hepatology, Medical University Graz, Austria
[11] Department of Surgical Gastroenterology, Herlev Hospital; Endoscopic Unit, Gentofte Hospital, Copenhagen University, Hellerup, Denmark
[12] Division of Gastroenterology, Deutsche Klinik für Diagnostik, Wiesbaden, Germany
[13] Department of Anesthesiology, Geneva University Hospitals, Geneva, Switzerland

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