

Report on the Development of Practice Recommendations for the Use of Sedation for Hospital-Based Routine Colonoscopies

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Abbreviations

CCO	Cancer Care Ontario
CIHI	Canadian Institute of Health Information
CRC	Colorectal Cancer
LHIN	Local Health Integration Network
NACRS	National Ambulatory Care Reporting System
OHIP	Ontario Health Insurance Plan
QBP	Quality-Based Procedures
RN	Registered Nurse

Executive Summary

For many patients, sedation improves the experience of colonoscopy. However, endoscopists lack guidance on the appropriate use of sedation, leading to variation in agents used and methods of delivery and monitoring. These variations can have major cost implications and may affect the quality of care provided to patients. Given the importance of colonoscopy in reducing the burden of colorectal cancer as well as the diagnosis and management of other gastrointestinal disorders, it is critical to ensure colonoscopy is delivered efficiently while maintaining an excellent patient experience. To provide guidance to the field we evaluated the evidence supporting various sedation practices (Specific Aim 1: Evidence Reviews) and the cost impact of common sedation practices (Specific Aim 2: Cost Analysis). We then gathered experts and stakeholders to review the evidence and develop recommendations to guide practice regarding the use of sedation for routine hospital-based colonoscopy in Ontario (Specific Aim 3: Development of Practice Recommendations).

Specific Aim 1: Evidence Reviews

We conducted 5 systematic reviews of the evidence for sedation practices for colonoscopy. Overall, the literature was poor and few studies compared important outcomes for the most commonly used sedative agents. The data were consistent that nurses were able to monitor moderately sedated patients, and that there was a need for an anesthesia provider to deliver and monitor patients having deep sedation for endoscopy. There were no differences in outcomes related to safety between patients receiving propofol for deep sedation and patients receiving traditional sedative agents. Propofol resulted in greater patient satisfaction and shorter procedure times; however, these differences were small and unlikely to be clinically significant (average difference in time for colonoscopy with and without sedation: 1.48 minutes; 95% confidence interval: 0.32-2.65 minutes).

Specific Aim 2: Cost Analysis

We used administrative data to determine the system costs attributable to the use of anesthesia for hospital-based outpatient colonoscopy and evaluated temporal trends in anesthesia use over 10 fiscal years. We found wide variability in the use of anesthesia by hospital and by Local Health Integration Network (LHIN) with an overall trend of increasing use of anesthesia for hospital-based outpatient colonoscopy across all LHINs. We determined that colonoscopies performed with anesthesia cost an additional \$152.27 per procedure. Anesthesia costs in the 2014/2015 fiscal year for outpatient hospital-based colonoscopy totalled over 18 million dollars.

Specific Aim 3: Development of Practice Recommendations

We convened a panel of 31 multidisciplinary stakeholders (including gastroenterologists, general surgeons, anesthesiologists, members of the public, Cancer Care Ontario representatives, hospital administrators, endoscopy nurses, funders/administrators, the College of Physicians and Surgeons of Ontario, as well as visiting experts in endoscopy) for a 1-day meeting to develop practice recommendations to guide the use of sedation for routine hospital-based colonoscopy. Each panel member participated in a webinar presenting the results of Specific Aims 1 and 2.

To inform the process, panel members participated in a pre-meeting values survey. The most important factors for evaluating sedative method identified by the panel included safety, death, cardiorespiratory outcomes, and procedural complications.

The panel then voted in an anonymous online survey, indicating their degree of agreement with 9 practice recommendations. The panel attended a full day consensus meeting to review and discuss the evidence, and their values. Although consensus was achieved in the pre-meeting vote, we discussed the wording of the practice recommendations and the results of preliminary voting at the meeting. Means of improving the patient experience were also discussed at the meeting; communication with patients about expected discomfort, evaluating comfort levels and titrating sedation to patients' responses, and soliciting post-procedural feedback were some of the strategies identified as opportunities to enhance the patient experience under moderate sedation.

After the meeting the practice recommendations were modified based on the in-person discussion, and a final round of anonymous on-line voting was conducted. There was > 80% agreement on all practice recommendations indicating a high level of consensus.

Final Practice Recommendations and % Agreement

All endoscopists performing colonoscopy should be able to complete colonoscopy safely and effectively (per accepted benchmarks) using moderate sedation or less.	93%
Endoscopists unable to complete colonoscopy safely and effectively (per accepted benchmarks) using moderate sedation should undergo additional training.	89%
For patients undergoing routine colonoscopy, endoscopists can safely administer and monitor moderate sedation with the assistance of a trained nurse.	89%
For routine in-hospital colonoscopy under moderate sedation, a single RN can both monitor the patient and perform brief interruptible tasks.	86%
Select patients undergoing routine colonoscopy may benefit from deep sedation.	93%
Institutions will not mandate the use of deep sedation for routine colonoscopy.	93%
Deep sedation for colonoscopy should only be administered by an anesthesia provider.	82%
For routine colonoscopy under deep sedation, an anesthesia provider will be responsible for monitoring the patient and should not be responsible for additional tasks.	93%
Select patients undergoing colonoscopy, such as those with severe comorbidities, may benefit from having sedation administered and monitored by an anesthesia provider, irrespective of level of sedation.	96%

Conclusions and Future Directions

A review of the evidence for sedation practices for routine colonoscopy was conducted. Nine practice recommendations were voted on by a multidisciplinary panel and a high level of consensus was achieved. The appropriate use of moderate and deep sedation for routine colonoscopy can improve patient and provider satisfaction, and has the potential to result in significant cost savings or the ability to invest in other activities (such as implementation of population-based screening with Fecal Immunohistochemistry Testing) in Ontario. The results of this study can be used to drive policy decisions with respect to the use of deep sedation for routine hospital-based colonoscopy.

Scientific Report

Background

Colonoscopy can be an uncomfortable procedure; however, it is an essential tool for the diagnosis and treatment of many gastrointestinal conditions including colorectal cancer. Patient pain and discomfort experienced during colonoscopy can lead to hesitance for future procedures and, in some cases, necessitate termination of the procedure prior to complete colonic visualization. Patient anxiety prior to and during the procedure may also be considerable. Strategies to optimize the patient experience are therefore important. The use of sedation is known to reduce the pain, anxiety, and memory of the procedure, and to increase tolerance and cooperation. Sedation is, therefore, recommended for most patients undergoing colonoscopy. However, there is wide variation in sedation practices. Moderate sedation (most commonly with a combination of midazolam/fentanyl) is usually administered by an endoscopist and monitored by a nurse, with no additional providers present other than those required to perform the scope. In contrast, deep sedation (i.e. propofol) requires delivery by a trained anesthesia professional, who is also responsible for monitoring the patient. The method of sedation delivery has potential quality, safety, and budgetary implications. To ensure that all patients undergoing endoscopy receive safe and quality care, guidance regarding sedation practices is needed.

Objective

We conducted a research study to inform the development of practice recommendations that will drive policy decisions with respect to the use of sedation for routine hospital-based colonoscopy. This included 1) literature reviews of the evidence for sedation practices, 2) an analysis of the cost of colonoscopies performed with anesthesia and trends in the use of anesthesia, and 3) convening an expert panel to develop consensus on practice recommendations for the use of sedation for routine hospital-based colonoscopy.

Methods

Evidence Reviews: Five systematic reviews were conducted to assess the evidence for current sedation practices. These included 1) a review of current guidelines to determine whether consensus existed on the use of sedation for colonoscopy, 2) a review of the impact of the presence of an anesthesiologist on the safety and effectiveness of colonoscopy, 3) a meta-analysis comparing the incidence of complications between propofol and traditional sedatives, 4) a network meta-analysis comparing the incidence of cardiorespiratory events between individual agents commonly used for sedation, and 5) a meta-analysis comparing patient-centred and efficiency outcomes between propofol sedation and sedation with midazolam/fentanyl. Finally, the results of a published meta-analysis on the benefits of propofol versus traditional sedative agents were reviewed. Studies included in the review were not limited by colonoscopy setting; colonoscopy could be performed in a hospital-based or clinic setting.

Cost Analysis: Using CIHI-NACRS and OHIP data, we assessed temporal trends in the number and proportion of colonoscopies performed with anesthesia over 10 fiscal years (**Figure 1**). We assessed the system cost of colonoscopy and included all OHIP billings for provider costs plus the QBP price for hospital costs as the components contributing to the total system cost of colonoscopy. We compared the cost of colonoscopy with and without anesthesia.

Expert Panel: We purposively sampled 32 multi-disciplinary participants including gastroenterologists, general surgeons, anesthesiologists, members of the public, Cancer Care Ontario representatives, hospital administrators, endoscopy nurses, funders/administrators, the College of Physicians and Surgeons of Ontario, as well as visiting experts in endoscopy. The panel members reviewed our findings and participated in a modified Delphi process to develop consensus statements for the use of sedation in routine hospital-based colonoscopy. We considered over 60% agreement to represent consensus. Activities of the panel were as follows:

1. Panel members attended a 1.5-hour webinar to discuss the results of the systematic reviews and cost analysis. Members asked questions and provided guidance for further analyses/clarifications required.
2. Panel members were asked to rank the importance of various factors/outcomes that could be considered when evaluating methods of sedation for routine colonoscopy using an online tool (SurveyMonkey®).
3. Panel members participated in a second online anonymous online survey, and indicated their agreement with a series of 9 practice recommendations regarding the use of sedation for routine hospital-based colonoscopy.
4. Panel members attended a 1-day meeting to review the evidence and results of the values assessment, and discuss the results of voting on the practice recommendations.
5. Panel members reviewed modifications made to the practice recommendations based on feedback at the meeting.
6. Panel members voted using an anonymous online survey on the final practice recommendations.

Results

Evidence Reviews:

1. A review of existing guidelines on the use of sedation for colonoscopy identified consensus on the ability of nurses to assist with administration and monitoring of patients undergoing colonoscopy with moderate sedation and the requirement for an anesthesia provider to administer deep sedation. Recommendations for all other areas of sedation practice, including agents recommended for use, were not consistent.
2. There were no statistically significant differences in hospital admission, mortality, aspiration, splenic injury, myocardial infarction, stroke, polyp detection rate, cecal intubation rate, or patient satisfaction between anesthesia and non-anesthesia provider administered sedation.
3. When propofol was compared to traditional agents, there were no differences in the incidence of serious complications. Rates of complications and intra-procedural cardiorespiratory events were low regardless of agent administered.
4. Although no statistically significant differences were found in the rate of cardiorespiratory events between commonly used agents, there was a trend towards fewer events when short-acting opioids were used alone and more events when long-acting opioids (e.g. meperidine) were combined with benzodiazepines.
5. The limited data on satisfaction and efficiency outcomes demonstrated a trend toward greater post-procedure satisfaction and shorter procedure times (<2-minute difference) with propofol; however, these differences were small and no differences were found in patient reports of pain or in patient recovery time.
6. In a published Cochrane review, the use of Propofol was associated with reduced recovery time and higher patient satisfaction, however there was no difference in procedure time.

Only one study published in abstract form with no subsequent peer-reviewed publication demonstrated a difference in cecal intubation rate.

Cost Analysis: We identified 275,543 hospital-based colonoscopies performed in the 2014/2015 fiscal year, 45% of which were performed with anesthesia. Cases involving anesthesia cost \$152.27 more than cases performed without anesthesia and the use of anesthesia had an overall budget impact of over 18 million dollars. A trend of increasing use of anesthesia was seen over the 10 fiscal years across all LHINs; however, we identified significant variability in anesthesia use between LHINs (range 5-95%) (**Figure 2**).

Expert Panel: The 32 experts attended a 1.5 hour webinar to familiarize them with the results of the systematic reviews and to clarify / discuss any outstanding questions. 29 of the 32 invited multidisciplinary experts responded the pre-meeting surveys. While all outcomes were considered important by panel members, the most important factors/outcomes to be considered when evaluating methods of sedation for routine colonoscopy were safety, death, cardiorespiratory outcomes, and procedural complications (**Figure 3**). A total of 27 panel members voted on 9 practice recommendations before the meeting. Consensus was achieved for all recommendations (**Table 1**).

31 experts attended the 1-day expert panel meeting where the findings of Specific Aims 1 and 2 were reviewed and the results of the pre-meeting survey presented and discussed (**Appendix 4**). The day consisted of presentations by the study team, guest speaker presentations, and small and large group discussions (**Appendix 2**). Suggestions were made regarding wording of the practice recommendations. Small group breakout sessions identified several patient groups that would warrant consideration of deep sedation and multiple strategies that could be implemented before, during, and after colonoscopy to enhance the patient experience under moderate sedation (**Appendix 3**). Overall, attendees rated the stakeholder meeting as well organized, engaging, and a stimulant of honest discussion (**Appendix 5**).

After the meeting, the practice recommendations were reworded and further feedback solicited from panel members. A final round of voting on the reworded practice recommendations was conducted. Agreement was greater than 80% for all practice recommendations indicating a high level of panel consensus on the recommendations (**Table 2**).

Project Scope

Our research focused on routine colonoscopy, however the use of deep sedation has increased for other routine endoscopic procedures (gastroscopy and flexible sigmoidoscopy) over the same period. Although these procedures were not specifically considered, the conclusions of this work should apply to the use of sedation for these routine endoscopic procedures as well. Our work also focused on routine hospital-based outpatient colonoscopy as the majority of colonoscopy in Ontario is performed in hospitals. Our systematic reviews were not limited by the colonoscopy setting and thus findings from the literature are broadly applicable to routine colonoscopy performed in any setting (i.e. both hospital-based and clinic-based routine colonoscopy).

Conclusions and Future Directions

A review of the evidence for sedation practices for routine hospital-based colonoscopy was conducted and found little difference in outcomes for routine colonoscopy with the use of moderate or deep sedation – either method was very safe. The costs associated with deep sedation / anesthesia delivered sedation for routine hospital-based colonoscopy was substantial (18 million dollars in

2014/15). Nine practice recommendations were voted on by a multidisciplinary panel and a high level of consensus was achieved. Multiple additional strategies to optimize patient selection for deep sedation and to improve the patient experience were identified.

The appropriate use of moderate and deep sedation for routine colonoscopy can improve patient and provider satisfaction, and potentially lead to significant cost savings or enable investment in other activities (such as implementation of population-based screening with Fecal Immunohistochemistry Testing) in Ontario. Changing practice in the province will require the engagement of hospitals, patients, professional associations, endoscopists, trainers, and the Ontario Ministry of Health and Long-Term Care to ensure safe, effective, and efficient colonoscopy while maintaining / achieving an excellent patient experience.

Lay Summary

Colonoscopy can be used as a screening test for colon cancer or as a diagnostic test in patients who have signs or symptoms of colorectal disease. Colonoscopy allows the endoscopist to visualize the entire colon but can be uncomfortable for patients and create anxiety. Sedation is recommended for most patients to reduce discomfort and anxiety during colonoscopy and various levels of sedation can be used for the procedure. Patients who undergo colonoscopy under moderate sedation (asleep but easily awoken) are commonly monitored by the endoscopist and a trained nurse, whereas those who undergo deep sedation (asleep and not easily awoken) are monitored by an anesthesia professional. These differences in depth of sedation and monitoring can lead to differences in the patient experience and can greatly impact the cost of the procedure. Currently, there is no guidance for endoscopists in selecting the most appropriate method of sedation for patients undergoing routine hospital-based colonoscopy.

We conducted a research study to inform the development of recommendations for practice that will guide the use of anesthesia and sedation for colonoscopy. Our work involved: 1) reviews of previously published studies evaluating and comparing sedatives used for colonoscopy, 2) a comparison of the cost of colonoscopies performed with and without an anesthesia provider, and 3) a stakeholder meeting to obtain consensus on practice recommendations that will guide the use of sedation for colonoscopy.

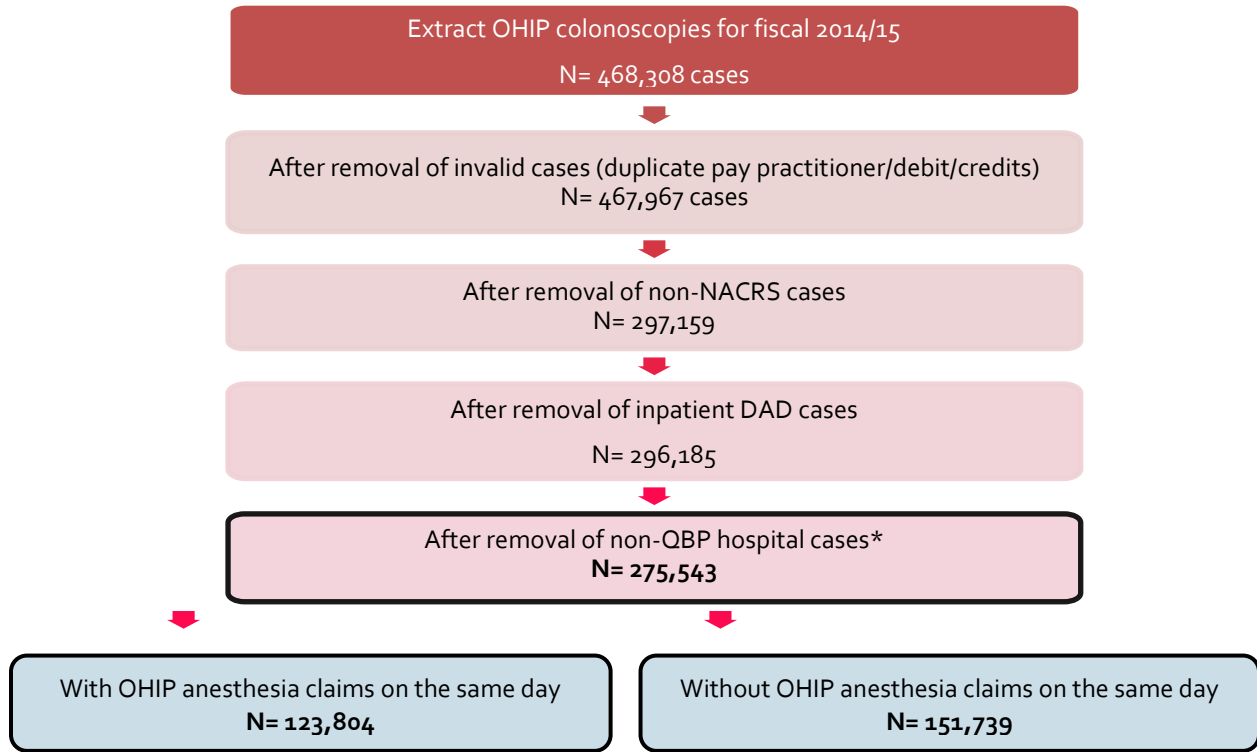
Our review of the evidence for sedation found few differences between the various sedatives that can be used for colonoscopy. There were no differences in complication rates for patients having deep and moderate sedation. Deep sedation appeared to result in greater patient satisfaction and shorter procedure time than moderate sedation; however, these differences were small.

On review of colonoscopies performed in Ontario in 2014-2015, we found that each procedure performed with an anesthetist present cost \$152.27 more than a procedure performed without anesthesia. Overall, over 18 million dollars were spent for anesthesia providers to be present for routine hospital-based colonoscopies performed during this period. We found a wide range in the proportion of colonoscopies performed with anesthesia across the various geographical regions of the province but an overall trend towards increasing use of anesthesia throughout Ontario.

Thirty-one stakeholders, including members of the public, attended a 1-day meeting where these findings were presented and agreement on guiding principles for the use of sedation was obtained. Experts agreed that safety considerations were extremely important and that the use of deep sedation was warranted in select cases. Strategies to enhance the experience of patients undergoing colonoscopy under moderate sedation were also explored. The stakeholders voted on practice recommendations and reached agreement that all endoscopists should be able to perform colonoscopy under moderate sedation safely and effectively and that no hospitals should mandate the use of deep sedation. The stakeholders agreed that endoscopists could administer and monitor patients under moderate sedation with the assistance of a trained nurse who is helping with the procedure, but select patients benefit from deep sedation and/or monitoring by an anesthesia provider. Changing practice in the province will require the engagement of hospitals, patients, professional associations, endoscopists, trainers, and the Ontario Ministry of Health and Long-Term Care to ensure safe, effective, and efficient colonoscopy while maintaining / achieving an excellent patient experience

Figures

Figure 1. Methodology for cost analysis.



*QBP hospitals with shadow billings were also removed from the analysis

Figure 2. Ten-year trend by LHIN

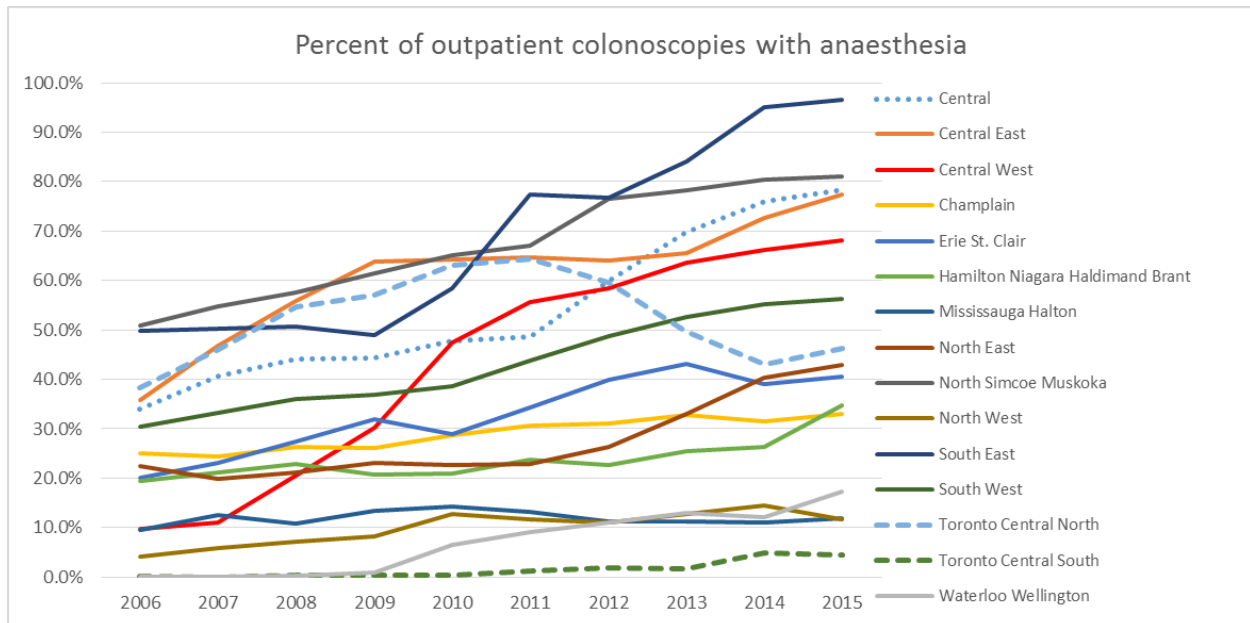


Figure 3. Results of values assessment (n = 29)

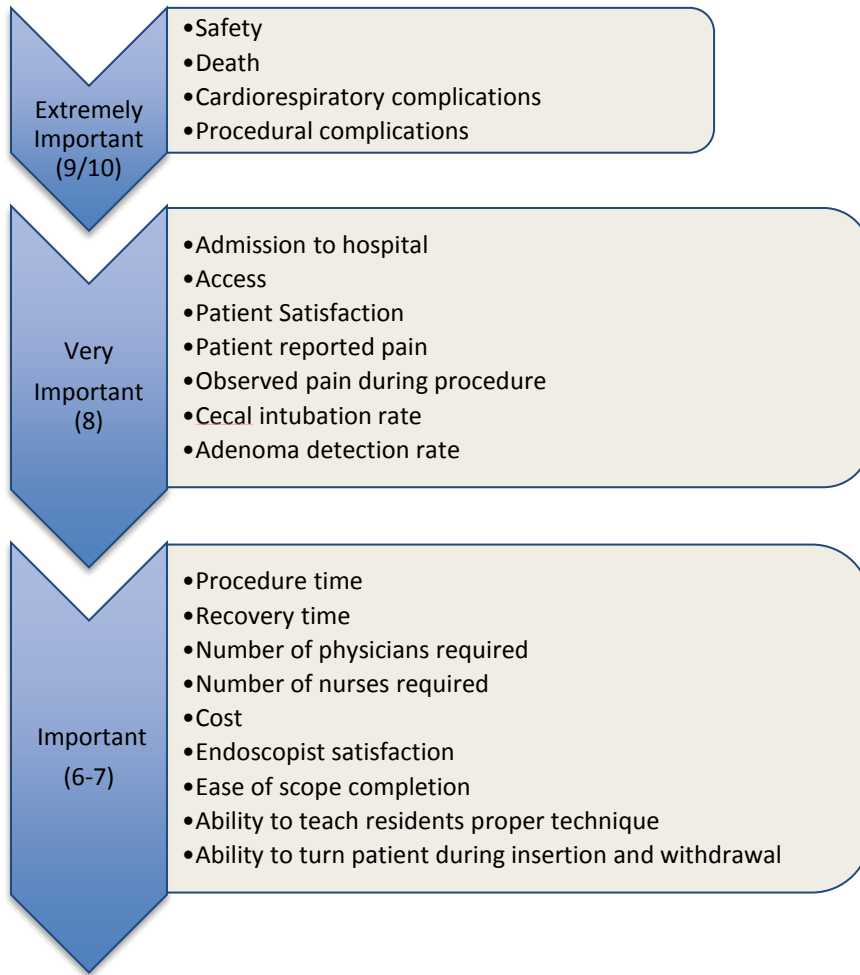


Table 1. Preliminary practice recommendations and % of agreement

Preliminary Practice Recommendations	# of respondents	Strongly Agree/ Agree	Unsure	Disagree/ Strongly Disagree	No option/ Lack of expertise
1. All endoscopists should be able to perform routine colonoscopy safely and effectively on most patients using moderate sedation.	29	90%	3%	7%	0
2. Endoscopists unable to perform colonoscopy safely and effectively with moderate sedation should undergo additional training.	27	81%	11%	4%	4%
3. For routine colonoscopy, endoscopists can safely administer moderate sedation.	27	78%	7%	11%	4%
4. For routine in-hospital colonoscopy under moderate sedation, a single RN can monitor the patient and perform brief interruptible tasks.	27	74%	11%	15%	0%
5. Select patients undergoing routine colonoscopy may benefit from deep sedation.	27	89%	7%	0%	4%
6. For routine colonoscopy, deep sedation should not be institutionally mandated.	27	85%	7%	4%	4%
7. Deep sedation for colonoscopy should only be administered by an anesthesia provider.	27	82%	11%	7%	0%
8. For colonoscopy under deep sedation, an anesthesia provider should be responsible for monitoring the patient and should not be responsible for any additional tasks.	27	85%	11%	4%	0%
9. Select patients undergoing colonoscopy benefit from having sedation administered and monitored by an anesthesia provider, irrespective of level of sedation.	27	67%	18%	11%	4%

Table 2. Final practice recommendations and % of agreement.

Final Practice Recommendations	# of respondents	Strongly Agree/ Agree	Unsure	Disagree/ Strongly Disagree	No option/ Lack of expertise
1. All endoscopists performing colonoscopy should be able to complete colonoscopy safely and effectively (per accepted benchmarks) using moderate sedation or less.	28	93%	0%	3.5%	3.5%
2. Endoscopists unable to complete colonoscopy safely and effectively (per accepted benchmarks) using moderate sedation should undergo additional training.	28	89%	7%	4%	0%
3. For patients undergoing routine colonoscopy, endoscopists can safely administer and monitor moderate sedation with the assistance of a trained nurse.	28	89%	7%	4%	0%
4. For routine in-hospital colonoscopy under moderate sedation, a single RN can both monitor the patient and perform brief interruptible tasks.	28	86%	3%	11%	0%
5. Select patients undergoing routine colonoscopy may benefit from deep sedation.	28	93%	3.5%	0%	3.5%
6. Institutions will not mandate the use of deep sedation for routine colonoscopy.	28	93%	0%	3.5%	3.5%
7. Deep sedation for colonoscopy should only be administered by an anesthesia provider.	28	82%	11%	7%	0%
8. For routine colonoscopy under deep sedation, an anesthesia provider will be responsible for monitoring the patient and should not be responsible for additional tasks.	27	93%	3.5%	3.5%	0%
9. Select patients undergoing colonoscopy, such as those with severe comorbidities, may benefit from having sedation administered and monitored by an anesthesia provider, irrespective of level of sedation.	27	96%	0%	4%	0%

Appendices

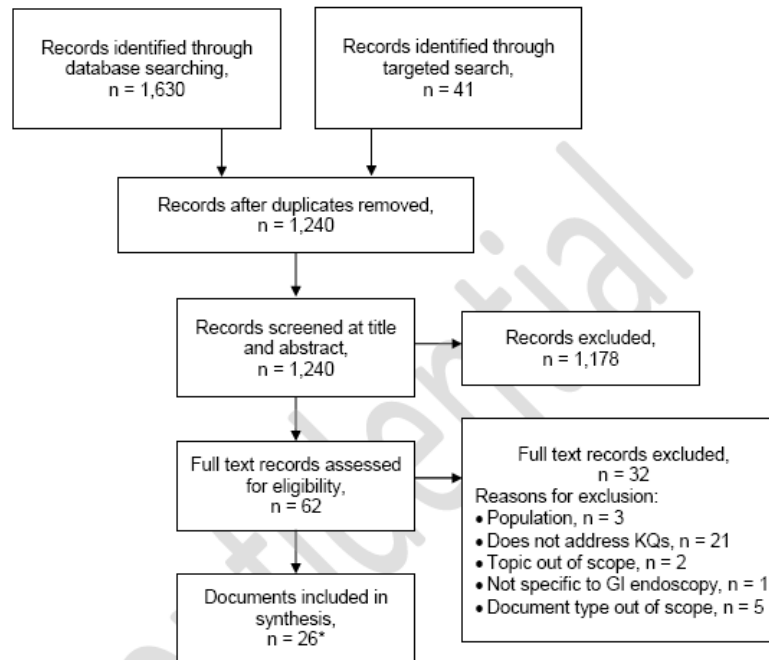
Appendix 1. Systematic Reviews

1. Sedation practices for routine colonoscopies and gastroscopy procedures: a guideline review

Objective: The objective of this guideline review was to identify and synthesize recommendations from existing guidelines and position statements relating to sedation practices for routine colonoscopy and gastroscopy procedures.

Methods: To conduct this guideline review PubMed, guideline databases and the websites of relevant professional associations and Canadian provincial and territorial ministries of health were searched from January 1, 2005 to February 6, 2017 for relevant English-language guidelines and position statements.

Integrated search and selection diagram:



* Two citations [25,26] were considered companion documents and treated as one result; the updated search identified updated versions [30,32,33] for three documents [17,22,28] included in the original review, only the most recent versions of these documents were included in the synthesis.

Conclusion: The results of this guideline review demonstrated a general consensus regarding the recommended skills and training for those administering sedation or monitoring sedated patients, and the type of monitoring equipment that should be used. Across documents, variations were observed in the recommended classes of drugs for sedating patients, the type of health care professionals responsible for administering sedation or monitoring patients and the number of healthcare professionals that should be present during the procedure. Variations are likely a result of differences in sedation practices and policies across jurisdictions.

Disclaimer: This Summary may not provide a complete reflection of the methodology used in and results obtained from this review. Please consult the full report for more details.

2. Propofol for sedation during colonoscopy gastrointestinal endoscopy procedures: a systematic review

Harminder Singh, William Poluha, Mary Cheang, Nicole Choptain, Ernest Inegbu, Ken Baron, Shayne P Taback

Background: Propofol is increasingly used for sedation during colonoscopy, with many recent reports of randomised controlled trials (RCTs) and large non-randomized case series. **Objectives:** The primary objective was to identify, analyze and summarize RCTs comparing the relative effectiveness, patient acceptance and safety of propofol for colonoscopy, to traditional sedatives (narcotics and/or benzodiazepines). The secondary objective was to synthesize the studies comparing propofol administration by anaesthesiologists to that by non-anaesthesiologists for sedation during colonoscopy.

Search methods: We searched Pubmed, Cancerlit, EMBASE, CINAHL, LILACS, Biological Abstracts, Web of Science and the Cochrane Controlled Trials Registry database between January 1980 and June 2007; and conference proceeding abstracts for DDW, EUGW and ACG between 1990 and June 2007. There were no language restrictions. For this update, searches were repeated for articles and abstracts published between July 2007 and December 2010.

Selection criteria: Randomized controlled trials comparing use of propofol and traditional agents or administration of propofol by anaesthesiologists to that by non-anesthesiologists for sedation during colonoscopy.

Data collection and analysis: Two reviewers independently extracted the data. The data were pooled using the Cochrane Collaborations' methodology and statistical software RevMan 5.1.

Main results: Twenty two studies met the inclusion criteria for the primary objective in this updated review, in which we have included results from three additional publications. Many of the studies had a potential of moderate to high risk of bias and combining data for some of the outcomes was problematic. Most studies included only healthy out-patients. Recovery (11 studies; 776 patients) and discharge times (7 studies; 542 patients) were shorter with use of propofol. There was higher patient satisfaction with use of propofol (10 studies, 819 patients; OR for dissatisfaction 0.35, 95% CI 0.23, 0.53). There was no difference in procedure time (9 studies; 736 patients) or complication rates. There was no difference in pain control with non- patient controlled sedation (PCS) use of propofol as compared to the traditional agents (5 studies, 396 patients; OR 0.90; 95% CI 0.58, 1.39). There was only one study (94 patients) comparing administration of propofol by anaesthesiologists to that by non-anesthesiologists for sedation during colonoscopy, with no difference in procedure time or patient satisfaction.

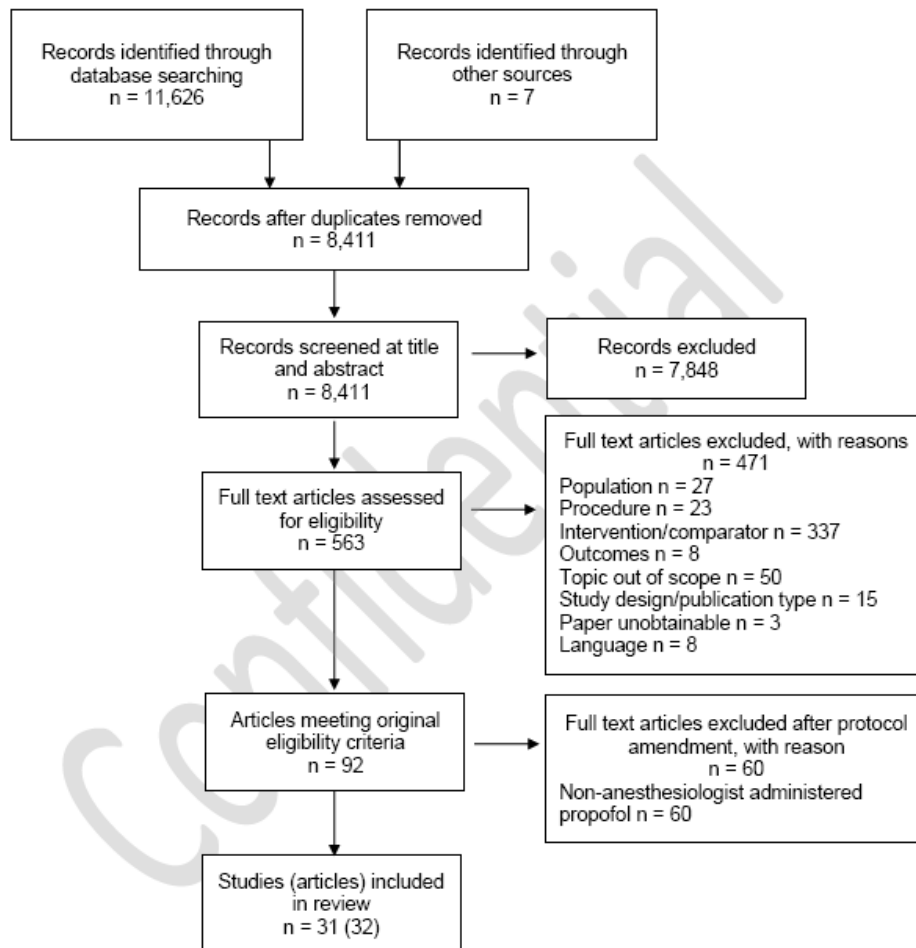
Authors' conclusions: Propofol for sedation during colonoscopy for generally healthy individuals can lead to faster recovery and discharge times, increased patient satisfaction without an increase in side-effects. For the comparison of propofol administration by anaesthesiologists to that by non-anesthesiologists, we found insufficient high quality evidence. There is a need for better quality studies, with double blind randomizations, reporting of allocation concealment and more standardized reporting of outcomes.

[Cochrane Database Syst Rev.](#) 2008 Oct 8;(4):CD006268. doi: 10.1002/14651858.CD006268.pub2.

3. Administration of sedation by anesthesia providers in routine gastrointestinal endoscopy procedures: a systematic review

Objective: To find and synthesize evidence on how administration of sedation by anesthesia providers impacts the quality, efficacy, cost and safety of routine GI endoscopy procedures as compared to non-propofol sedation provided without an anesthesia provider present.

Data sources: We searched PubMed, EMBASE, the Cochrane Database of Systematic Reviews and the National Health Service Economic Evaluation Database for studies published in English between January 1, 1969 and May 27, 2016. Reference lists of included studies and on topic systematic reviews were checked and advisory group members were asked to identify relevant citations.



Conclusion: The results of this review indicate that for colonoscopy there is no statistically significant difference in hospital admission, mortality, splenic injury, myocardial infarction, stroke, PDR, CIR and patient satisfaction with care depending on whether sedation is administered by anesthesia or non-anesthesia providers. For other colonoscopy-related outcomes and for all outcomes across the other procedure categories the evidence was sparse, inconsistent, incomplete and unclear.

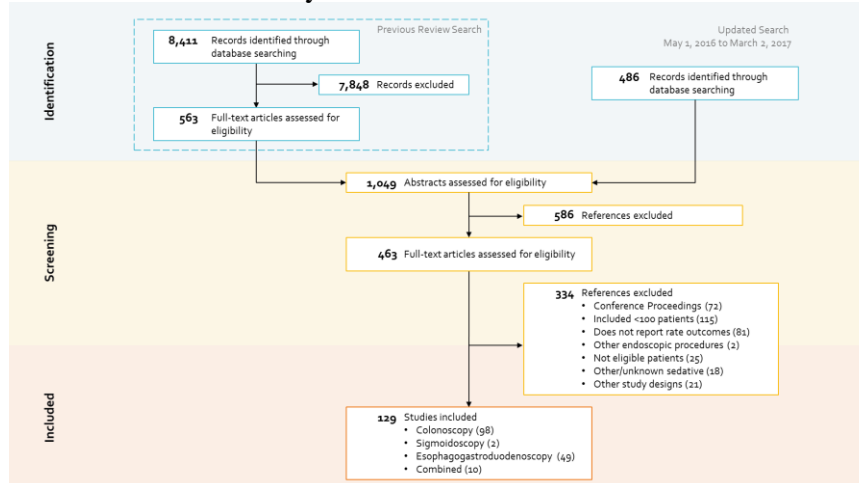
Disclaimer: This Summary may not provide a complete reflection of the methodology used in and results obtained from this review. Please consult the full report for more details.

4. Serious complications of sedation for gastrointestinal endoscopy: a systematic review and meta-analysis

Introduction: Sedation used for endoscopy can decrease patient-reported pain and improve the overall patient experience. However, sedative agents associated with agent-specific risks of cardiorespiratory and procedure-related complications. Previous meta-analyses of complications related to sedation for gastrointestinal endoscopy (GIE) are limited to data from randomized clinical trials (RCTs). However, RCTs may not adequately capture uncommon, but serious, complications. We, therefore, aimed to quantify the incidence of serious complications in patients who underwent routine GIE under sedation by using data from a broader range of study designs.

Methods: A rapid review methodology was used. PubMed, EMBASE, Cochrane, NHS Economic Evaluation Database were searched from inception to March 2, 2017 for RCTs and cohort studies including at least 100 patients undergoing average-risk GIE under sedation and reporting rare complications. We pooled the incidence of uncommon complications using generalized linear random/mixed-effects meta-analysis models and an exact likelihood approach based on a Poisson distribution by type of GIE procedure and type of sedation: deep sedation with propofol and conscious sedation using narcotics and/or benzodiazepines. Uncommon complications included gastrointestinal perforation, aspiration, respiratory distress (including respiratory arrest, bag-mask ventilation or endotracheal intubation), cardiac arrest, gastrointestinal bleeding, admission to hospital within 30 days from GIE, and death from any cause.

PRISM flow chart of study selection



Conclusion: Uncommon outcomes were rare with any type of sedation and no significant differences were observed by type of sedation. Perforation, aspiration, respiratory distress, cardiac arrest, admission to hospital, and death were very infrequent following colonoscopy with any type of sedation, with event rates below 10 cases per 10,000 procedures. The incidence of bleeding was slightly higher, with event rates between 10 and 30 cases per 10,000 procedures. No significant differences were observed by type of sedation.

Disclaimer: This Summary may not provide a complete reflection of the methodology used in and results obtained from this review. Please consult the full report for more details.

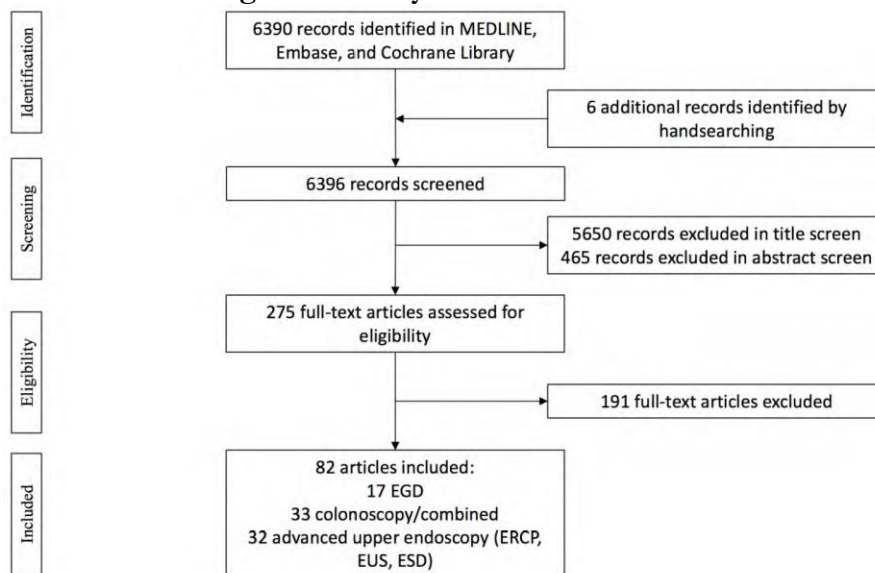
5. Sedative-related cardiorespiratory events in lower gastrointestinal endoscopy: a systematic review and network meta-analysis

Background: Previous meta-analyses have attempted to evaluate the safety of sedatives; however, these reviews have been limited to assessing propofol against a group of all non-propofol agents. No previous studies have compared the safety of the various commonly used sedative combinations against one another.

Objective: To compare the frequency of adverse cardiorespiratory events among the various sedative combinations used in gastrointestinal endoscopy.

Methods: We conducted a systematic review and network meta-analysis to evaluate the frequency of cardiorespiratory events among the various sedatives used in lower endoscopy. We searched MEDLINE, EMBASE, and the Cochrane Library from inception to March 28, 2017 for randomized controlled trials comparing sedatives used for gastrointestinal endoscopy. Citations were screened by two reviewers for inclusion. Data on study, patient, and sedative characteristics were extracted from studies selected for inclusion by a single reviewer. The primary outcome was the frequency of cardiorespiratory events, defined as intra-procedural episodes of hypotension or hypoxemia. Sedatives evaluated included short-acting opioids, long-acting opioids, benzodiazepines, propofol, short-acting opioids + benzodiazepines, long-acting opioids+benzodiazepines, and short-acting opioids+propofol. We conducted a random-effects Bayesian network meta-analysis using Markov Chain Monte Carlo simulation methods to generate risk ratios (RR) and 95% credible intervals (CrI) for each comparison. We plotted cumulative ranking probabilities based on estimates generated by the network meta-analysis.

PRISMA flow diagram of study selection



Conclusion: The use of short-acting opioids alone is associated with fewer cardiorespiratory events than the combination of long-acting opioids and benzodiazepines. No other comparisons of sedative combinations used for lower gastrointestinal endoscopy demonstrated statistically significant differences in the frequency of cardiorespiratory events.

Disclaimer: This Summary may not provide a complete reflection of the methodology used in and results obtained from this review. Please consult the full report for more details.

Appendix 2. Development of practice recommendations for the use of sedation in routine colonoscopies expert panel member meeting invitation

Sent on behalf of Dr. Nancy Baxter and Research Team with the support of Cancer Care Ontario

Dear Dr. _____,

Our research team is currently in the process of developing policy recommendations for the use of sedation for routine hospital-based colonoscopies and require expert guidance. To date, our team has completed a systematic review of guidelines for sedation practices for routine colonoscopy and gastroscopy procedures, a systematic review on serious complication related to the use of sedation, a network meta-analysis on the impact of type of sedation on colonoscopy outcomes, and a systematic review on sedation administration by anesthesia provider for routine GI endoscopy procedures. We have worked with Cancer Care Ontario to evaluate the trends and current rates of anesthesia use for routine hospital-based colonoscopy in Ontario and have completed a cost evaluation of hospital-based colonoscopy with and without the use of anesthesia in the province.

We are planning to convene a 1-day expert panel with clinicians, policy-and decision-makers, and members of the public from across Canada to present our findings and to develop consensus that will guide recommendations for the use of sedation in routine colonoscopies.

Your participation and input would be highly valued by our team. The Terms of Reference for the expert panel has been attached for your information. Your expected involvement would include attendance at a 1 day panel meeting on June 9 (8:00 – 3:30 pm) and a 90 minute pre-meeting webinar that will be offered on several dates/times in May. We will cover the cost of travel to the meeting and accommodation.

We look forward to your participation in this important piece of work. Please let us know if you are willing to participate in the panel by emailing Anne Sorvari (sorvaria@smh.ca) by March 31, 2017.

Thank you very much for your consideration,

Nancy

Dr. Nancy Baxter
Professor of Surgery
St. Michael's Hospital
University of Toronto

Appendix 3. Development of practice recommendations for the use of sedation in routine colonoscopies.

Agenda

Date: June 9, 2017

Location: St. James Cathedral, 65 Church Street

Time: 8:00am – 3:30pm

TIME	ACTIVITY & OBJECTIVES	LEAD
8:00-8:30	Registration and Breakfast	
8:15-8:30	Welcome, Meeting Objectives, Overview of Day	Anna Gagliardi
8:30-9:15	Recap on Research to Date, update from Webinar Feedback, Ontario Budget Data	Nancy Baxter
9:15-9:30	Optimising sedation for gastrointestinal endoscopy, the UK experience	Roland Valori
9:30-9:45	Question & Answer	Anna Gagliardi
9:45-10:00	BREAK	
10:00-10:30	Sedation practices for routine colonoscopy, the VA perspective	Jason Dominitz
	Sedation practices for Screening Colonoscopy at the Colon Cancer Screening Centre, the Alberta perspective	Bob Hilsden
	Monitoring and Levels of Sedation in Canada	Matt Kurrek
10:30-11:00	Question and Answer Period	Anna Gagliardi
11:00-11:30	Small Group Activity # 1: Who needs deep sedation for routine colonoscopy	
11:30-12:00	Report back to group and discussion	Anna Gagliardi
12:00-12:30	LUNCH	
12:30-1:00	Small Group Activity #2: How do we enhance the patient experience with routine colonoscopy under moderate sedation?	
1:00-1:30	Report back to group	Anna Gagliardi
1:30-2:00	Consensus Development	Anna Gagliardi
2:00-2:15	BREAK	
2:15-3:30	Consensus Development Continued + Next Steps	Anna Gagliardi
3:30	ADJOURNMENT	

This initiative was funded by Cancer Care Ontario.

Appendix 4. Small group activities

Small Group Activity # 1: Who needs deep sedation for routine colonoscopy?

- Discuss and report factors that may warrant consideration for the use of deep sedation
 - Patient factors/characteristics
 - Contextual factors

• Chronic opiate users	• Anesthesiologist on hand/readily available
• Patients who have failed with moderate sedation in the past due to discomfort	• Smaller centres/hospitals depend on anesthesiologist as a revenue stream
• Hypersensitivity to traditional sedation agents leading to vomiting and nausea	• May use anesthesiologist because they need to provide them with enough cases to keep them employed
• History of sexual abuse	• Pediatric patients
• IBS patients	• Patient preference
• Complex EMR	• Lengthy procedure
• Fibromyalgia	• Previous procedure
• Patients with cognitive disabilities (dementia)	• Previous diverticulitis
	• Skill level of endoscopist
	• Patient is alone

Small Group Activity # 2: How do we enhance patient experience under moderate sedation?

- Discuss strategies to optimize patient satisfaction and minimize pain

• Provide friendly, clean environment for the patient
• Educate the patient regardless of the sedation they will receive (standardized learning materials – not just a prep sheet) <ul style="list-style-type: none"> • Information about what to expect before, during and after procedure • Start educating the patient as early as possible • Train all staff in proper education protocols
• Prepare patient for possibility of pain/discomfort
• Communicate & listen to the patient <ul style="list-style-type: none"> • Address concerns & answer questions • Build a rapport • Address language barriers if necessary
• Continual education/improvement for medical staff

<ul style="list-style-type: none">• Skill enhancing courses for endoscopists and nurses (need infrastructure to make this mandatory)
<ul style="list-style-type: none">• Endoscopist report card (patient rates comfort level during procedure)
<ul style="list-style-type: none">• Use patient feedback to improve
<ul style="list-style-type: none">• Ensure patient is comfortable (temperature of room, choice in music, etc.)
<ul style="list-style-type: none">• “Time out” before, during and after procedure
<ul style="list-style-type: none">• Use of narcotics to minimize recall of pain when necessary
<ul style="list-style-type: none">• Communicate with patient during the procedure (warn about any discomfort they may feel)
<ul style="list-style-type: none">• Allow family member in room with certain patients (ex. Patients who are hearing impaired)
<ul style="list-style-type: none">• Skilled IV placement
<ul style="list-style-type: none">• Patient-controlled sedation
<ul style="list-style-type: none">• Titration of sedation dosage
<ul style="list-style-type: none">• Start patient lightly sedated & increase sedation if necessary
<ul style="list-style-type: none">• Use of abdominal pressure & variation in patient positioning
<ul style="list-style-type: none">• Use of CO2 instead of air<ul style="list-style-type: none">• Carbon dioxide helps in the recovery phase• Patients report less pain following procedure

Appendix 5. Final list of attendees at the development of consensus guidelines for the use of sedation in routine in-hospital colonoscopies expert panel meeting.

Specialty	Attendee	Affiliation
Anesthesia	Eric Goldszmidt	Assistant Professor, Department of Anesthesia University of Toronto Deputy Anesthesiologist-in-Chief, Mount Sinai Hospital
	Matt Kurrek	Associate Professor, Department of Anesthesia University of Toronto
	Sue Belo	Chair, Medical Advisory Committee Anesthesiologist-in-Chief, Sunnybrook Health Sciences Centre
	Fred Baxter	Associate Clinical Professor, Division of Clinical Care Department of Anesthesia, McMaster University
	Brent Kennedy	Chair of Anesthesia, Northern Ontario School of Medicine, Health Sciences North
Endoscopists	Roland Valori	Clinical Advisor, Healthcare Quality Improvement Partnership London Clinical Lead for CRC, Public Health England
	Jason A. Dominitz	National Program Director for Gastroenterology, Department of Veteran’s Affairs Gastroenterology Section Chief, VA Puget Sound Health System Professor of Medicine, Gastroenterology Division, University of Washington School of Medicine
	Chris Vinden	Associate Professor, Department of Surgery University of Western Ontario
	David Armstrong	Gastroenterologist Hamilton Health Sciences McMaster University
	Stan Feinberg	Medical Director, Ambulatory and Cancer Care Program, North York General Hospital

	Iain Murray	President, Ontario Association of Gastroenterology
	Clarence Wong	Medical Lead, Alberta Colorectal Cancer Screening Program
	Andrew Bellini	Regional Lead, Colorectal /GI Endoscopy Mississauga Halton Central West Regional Cancer Program
	Robert J. Hilsden	Associate Professor, Cumming School of Medicine University of Calgary Director of Research, Alberta Health Services Colon Cancer Screening Program
Cancer Care Ontario	Nancy Baxter	GI Endoscopy Provincial Lead, Cancer Care Ontario Professor of Surgery, University of Toronto
	Catherine Dubé	Clinical Lead, ColonCancerCheck Program Associate Professor, Department of Medicine, Division of Gastroenterology, University of Ottawa
	Jill Tinmouth	Scientific Lead, ColonCancerCheck Staff Physician, Sunnybrook Health Sciences Centre
	David Morgan	Provincial Lead, Colonoscopy Quality Management Program Associate Professor, Division of Gastroenterology, Department of Medicine, McMaster University
Public Representatives	Roslyn Doctorow	Volunteer Patient and Family Advisor Cancer Care Ontario
	Anne Newman	Volunteer Patient and Family Advisor Cancer Care Ontario
Administrators / Fundors	Michael Klar	Medical Consultant, Negotiations Branch Ministry of Health and Long Term Care
	Tim Rice	Director, Medicine and Family Medicine Services, London Health Science Centre – Victoria Hospital
	Farah Khan	Regional Director, Mississauga Halton Central West Regional Cancer Program
Cost-Effectiveness Experts	Nicole Mittman	Chief Research Officer, Analytics & Informatics, Cancer Care Ontario

	Beate Sander	Director of Population Health Economics, Toronto Health Economics and Technology Assessment (THETA) Collaborative Toronto General Hospital Research
Endoscopy Nursing	Claudette Booth	Manager, Clinical Programs Humber River Regional Hospital
	Jacque Ho	Interim Director of Surgery, Orthopedics, MDRD & Rehabilitation Scarborough and Rouge Valley Hospitals
	Mae Burke	Clinical Leader Manager, Therapeutic Endoscopy St. Michael's Hospital
Hospital Endoscopy Program Managers	Adam Lamoureux	Corporate Program Manager, Endoscopy Program The Ottawa Hospital
	Dianne Pletz	Program Manager, Endoscopy St. Mary's General Hospital
Regulators	Shandelle Johnson	Manager, Practice Assessment & Enhancement Department, College of Physicians and Surgeons of Ontario
Facilitator*	Anna Gagliardi	Scientist, Toronto General Hospital Research Institute (TGHRI)
CCO Support*	Michelle Helm	Group Manager, Implementation, Cancer Screening
	Zahrah Khalid	Team Lead, Implementation, Cancer Screening
	Bronwen McCurdy	Group Manager, ColonCancerCheck/GI Endoscopy, Cancer Screening
	Melissa Coulson	Director, Implementation, Cancer Screening
	Shamara Baidoobonso	Team Lead, Evidence and Program Integration, Cancer Screening

* the meeting facilitator and CCO support staff were not members of the panel and did not vote on practice recommendations

Appendix 6. Summary of consensus guidelines meeting evaluation.

Criteria	Disagree						Agree	Responses averaged
	1	2	3	4	5	6	7	
The goals and objectives of the meeting were clear	1	2	3	4	5	6	7	5.9
The meeting was well organized	1	2	3	4	5	6	7	6.7
Length of meeting was appropriate	1	2	3	4	5	6	7	6.3
Presentations contributed to my understanding	1	2	3	4	5	6	7	6.4
Breakout activities were well prepared and encouraged collaboration	1	2	3	4	5	6	7	6.3
Full group discussion generated useful ideas	1	2	3	4	5	6	7	6.5
I had adequate opportunity to express my thoughts relative to the topics discussed	1	2	3	4	5	6	7	6.6
I felt heard and able to contribute	1	2	3	4	5	6	7	6.7
The meeting stimulated participation and interaction among health care providers, advocacy groups and patients	1	2	3	4	5	6	7	6.4
	Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied			Responses averaged
How would you rate your overall satisfaction with this meeting?	1	2	3	4	5			4.7

What did you like best about this session?

- Very interactive, good discussion, excellent speakers
- Group participation, experts
- Discussions and presentations from other jurisdictions
- Well organized, productive
- Group discussions, hearing about practices in different settings (across Canada/internationally)
- Input from a variety of stakeholders was very interesting
- Open forum, lots of time for discussion
- Interactive discussion
- Opportunity to share perspectives from our diverse backgrounds and mix-up at the tables
- Open discussion with participants from multiple disciplines and locations! The international speakers were excellent and were a good addition.
- Intimate group
- Group interaction

- Time for group discussion
- Hearing perspectives from a different healthcare
- Open discussion. Honesty
- Amazing work! Complex topic, you managed the meeting so that key ideas were clear, a common direction was adopted and everyone was able to speak their mind
- Interactive discussion - multi-stakeholder input
- Comprehensiveness, lots of voices
- Open discussion
- Presentations (but could have been shorter), small group discussions
- Interesting and informative
- Presentations were fantastic and appreciated. Group + open discussions were insightful

What could we have done differently to make this a better experience for you?

- Better explanations of survey right before
- Voting pads for immediate feedback
- Clear direction about the outcome of the consensus statements - created too much confusion/misunderstanding among participants
- Very well organized - the pre meeting info was great, the webinar was very helpful
- Voting (clickers) for the last portion of the day to get consensus
- Maybe run over Fri/Sat morning with the Saturday morning being a wrap-up and voting on guidelines. Would have been useful to have OHIP representative and data from outpatient centers
- It was unclear to me what the purpose of this meeting was for, but I suspected a hidden financial agenda
- Cocktails after
- Project timelines - from webinar to publication so we know the duplication
- Perhaps more community based practitioners as participants (both anesthesiologists and endoscopists in OHPs) - I know that this was not planned as part of scope but we ended up discussing + plan to write on it - might not be quite fair w representatives
- The breakout groups could have focused more on the controversial issues
- Include OHP providers
- I can picture future meetings/workshops to work at the implementation of this likely through QMP
- Brighter slides, more microphones, perhaps on-site voting keypads
- Excellent process, looking forward to next steps
- Be more upfront and transparent; talk about this being primarily about funding and not about quality
- Some clinical definitions re acronyms

- None. Fantastic and well organized Brainstorming in person.

Other thoughts or feedback you'd like to share:

- Wish this info was available to endoscopists in my hospital, Came away with projects that would like to implement in our endoscopy unit
- A difficult topic - hopefully the output will be valuable in directing change
- Would have liked statement on main driver for developing these guidelines
- Great job!
- Well done and well organized. Also appreciated all the preparatory work
- "Anesthesia" is not a commodity to be bartered away lightly
- Agree with voting independently afterwards
- Well run!
- Process of policy development should have been clear. The pre-vote was prior to discussion, thus you can't rely even on 90% agreement. Discussion changes
- Loved it
- Thank you
- Acoustics
- Thank you. It will be interesting to see how this evolves in the province

Appendix 7. Comments and responses from panel members.

The report was circulated in draft to all panel members for comment, and amended based on feedback as follows:

Dr Matt Kurrek

Comment

1. setting the threshold at 60% to declare 'consensus' - this allows you to declare that 'consensus was achieved for all recommendations' - is highly questionable

Response

60% agreement indicates more the plurality, however given that we achieved over 80% agreement for all statements the minimal threshold is not of major importance.

Comment

2. Twenty-six percent of the participants (26%!) were either unsure or frankly disagreed with the statement that a single RN could both monitor the patient and perform 'brief interruptible tasks'. This was a very important discussion point with implications for patient safety. Studies have shown that a large number of patients intended for 'moderate' sedation end up (at least temporarily) in a state of deep sedation with a higher risk of adverse respiratory events unless immediately diagnosed and corrected. A nurse who can't pay attention to the patient because she is busy with another task represents a risk to patient safety.

Response

After presentations and group discussion at the face to face meeting the % agreement with the recommendation #4 "*For routine in-hospital colonoscopy under moderate sedation, a single RN can both monitor the patient and perform brief interruptible tasks.*" increased from 74% in the premeeting voting to 86% indicating a high level of consensus with this statement. In the discussion at the meeting it was clear that this approach was standard practice in many endoscopy units in the province of Ontario and in other jurisdictions. To ensure that the % agreement on the final recommendations is clear, we have added the practice recommendations and % final agreement to the Executive Summary.

Comment

3. The statement that this practice will lead to cost-saving is questionable, as the funding will likely be re-allocated to different services.

Response

We acknowledge that it is unclear whether savings would be realized or reinvested. We have therefore modified the statement to read:

*"The appropriate use of moderate and deep sedation for routine colonoscopy can improve patient and provider satisfaction, and potentially lead to significant cost **savings or enable investment in other activities (such as implementation of population-based screening with Fecal Immunohistochemistry Testing)** in Ontario"*

Comment

4. I thought I had made some suggestions for additional language that could have easily been inserted ('the monitoring of the patient remains the primary responsibility', 'the participation in interruptible tasks must not compromise the safety of the patient'). Such addition would have not compromised the underlying conclusions of the consensus statement, yet clarified a point that in my opinion is absolutely crucial for patient safety (and I seem to recall that others were supportive of that as well). I am at a loss to understand why that was not added.

Response

We made modifications to a number of recommendations based on the discussions at the in person when there was agreement on the modification. We then circulated the recommendations to panel members and made further modifications based on additional comments. In some cases, panel members disagreed on optimal wording, and the final the wording reflected a compromise. Fortunately, a high level of agreement was nonetheless achieved for all recommendations.

Ms. Farah Kahn

Comment

1. I've read through the report and have no further comments to add. It's very impressive work, and please extend my thanks for participating to Nancy and the team.

Response

We appreciate the participation of Ms. Kahn and all the other panel members!

Dr. Roland Valori

Comment

1. The report looks very good and reflects well what I recall of the meeting and voting.

Response

We appreciate the participation of Dr Valori, who was one of our international panel participants.

Comment

2. In the lay summary you have included a limited and watered down summary of the practice recommendations. I think these could be beefed up and made more explicit. I don't think we should shy away from being explicit to the public of the situation. Perhaps plant a seed to get the media to ask the question of why some people and practices need to give propofol when others don't.

Response

The lay summary has been expanded to more completely describe the practice recommendations.

Comment

3. In our practice sedation is mainly used to allay anxiety not reduce pain. There is no mention of the fact that many patients come to the examination in an anxious state. Of course more anxious patients will experience more pain so the anxiolytic reduces pain as well. There should be reference to anxiety as well as pain.

Response

We have added that sedation assists in management of anxiety as well as pain throughout the document.

Comment

4. The paper lacks a 'what next' proposal. This could be framed in what the various stakeholders: payers; hospitals; patients; professional associations; endoscopists; trainers; etc individually might do next to apply the guidance/recommendations. And critically what the consequences of not doing so will be.

Response:

We have added a future directions section and expanded on the need to engage a variety of stakeholders to implement the practice recommendations.

Comment

5. Following on the from the last point can it be made more explicit that no more resource is expected for implementation of FIT given the inexorable rise in costs of colonoscopy in recent years. Clearly one aspect of these rising costs is anesthesia and the purpose of this piece of work was to see whether these extra costs are justified – which they clearly are not. The literature review and recommendations reflect this.

Response

We have added a comment indicating that potential cost savings with a change in the use of moderate and deep sedation in Ontario might be redirected to implementation of FIT.

Comment

6. One way of sorting the cost problem is for the payer to stop re-imbursing anesthesia costs except in exceptional circumstances. If the patient wants propofol they have to pay for it. This might be a recommendation for payers to consider

Response

Future funding of costs is beyond the scope of this document. However, it is important to note that some patients benefit from the use of deep sedation and / or the presence of an anesthesia provider during endoscopy.

Comment

7. One small point: there is a 'to' missing from the second recommendation in the final voting list.

Response

This has been corrected.

Dr. Stanley Feinberg

Comment

1. Very professional. Nice work.

Response

We appreciate the participation of Dr. Feinberg.

Mr. Adam Lamoureux

Comment

1. Amazing work Anne. Thank you for the opportunity to provide feedback- all I can say is "great job to all involved".

Response

We appreciate the participation of Mr. Lamoureux.

Dr. Catherine Dube

Comment

1. thank you for allowing me to review the report. It is very well organized and very well written, congratulations!

Response

We appreciate the participation of Dr. Dube.

Comment

2. I think there should be a section explaining whether or why the findings from the SRs and the consensus discussions would/would not be applicable to OHPs. From my recollection of the SRs, it seems to me the contexts and study populations were applicable to OHPs as well as hospitals, were they not? we also had a discussion during the consensus as to whether this could be applicable to clinics, so considerations raised at the time could also be summarized in that same paragraph. It's the question that one asks themselves throughout the report.

Response

A section termed "project scope" was added, that described the possible application of our findings to other settings (i.e. out of hospital colonoscopy) and to other endoscopic procedures (i.e. gastroscopy and flexible sigmoidoscopy).

Comment

3. in the summary table of situations that might favour anesthesia, please put more context. although the question was to discuss factors "that would necessitate" propofol, it is clear that the list the group came up with is of situations "that may warrant consideration for propofol", i.e. totally relative as opposed to absolute indications. It would be important to make this clear. Minor comment regarding that table: "hypersensitivity to vomiting and nausea" doesn't make sense - is it hypersensitivity to traditional sedation agents?

Response

We have changed the wording from "that would necessitate" to "that may warrant consideration" in the summary table in Appendix #3.

Comment

4. I would suggest to append the flow diagrams of the literature searches to highlight the massive amount of literature review that took place.

Response

We have added an appendix 1 to outline the steps of the literature reviews that supported this work.

Comment

5. page 4 "specific Aim #1" line 6: I would say patients "receiving" (propofol/traditional agents) as opposed to "treated with".

Response

This change has been made.

Comment

6. page 6 "evidence reviews", line 9: "6)" instead of "6:"

Response
This change has been made.