ENDOSCOPY INTRAPROCEDURAL ORIENTATION MANUAL FOR REGISTERED NURSES

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Abstract

Background: The minimally invasive nature of endoscopy has increased the demand for its diagnostic and therapeutic capabilities. However, being utilized as an alternative to surgical intervention has resulted in an increase in patient acuity and procedural complexity. It is imperative endoscopy education and training for registered nurses (RNs) meets the needs of this evolving endoscopic landscape. Training for new RNs needs to be standardized and integrate updated, evidence-based research, practices and competencies, as set forth in the clinical nursing standards**. Purpose:** The purpose of the practicum project was to develop the endoscopy intraprocedural orientation manual (EIOM) to orientate new RNs into the endoscopy unit. **Methods:** An integrated literature review, environmental scan and stakeholder consultation interviews were conducted. **Results:** The need for an orientation manual in endoscopy was substantiated by the lack of existing educational material, evident in the findings of the environmental scan and integrated literature review. A lack of structured teaching material and need for additional education were also concerns highlighted during stakeholder interviews. Benner's Novice to Expert Model was used to develop the 6-chapter EIOM for new endoscopy RNs, focusing on providing a foundation of gastrointestinal anatomy, pathophysiology, pharmacology and endoscopic procedure. **Conclusion:** Prospective implementation will occur in collaboration with the clinical educator and patient care coordinator of endoscopy. Once finalized, it will be implemented into the existing orientation program for new RNs. Evaluation will involve knowledge-based questionnaires completed by orientating students, at the 3-month, 6-month and 12-month intervals, to evaluate the clarity, usefulness and adequacy of the EIOM.

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Endoscopic procedures are the primary choice of minimally invasive investigation and intervention for many serious gastrointestinal conditions such as cancer, achalasia, gastrointestinal bleeding, colitis, and anemia (Chandraekhara, Elmunzer, Khashab, & Muthusamy, 2019). These procedures are an efficient and effective means of achieving diagnostic results and therapeutic interventions, while providing a less invasive and safer approach for patients (Association of periOperative Registered Nurses [AORN], 2005). The expansion of endoscopic capabilities has increased procedural demand, driven by population-based colon cancer screening, advancements in endo-surgical therapeutic procedures, the aging population, and an increase in diseases with endoscopic requirements (Barkun, Ginsberg, Hawes, & Cotton, 2010; Beilenhoff & Neumann, 2011; Matharoo, Thomas-Gibson, Haycock, & Sevdalis, 2014; Shenbagaraj et al., 2019).

The growing acuity of the patient population, procedural complexity and demands risk impacting patient outcomes. Equal advancements in nursing education and training are required to ensure high quality, safe care remains the priority (Barkun et al., 2010; Tom Deas & Sinsel, 2014). It is imperative endoscopy education and training for registered nurses (RNs) integrates updated, evidence-based practice and competency research, as set in the clinical nursing standards (Society of Gastroenterology Nurses and Associates [SGNA], 2014). A standardized, evidence-based intraprocedural orientation manual can provide the structure to educate and evaluate the preparedness of RNs,

providing them with the best opportunity to succeed while ensuring consistency and competency within the workplace.

Background

Endoscopy, meaning “to look within”, is a relatively new procedure in the field of medicine, accepted as a method of diagnostic procedure in the latter part of the 20th century (Khashab, Robinson, & Kalloo, 2014). The procedure involves the insertion of an endoscope into a body orifice to observe inside certain organs of the body in a safer, less invasive means than surgery, for diagnostic and therapeutic purposes. The basic endoscopic procedures include colonoscopy (scope of the large intestine), gastroscopy (scope of the esophagus, stomach and duodenum), bronchoscopy (scope of the lungs), cystoscopy (scope of the bladder), and cholangioscopy (scope of the pancreaticobiliary system).

Endoscopy can be used to achieve a wide variety of goals within the medical context. A gastroscopy can investigate and diagnosis primary causes of dysphagia, hematemesis, anemia, pain, motility issues and cancer. It can also be used for therapeutic procedures such as stricture dilatation, variceal banding, foreign body removal and treatment of acute hematemesis (Khashab et al., 2014). A modified gastroscopy using a side-view scope is used to perform endoscopic retrograde cholangiopancreatography (ERCP). This allows for diagnostic and therapeutic interventions within the biliary and pancreatic ducts to re-establish patency, empty bile and remove stones (Khashab et al., 2014). A colonoscopy procedure has both diagnostic and therapeutic capabilities in the

context of medical conditions such as crohn's, ulcerative colitis, inflammatory bowel disease, colon cancer, and hemostasis (Khashab et al., 2014). Despite colon cancer being the second and third leading cause of cancer-related deaths in men and women, it is preventable and treatable if appropriate measures are taken (Canadian Cancer Society, 2019). Screening and therapeutic colonoscopies are recommended to check for polyps and cancerous lesions in an effort to prevent and treat colon cancer in early non-metastatic stages (Cancer Care Ontario, 2017).

The role of the RN within the endoscopy unit is a complex position as they have a multifunctional, versatile position. RNs work in pre-admission area, endoscopy procedure room and the post anaesthesia care unit (PACU). The pre-admission area RN performs the patient assessment, including medical history, procedure preparation verification and venous access establishment. The procedure room RN's responsibilities are multifaceted; first, they prepare the procedure room, patient and tools. Secondly, the RN administers sedation and monitors the patient's cardiorespiratory condition and comfort level. Thirdly, they assist the physician in completing procedures and retrieving specimens. Lastly, the RN completes the documentation, processes the specimen and transfers the patient and procedure report to the PACU RN. The PACU RN continues monitoring the patient's cardiorespiratory status, coordinates discharge logistics and provides education to the patients and family members about the procedure, results and post-procedure care.

The growth of the endoscopy specialty has been facilitated by evolving technologies, improvements in sedation management and advancements in minimally invasive therapeutic endoscopic procedures. Currently, there are 5140 endoscopic

procedures performed at the Toronto Western Hospital endoscopy program annually. The increase in volume underscores the need to ensure high quality, safe, care remains a priority (Tom Deas & Sinsel, 2014). The most prominent endoscopy-associated risks are related to the inherently surgical nature of the procedures. The Report of the National Confidential Enquiry into Patient Outcomes and Deaths, published in the United Kingdom, reported 1818 deaths within 30 days of therapeutic endoscopy procedure, in which 14% of procedures were deemed inappropriate and 9% futile (Matharoo et al., 2014). Common indicators of patient safety compromise include cardiopulmonary resuscitation (CPR), hypoxia, allergic reactions, hypotension, bleeding, perforation, infection, unanticipated hospital admission and death (Borgaonkar et al., 2012). RNs need to possess a strong understanding of endoscopy, patient safety, procedural competence and knowledge of current research best practices to function in the environmental acuity these complex endoscopic procedures create.

The Society of Gastroenterology Nurses and Associates recommends endoscopy nurses have at least one year of acute care experience to develop a solid understanding of biological sciences, time management and emergency response (Bauer & Sauer, 2019). The recommended orientation of these experienced, yet novice RNs should include both didactic and clinical components with designated preceptors as immediate resources during training (AORN, 2018; Bauer & Sauer, 2019). The training should be focused on the measurable role competency and include cognitive, behavioural and technical aspects (AORN, 2018). Teaching should be customized to meet individual learner needs, based

on their existing knowledge and structured to accommodate their preferred learning style (AORN, 2018).

Rationale

This practicum project was chosen based on the need for new RNs to have a learning resource to structure the teaching of the specialized skills required in endoscopy. The endoscopy unit is a specialized area where nurses have the opportunity to use critical care, post-anesthesia care and minimally invasive surgical skills. With so few nurses possessing this combination of skills and the heavy amount of independent nursing care required, it is vital to provide structured and comprehensive training in endoscopic skills, and anesthesia administration. My own personal orientation experience became an informal needs assessment, as there was no structured guide to provide foundational information, or to standardize procedural practices I was taught. After a year into my current endoscopy employment, situations continue to arise that highlight information and teaching missed during orientation.

The current orientation for RNs hired within the endoscopy program is provided over ten 8-hour shifts of shadowing with a preceptor (staff RN) in the procedure room. All information is verbally taught through the preceptor, based on their own experiences and training. There is currently no theoretical teaching or standardized orientation material utilized in the endoscopy training program. A resource binder, created in 2006, exists as a quick access information reserve for current staff. It was formatted for RNs familiar with endoscopy but does not provide adequate theory and foundational material

to educate those without knowledge of the area. The information also requires updating, as some policies and procedures have changed since its publication. Although the resource has not been officially evaluated, experiences ascertained from current RNs, newly- hired RNs and the educator coincide with the insufficiency of the current resource and an indicated need for an updated and structured orientation manual.

Objectives

The goal of the practicum project was to provide new RNs with a learning resource manual that would provide foundation for their intraprocedural orientation in the endoscopy unit. The manual was also designed to structure and standardize the practices of current and future endoscopy RNs to ensure everyone is provided the best opportunity to succeed with consistency and competency in the workplace. At the commencement of this project, several objectives were outlined to guide the development of the project. The main objectives are outlines below:

- To describe the current methods used in the orientation education of registered nurses to the endoscopy setting within the current published literature in a integrative literature review.
- To identify, in consultation with key stakeholders, relevant educational issues and organizational unit specific nursing practices and policy standards needs of the endoscopy unit.
- To collect and analyze the data of existing RN learning resources from similar hospitals in the local environment.
- To develop an orientation learning manual for the intraprocedural endoscopy setting.
- Demonstrating advanced nursing practice competencies utilized throughout the practicum course.

Ethical Approval

The Health Research Ethics Authority (HREA) screening tool was completed to determine if the conduction of this research plan had the potential to impose an ethical risk to participants. The results of the tool indicated ethical approval was not required, given the type and capacity of the project. The HREA screening tool is included in Appendix A.

Overview of Methods

As part of the practicum process, three methods of investigation were utilized to determine if there was a definable need for the development of an endoscopy learning manual for RNs. An integrated literature review was conducted to examine currently published nursing education for endoscopy and the most effective teaching methods to deliver the information. An environmental scan was completed to collect and evaluate the teaching resources of other endoscopy units in urban teaching hospitals. Lastly, consultation interviews with key stakeholders were completed, including current endoscopy RNs, new RNs, clinical nurse educators, product representatives and physicians, to also establish a need, identify necessary content and effective means of information delivery. The results of these methods created the structure for the development of the EIOM, found in Appendix D of this report.

Summary of Literature Review

A search for relevant literature on nursing orientation into the endoscopy setting was performed in the CINAHL, PubMed, and Google Scholar databases, using the

language (English), and publication date (2000 to present) filters to acquire the most recent literature. Search terms utilized included “endoscopy”, “nurse”, “best practice”, “methods”, “orientation”, “training”, “experienced nurse”, “training”, “job transition”, “orientation” and “senior nurse”. Accumulated results from the search terms are included in the Appendix of the literature review in Appendix A of this report.

The scant amount of literature specifically examining the orientation of nurses into the endoscopy setting required the expansion of the literature search, broader limitations and included articles about operating room orientation methods. The identification of this research gap demonstrated the lack of reference material available to guide endoscopy orientation, reinforcing the need for the creation of the EIOM.

The integrated literature review conducted described the current methods of teaching used in the orientation of nurses to endoscopy. The scant amount of literature specifically examining endoscopy demonstrated a lack of reference material available to guide orientation resource development. The literature search yielded stronger results when expanded to include surgical orientation programs. The majority of literature published on the orientation of nurses into an acute, critical and operating room settings use differentiated, mixed method orientation programs. This means the processes of teaching are delivered in multiple formats to reach a variety of learners, creating a student-centered learning plan (Shepard, 2014).

Learning in the controlled environment of didactic teaching creates limitations for the adult learner, such as a passive learning atmosphere that lacks student involvement

(Altimier, 2009; Scheckel, 2016). With the significant changes in patient acuity and nursing practice in healthcare over recent years, the passive, lecture testing methods are no longer a suitable approach to obtain clinical competence (Distler, 2007). Literature suggests the inclusion of a preceptorship component in an orientation program for RNs significantly increases the positive experience and training outcomes reported by participants (Sandau & Halm, 2010). This approach helps to connect theory to practice, while increasing the confidence and job satisfaction of the newly- hired nurses (Haggarty, Holloway, & Wilson, 2013; McSharry & Lathlean, 2017).

Whelan, Shi, Andony, Yorke, and Poonai (2018) demonstrated simulation training is a safe way to improve learners' competency, confidence and communication skills. Non-technical skill development, such as individual and team performance, can be enhanced to better benefit safe patient outcomes through latent error detection, side-by-side skill demonstration and experience sharing, fostered by simulation training (Heard, Fredette, Atmadja, Weinstock, & Lightdale, 2011; Ravindran, Thomas-Gibson, Murray, & Wood, 2019).

Starting work in a new area of healthcare brings with its numerous stresses and barriers threatening a nurse's successful transition. Dellasega, Gabbay, Durdock, and Martinez-King (2009) emphasize that a successful orientation is one that allows the experienced nurse time to embrace the transition into being a novice in the new role, without the pressures and expectations associated with job experience. Providing support for the learner is achieved by creating an open dialogue for expectations, establishing realistic learning goals and encouraging personal adjustment to learning plans (Dellasega

et al., 2009). Well-developed and structured orientation programs have the ability to retain new nurses by easing their transition and journey to feeling like a confident and competent team member (Allen, 2011).

The use of mixed method orientation programs, especially those combining didactic and preceptorship teaching methods provide high rates of success and satisfaction amongst learners. However, it remains important to tailor teaching content and methods to the experience of the learner and recognize the differences in learning method preferences. The use of Benner's Novice to Expert Model and Knowles' Adult Learning Theory (1984) as conceptual structures will ensure the EIOM is tailored to the appropriate experience stage and utilizes learning techniques suited for the adult learner.

There is a significant lack of published literature focusing on endoscopy orientation for RNs, evident from the literature review. Comparable fields, such as the operating room, have substantially more published literature on the orientation programs for new nurses. This is a demonstration, in and of itself, of the need for the creation and evaluation of such a resource for endoscopy. In light of the ongoing advancements in the endoscopy field, RNs require more education to maintain their competency, in the form of structured training tools and resources. The creation of the EIOM will provide a basis for future practice research and policy development around the standardized training programs for endoscopy nurses and the impact these programs have on the care and safety of patients. The completed integrated literature review is included in Appendix A.

Summary of Consultation Interviews

Consultation interviews for the practicum project were used to obtain information and insight into current orientation practices and identify content recommendations for the EIOM development. Current orientation practices were examined to identify areas of concern and potential solutions. Relevant corporate policies and procedures were discussed to determine which were applicable to endoscopy nursing practice. Lastly, preferred methods of teaching were identified to guide the development of the EIOM delivery methods. The information was obtained through interviews conducted with the nurse manager, advanced practice nurse educator, medical director, RNs, product representative and reprocessing technician.

Stakeholder consultations were completed through semi-structured interviews using individualized sets of open-ended questions, specific to the stakeholder's role in endoscopy. All individuals outlined were directly approached to obtain consent to participate in the interview. The objective of the interview and intended use of data collected was explained during the consent process. An oral agreement to participate indicated verification of consent. Participants were informed that their participation was voluntary and that they could withdraw at any time without consequence.

The responses from the interviews support the existence of multiple knowledge gaps and necessitates the need for a standardized orientation manual, to be used in the training of new endoscopy RNs and as a reference tool for current endoscopy RNs. Educational areas of improvement, identified by the interviewees, included consistency

of practices in infection control and documentation, standardization of procedure room set up and function, and the provision of foundational education to new RNs. Content recommendations for the EIOM, by the participants included anatomy and physiology, pharmacology and sedation, procedure equipment and accessories, infection control practices, reprocessing procedures and hospital policies. The consultation interview results, and report are included in Appendix B.

Summary of Environmental Scan

During the development of the practicum project, an environmental scan was utilized to describe the breadth of endoscopy orientation resources relating to intraprocedural education for registered nurses within Ontario and Newfoundland and Labrador (NL). The information collected was intended to assist in development of an endoscopy intraprocedural orientation manual (EIOM), influenced by current best practice guidelines.

Representatives of endoscopy units in Ontario and Newfoundland and Labrador were contacted by email survey and telephone to obtain participation and information, as part of the environmental scan process. The nine hospitals contacted were urban, teaching hospitals, serving ethnically diverse populations. Two private endoscopy organizations were also contacted, to determine if their training and educational resources were similar, despite differences in patient capacity and procedure acuity, to public organizations. Information collected included demographic information pertaining to the structure of each unit, staffing composition, procedures description and annual case count. Specific

information on orientation practices was also collected, including orientation structure, teaching methods of information delivery, evaluation methods, endoscopic tool instruction, sedation administration, and patient monitoring.

Results obtained from the three participating public hospitals indicated the majority of endoscopy unit staffing was filled with RNs. The RNs also possessed a wide array of clinical backgrounds and years of experience. Overall, there were only 1 to 3 RNs hired per year on average. Requirements for applicants varied, including critical and acute care experience, endoscopy experience and advanced cardiovascular life support. Most endoscopy units utilized a preceptorship program as their primary method of orientation. There were no structured teaching resources noted at any site, although all sites confirmed their training was guided by the CSGNA and other reputable publications.

The environmental scan was unable to obtain participation from multiple organizations due to the political environment of the healthcare industry, resulting in a lack of information for analysis. The results that were obtained indicated preceptorship was the most established orientation method for RNs. There remains an absence of structured and standardized material being utilized to deliver foundational knowledge, consistent with the findings of the literature review. Given the purpose of the practicum project was to create an educational orientation manual to satisfy the training gaps identified at Toronto Western Hospital, the EIOM was developed based on the needs of Toronto Western Hospital endoscopy unit and the results of the consultation process. The environmental scan results, and report are included in Appendix C.

Theoretical Basis

Learning theories provide insight into what makes students effective learners and how they acquire, retain and process information. Applying theories in the development of the EIOM will improve learning outcomes and foster greater learner participation (Candela, 2016). The EIOM will utilize Knowles Adult Learning Theory and Benner's Novice to Expert Model (1984) as structure to guide the selection of teaching content and delivery methods incorporated. These cognitive development learning theories focus on the impact a student's maturation and experience has on their learning development over a sequential period of time (Candela, 2016).

Knowles' adult learning theory.

Knowles' Adult Learning Theory (1984) focuses on how an adult's desire, drive and ability to learn is unique to those of a child. The theory surmises adults are autonomous and self-directed in their learning, using their experiences as a resource to ground their learning (Collins, 2004). They use insight and maturity, developed from life experiences, and are problem-oriented, focusing on the relevancy of the information to their job. Basing teaching material in real life situations and practical outcomes associates learning to the interests of the adult learner (Collins, 2004).

This approach was chosen as a guiding theory for the EIOM because the target audience are RNs with previous career experience in critical care areas. By focusing on their existing knowledge as a foundation for the introduction of new concepts and ideas, the experience of the adult learner is maximized. Students need discipline-specific

knowledge to provide safe and effective nursing care; providing the reasons for learning increases their readiness for learning. With the assistance of the educator and their preceptor, learners can decide what areas of the EIOM require more attention and incorporate this knowledge into their clinical learning.

Benner's novice to expert model.

Benner's Novice to Expert model is another theoretical framework that will be applied in the development of the EIOM, as its staged development design is frequently used in orientation and residency programs (Candela, 2016). Benner utilizes the Dreyfuss model of skill acquisition to differentiate between the various levels of nursing expertise: novice, advanced beginner, competent, proficient, expert, and master (Candela, 2016). The theory's surmises that a nurse's abilities grow from novice to expert by gaining experience over time, as the stages of learning build on one another professional growth occurs. Growth is a product of the learner's self-reflection; identifying knowledge gaps and opportunities to adjust the teaching plan in collaboration with the educator (Candela, 2016).

The Novice to Expert model provides the necessary conceptual structure to guide the EIOM development and its underlying trajectory by identifying the educational and infrastructure needs of learners at the various stages of their development. Even though the EIOM will be mainly directed at experienced yet new-to-endoscopy nurses, the definition of a novice nurse will be used to understand their learning needs. As previously stated, a nurse is novice when transitioning to a new job, regardless of their previous

clinical expertise because the practice environment may be different from what they are familiar with (Benner, 1984). The EIOM will be used to structure the orientation of experienced nurses, supporting the development of confidence in knowledge and endoscopy skillset as they transition from novice to expert.

Overview of Learning Resource Manual

The EIOM was developed to assist in the orientation of new RNs to the information and skills of the procedure room in endoscopy. This manual will also be a concise and standardized reference resource, available to current RNs working in endoscopy at Toronto Western Hospital (TWH), to ensure patient care is research-based and consistent throughout. The manual consists of the following six chapters:

- Chapter 1:The Anatomy and Physiology of the Gastrointestinal System
- Chapter 2: Pathophysiology, Abnormalities and Hereditary Conditions
- Chapter 3: Conscious Sedation and Patient Monitoring
- Chapter 4: Endoscopy Equipment and Accessories
- Chapter 5: Diagnostic Tests and Therapeutic Procedures
- Chapter 6: Endoscopic Emergencies and Equipment Troubleshooting

Resource Manual Content Description

Chapter one reviews the anatomy and physiology of the gastrointestinal system. The upper gastrointestinal tract includes the oral cavity, esophagus, stomach, and small intestine. The lower gastrointestinal tract includes the large intestine and the biliary tract

includes the liver, pancreas and gallbladder. The objective is to provide foundational knowledge from which the endoscopy-specific information can build upon.

Chapter two discusses the most common pathophysiological processes and hereditary conditions addressed by endoscopic procedures. The chapter is organized by upper and lower gastrointestinal diseases and includes symptom presentation, complications and treatment plan for each process.

Chapter three covers conscious sedation and patient monitoring. To provide competent care, RNs require the skills to understand the actions, complications and contraindications of the medications they are administering. It is also important to understand how these medications affect the hemodynamical stability of a patient, how to interpret vital sign information and awareness of when an immediate response is required.

Chapter four thoroughly explains the common endoscopy equipment and accessories, including their indication, contraindication, disposal and operator considerations. It is important that nurses are knowledgeable and competent in using all equipment in order to provide safe, effective care in the fast paced, time sensitive environment.

Chapter five discusses the common diagnostic tests and therapeutic procedures used in endoscopy, this includes procedure indications and required equipment. The objective is to strengthen the learners understanding of these components, develop critical thinking, procedure foresight and promote patient safety.

Chapter six provides an analytical approach to endoscopic emergencies and equipment troubleshooting. The objective is to familiarize nurses with the common abnormalities that can arise during an endoscopy procedure, relating to the patient and/or the equipment. It is important for the nurse to have a strong understanding of how procedures and equipment function, in order to critically assess and perform in an emergency situation.

Implementation and Evaluation

The EIOM was not implemented or evaluated during the practicum due to the time constraints of the program. Upon completion of the degree program, the EIOM will be presented to the Patient Care Coordinator, APNE, and Nurse Manager for approval. Upon approval, the manual will be printed and distributed in the orientation session for newly hired endoscopy nurses in April 2020. The APNE will be the main individual involved in implementing the manual as she directs the orientation program. Her role as an APNE is to utilize "best practice in education to assess learning needs, develop, design, deliver and evaluate educational programs" (University Health Network, 2019, p. 1). With the permission of the Nurse Manager, the manual will also be introduced to the existing endoscopy nurses at TWH, to be discussed during Friday education huddles and made available on the endoscopy unit for any other interested parties.

The overall aim of the evaluation is to determine if the content of the orientation manual is informative and if the methods of teaching are effective. The Patient Care Coordinator, APNE, Nurse Manager and current endoscopy RNs will be approached to

participate in the evaluation of the EIOM. Those who have agreed to participate will complete a multiple-choice questionnaire to evaluate the following:

- The effectiveness of the Endoscopy Intraprocedural Orientation Manual as an education tool for new RNs.
- The success of the information delivery methods in engaging learners in the orientation manual.
- The comprehensiveness of the orientation manual content in increasing the learner's knowledge of endoscopy materials.
- The adequacy of the orientation manual prepares the learners for preceptorship.

The results of the evaluations will determine if the EIOM is effective in its purpose to prepare and education newly nurses hired to the endoscopy unit. The feedback will guide any necessary changes to the manual content, ensuring the information accurately addresses the issues and needs of the endoscopy unit and its learners, as identified by the participants.

Advanced Nursing Practice Competencies

Advanced practice nurses utilize knowledge, collaboration and innovation to address the holistic needs of the population and influence healthcare reform. The development of this practicum project has demonstrated several advanced nursing practice competencies, as set out by the Canadian Nursing Association (2019). The competencies addressed, include optimizing health systems, education, research and leadership, are explained below.

Optimize Health System

"Advanced practice nurses contribute to the effective functioning of health systems through advocacy, promoting innovative client care and facilitating equitable, client-centered health care" (Canadian Nurses Association, (CNA, 2019, p. 30). The creation of an endoscopy intraprocedural orientation manual addresses gaps in care delivery and employee training, promoting the safety of staff and patients. The incorporation of new research and knowledge in collaboration with key stakeholders such as physicians, endoscopists and registered nurses, advances nursing practice. The implementation of the orientation manual displays strategic planning participation and retention initiative, both contributing to the cost-effectiveness of the endoscopy unit.

Education

"Advanced practice nurses are committed to professional growth and learning for all health-care providers, as well as students, and for client and family learning related to health and wellness" (CNA, 2019, p. 31). This practicum project's primary purpose is to address an identified learning need within the endoscopy unit and provide a solution in the form of an up-to-date manual of evidence-based knowledge and practice guidelines. Utilization of this manual by existing nursing staff demonstrates contribution to the advancement of colleagues and an opportunity to be a role model.

Research

"Advanced practice nurses are committed to generating, synthesizing, critiquing and applying research evidence" (CNA, 2019, p. 32). The creation of the endoscopy

intraprocedural orientation manual will be an extensive research-based undertaking. The synthesis, critique and application of current research will ensure the manual is based on best-practice evidence and follows relevant policies and practice guidelines. The investigation of currently published endoscopy orientation tools will allow for the adopting and integration of effective training strategies in the care of patients. This will also allow me to evaluate the current practices of the endoscopy unit to determine what areas require change.

Leadership

“Advanced practice nurses are leaders in the organizations and communities where they work. They are agents of change, consistently seeking effective new ways to practise, improve care and promote APN” (CNA, 2019, p. 33). The creation of the endoscopy intraprocedural orientation manual is demonstration of change initiation driven by RN self-identified problems. The manual will demonstrate professional development and the organizations vision for up-to-date, competent programs fueling the care provided by RNs.

Conclusion

The purpose of the practicum project was to development a learning resource manual to aid in the orientation of newly hired RNs to the endoscopy unit at Toronto Western Hospital. Numerous approaches were utilized to gather evidence supporting the need for the EIOM and investigate existing resources. Findings from the integrative literature review highlighted the gap in available educational resources for endoscopy

orientation. The lack of resources identified in the environmental scan further supported the existence of an educational gap. Lastly, consultation with key stakeholders identified areas of learning that required educational support. These results provided the direction and foundation for the EIOM development. The utilization of the EIOM in RN endoscopy orientation will provide a structured and standardized learning experience, ensuring everyone is provided the best opportunity to succeed with consistency and competency in the workplace.

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Appendix A – Literature Review

Endoscopy Intraprocedural Orientation Manual (EIOM) for Registered Nurses

Literature Review Outline

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ENDOSCOPY INTRAPROCEDURAL ORIENTATION MANUAL FOR REGISTERED NURSES

Endoscopic procedures are the primary choice of minimally invasive investigation and intervention for many serious gastrointestinal concerns such as multiple types of cancer, achalasia, gastrointestinal bleeding, colitis, and anemia (Chandraekhara, Elmunzer, Khashab, & Muthusamy, 2019). These procedures are favoured because they are an efficient and effective means of facilitating diagnostic results and therapeutic procedures (Association of periOperative Registered Nurses [AORN], 2005). Advancements in endoscopy tools and techniques also offer a less invasive and safer approach for patients, especially those whose medical conditions make them poor candidates for surgery (AORN, 2005).

According to a national survey in the United Kingdom (2017), there has been a marked increase in demand for endoscopic procedures over the last five years (Shenbagaraj et al., 2019). Drivers of this demand include population-based bowel cancer screening, advancements in endo-surgical therapeutic procedures, the aging population, and an increase in diseases with endoscopic requirements (Barkun, Ginsberg, Hawes, & Cotton, 2010; Beilenhoff & Neumann, 2011; Matharoo, Thomas-Gibson, Haycock, & Sevdalis, 2014). The quality and safety of patient care is at risk of being compromised if the knowledge and competencies of nursing staff does not meet the advancing endoscopic practices. Education and training for nurses needs to advance at the same momentum as the endoscopic field, specifically in the care of complex patient populations and complicated procedures (Barkun et al., 2010). The Society of Gastroenterology Nurses

and Associates (2014) clinical nursing standards emphasize the importance of endoscopy education and training being reflective of current nursing practices and based on up-to-date evidence-based research.

There is currently no orientation manual in the Toronto Western Hospital endoscopy unit and the existing educational materials are outdated as policies and practices have changed. In this paper, I will complete an integrative literature review describing the current methods used in the orientation of registered nurses (RNs) in the endoscopy setting. I will also explore relevant learning theories that will be used to develop an endoscopy intraprocedural orientation manual (EIOM).

Background of Topic

Endoscopy, meaning "to look within", is a relatively new procedure in the field of medicine, only accepted as a method of diagnostic procedure in the latter part of the 20th century (Khashab, Robinson, & Kalloo, 2014). The procedure involves the use of an endoscope to enter and observe inside certain organs of the body in a safer, less invasive means than surgery, for diagnostic and therapeutic purposes. The basic endoscope is a small, flexible fibreoptic tube of varying lengths and diameters with a camera and light at the end as well as other channels to assist the operator. The basic endoscopic procedures include colonoscopy (scope of the large intestine), gastroscopy (scope of the esophagus, stomach and duodenum), bronchoscopy (scope of the lungs), cystoscopy (scope of the bladder), and cholangioscopy (scope of the pancreaticobiliary system). In the endoscopy unit of focus for this project, bronchoscopy and cystoscopy will not be addressed, as they

are separate from the gastrointestinal endoscopy unit and have their own designated staff under the endoscopy department.

Endoscopy can be used to achieve a wide variety of goals within a medical context. A gastroscopy can investigate and diagnosis primary causes of dysphagia, hematemesis, anemia, pain, motility issues and cancer. It can also be used for therapeutic procedures such as stricture dilatation, variceal banding, foreign body removal and treatment of acute hematemesis (Khashab et al., 2014). A modified gastroscopy using a side-view scope is used to perform endoscopic retrograde cholangiopancreatography (ERCP) in which therapeutic interventions are made within the biliary and pancreatic ducts to re-establish patency and emptying of bile and stones (Khashab et al., 2014).

A colonoscopy procedure has both diagnostic and therapeutic capabilities in the context of medical conditions such as crohn's, ulcerative colitis, inflammatory bowel disease, colon cancer, and hemostasis (Khashab et al., 2014). Despite colon cancer being the second and third leading cause of cancer-related deaths in men and women, it is preventable and treatable if appropriate measures are taken (Canadian Cancer Society, 2019). Screening and therapeutic colonoscopies are recommended to check for polyps and cancerous lesions in an effort to prevent and treat colon cancer in early non-metastatic stages (Cancer Care Ontario, 2017). These screening initiatives use the fecal immunochemical test (FIT) to detect blood in stool samples, (suggesting a polyp or lesion may be present in the colon) indicating the need for a colonoscopy (Cancer Care Ontario, 2017). Initiatives like FIT screening reduce the number of normal, low yield colonoscopies performed and increase the number of technically complex, high yield

colonoscopies (Cancer Care Ontario, 2017; Shenbagaraj et al., 2019). The safety risks and specialized skillsets associated with these complex procedures underlines the need for RN endoscopy training to be standardized and up to date in best practice guidelines. This will ensure RNs possess the competency and knowledge to assist in such high risk, technical procedures.

The role of the RN within the endoscopy unit is a complex position as they have a multifunctional, versatile position. RNs work in pre-admission, endoscopy procedure room and the post anaesthesia care area (PACU). The pre-admission area RN performs the patient assessment, including medical history, procedure preparation verification and venous access establishment. The procedure room RN's responsibilities are multifaceted; first, they prepare the procedure room, patient and tools. Secondly, the RN administers sedation and monitors the patient's cardiorespiratory condition and comfort level. Thirdly, they assist the physician in completing procedures and retrieving specimens. Lastly, the RN completes the documentation, processes the specimen and transfers the patient and procedure report to the PACU RN. The PACU RN continues monitoring the patient's cardiorespiratory status, coordinates discharge logistics and provides education to the patients and family members about the procedure, results and post-procedure care.

Topic Relevance

The growth of the endoscopy specialty has been facilitated by evolving technologies, improvements in sedation management and advancements in minimally invasive therapeutic endoscopic procedures. The increase in volume underscores the need

to ensure high quality, safe, care remains a priority (Tom Deas & Sinsel, 2014). The most prominent endoscopy-associated risks are related to the inherently surgical nature of the procedures. The Report of the National Confidential Enquiry into Patient Outcomes and Deaths, published in the United Kingdom, reported 1818 deaths within 30 days of therapeutic endoscopy procedure, in which 14% of procedures were deemed inappropriate and 9% futile (Matharoo et al., 2014). Common indicators of patient safety compromise include cardiopulmonary resuscitation (CPR), hypoxia, allergic reactions, hypotension, bleeding, perforation, infection, unanticipated hospital admission and death (Borgaonkar et al., 2012). RNs need to possess a strong understanding of endoscopy, patient safety, procedural competence and knowledge of current research best practices to function in the environmental acuity these complex endoscopic procedures create.

Currently, there are 5140 endoscopic procedures performed at the Toronto Western Hospital endoscopy program annually. These procedures include colonoscopy, gastroscopy, ERCP, fecal transplantation and percutaneous endoscopic transgastric jejunostomy tube insertion. The RNs hired within the endoscopy program are provided with ten 8-hour shifts of shadowing with a preceptor (staff RN) in the procedure room as orientation. All information is anecdotally provided from the preceptor in verbal form. There is currently no theoretical teaching or standard orientation material utilized in the endoscopy program. A resource binder exists, created in 2006, as a quick access information reserve for current staff. It was formatted for RNs familiar with endoscopy but does not provide adequate theory and background detail to educate those without knowledge of the area. The information also requires updating as some policies,

procedures and unit operations have changed since 2006. Although the resource has not been officially evaluated, experiences ascertained from current RNs, newly- hired RNs and the educator coincide with the indicated need for an updated and structured orientation manual.

The Society of Gastroenterology Nurses and Associates recommends endoscopy nurses have at least one year of acute care experience to develop a solid understanding of biological sciences, time management and emergency response (Bauer & Sauer, 2019). The recommended orientation of these experienced, yet novice RNs should include both didactic and clinical components with designated preceptors as immediate resources during training (AORN, 2018; Bauer & Sauer, 2019). The training should be focused on the measurable role competency and include cognitive, behavioural and technical aspects (AORN, 2018). Teaching should be customized to meet individual learner needs, based on their existing knowledge and structured to accommodate their preferred learning style (AORN, 2018). The purpose of this practicum project is to create an education manual for intraprocedure orientation of newly hired RNs, while utilizing, updating, and expanding on the existing resource binder.

Integrative Literature Review

Search Terms and Databases

A search for relevant literature on nursing orientation into the endoscopy setting was performed using the following databases/search engines: CINAHL, PubMed, and Google Scholar. The results were refined by language (English), and publication dates

(2000 to present) to acquire the most recent literature. To identify literature on the experienced nurses in job transition, a search was completed using the search terms "experienced nurse", "training", "job transition", "orientation" and "senior nurse". The key search terms for endoscopy nurse orientation methods included "endoscopy", "nurse", "best practice", "methods", "orientation", and "training" (see search results in Appendix A).

The scant amount of literature specifically examining the orientation of nurses into the endoscopy setting required the expansion of the literature search using broader limitations and included articles about operating room and critical care orientation methods. The identification of this research gap demonstrates the lack of reference material available to guide endoscopy orientation, reinforcing the need for the creation of an educational resource such as the EIOM.

Types of Teaching Methods

Starting work in a new area of healthcare brings with its numerous stresses and barriers threatening a nurse's successful transition. Well-developed and structured orientation programs have the ability to retain new nurses by easing their transition and journey to feeling like a confident and competent team member (Allen, 2011). Some of the earliest research on the orientation of nurses to endoscopy, by Bodinsky (1991), focused on a four-phase orientation process of planning, organizing, executing and evaluating, guided by the adult learning framework. Bodinsky (1991) emphasized the need to define objective and task expectations to structurally root an orientation program.

From here, planning focused on what motivated the adult to achieve those objectives and how to organize the program in a way that highlighted both the learner and teacher's expectations. In addition, Bodinsky (1991) suggests execution of an orientation manual should be structured with comprehensive outlines and guiding foundational material in order for consistency and continuity for nurses completing preceptorship. Lastly, the evaluation phase should be periodic and ongoing for both the assessment of the student and the program to allow for modification and improvements of performance.

The American Association of Colleges of Nursing (AACN) (2006) states learning to perform as a nurse is predicated on engaging in experiential learning with patients. Modalities providing such learning include simulation, case studies, videos, and clinicals (AACN, 2006). The majority of literature published on the orientation of nurses into an acute, critical and operating room settings use differentiated, mixed method orientation programs. This means the processes of teaching are delivered in multiple formats to reach a variety of learners, creating a student-centered learning plan (Shepard, 2014). The three main methods of teaching reported in the literature include preceptorship, simulation and didactic.

Preceptorship.

Preceptorship is a vital part of most orientation programs as it utilizes the knowledge, clinical skills and theory of current employees to guide new orientees in the real clinical setting. This approach helps to connect theory to practice while increasing the confidence and job satisfaction of the newly- hired nurses (Haggarty, Holloway, &

Wilson, 2013). Literature suggests the inclusion of a preceptorship component in an orientation program significantly increases the positive experience and training outcomes reported by participants (Sandau & Halm, 2010).

A phenomenological study by McSharry and Lathlean (2017) explored the preceptor's teaching role and the impact the learner-preceptor relationship has on learner development. Interviews were conducted with 13 students and 13 preceptors, purposefully chosen from four acute care hospitals. The findings indicated the time students and preceptors spent together consistently strengthened the teaching relationship between them, demonstrated mutual respect and improved the student's performance and confidence. Interactive dialogue and coaching offered by the preceptor, explaining tasks, planning and reasoning behind actions, resonated strongly with students as it provided rationale for care and increased their comfort in asking questions. Negative impacts on the learning experience of students included a preceptor lacking the time to teach and relying on the student to alleviate the preceptor's workload.

A UK study by Marks-Maran, Ooms, Tapping, Muir, Phillips and Burke (2013) evaluated the engagement, impact, value and sustainability of a preceptorship program for 44 newly-qualified nurses (NQNs), based on preceptees' perspectives. Data was collected using a mixture of quantitative and qualitative evaluation methods, including questionnaires, journals, audio recordings and interviews. The findings showed the majority of preceptees (85%) valued the preceptorship program. Specific comments were reported about the positive impact it had on their communication and clinical skills.

Growth of the preceptee was also noted within personal and professional development, including stress management and the support the preceptor provides.

Simulation.

Simulation as a teaching modality provides learners an opportunity to practice in a controlled, safe environment without the risk of harm to patients or oneself, while allowing for reflection and constructive feedback in real time (Matharoo et al., 2014; Ravindran, Thomas-Gibson, Murray, & Wood, 2019). A phenomenological study that looked at the satisfaction levels of nurses after a perioperative nursing simulation training indicated it was an effective means of training (Whelan, Shi, Andony, Yorke, & Poonai, 2018). The study included 46 nurses (24 registered nurses and 22 licensed practical nurses) who completed 80 training hours in simulation labs, focusing on anesthesia, crisis management, post-operative care, surgery instruments, endoscopy, communication, laser management, positioning and medical device reprocessing. Self-assessment evaluations and satisfaction surveys, completed before and after the simulation lab using a Likert scale measurement, indicated 86% of participants felt satisfied with their training experience and felt more OR ready after the simulation (4.4/5 vs. 3.9/5). The nurses also reported an increase in confidence and comfort levels in performing specific procedures. Overall, Whelan et al. (2018) demonstrated simulation training is a safe way to improve learners' competency, confidence and communication skills.

Simulation can be used to teach basic and advanced skills, from the insertion of an IV in a model arm to performing a colonoscopy in an interactive, life-like model. It is

also useful in the development of individual and team performance. Referred to as *human factors* by Ravindran et al. (2019), these non-technical skills can be enhanced to better benefit safe patient outcomes through latent error detection in simulation training. There are also scenario simulations for high stress, critical situations such as code blue and managing other emergencies.

A phenomenological study by Heard, Fredette, Atmadja, Weinstock, and Lightdale (2011) assessed endoscopy nurses and technicians' perceptions of simulation-based training (SBT) to teach critical event management. The SBT program focused on improving technical and nontechnical skills in sedation, endoscopy and crisis resource management. The program was comprised of four 1-hour sessions which included a case presentation, simulation and debriefing. Surveys using a Likert scale measured enjoyability, usefulness, realism, and applicability (1= not enjoyable etc., 5 = very enjoyable etc.), were completed prior to, immediately following and 1-month post-SBT. The participants, 12 nurses (seven <5 years' experience and five >5 years' experience) and 5 technicians, had minimal experience with an SBT program. Results indicated prior to the SBT, experienced nurses rated their perceived enjoyment of SBT lower than their inexperienced counterparts (mean = 2.6 vs. 4.4, p=.004). However, after the SBT both groups of nurses found it enjoyable (3.8 vs. 4.4), useful (4.6 vs. 5.0), applicable (4.0 vs. 4.6) and realistic (4.0 vs. 4.4). Overall, participants found the SBT to be highly enjoyable, useful, realistic and applicable, commenting on how the improvements in their communication and debriefing skills have positively influenced the team environment and patient outcomes during crisis events. Heard et al. (2011) highlighted the team

development opportunities the SBT program provided, in terms of side-by-side skills, information and experience sharing, that is not offered with the traditional didactic teaching method.

Didactic method.

The didactic method is the dissemination of information through lectures and discussions, allowing the teacher to focus on important points while teaching a large group (Carcich & Rafti, 2007). Teaching through the controlled environment of didactic teaching may be comfortable for instructors but from an adult learning perspective, it creates limitations for the learner (Altimier, 2009; Scheckel, 2016). While this may be an effective way to distribute a large amount of information, it can consequentially create a passive learning atmosphere, where students are taught at rather than involved in the learning. With the significant changes in patient acuity and nursing practice in healthcare in recent years, the passive, lecture testing methods are no longer a suitable approach to obtain clinical competence (Distler, 2007).

Mixed method programs.

Mixed method programs, designed to incorporate forms of clinical experience with didactic teaching, are being favoured to provide foundational information that is reinforced and built upon by interactive teaching methods (Distler, 2007). An example is the PACU orientation program, developed by Elliotte (2010). The design uses a four-stage model of didactic classes, simulations and preceptorship to train experienced nurses. Specific examples include presentations by area leaders (i.e., . Pharmacy

Personnel), demonstrations and instructions of basic clinical skills, online self-learning modules, videos, and case studies. Preceptorship is a major component used to merge the practical nursing skills and knowledge with the peri anaesthesia specialty skills. As preceptors are expected to provide coaching, critiquing, directing, evaluating, and support to students, a preceptor training program is used to provide standardization and objective measurement in the program. Evaluation consists of written examinations, preceptor written evaluation, orientee diary and meetings with educator and completion of a skills checklist.

A critical care orientation program for graduate nurses used a similar mixed method approach to train newly hired nurses (Bortolotto, 2015). Referred to as a clinical staging program, it integrates didactic, simulation and preceptorship methods. Online, self-study modules replaced the previous 8-hour lecture classes, simulated patient case studies were used to integrate theory with practice in educator-guided group activities and preceptorship placements provided clinical training experience. Each stage focuses on a specific set of skills, introduced in the online modules, reinforced in the case study and integrated in the preceptorship placement. The patient assignment in preceptorship directly correlates with the skills taught in the module and case study. The skills increase in difficulty as the stages progress, translating to an increase in complexity and responsibility in the corresponding patient assignment. Matching the stage skills with the patient assignment allows the student to focus on integrating knowledge and skill learned into practice. Between July 2008 and October 2013, 164 of the 175 students enrolled in

the clinical staging program successfully completed the program and chose to continue nursing in the critical care area.

The impact mixed method orientation programs have on nursing job satisfaction and retention is demonstrated in the article by Wilson (2012), where the redesign of an operating room orientation program improved nurse vacancy, turnover and morale issues. The hiring of inexperienced nurses, stressful OR environment, hierarchical staffing attitude, and negative social culture were barriers to retaining new nurses at a York University trauma centre. To address these barriers, a mixed method orientation program was created incorporating didactic teaching (PeriOp Core Curriculum program) providing foundational perioperative skills and a preceptorship program. Using designated preceptors was found to increase the consistency in teaching and evaluation. Daily feedback, provided by the preceptor and student, guided the growth of both individuals and the improvement of the orientation program. In the four years since the program's introduction, the operating room has retained 37 new nurses.

In a UK study, Davies, Platts, Beasley, Bone, and Khiyar (2018) found combining didactic and simulation teaching strategies increased learner comprehension and technical skill development during a one-day endoscopy training course. The course used a VARK (visual, auditory, read, kinesthetic) teaching design by including presentations, case studies, videos, photos and diagrams into the teaching material. Simulation was used in the replication of endoscopy procedures using a porcine colon and stomach. Between 2013 and 2018, 78 healthcare professionals (HCPs) completed the course and 24 provided follow-up feedback. Davies et al. (2018) analysis of the feedback indicated most

HCPs reported the course enhanced their knowledge and confidence in performing endoscopic procedures. The HCPs also described that the course significantly improved their communication and professionalism as well as strengthening their understanding of the endoscopist role.

Orientation of Experienced Nurses

Knowles' (1984) adult learning theory emphasizes the importance of structuring learners' education to what best suits their preferred method of teaching. Experienced nurses are expected to be self-directed and encouraged to control their own learning experience, making a self-learning module sound like the ideal delivery method.

Interestingly, a randomized after-only control study by Carcich and Rafti (2007) found some nurses preferred traditional didactic teaching. The authors explored experienced RNs satisfaction with self-learning modules compared to the traditional didactic teaching method. The sample of 20 experienced nurses were randomly divided into a control and experimental group. The control group received traditional didactic teaching in class, by a nurse educator. The experimental group completed a self-learning module in a study environment of their choosing. Study findings showed the nurses reported higher satisfaction rates with the traditional didactic teaching compared to the self-learning module, with satisfaction scores of 5.2/6 and 4.6/6 respectively. The nurses found the traditional teaching method more engaging and less isolating than the self-learning module. While there was no time limit assigned, Carcich and Rafti (2007)

identified that the self-learning module required more time for the experimental group to complete, compared to the completion time of the traditional lecture (75min vs 45min).

With endoscopy being considered a specialty area, RNs hired usually possess experience from other areas of healthcare. While these experiences provide them with a strong foundation to build on, Dellasega, Gabbay, Durdock, and Martinez-King (2009) emphasize that a successful orientation allows the experienced nurse time to embrace being a novice in a new role, without the pressures and assumptions makes transition easier for them.

In a phenomenological study, Dellasega et al. (2009) monitored three experienced nurses to determine if their learning needs differed from the needs of novice nurses during an orientation program. During three-month sessions, traditional didactic teaching and supervised clinical training was provided to the experienced and novice nurses. The researchers collected experiential data (i.e. thoughts and feelings evoked from the orientation process) from journal entries and focus groups. Dellasega et al. (2009) described three common themes that helped support the learning needs of experienced nurses: assessing learner expectation, realistic appraisal and adjustment. Encouraging realistic expectations through open dialogue between students and teachers and providing concrete information can help assess learner expectations. Realistic appraisal is encouraged by adjusting the learning program to focus on the learner's needs and providing ongoing feedback. Also, teachers can promote adjustment by allowing the learner to apply their own significance to the position.

Theoretical Basis

Learning theories provide insight into what makes students effective learners and how they acquire, retain and process information. Applying theories in the development of the EIOM will improve learning outcomes and foster greater learner participation (Candela, 2016). The EIOM will utilize Knowles Adult Learning Theory and Benner's Novice to Expert Model (1984) as structure to guide the selection of teaching content and delivery methods incorporated. These cognitive development learning theories focus on the impact a student's maturation and experience has on their learning development over a sequential period of time (Candela, 2016).

Knowles' Adult Learning Theory

Knowles' Adult Learning Theory (1984) focuses on how an adult's desire, drive and ability to learn is unique to those of a child. The theory surmises adults are autonomous and self-directed in their learning, using their experiences as a resource to ground their learning (Collins, 2004). They use insight and maturity, developed from life experiences, and are problem-oriented, focusing on the relevancy of the information to their job. Basing teaching material in real life situations and practical outcomes associates learning to the interests of the adult learner (Collins, 2004).

Adult learner's preference for experiential learning encourages them to explore and learn from mistakes. Constructive feedback and maintaining a respectful environment deter the fear of failure and creates valuable teaching opportunities for the learner (Candela, 2016).

Adult learners prefer to be involved in the learning process because objectives based on their needs and interests provides empowerment and motivation (Candela, 2016). An educator can achieve a sense of autonomy by including the adult learner in the decisions that determine the learning plan to identify mutual learning goals (Candela, 2016). Adults have life experiences and base their understanding of new information on what they already know. Acknowledging previous experiences and integrating the learner's preferred teaching methods in the learning experience promotes an environment for success (Candela, 2016).

This approach was chosen as a guiding theory for the EIOM because the target audience are RNs with previous career experience in critical care areas. By focusing on their existing knowledge as a foundation for the introduction of new concepts and ideas, the experience of the adult learner is maximized. Students need discipline-specific knowledge to provide safe and effective nursing care; providing the reasons for learning increases their readiness for learning. With the assistance of the educator and their preceptor, learners can decide what areas of the EIOM require more attention and incorporate this knowledge into their clinical learning.

Benner's Novice to Expert Model

Benner's Novice to Expert Model (1984) is another theoretical framework that will be applied in the development of the EIOM, as its staged development design is frequently used in orientation and residency programs (Candela, 2016). Benner utilizes the Dreyfuss model of skill acquisition to differentiate between the various levels of nursing expertise: novice, advanced beginner, competent, proficient, expert, and master

(Candela, 2016). The theory's surmises that a nurse's abilities grow from novice to expert by gaining experience over time, as the stages of learning build on one another professional growth occurs. Growth is a product of the learner's self-reflection; identifying knowledge gaps and opportunities to adjust the teaching plan in collaboration with the educator (Candela, 2016).

At the novice stage, nurses have no situational experience and minimal confidence in their practice (Benner, 1984; Candela, 2016). They require supervision with verbal and physical cues and possess no discretionary judgement (Benner, 1984). A nurse is considered novice when they transition to a new job, regardless of the level of their previous expertise because they possess little situational experience within the practice and environment of the new area (Benner, 1984).It is important for an educator to understand what stage of learner they are working with to identify and appropriately meet the practice needs and learning requirements.

In the advanced beginner stage, the nurse's performance is developing; they can execute some aspects of work efficiently, but their lack of perception prevents them from understanding the large-scale picture (Dreyfus & Dreyfus, 1980). While their knowledge and judgement is improving with exposure to practice and cuing is required less frequently, supervision is still required (Benner, 1984; Candela, 2016). The guiding principles of care, based on acquisition of experience, begin to form (Benner, 1984).

The competency stage is usually demonstrated two to three years into practice in similar areas (Benner, 1984). Here, the nurse is confident, efficient and coordinated in his/her actions (Benner, 1984). They are able to recognize and prioritize the plan of care

and visualize short- and long-term goals, demonstrating conscious, analytical and abstract thinking (Benner, 1984; Candela, 2016; Dreyfus & Dreyfus, 1980). While the competent nurse has a sense of mastery, they lack speed, flexibility and experience to recognize an overall clinical picture and identify its important aspects (Benner, 1984).

The proficiency stage is demonstrated by a nurse's ability to view a situation as a whole. The learner is able to anticipate, recognize, prioritize and modify the plan of care in response to any deviation from the normal expectation (Benner, 1984; Dreyfus & Dreyfus, 1980). A strong grasp of holistic understanding is demonstrated in their confident and competent decision-making ability (Benner, 1984). Proficient nurses often hold roles that require them to be responsible for the management of other individuals (Candela, 2016).

At the final stage, an expert nurse possesses deep situational understanding, and the ability to transcend guideline dependence (Dreyfus & Dreyfus, 1980). They have an intuitive grasp on situations and are able to resolve issues without performing erroneous actions (Benner, 1984).This is demonstrated in the proficient and fluid nature of their performance, as they no longer consciously rely on rules to guide them and only rely on analytical skills when an unfamiliar event occurs (Benner, 1984).

The Novice to Expert Model (1984) provides the necessary conceptual structure to guide the EIOM development and its underlying trajectory by identifying the educational and infrastructure needs of learners at the various stages of their development. Even though the EIOM will be mainly directed at experienced yet new-to-endoscopy nurses, the definition of a novice nurse will be used to understand their

learning needs. As previously stated, a nurse is novice when transitioning to a new job, regardless of their previous clinical expertise because the practice environment may be different from what they are familiar with (Benner, 1984). The EIOM will be used to structure the orientation of experienced nurses, supporting the development of confidence in knowledge and endoscopy skillset as they transition from novice to expert.

Conclusion

Reoccurring themes from the completion of the integrated literature review have provided many important points to consider in the creation of the EIOM. The new advancements occurring within endoscopy bring increased levels of procedural complexity, acuity and technical skill to the nursing field. The current shift towards non-invasive surgeries suggests the demand for endoscopically trained nurses will continue to be significant. The ability to meet the staffing needs for experienced RNs in the endoscopic setting will continue to be difficult, fueled by generational retirement, and the ongoing nurse shortage. This is resulting in the hiring of new graduate nurses into roles previously requiring experience. The use of mixed method orientation programs, especially those combining didactic and preceptorship teaching methods provide high rates of success and satisfaction amongst learners. However, it remains important to tailor teaching content and methods to the experience of the learner and recognize the differences in learning method preferences. The use of Benner's Novice to Expert Model and Knowles' Adult Learning Theory as conceptual structures will ensure the EIOM is tailored to the appropriate experience stage and utilizes learning techniques suited for the adult learner.

There is a significant lack of published literature focusing on endoscopy orientation for RNs evident from the literature review. Comparable fields, such as the operating room, have substantially more extensive literature available on the orientation of nurses. This is a demonstration, in and of itself, of the need for the creation and evaluation of such a resource for endoscopy. Future research is recommended, both in the creation of orientation programs for nurses in the endoscopy setting, and the evaluation of existing orientation programs currently published to strengthen its applicability and usefulness. More education is needed within the endoscopy setting in the form of structured training tools and resources to maintain competency of RNs in light of the constant developments in this field of nursing. As well, future policy and practice will be affected by research on the requirement of standardized training programs for endoscopy nurses and the impact these programs may have on the care and safety of patients.

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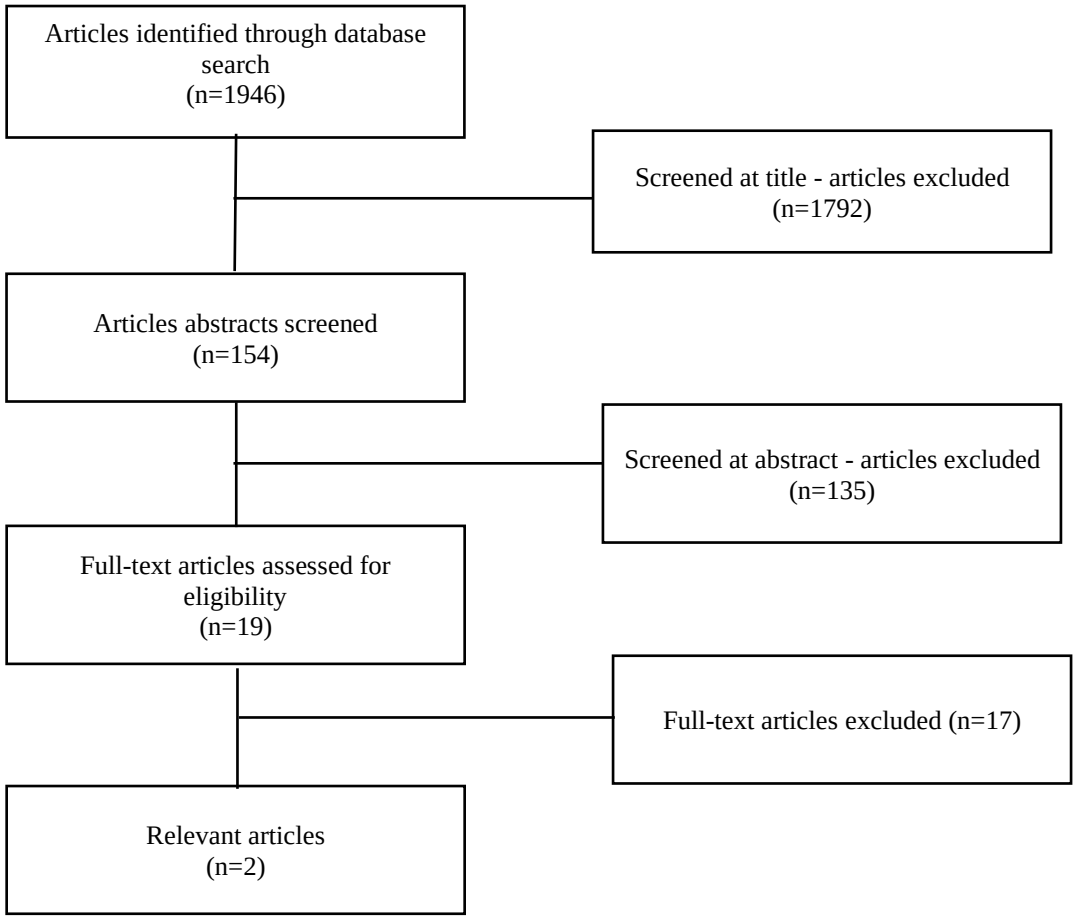
Appendix A

Literature Search Tree

Search terms: “endoscopy”, “nurse”, “orientation” and “training”.



Appendix B – Consultation Report

Endoscopy Intraprocedural Orientation Manual (EIOM) for Registered Nurses

Consultation Report

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During the development of the practicum project, the consultation process will be used to obtain information from stakeholders about the orientation needs of newly hired nurses in endoscopy, specifically information about best practices, fundamental orientation content and key reference resources. Consultation and collaboration within the nursing profession contributes to quality improvement initiatives and strengthens communication amongst colleagues to improve nursing practice and patient care (Canadian Nurses Association [CNA], 2008). The stakeholders consulted included the endoscopy staff registered nurses (RNs), advanced practice nurse educator (APNE), patient care coordinator (PCC), nurse manager, reprocessing technician, medical director of endoscopy, and the Olympus, Boston Scientific and Vantage product representatives. The results from the consultation process will be utilized in the creation of the Endoscopy Intraprocedural Orientation Manual (EIOM), ensuring the information accurately addresses the issues and needs of the endoscopy unit as identified by the stakeholders.

In this consultation report, I will substantiate the need for the practicum project, provide a summary of the integrative literature review and underline the importance of the consultation process. A description of the participants, data collection methods, analysis, and consultation results will be provided. Lastly, I will discuss how the data obtained from the consultation process will be utilized in the development of the EIOM.

Substantiating the Need for the Practicum Project

Endoscopic procedures are the primary choice of minimally invasive investigation and intervention for many serious gastrointestinal concerns such multiple types of cancer,

achalasia, gastrointestinal bleeding, colitis, and anemia (Chandraekhara, Elmunzer, Khashab, & Muthusamy, 2019). These procedures are favoured because they are an efficient and effective means of achieving diagnostic results and therapeutic interventions while also offering a less invasive and safer approach for patients (Association of periOperative Registered Nurses [AORN], 2005). The expansion of endoscopic capabilities has increased in procedural demand, driven by population-based colon cancer screening, advancements in endo-surgical therapeutic procedures, the aging population, and an increase in diseases with endoscopic requirements (Barkun, Ginsberg, Hawes, & Cotton, 2010; Beilenhoff & Neumann, 2011; Matharoo, Thomas-Gibson, Haycock, & Sevdalis, 2014; Shenbagaraj et al., 2019).

Currently, there are 5140 endoscopic procedures performed in the Toronto Western Hospital endoscopy program annually. The growing acuity of the patient population, procedural complexity and demands have the potential to impact patient care. To ensure high quality, safe care remains the priority, equal advancements in nursing education and training are required (Barkun et al., 2010; Tom Deas & Sinsel, 2014). It is imperative endoscopy RN education and training integrates updated, evidence-based practice and competency, as set in the clinical nursing standards (Society of Gastroenterology Nurses and Associates [SGNA], 2014).

Summary of the Integrated Literature Review

The integrated literature review conducted described the current methods of teaching used in the orientation of nurses to endoscopy. The scant amount of literature

specifically examining endoscopy demonstrated a lack of reference material to guide orientation resource development. The literature search yielded stronger results when expanded to include surgical orientation articles. The majority of literature published on the orientation of nurses into an acute, critical and operating room settings use differentiated, mixed method orientation programs. This means the processes of teaching are delivered in multiple formats to reach a variety of learners, creating a student-centered learning plan (Shepard, 2014).

Learning in the controlled environment of didactic teaching creates limitations for the adult learner such as a passive learning atmosphere that lacks student involvement (Altimier, 2009; Scheckel, 2016). With the significant changes in patient acuity and nursing practice in healthcare in recent years, the passive, lecture testing methods are no longer a suitable approach to obtain clinical competence (Distler, 2007). Literature suggests the inclusion of a preceptorship component in an orientation program significantly increases the positive experience and training outcomes reported by participants (Sandau & Halm, 2010). This approach helps to connect theory to practice while increasing the confidence and job satisfaction of the newly- hired nurses (Haggarty, Holloway, & Wilson, 2013; McSharry & Lathlean, 2017).

Whelan et al. (2018) demonstrated simulation training is a safe way to improve learners' competency, confidence and communication skills. Non-technical skill development, such as individual and team performance, can be enhanced to better benefit safe patient outcomes through the latent error detection, side-by-side skill demonstration

and experience sharing, fostered by simulation training (Heard, Fredette, Atmadja, Weinstock, & Lightdale, 2011; Ravindran, Thomas-Gibson, Murray, & Wood, 2019).

Starting work in a new area of healthcare brings with its numerous stresses and barriers threatening a nurse's successful transition. Dellasega, Gabbay, Durdock, and Martinez-King (2009) emphasize that a successful orientation allows the experienced nurse time to embrace being a novice in a new role, without the pressures and assumptions makes transition easier for them. Providing support for the learner is achieved by creating an open dialogue for expectations, establishing realistic learning goals and encouraging personal adjustment to learning plans (Dellasega et al., 2009). Well-developed and structured orientation programs have the ability to retain new nurses by easing their transition and journey to feeling like a confident and competent team member (Allen, 2011).

Consultation Purpose

The consultation process was conducted with stakeholders to obtain information and insight into current orientation practices and identify content recommendations for the EIOM development. Current orientation practices were examined in the consultations to identify areas of concern and potential solutions. Relevant corporate policies and procedures were discussed to determine which were applicable to endoscopy nursing practice. Lastly, preferred methods of teaching were identified to guide the development of the EIOM delivery methods.

The information collected will be translated into the development of the EIOM. This will ensure the key areas of teaching, identified by the stakeholders, is appropriately addressed for the orientation of newly hired endoscopy RNs.

Participants

The stakeholders identified to be consulted included: six endoscopy staff RNs, the advanced practice nurse educator, patient care coordinator, nurse manager, reprocessing technician, medical director of endoscopy, anesthesia assistant, and the Olympus, Vantage and Boston Scientific product representatives. Participants were contacted in person and by email and provided a letter of intent, describing the practicum project, data collection purposes and methods as well as participant rights and protection of privacy (see Appendix B). All participants provided verbal consent prior to participation.

The six RNs (four senior nurses and two novice nurses) in the endoscopy unit at Toronto Western Hospital were approached for consultation because these individuals possessed diverse nursing career backgrounds and an array of clinical experience. Each RN has worked in different critical and acute care areas (operating room, emergency room, acute care, intensive care unit, post-anesthesia care unit and dialysis) and therefore offered a variety of points-of-view in relation to learning in endoscopy. Their previous employment areas may have offered orientation programs, given the specialty areas, which provided insight into what methods of information delivery and orientation structure was preferred.

The patient care coordinator, nurse manager, and advanced practice nurse educator of the endoscopy unit were consulted because they hold positions based heavily in hospital policy and training procedures. They were able to provide insight into mitigating potential barriers, resources and protocols in which I am not familiar with. I also consulted the medical director of endoscopy to obtain information on resources for best practice guidelines and the latest procedures being practiced in endoscopy units.

The Vantage product representative was consulted because they are the supplier of endoscopy equipment and tools for healthcare agencies. The consultation aimed to collect information on the operation, indication and troubleshooting procedures of Vantage endoscopy tools and electrocautery equipment. This discussion also intended to identify additional reference resources to include in the manual. Despite multiple email attempts to consult the Olympus and Boston Scientific product representatives, no contact was received.

The reprocessing technician in the endoscopy unit was consulted to obtain information on their role and how the endoscopy equipment is reprocessed. They were also interviewed to identify current issues and inconsistencies in the RN staff scope handling practices prior to reprocessing. The information obtained from the consultation assisted in the identification of areas where standardization of practice is needed and information to include in the EIOM.

The consultation proposal included intent to consult an anesthesia assistant or anesthesiologist within the Toronto Western Hospital anesthesia department to discuss

the administration of conscious sedation, required nursing skills, assessment criteria and evaluation as well as other information resources. Unfortunately, despite multiple email attempts and one in-person discussion, I was unable to gain consent for consultation.

Data Collection Methods, Management and Analysis

Data was collected by face-to-face, audio-taped, semi-structured interviews using guided questions (see Appendix A), conducted in a private room within the Toronto Western Hospital endoscopy unit during July 2019. Participants were notified that the interview was expected to be 30 minutes in length and their responses would be documented via audio recording and field notes. Once the individual agreed to participate, a suitable date and time for both parties was arranged. Three participants completed a paper questionnaire as per their requests and submitted the questionnaire in an envelope to the designated location on the endoscopy unit.

At the completion of all interviews and questionnaires, the recordings were replayed, and responses transcribed by Sandralee Rose. The transcriptions were combined with the field notes and analyzed for common themes. Debriefing of the common themes was undertaken with the participants to validate the data.

Ethical Considerations

Permission to conduct data collection was requested from the endoscopy manager, Sandra Robinson MN NP. The results of the Health Research Ethics Authority Screening Tool provided by Health Research Ethics Review Board, concluded the proposed project did not require ethical approval (see Appendix C).

All individuals outlined in the previous participants section were directly approached to obtain consent to participate in the interview. The objective of the interview and intended use of data collected was explained during the consent process. An oral agreement to participate indicated verification of consent. Participants were informed that their participation was voluntary and that they could withdraw at any time without consequence.

Confidentiality was maintained by removing all identifying information from all materials used during the consultation process. All documents were stored in a locked filing cabinet, only accessible by me. Electronic data was entered into a computer word document and saved on an encrypted USB device. The paper and electronic documents will be kept until January 3, 2020 and then destroyed using a secure document shredding and destruction company.

Results of Consultations

Primary Interview Themes

Common themes emerged in the analysis of the data from the consultation interviews with stakeholders. The primary themes will be discussed below, followed by a breakdown of secondary themes identified by each stakeholder category. A summarized version of the overall response themes is also available in Appendix D.

Standardized practices. All interviewees emphasized the need for standardization in almost all areas of endoscopy practice. The patient assessment and preparation practices are inconsistent, with some patients wearing shoes, shirts and

jewellery in the procedure room. Assessment forms are not always thoroughly completed, risking the safety of the patient. Some interviewees noted confusion with which patient preparation circumstances (in terms of fasting, anticoagulation use and escort presence) are acceptable and which will result in a procedure cancellation. The nurses requested set guidelines to use as supportive evidence when conflicting situations arise.

Interviewees noted the inconsistencies in documentation practices created confusion and misinterpretation for the reader. The educator echoed similar concerns, noting the inconsistencies negatively impact communication, nursing practice, patient safety and legal proceedings. Given endoscopy's specialized nature and the time restraints it imposes, interviewees stated identifying what information to chart and how to objectively describe the procedure is challenging. They also noted the formatting of the procedure documentation forms are not user-friendly. Some interviewees requested additional information on the electronic charting system (ORSOS), specifically, what the purpose of the data collection is.

A lack of standardization in the procedure room set up and procedure execution was highlighted in a number of interviews. The variation of equipment placement in each room affects efficiency and safety during procedures and creates frustration for staff members. The educator stated the endoscopy room should be set up like the OR, in that, no matter what person or room entered, they are able to find everything in the same locations. The medical director suggested the use of a standardized language to communicate specimen locations, tool requests and procedure information. This approach would reduce labelling and charting errors as well as create clear instructions for staff.

Infection control. A reoccurring theme amongst all interviews was the concern of inconsistent infection control practices at various points of the processes in the endoscopy procedure room. While all interviewees highlighted infection control practices as an area requiring standardized training, each interviewee focused on a different aspect of infection control. Multiple issues identified related directly to the handling of the endoscope. The product representative observed incorrect bedside endoscope cleaning practices. The reprocessing technician mirrored these concerns, noting the high volume of heavily dirtied endoscopes received in the medical device reprocessing department. Handling endoscopes without gloves, incorrect endoscope positioning in procedure bins causing damage and unclear demarcation of endoscope condition (clean vs. dirty) were also mentioned.

Other areas of infection control concerns included interpersonal inconsistency in the procedure area cleaning practices. It was noticed that working area disinfection routines varied between nursing staff. Disparity was also noted in the process of dawning and doffing personal protective equipment. Lastly, some staff were unaware some secondary support items in the procedure room were single use and required changing between procedures.

Mixed methods teaching. All stakeholders identified the combined use of multiple teaching methods was the most effective delivery method for endoscopic training. Interviewees stated new information should be introduced using didactic or self-study literature to provide foundational concepts and terminology that future training will build upon. Multiple requests were also made to include pictures within the literature to

assist the reader in visualizing content such as equipment and patient positioning. Simulation, videos and opportunities for hands-on training were identified by the interviewees as being vital to successful training in endoscopic procedure. They specifically acknowledged being able to touch and practice with the endoscope and its accessories to develop tactile familiarity.

Secondary Interview Themes by Stakeholder

Registered nurses.

Learning challenges for new nurses. Nurses stated the biggest challenge faced is the different environmental flow and nursing role present in endoscopy compared to any other area. Several interviewees noted feelings of confusion and stress were attributed to the fast-paced turnover and the isolating feeling of working in the procedure room. One nurse described endoscopy's nursing nature as broadly team oriented but largely independent at the same time. Another challenge identified by the participants was the multi-tasking skills required to assess and monitor the patient while documenting and assisting in therapeutic procedures; requiring strong critical thinking and assessment skills. Participants also noted the steep learning curve associated with endoscopy accessories, requiring a lot of exposure and practice before competence is achieved. One participant emphasized the importance of new nurses being exposed and trained in all accessories, including the ones that are rarely used, before being deemed competent.

Teaching content for new nurses. Nurses stated an orientation resource is needed to structure the training for new nurses and as a reference resource for all endoscopy nurses. Newly- hired nurses stated understanding the anatomy from the viewpoint of the endoscope was difficult and recommended basic anatomy and physiology from the endoscope view be included in orientation content. They also stated procedure training was task-oriented and therefore did not provide foundational knowledge to foster the critical thinking required to anticipate and manage complications. Nurses stated more knowledge and training is needed for new and current nurses on the administration of sedation, pharmacology and the hospital policy for conscious sedation, as it is a nursing skill not present in most other areas. Additionally, nurses requested more information on the endoscopy equipment and accessories, specifically the ERBE electrocautery machine, use of argon gas and equipment troubleshooting.

Patient care coordinator, nurse educator and nurse manager.

Learning needs of newly- hired nurses. The participants stated the learning needs of experienced nurses vary from those who are less experienced . They elaborated that experienced nurses have developed time management, organizational, assessment and critical thinking skills; however, they may also bring practices that are inconsistent with the hospital procedures. The participants likened inexperienced nurses to a blank slate; while they may lack strong skill development, they offer an opportunity to learn skills correctly. The nurse manager stated critical care and conscious sedation experience are essential skills for new nurses to possess prior to being hired.

The interviewees noted teaching methods preferred by learners varied, regardless of the experience of the learner and depended more on the type of material taught. They noted simulation, hands-on training and preceptorship were most effective methods to teach endoscopy skills, given the difficulty in accurately articulating the actions on paper. The patient care coordinator suggested newly-hired nurses should be provided time in the procedure room without a patient or physician present to become familiar with the equipment, set up and stocking – something that is not currently offered in the orientation plan. All participants identified a need for standardized training and evaluation of the orientation process to ensure nurses have met the competency and knowledge requirements to practice independently.

Implications for Consideration and Conclusion

The results from the stakeholder consultations provided information that will be used to guide the development of the EIOM. The responses from the interviews support the presence of multiple knowledge gaps and necessitate the need for a standardized orientation manual to use in the training of new endoscopy nurses and as a reference tool for current endoscopy nurses. Educational areas of improvement, identified by the interviewees, include improving consistency of practices in infection control and documentation, standardizing procedure room set up and function, and providing foundational education to new nurses. Content recommendations by the participants, for the development of the EIOM, include anatomy and physiology, pharmacology and sedation, procedure equipment and accessories, infection control and reprocessing and hospital policies. Ongoing collaboration with the stakeholders will be maintained during

the development process in Nursing 6661 for input and internal validity testing of the completed EIOM. While the literature review was unable to identify published literature about endoscopy orientation tools, the teaching method preferences, orientation challenges and necessity of standardization within surgical environments was consistent between both the literature review findings and the consultation data.

The information concluded in the integrative literature review and the consultation report have identified an educational void in endoscopy training and orientation. This presents a valuable opportunity for the development and implementation of an educational manual to streamline endoscopy nurse orientation. This consultation report discussed the practicum project, stakeholder selection, data collection methods, analysis, ethical considerations and the resulting themes from the data review. These results support the need and benefit of the development of the standardized endoscopy intraprocedural orientation manual for newly hired nurses to the endoscopy unit.

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Appendix A: Interview Questions

Appendix A1

Endoscopy Consultation Interview Questions

Registered Nurse:

Do you think the current orientation procedures are an effective training tool for endoscopy?

Yes ___ No___

If no, please explain?

What content from the current orientation materials would you remove? What information would you add?

What method(s) of information delivery do you find most effective when learning about endoscopy related material?

What skills do newly- hired nurses find most challenging during the endoscopy orientation?

What skills would you, as a current endoscopy nurse, like additional training or information about?

What are key areas of miseducation in nursing care you have observed related to your area of employment?

What information topics are important to include in the orientation manual for new nurses?

Appendix A: Interview Questions

Appendix A2

Endoscopy Consultation Interview Questions

Nurse Educator and Patient Care Coordinator:

What materials are currently used to orientate newly hired nurses in endoscopy?

Are the current orientation procedures an effective training tool to prepare nurses to start work in endoscopy? Yes ___ No___

If no, please explain?

What improvements would you recommend to the current orientation materials?

What method(s) of information delivery have you found nurses are most receptive to when teaching endoscopy related material?

Are there differences in orientating an experienced nurse compared to a newly graduated nurse transitioning to endoscopy? If yes, please explain.

What key areas of miseducation you have observed related to nursing care in the endoscopy practices?

What information topics do you think are important to include in the orientation manual for nurses?

Are there specific resources that can be referenced pertaining to this information?

Yes ___ No___

If yes, what are they?

Is there anything else you feel is important to contribute to the development of this resource?

Yes ___ No___

If yes, please explain.

Appendix A: Interview Questions

Appendix A3

Endoscopy Consultation Interview Questions

Nurse Manager:

How many nurses are hired in endoscopy each year?

What professional experience do you seek in a potential nurse candidate?

How many incidents and near misses occur in the endoscopy unit each year?

Incidents:_____

Near misses:_____

What types of incidents are they?

What areas of training could be revised to address the previously listed incidents?

What information topics do you think are important to include in the orientation manual for nurses relating to your role as nurse manager?

Is there anything else you feel is important to contribute to the development of this resource?

Yes ___ No___

If yes, please explain.

Appendix A: Interview Questions

Appendix A4

Endoscopy Consultation Interview Questions

Product Representatives and Reprocessing Technicians:

What areas of miseducation or incorrect practice have you observed related to nursing endoscopy equipment practices?

What information topics do you think are important to include in the orientation manual for nurses pertaining to the function and reprocessing of the equipment?

Are there specific resources that can be referenced pertaining to this information? If so, what are they?

Is there anything else you feel is important to contribute to the development of this resource? Please explain.

Appendix A: Interview Questions

Appendix A5

Endoscopy Consultation Interview Questions

Anesthesia Assistant and Medical Director:

What areas of miseducation or incorrect practice have you observed related to patient care and/or endoscopy practice?

What method(s) of information delivery do you find most effective when learning about endoscopy-related material?

What information topics do you think are important to include in the orientation manual for nurses pertaining to your area of employment?

Are there specific resources that can be referenced pertaining to this information? If so, what are they?

Is there anything else you feel is important to contribute to the development of this resource? Please explain.

Appendix B: Letter of Intent

To the participant,

My name is Sandralee Rose, I am a Registered Nurse completing my Master of Nursing Program through Memorial University of Newfoundland Faculty of Nursing. I am currently developing an endoscopy intraprocedural orientation manual (EIOM) to utilize in the orientation training of newly- hired nurses to endoscopy. Your participation in completing the questionnaire will provide information about current endoscopy training practices and areas for improvement, to influence the development of the EIOM. The questionnaire can be answered in an audio-taped, interview conducted in a private room within Toronto Western Hospital, or independently in paper form. This questionnaire may take 15-30 minutes to complete and can be returned to the envelope in the staff room.

The answers will be recorded via field notes and voice recording device during the interview. All personal information will be protected and remain private and will not be include in the EIOM. The recordings and field notes will be kept in a locked office and electronic documents will be protected by password. All information will be destroyed January 5, 2020 using a secure digital and document disposal company. Follow up contact via email or phone call will be made 7 days after initial contact..

Sincerely,

Sandralee Rose, BN, RN

Graduate Student

Appendix C: Health Research Ethics Authority Screening Tool

	Question	**Yes**	**No**
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review		x
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?		x
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.		
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	x	
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?		x
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?		x
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?		x
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?		x
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		**1**	**6**
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	x	

9.	Is the project intended to define a best practice within your organization or practice?	x	
10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	x	
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	x	
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?		**x**
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**4**	**1**
	SUMMARY **See Interpretation Below**	**5**	**7**

Interpretation:

- If the sum of Line A is greater than Line B, the most probable purpose is **research**. The project should be submitted to an REB.
- If the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).
- If the sums are equal, seek a second opinion to further explore whether the project should be classified as Research or as Quality and Evaluation.

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.aspx.

Appendix D: Stakeholder Consultation Results

Interview Questions (See Appendix A)	Responses
Do you think the current orientation procedures are an effective training tool for endoscopy? Please explain.	No by all 9 stakeholders Minimal orientation material available No evaluation of nurse orientation performance No standardization of current practices No teaching on the anatomy and pathophysiology of the gastrointestinal system Do not receive training on all tools before deemed competent.
What content would you add to the orientation materials?	Corporate/Hospital policies Pharmacology Endoscopic tools and troubleshooting Endoscopic procedure and complication management Anatomy and pathophysiology Infection control
What methods of information delivery is effective in teaching endoscopy material?	Mixed methods Simulation Pictures Video Hands on training

	Hard or digital copies of reference materials
As a current endoscopy nurse, what skills would you like more information on?	Hospital policies Sedation pharmacology Endoscopic tools and troubleshooting Endoscopic procedures and complications ERBE training and electrocautery Rare diseases Argon gas use
What skills do newly hired nurses find most challenging?	Not having a written resource to reference Using the endoscopy accessories Sedation procedures Fast pace and pressure Assessment of patient and critical thinking in the situation
What are key areas of miseducation in nursing care and equipment management you have observed?	Incorrect infection control practices Incorrect scope preparing, handling and bedside cleaning practices Incorrect handling of the electrocautery equipment Incorrect charting and documentation practices Failing to maintain patient privacy Poor environmental flow practices

	Internal and interpersonal consistency of processes and practice Poor interprofessional communication
What information topics are important to include in the orientation manual?	Hospital policies Sedation pharmacology Endoscopic tools and troubleshooting Endoscopic procedures and complications ERBE training and electrocautery Anatomy and Physiology Patient Monitoring Scope internal functions Specimen Processing Standardized processes for each RN role Standardized medical language and commands Evaluation of competence Patient flow map Reprocessing

Appendix C – Environmental Scan Report

Endoscopy Intraprocedural Orientation Manual (EIOM) for Registered Nurses

Environmental Scan Report

Sandralee Rose

Memorial University of Newfoundland

Faculty of Nursing, Master of Nursing Program

The function of a registered nurse (RN) within the endoscopy unit is a complex, demanding, multifunctional, and versatile position. The increase in volume and acuity of endoscopic procedures underscores the need to ensure high quality, safe care remains a priority (Tom Deas & Sinsel, 2014). The safety risks and specialized skillsets associated with these complex procedures emphasize the need for RN endoscopy training to be standardized and up to date in best practice guidelines. The Society of Gastroenterology Nurses and Associates (2018) practice standards specify a nurse should attain knowledge and competence that reflects current nursing practice. This will ensure RNs possess the competency and knowledge to assist in such high risk, technical procedures.

During the development of the practicum project, an environmental scan was utilized to identify what educational resources are currently being used within other endoscopy units. An environmental scan is the monitoring and evaluating of current external events and trends that affect aspects of healthcare, in an effort to contribute to the strategic planning of an organization's initiatives and programs (Veltri & Barber, 2016). The consultation of health care institutions within Ontario and Newfoundland and Labrador was done to gauge the current field and nature of its offerings. The information collected will assist in the development of the Endoscopy Intraprocedural Orientation Manual (EIOM), ensuring the information accurately addresses the issues and needs of the endoscopy unit as identified by the environmental scan.

In this report, I will substantiate the need for the practicum project, provide a summary of the integrative literature review and underline the importance of the environmental scan process. A description of the participants, data collection methods,

analysis, and environmental scan results will be provided. Lastly, I will discuss how the data obtained from the process will be utilized in the development of the EIOM.

Substantiating the Need for the Practicum Project

Endoscopic procedures are the primary choice of minimally invasive investigation and intervention for many serious gastrointestinal concerns such as multiple types of cancer, achalasia, gastrointestinal bleeding, colitis, and anemia (Chandraekhara, Elmunzer, Khashab, & Muthusamy, 2019). These procedures are favoured because they are an efficient and effective means of achieving diagnostic results and therapeutic interventions while also offering a less invasive and safer approach for patients (Association of periOperative Registered Nurses [AORN], 2005). The expansion of endoscopic capabilities has increased in procedural demand, driven by population-based colon cancer screening, advancements in endo-surgical therapeutic procedures, the aging population, and an increase in diseases with endoscopic requirements (Barkun, Ginsberg, Hawes, & Cotton, 2010; Beilenhoff & Neumann, 2011; Matharoo, Thomas-Gibson, Haycock, & Sevdalis, 2014; Shenbagaraj et al., 2019).

Currently, there are 5140 endoscopic procedures performed in the Toronto Western Hospital endoscopy program annually. The growing acuity of the patient population, procedural complexity and demands have the potential to impact patient care. To ensure high quality, safe care remains the priority, equal advancements in nursing education and training are required (Barkun et al., 2010; Tom Deas & Sinsel, 2014). It is imperative endoscopy RN education and training integrates updated, evidence-based

practice and competency, as set in the clinical nursing standards (Society of Gastroenterology Nurses and Associates [SGNA], 2014).

Summary of the Integrated Literature Review

The integrated literature review conducted described the current methods of teaching used in the orientation of nurses to endoscopy. The scant amount of literature specifically examining endoscopy demonstrated a lack of reference material available to guide orientation resource development. The literature search yielded stronger results when expanded to include surgical orientation articles. The majority of literature published on the orientation of nurses into an acute, critical and operating room settings use differentiated, mixed method orientation programs. This means the processes of teaching are delivered in multiple formats to reach a variety of learners, creating a student-centered learning plan (Shepard, 2014).

Learning in the controlled environment of didactic teaching creates limitations for the adult learner, such as a passive learning atmosphere that lacks student involvement (Altimier, 2009; Scheckel, 2016) With the significant changes in patient acuity and nursing practice in healthcare over recent years, the passive, lecture testing methods are no longer a suitable approach to obtain clinical competence (Distler, 2007). Literature suggests the inclusion of a preceptorship component in an orientation program for RNs significantly increases the positive experience and training outcomes reported by participants (Sandau & Halm, 2010). This approach helps to connect theory to practice

while increasing the confidence and job satisfaction of the newly- hired nurses (Haggarty, Holloway, & Wilson, 2013; McSharry & Lathlean, 2017).

Whelan, Shi, Andony, Yorke, and Poonai (2018) demonstrated simulation training is a safe way to improve learners' competency, confidence and communication skills. Non-technical skill development, such as individual and team performance, can be enhanced to better benefit safe patient outcomes through the latent error detection, side-by-side skill demonstration and experience sharing, fostered by simulation training (Heard, Fredette, Atmadja, Weinstock, & Lightdale, 2011; Ravindran, Thomas-Gibson, Murray, & Wood, 2019).

Starting work in a new area of healthcare brings with its numerous stresses and barriers threatening a nurse's successful transition. Dellasega, Gabbay, Durdock, and Martinez-King (2009) emphasize that a successful orientation allows the experienced nurse time to embrace being a novice in a new role, without the pressures and assumptions, makes transition easier for them. Providing support for the learner is achieved by creating an open dialogue for expectations, establishing realistic learning goals and encouraging personal adjustment to learning plans (Dellasega et al., 2009). Well-developed and structured orientation programs have the ability to retain new nurses by easing their transition and journey to feeling like a confident and competent team member (Allen, 2011).

Purpose of the Environmental Scan

Currently, there is minimal published literature on endoscopy intraprocedural orientation manuals for registered nurses. The objective of the environmental scan was to describe the breadth of endoscopy orientation resources relating to intraprocedural education for registered nurses within Ontario and Newfoundland and Labrador (NL). The information collected will assist in development of an endoscopy intraprocedural orientation manual (EIOM), influenced by current best practice guidelines.

The environmental scan process was conducted with representatives of the endoscopy units contacted in Ontario and NL to obtain information and insight into the current endoscopy landscape and nursing orientation practices. Demographic information pertaining to the structure of each unit, staffing composition, procedures description and annual case count was requested. The collection of information about specific orientation practices included orientation structure, teaching methods of information delivery, evaluation methods, endoscopic tool instruction, sedation administration, and patient monitoring.

Participants

Organizations chosen in Ontario and NL are acute care hospitals with endoscopy units residing in urban city settings with large, ethnically diverse populations. These characteristics closely represent the demographics of the endoscopy unit at Toronto Western Hospital, where the EIOM will be implemented. All nine hospital organizations chosen are teaching hospitals, as it is speculated they may have orientation training

resources used in teaching students and other health professionals.

Two private organizations were contacted to determine if the training and educational resources were similar, despite differences in patient capacity and procedure acuity, to public organizations.

Contact with the organizations were made through email with a formal, standardized letter (see Appendix A) introducing myself, my affiliation as a graduate student in the Faculty of Nursing, Master of Nursing Program, with Memorial University of Newfoundland and staff nurse at Toronto Western Hospital, and the purpose and objectives of the student project. The email also informed participants the information would be collected through the attached survey and the possible length of time to complete the survey. Lastly, the letter provided my contact information to allow respondents to ask questions about the project and required date of completion.

Data Collection Methods, Management and Analysis

Data was collected from healthcare organizations in Toronto, Ontario (public and private sector) and St. John's, NL between July and August 2019. Data collection involved the completion of a self-report survey (see Appendix B). A request for participation was made to the appropriate organization representative through email (see Appendix A). Follow-up contact was completed by email and telephone, reiterating the purpose of the request, information requested and collection details. Information sought from all organizations included the following: 1) consent to participate 2) organization population demographics, staffing composition and patient services, 3) current

orientation practices, 4) existing orientation training resources, and 5) development and critique of existing resources and practices. To ensure consistency, survey instructions were provided to each contact person within the healthcare organization through email. Respondents were informed the survey was voluntary and would take approximately 20-25 minutes to complete.

Responses to the questionnaire were placed into an excel spreadsheet. Categories were created based on commonalities in the responses and from these, themes were identified. The endoscopy nurse educator was provided a copy of the survey results and identified themes for validation. Electronic data was entered into a computer word document and saved on an encrypted USB device. All documents and devices were stored in a locked filing cabinet, only accessible by me. The paper and electronic documents will be kept until January 3, 2020 and then destroyed using a secure document shredding and destruction company.

Ethical Considerations

Permission to contact these organizations as a graduate nursing student and, as an employee of Toronto Western Hospital was obtained from the manager of the Toronto Western Hospital endoscopy unit, Sandra Robinson, MN NP. Permission to contact these organizations on behalf of myself, as a student of Memorial University of Newfoundland's Faculty of Nursing, Master of Nursing program was obtained from Dr. Robert Meadus. The results of the Health Research Ethics Authority Screening Tool provided by Health Research Ethics Review Board, concluded the proposed project did

not require ethical approval (see Appendix C).

Permission to obtain and use the information from the environmental scan was requested from the participating organizations as evidenced by completion of the survey. The first survey question allowed participants to choose to provide consent for the survey by answering "yes" (see Appendix B, question 1). Confidentiality was maintained by removing all identifying information from reported information. The characteristics of the organization, their population and services provided was the information of interest and therefore the omission of the organization name did affect the integrity of the environmental scan results. All data was entered into a computer word document, protected by a password, saved on a secure USB and kept in a secure filing cabinet.

Results of Consultations

Due to environmental politics beyond my control and the time constraints of the course, responses were received from only four public hospitals and no private clinics, despite repeated attempts to contact all participants. Of the four responses, three participants completed the survey and one declined to participate. The results of the surveys will be discussed, and a summary of responses provided in Appendix D.

Organization Profiles

All participants represent urban, public, teaching hospitals; two are located in Toronto, Ontario and one in St. John's, Newfoundland. The main demographics serviced by the endoscopy units was identified as the adult population, aged 50 and older. On average, the units completed between 3600 and 8800 procedures annually. These

consisted of gastroscopies, colonoscopies, and sigmoidoscopies at all units as well as Peg tube insertions and ERCPs at two units.

All endoscopy procedure rooms, and recovery areas were staffed by registered nurses (RNs) and two of the units also employed a registered/licensed practical nurse to support the procedure room preparations. The clinical backgrounds of current RNs in all three units are a mixture of critical care, medical/surgical and endoscopy experience. Two units have a mixture of novice and experienced RNs (2 months to 15 years' experience) and the third unit's RNs have over fifteen years' experience. The number of RNs hired annually is low for all units, with 1-3 RNs per year, dependent on staff turnover. The key clinical experiences required in newly- hired RNs varied between the three units, with one unit stating, "hiring is based solely on seniority within the corporation". The second unit required acute care experience, while the last unit required critical care and endoscopy experience as well as Advanced Cardiac Life Support certification.

Training and Resource Materials

The major theme and only commonality in the orientation programs at each endoscopy unit was the use of co-signed preceptorship shifts as the main method of training. The training period was 3 – 6 weeks long depending on the learner's needs and included training in the preadmission, intraprocedure and post-anesthesia care areas. Two units also reported including exposure to the hospital policies in their orientation training. Participants noted while stakeholders, such as endoscopy nurses, physicians and

anesthesiologists, were consulted in the initial development of the orientation processes, the tools have been inconsistently maintained or updated.

All participants noted training methods were guided by the Canadian Society of Gastroenterology Nurses and Associates (CSGNA) standards of practice, however, only one endoscopy unit had used the CSGNA standards and hospital policies to develop an orientation manual. Other reference resources included Canadian Digestive Health Foundation, European Society of Gastrointestinal Endoscopy, National Association of periAnesthesia Nurses of Canada, Association of perioperative Registered Nurses and Operating Room Nurses Association of Canada. Only one participant cited the use of an evaluation checklist, all other participants used RN and physician feedback to determine the success of training. Overall, all interviewees found preceptorship (using a senior nurse) was the most effective method of training and evaluating new RNs. Most participants noted no issues with their current orientation methods, although one participant reported too much text content in the current orientation material.

Implications for Consideration

While the lack of information received from the environmental scan resulted in a suboptimal information analysis, the results of the completed surveys indicated preceptorship training was the most effective method of teaching in an RN orientation program. There is a significant absence of structured and standardized orientation material being utilized, specifically relating to the foundational knowledge delivery and

evaluation processes. These findings are consistent with the research gap identified in the integrative literature review and the needs identified in the consultation report.

Conclusion

The environmental scan yielded few beneficial results due to the political environment of the healthcare industry, resulting in a lack of participation and information being shared. Based on discussions with the Dean of Graduate Nursing studies, Dr. Donna Moralejo and course instructor, Dr. Robert Meadus, the environmental scan was modified, analyzing the information received up to August 8, 2019. Given the purpose of the practicum project was to create an educational orientation manual to satisfy the training gaps identified at Toronto Western Hospital, the EIOM will be developed based on the needs of Toronto Western Hospital endoscopy unit and the results of the consultation process.

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Appendix A

Environmental Scan Contact Letter

To (enter organization name/respondent name),

My name is Sandralee Rose, I am a Registered Nurse completing my Master of Nursing Program through Memorial University of Newfoundland Faculty of Nursing and a current employee of the Endoscopy unit at Toronto Western Hospital. I am conducting an environmental scan of the training resources used to provide orientation to newly hired registered nurses within an endoscopy setting. The results of this environmental scan will contribute to a larger project in the development of a standardized endoscopy intraprocedural orientation manual at Toronto Western Hospital, to be used in the training of newly hired registered nurses. I am contacting hospitals and private endoscopy clinics mainly within the Toronto area to request their participation in completion of a short survey.

The survey has three sections, the first section, seeks consent to use the information collected in the environmental scan report and the future creation of educational materials. The second section, requests information about the nature of your organization's patient and staffing populations, types and number of procedures offered and characteristics of the newly hired registered nurse population. The main and final section seeks information about the current training practices in place, specifically the resource materials, their development, teaching, and evaluation methods as well as successes and issues you may have noted during the orientation process. This survey may take 20-25 minutes to complete and can be returned by email to rose.sandralee@gmail.com within 7 days of receiving the survey. Follow up contact via email or phone call may be done two weeks after initial contact.

Any questions or concerns can be directed to my attention, Sandralee Rose, at the email address above.

Best Regards,

Sandralee Rose, BN, RN

Graduate Student

Appendix B

Endoscopy Environmental Survey

This survey asks questions about the education and training material used in the orientation of registered nurses in the endoscopy department. The information from the survey will be used to identify current orientation practices and influence the development of an endoscopy intraprocedural orientation manual.

Consent

1. Would you like to participate in this survey?

   Yes __ No __

2. If you have decided not to participate, please indicate why. This helps to ensure the survey is relevant and inclusive.

_____

_____

_____

_____

Please note, while personal identification information and organization names will not be included in the final report, organization profile information and professional designation of the individual surveyed may be included.

3. If you have read and understand the above information and agree to participate in the project, please check “yes”.

   Yes __ No __

Organization Profile

4. What is the name of your organization and location?

_____

5. Is your organization a private medical practice, a public hospital or other?

_____

6. What are the patient population characteristics?

_____

7. What type of procedures are performed in your organization?

_____

_____

8. How many endoscopy cases do you complete annually?

_____

9. What is the staffing structure of the endoscopy unit?

_____

10. What is the experience background of your current nursing staff (years of practice and other practice area experience)?

_____

11. How many new Registered Nurses do you hire annually?

12. What are the job requirements (i.e.,. years of experience, education, training, & previous experience) wanted in a newly hired nurse?

_____

_____

Training and Resource Materials

13. What is the structure of the orientation training?

_____

_____

_____

14. What is the length of time allocated for the training of newly hired nurses?

_____

_____

15. Do you use standardized training resource materials?

_____

_____

_____

16. What are the sections/topics within the resource materials?

_____

_____

_____

17. What teaching methods does it utilize? How is it structured?

_____

_____

_____

18. What methods are used to evaluate the progress/performance of the trainee?

_____

_____

_____

19. What sources of information were used in the creation of the training resource material?

_____

_____

_____

20. Were there stakeholders consulted during the development of the training program? If so, who were they and what was their relation to endoscopy?

_____

_____

21. How often is the training program updated?

_____

_____

_____

22. Is there a best practice document the training materials are guided by?

_____

_____

_____

23. Are there barriers to training with the current resource material? If so, please explain?

_____

_____

_____

24. Is there a component(s) of the material you find effective? If so, what is it and why is it effective?

_____

25. Would you be willing to provide a copy of the orientation resources? If so, please attach to completed survey.

_____

_____

_____

Appendix C

Health Research Ethics Authority Screening Tool

	Question	**Yes**	**No**
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review		x
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?		x
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.		
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	x	
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?		x
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?		x
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?		x
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?		x
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		**1**	**6**
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	x	

9.	Is the project intended to define a best practice within your organization or practice?	x	
10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	x	
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	x	
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?		**x**
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**4**	**1**
	SUMMARY **See Interpretation Below**	**5**	**7**

Interpretation:

- If the sum of Line A is greater than Line B, the most probable purpose is **research**. The project should be submitted to an REB.
- If the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).
- If the sums are equal, seek a second opinion to further explore whether the project should be classified as Research or as Quality and Evaluation.

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.aspx.

Appendix D

Environmental Scan Responses

Survey Questions	Participant Responses
13. What is the structure of the orientation training?	• Hospital orientation and on the job training inside and outside the procedure rooms. • Unstructured, 3 weeks of buddy shifts • Read policies, 4-6 weeks training with an assigned RN, on call with another RN
14. What is the length of time allocated for the training of newly hired nurses?	• Variable based on nurse background. Generally 2 weeks in recovery and 4 weeks in the procedure rooms. • 3 weeks • 4 to 6 weeks, extra time for ERCP and extra time for on-call training
15. Do you use standardized training resource materials?	• Not at this time. • Unstandardized; pathophysiology and endoscopy guideline resources available but not up to date. Also resources from Canadian Digestive Health Foundation, European Society of Gastrointestinal Endoscopy and Society of Gastroenterology Nurses and Associates • Yes, by CSGNA standards and hospital policies.
16. What are the sections/topics within the resource materials?	• Checklist format • Pathophysiology, infection control, medications, procedures • Anything GI related, conscious sedation
17. What teaching methods does	• Checklist format

it utilize/ How is it structured?	• nurse to nurse hand on training • Reading policies, product manuals and hands on training
18. What methods are used to evaluate the progress/performance of the trainee?	• Observation, comfort level, feedback from nurses and doctors • Verbal feedback • The senior RN, paired with the new hire, evaluates them. Also a checklist of skills specific to GI
19. What sources of information were used in the creation of the training resource material?	• Workflow, typical cases, feedback from new staff. • Unknown • Hospital policies and CSGNA standards
20. Were there stakeholders consulted during the development of the training program? If so, who were they and what was their relation to endoscopy?	• Experienced staff, new staff, physicians and anesthesiologists. • Unknown • Unsure
21. How often is the training program updated?	• Unknown • Currently in the process, unknown prior to now • As needed
22. Is there a best practice document the training materials are guided by?	• CSGNA • Current practice standards: ESGE, NAPAN, AORN and ORNAC standards • CSGNA standards
23. Are there barriers to training with the current resource	• No • Text-heavy, not organized/accessible

material? If so, please explain?	• No
24. Is there a component(s) of the material you find effective? If so, what is it and why is it effective?	• CSGNA, CNA certification program • Unknown • Learn policies first and then apply them in practice
25. Would you be willing to provide a copy of the orientation resources? If so, please attach to completed survey.	• Will ask educator to share. • None • Provided via mail.

Appendix D – Learning Resource Manual

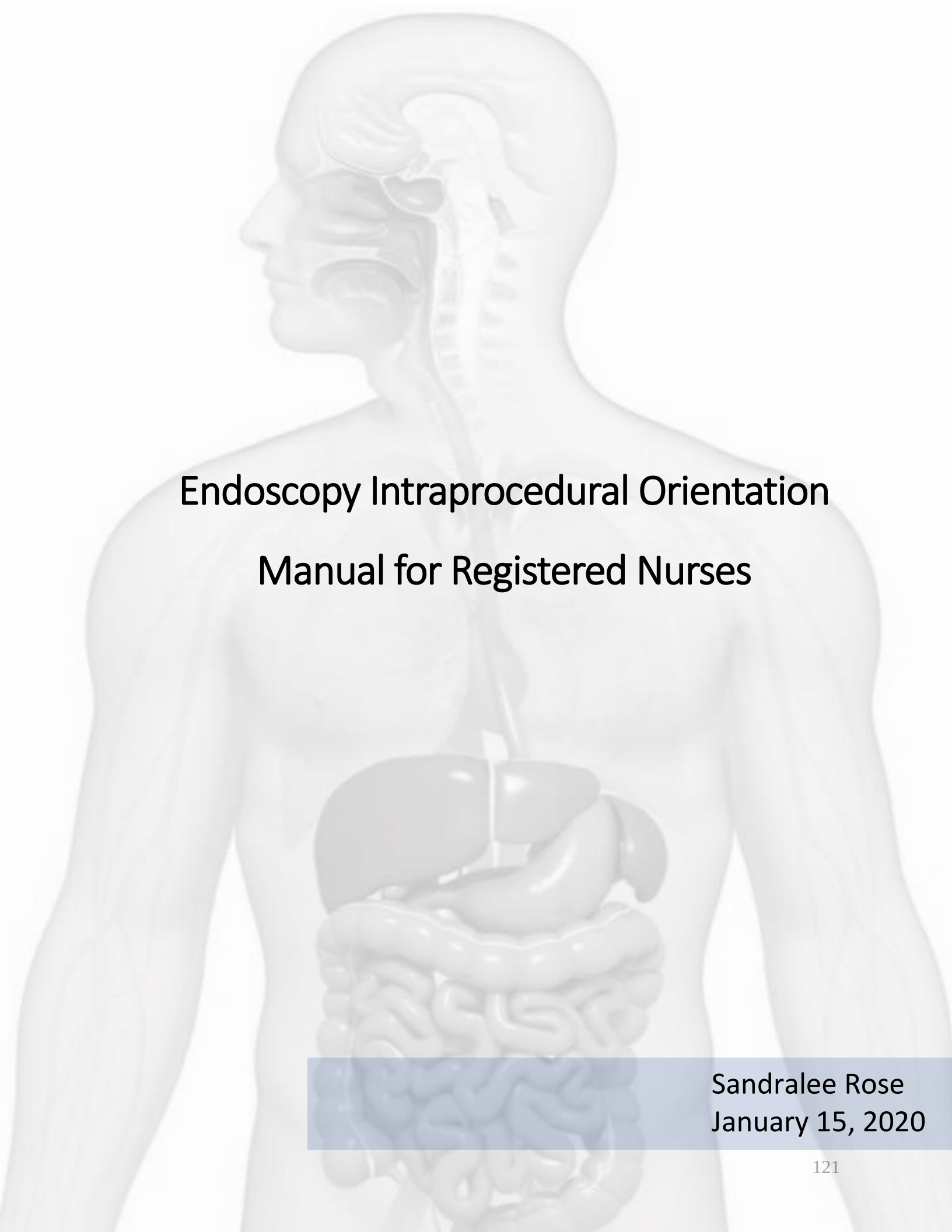
Endoscopy Intraprocedural Orientation Manual (EIOM) for Registered Nurses

Learning Resource Manual

Sandralee Rose

Memorial University of Newfoundland

Faculty of Nursing, Master of Nursing Program



Endoscopy Intraprocedural Orientation Manual for Registered Nurses

Sandralee Rose
January 15, 2020

Chapter 1: Anatomy and Physiology of the Gastrointestinal System

1 Anatomy and Physiology

1.1 Mouth and Esophagus

1.1.1 Oral cavity

1.1.2 Cheeks

1.1.3 Tongue

1.1.4 Teeth

1.1.5 Salivary glands

1.1.6 Hard palate, soft palate and uvula

1.1.7 Pharynx

1.1.8 Larynx

1.1.9 Esophagus

1.2 Stomach

1.3 Small Intestine

1.4 Large Intestine

1.5 Liver

1.6 Pancreas

1.7 Gallbladder

1.8 Chapter Evaluation

1.9 Chapter Evaluation Answers

Chapter 2: Pathophysiology, Abnormalities and Hereditary Conditions

2 Pathophysiology of the Gastroenterological Disease Processes

2.1 Mouth and Esophagus

2.1.1 Barrett esophagus

2.1.2 Gastroesophageal reflux disease (GERD)

2.1.3 Achalasia

2.1.4 Eosinophilic esophagitis

2.1.5 Esophageal varices

2.2 Stomach

2.2.1 Hiatal hernia

2.2.2 Gastroparesis

2.2.3 Bezoars

2.2.4 Peptic ulcer disease

2.3 Small Intestine

2.3.1 Crohn's disease

2.3.2 Celiac disease

2.4 Large Intestine

2.4.1 Colorectal cancer

2.4.2 Ulcerative colitis

2.4.3 Diverticular disease

2.4.4 Irritable bowel syndrome (IBS)

2.5 Liver

2.5.1 Cirrhosis

2.5.2 Hepatitis

2.5.3 Non-alcoholic steatohepatitis (NASH)

2.5.4 Primary biliary cirrhosis

2.5.5 Esophageal and gastric varices

2.6 Biliary System

2.6.1 Cholelithiasis

2.6.2 Choledocholithiasis/ cholangitis

2.6.3 Cholecystitis

2.6.4 Primary sclerosing cholangitis

2.7 Pathological Abnormalities

2.8 Neoplasm

2.9 Infectious Diseases

2.9.1 Clostridium difficile

2.9.2 Helicobacter pylori

2.10 Hereditary Diseases and Conditions

2.10.1 Wilson's disease

2.10.2 Hemochromatosis

2.10.3 Hereditary nonpolyposis colorectal cancer (Lynch syndrome)

2.10.4 Familial adenomatous polyposis

Chapter 3: Conscious Sedation and Patient Monitoring

3 Background of Conscious Sedation

3.1 Sedation Contraindications and Special Circumstances

3.2 Sedation and Analgesic Agents

3.2.1 Oropharyngeal anesthetic spray

3.2.2 Benzodiazepine

3.2.3 Opioid narcotics

3.3 Antagonist Medication

3.3.1 Flumazenil

3.3.2 Naloxone

3.4 Pre-Procedure Patient Assessment

3.5 Intra-Procedure Patient Monitoring

3.5.1 Patient assessment

3.5.2 Risk stratification

3.5.3 Pulse oximetry

3.5.4 Respiratory status

3.5.5 Automated sphygmomanometer

3.5.6 Continuous electrocardiogram

3.5.7 Capnography

3.5.8 Ramsay Sedation Score

3.5.9 Documentation

3.6 Post-Procedure Care and Documentation

3.7 Sedation-Related Emergencies

4.4.1.1 Bipolar electrohemostasis catheter

4.4.1.2 Needle injectors

4.4.1.3 Clipping devices

4.4.1.4 Multiple band ligator

4.4.1.5 Argon plasma coagulation (APC) probe

4.4.1.6 Endoloop ligator

4.4.2 Biopsy

4.4.2.1 Hot biopsy forceps

4.4.2.2 Multiple sample biopsy forceps

4.4.3 Resection and retrieval devices

4.4.3.1 Cold snares

4.4.3.2 Hot snares

4.4.3.3 Retrieval basket

4.4.3.4 Retrieval grasping forceps

4.4.3.5 Polyp trap

4.4.4 Cytology brush

4.4.5 Balloon tamponade

4.4.6 Dilation

4.4.6.1 Savary dilators

4.4.6.2 CRE Balloon dilatation catheters

4.4.7 Distal attachment cap

4.4.8 Percutaneous endoscopic gastrostomy (PEG) kit

4.4.9 Gastric overtube

Chapter 5: Diagnostic Tests and Therapeutic Procedures

5 Diagnostic Tests and Therapeutic Procedures

5.1 Diagnostic Tests

5.1.1 Colonoscopy

5.1.2 Anoscopy

5.1.3 Sigmoidoscopy

5.1.4 Esophagogastroduodenoscopy (EGD)

5.1.5 Small bowel capsule endoscopy

5.1.6 Endoscopic retrograde cholangiopancreatography (ERCP)

5.1.7 Enteroscopy

5.2 Therapeutic Procedures

5.2.1 Hemostasis and ablation

5.2.1.1 Clipping

5.2.1.2 Injection

5.2.1.3 Argon plasma coagulation

5.2.1.4 Variceal therapy

5.2.2 Gastric lavage

5.2.3 Dilatation

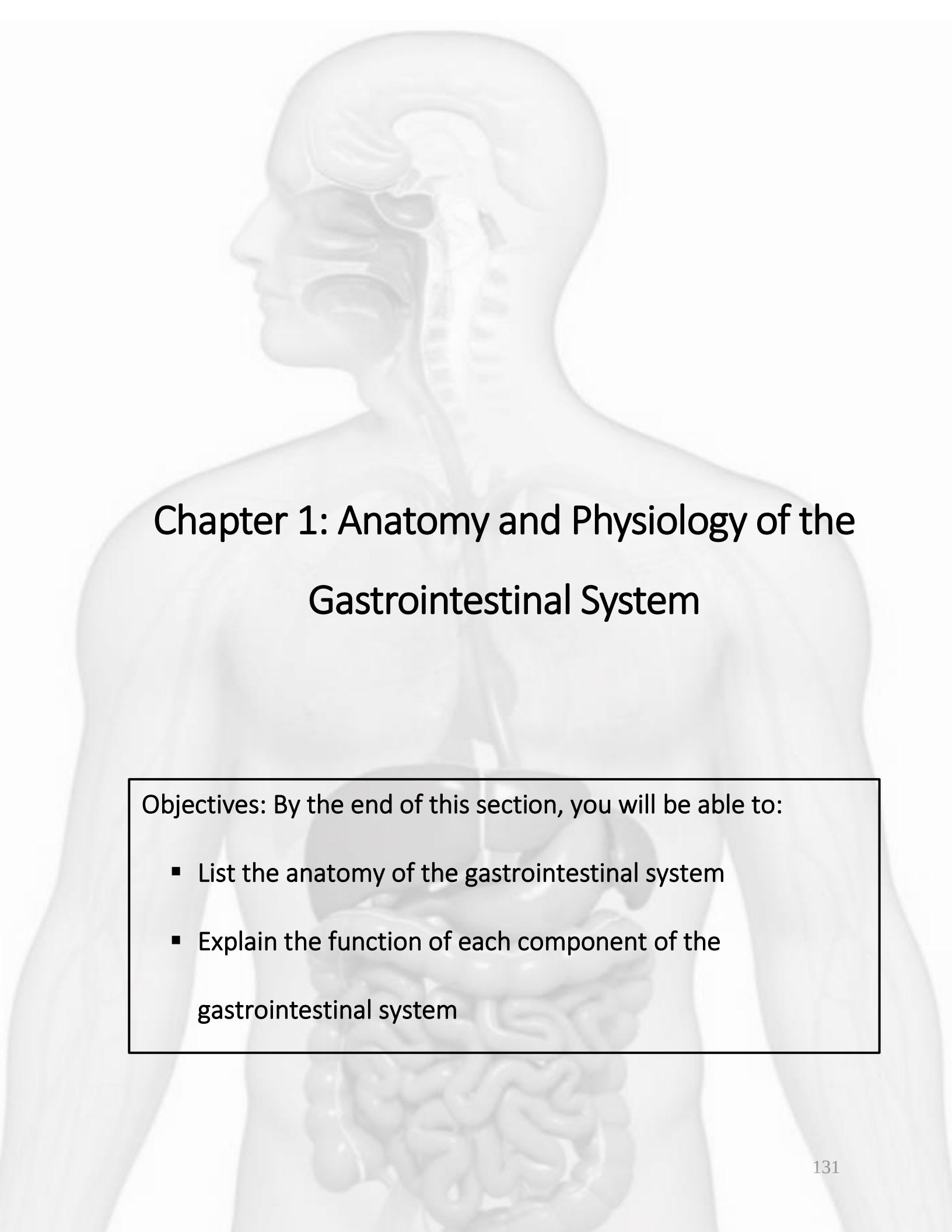
5.2.4 Stent insertion

5.2.5 Percutaneous endoscopic gastrostomy/ transgastric jejunostomy tube

5.2.6 Decompression

5.2.7 Biopsy

5.2.8 Polypectomy



Chapter 1: Anatomy and Physiology of the Gastrointestinal System

Objectives: By the end of this section, you will be able to:

- List the anatomy of the gastrointestinal system
- Explain the function of each component of the gastrointestinal system

1 Anatomy and Physiology

1.1 Mouth and Esophagus

1.1.1 *Oral cavity*

The oral cavity, also called the mouth, includes the cheeks, tongue, teeth, salivary glands, hard palate, soft palate and uvula (Betts et al., 2013).

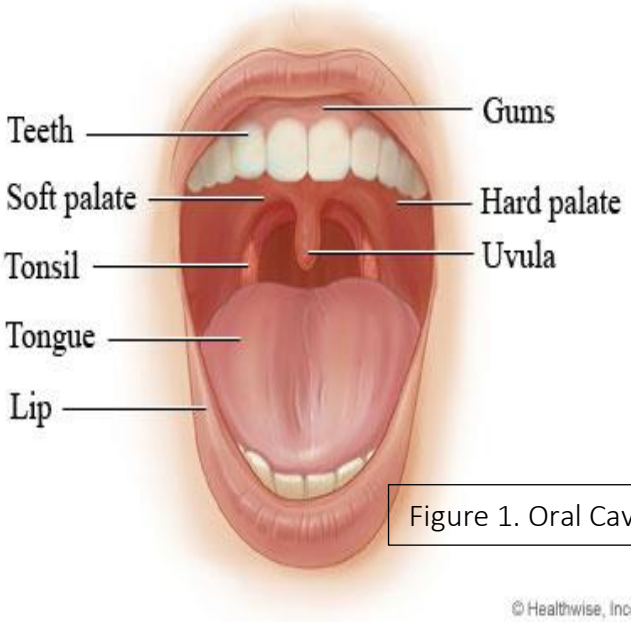


Figure 1. Oral Cavity

1.1.2 *Cheeks*

The cheeks are made of muscle layers covered in mucous membrane, forming the sidewalls of the oral cavity and aid in the movements of eating through contraction (Betts et al., 2013).

1.1.3 *Tongue*

The tongue is a strong group of muscle fibres that begin the process of breaking down food, facilitating ingestion, mechanical digestion, chemical digestion, sensation, swallowing and speech (Betts et al., 2013).

1.1.4 *Teeth*

The teeth are a bone-like structure made of dentin that facilitates the mechanical digestion of food using tearing and grinding motions.

1.1.5 *Salivary glands*

The three salivary glands located in the mucous membranes of the mouth and tongue are the: submandibular gland, sublingual gland, and parotid gland. These exocrine glands secrete saliva into the oral cavity to moisten the mouth and food as well as start the chemical breakdown of carbohydrates (Betts et al., 2013).

1.1.6 *Hard palate, soft palate and uvula*

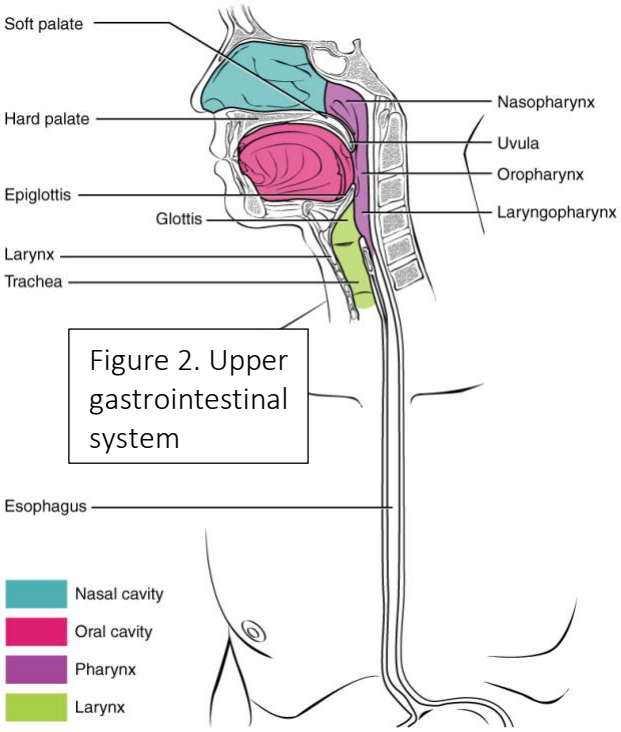


Figure 2. Upper gastrointestinal system

The palate in the roof of the mouth has two distinct sections: the hard palate and the soft palate. The hard palate forms a septum between the nasal and oral cavities. Its bony structure also allows the tongue to push food against it during ingestion.

The soft palate is located at the back of the hard palate where it changes into fleshier skeletal muscle. The uvula is the small teardrop-shaped tissue sac that hangs on the rear edge of the soft palate. The uvula and soft

palate protect the nasal cavity by moving upward during singing, yawning and from food and liquid during swallowing (Betts et al., 2013).

1.1.7 *Pharynx*

The pharynx, also known as the throat, plays a role in respiration by receiving air from the oral and nasal cavities. In digestion, the muscles contract involuntarily to protect the airway as it receives food from the oral cavity. The pharynx has three sections: the nasopharynx, oropharynx and laryngopharynx. The nasopharynx facilitates breathing and speaking. The oropharynx and laryngopharynx help with breathing and digestion through sequential muscle contraction (Betts et al., 2013).

1.1.8 *Larynx*

The larynx is the most superior aspect of the trachea. It connects to the laryngopharynx at an area known as the glottis. During the act of swallowing, a cartilaginous flap called the epiglottis contracts over the opening of the glottis to prevent food from entering the trachea and bronchi (Betts et al., 2013).

1.1.9 *Esophagus*

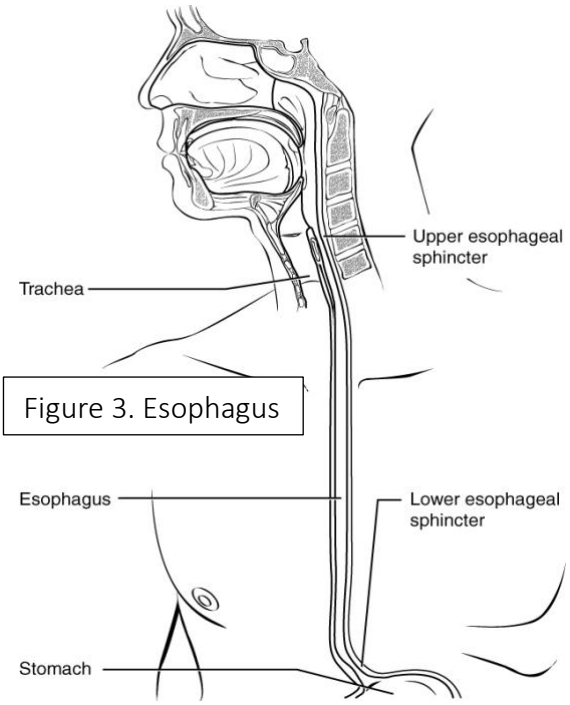


Figure 3. Esophagus

The esophagus is a tube of smooth and skeletal muscle fibres that lies behind the trachea, connecting the pharynx to the stomach through an opening in the diaphragm called the esophageal hiatus. At the top of the esophagus is the upper esophageal sphincter, a circular ring of muscle that controls the movement of food into the esophagus from the pharynx.

At the bottom of the esophagus is the lower esophageal sphincter, called the gastroesophageal junction (GEJ), where the esophagus connects to the stomach. It functions relaxing to let food pass from the esophagus into the stomach and contracting to prevent stomach acid from reaching the esophageal mucosa (Betts et al., 2013).

1.2 Stomach

The stomach has four main areas: the cardia, fundus, body and pylorus. The cardia is the region where the esophagus meets the stomach. The fundus is the top of the stomach, below the diaphragm and to the right of the cardia. The main part of the stomach is the body, located below the fundus. The pylorus is the bottom region of the stomach where it attaches to the duodenum via the pyloric sphincter. The large end of the cone-shaped pylorus is the called the antrum and the narrow end is called the pyloric canal.

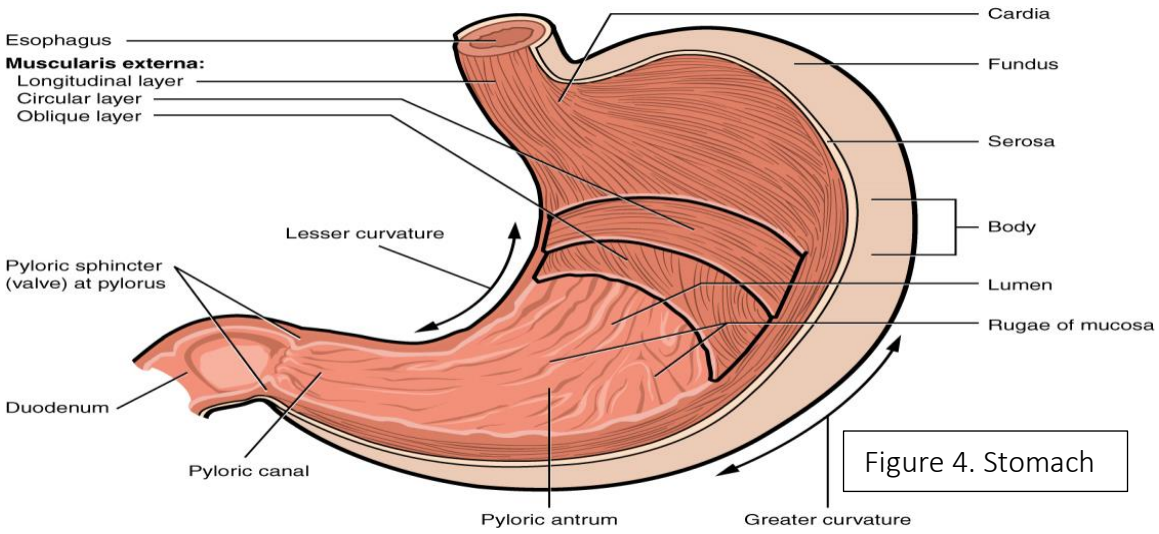


Figure 4. Stomach

The folds in the stomach, present when deflated, are known as ruga. These folds help with expansion of the stomach when filled with food/liquid and assist in mechanical digestion by moving the food/liquid bolus toward the pyloric sphincter and into the small intestine. The stomach walls contain mucus cells which secrete alkaline mucus to protect the lining from the digestive acidic

hydrochloric acid and intrinsic factors, secreted from small gastric pits in the stomach wall (Betts et al., 2013).

1.3 Small Intestine

The small intestine is about 3 meters long and 2.5 cm in diameter. It is divided into three sections: the duodenum, jejunum and ileum. The duodenum starts at the pyloric sphincter of the stomach and extends for 10 inches before becoming the jejunum. Within the duodenum lies the hepatopancreatic ampulla, where the common bile duct and main pancreatic duct introduce bile and pancreatic juices into the intestine. The jejunum runs between the duodenum and the ileum and is about 3 ft long. The final portion of the small intestine is the ileum, measuring 6 ft, it is thicker with more vascular patterns and deep mucosal folds. The end of ileum connects with the first section of the large intestine, through a valve called the ileocecal sphincter. The small intestine walls have deep circular folds lined with small finger-like projections called villi, which facilitate absorption. These tiny structures increases the absorption surface area of the small intestine by 600-fold

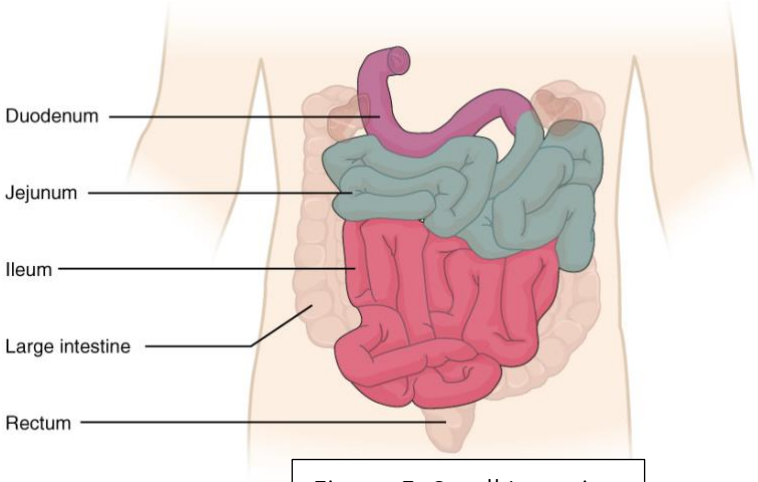


Figure 5. Small Intestine

and are the reason the small intestine is the body's primary digestive organ (Betts et al., 2013).

1.4 Large Intestine

The large intestine is the last organ in the digestive system. Beginning around the ileocecal valve, where it joins the end of the small intestine and ending at the anus, it is approximately 80 cm long and 7 cm in diameter. Its purpose is to complete the absorption of nutrients, water and vitamins as well as create and eliminate feces. The contraction of teniae coli muscles bunch up the intestinal walls into ridged pouches called haustras, forming the colon's wrinkled appearance. These muscles contract slowly to move the contents from one haustra to the next until the contents reach the rectum. The large intestine is subdivided into seven parts: cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum and anal canal. The appendicle orifice is also visible at the base of the cecum, attaching the appendix to the cecum. The cecum is a large pouch that absorbs water and salt from contents received from the ileocecal valve. The

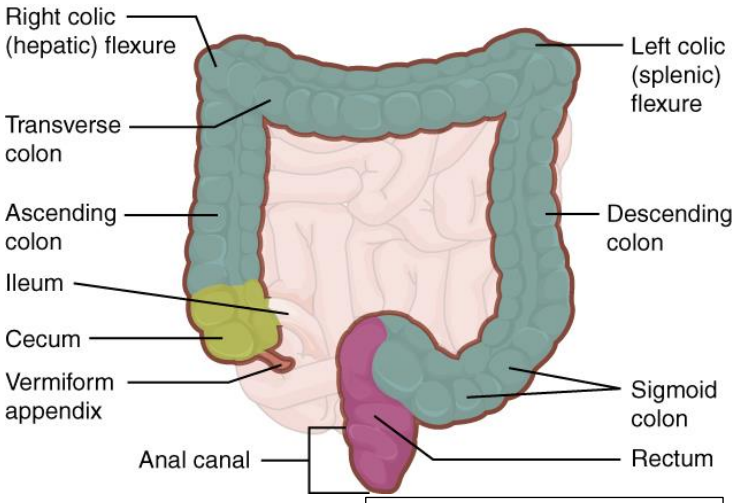


Figure 6. Large Intestine

remnants then travel up the ascending colon around the hepatic flexure (the bend in the right side of the colon, next to the liver). They continue across the transverse colon to the splenic flexure (the bend in the left side of the colon, next to the spleen). The contents travel down through the descending colon and into the turns of the sigmoid colon before reaching the rectum and anal canal (Betts et al., 2013).

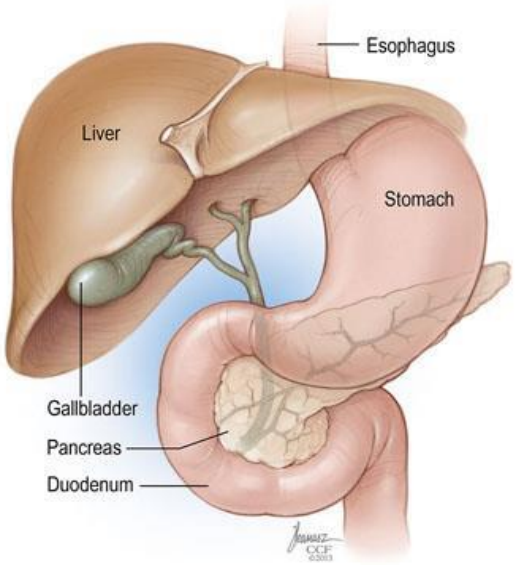


Figure 7. Liver, Pancreas and Gallbladder

1.5 Liver

The liver is a large gland, divided into two lobes: the larger right lobe and the smaller left lobe. It is located below the diaphragm on the right upper quadrant of the abdomen and plays a significant role in digestion, metabolism and body regulation (Betts et al., 2013).

1.6 Pancreas

The pancreas is situated behind the stomach and rests against the curve of the duodenum. It serves exocrine functions by secreting pancreatic juice filed with digestive enzymes into the duodenum. The pancreatic juice neutralizes the acid from the stomach and delivers enzymes that break down starch (amylase), fat (lipase), glucose, nucleic acids (nuclease) and protein. It also plays a role in the

body's endocrine functions by producing hormones such as pancreatic polypeptide, insulin, glucagon and somatostatin (Betts et al., 2013).

1.7 Gallbladder

The gallbladder is a sac located behind the right lobe of the liver. It refines, stores and excretes bile into the duodenal portion of the small intestine, through the common bile duct, to facilitate digestion (Betts et al., 2013).

1.8 Chapter Evaluation

1. What are the seven components of the oral cavity?

2. What cartilaginous flap involuntarily moves to protect the airway from food during the act of swallowing?

3. Name the two sphincters in the esophagus.
    a. Top sphincter and bottom sphincter
    b. Laryngeoesophageal sphincter and gastroesophageal sphincter
    c. Primary esophageal sphincter and secondary esophageal sphincter
    d. Upper esophageal sphincter and gastroesophageal junction
4. Identify the areas of the stomach in the correct order that the food will pass through gastroesophageal junction, antrum, cardia, body, pyloric sphincter, fundus.
    a. 6, 5, 4, 3, 2, 1
    b. 4, 1, 3, 2, 5, 6
    c. 1, 3, 6, 4, 2, 5
    d. 3, 6, 4, 2, 1, 5
5. The stomach secretes alkaline fluids, such as hydrochloric acid and intrinsic factor, to begin the digestion of food.
    a. True

b. False

6. The three regions of the small intestine are:

    a. Duowadenum, Iliac, jejunum

    b. Ilium, duodenum, jejunum

    c. Jejudenum, ileostomy, duodenum

    d. Cecum, ilium, jejunum

7. Finger-like projections, called villi, on the walls of the small bowel increase the surface area to allow for more absorption.

    a. True

    b. False

8. Identify and place in correct order all sections of the large intestine, including the two flexures.

    a.

    b.

    c.

    d.

    e.

    f.

    g.

    h.

    i.

j.

9. Where is the liver located in the abdomen?

    a. Mesenteric layer

    b. Lower right quadrant

    c. Upper right quadrant

    d. Upper left quadrant

10. Pancreatic enzymes help breakdown which food molecules:

    a. Fat, spice, sugar, fibre, protein

    b. Glucose, fructose, lactose, amylase

    c. Protein, fat, fibre, glucose, carbohydrate

    d. Protein, fat, nucleic acid, starch, glucose

11. The gallbladder plays a role in the endocrine system, producing insulin, glucagon, and somatostatin.

    a. True

    b. False

1.9 Chapter Evaluation Answers

1. Tongue, cheek, teeth, uvula, soft palate, hard palate, salivary glands
2. Epiglottis
3. D
4. C
5. B
6. B
7. A
8. Cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon, rectum and anal canal.
9. C
10. D
11. B

Reference

Betts, J. G., Johnson, E., Wise, W. A., … Young, K. A. (2013). *Anatomy and physiology (OpenStax).* Houston, TX: OpenStax CNX. Retrieved from https://opentextbc.ca/anatomyandphysiology/

Chapter 2: Pathophysiology, Abnormalities and Hereditary Conditions

Objectives: By the end of this section, you will be able to:

- List all disease processes of the gastrointestinal system
- Identify the system in which each disease process occurs.

2 Pathophysiology of the Gastroenterological Disease Processes

2.1 Mouth and Esophagus

2.1.1 *Barrett esophagus*

Esophageal squamous cells are repeatedly exposed to stomach acid causing cellular changes and development of specialized intestinal cell metaplasia. The metaplastic cells increase the risk for esophageal adenocarcinoma development. The gold standard for diagnosis is a gastroscopy with biopsies of the distal aspect of the esophagus. Treatment includes ongoing endoscopic monitoring and medication therapy (proton-pump inhibitor) (Jajoo & Saltzman, 2016).

2.1.2 *Gastroesophageal reflux disease (GERD)*

A common, chronic disorder where the acid contents of the stomach and duodenum regurgitate into the esophagus causing mucosal damage, known as esophagitis. This can be due to a hypotensive lower esophageal sphincter, hiatal hernia or gastric emptying impairment. Complications include esophageal ulcers, peptic strictures, and adenocarcinoma. Diagnosis requires a comprehensive consultation with a physician. Treatment includes a proton pump inhibitor (PPI) medication and lifestyle changes. Endoscopy is performed on patients who fail to respond to PPI therapy (DeVault & Castell, 2005).

2.1.3 *Achalasia*

The presence of uncoordinated esophageal contractions and a hypertensive lower esophageal sphincter causing dysphagia (progressive difficulty swallowing solids and liquids). Regurgitation without bile occurs due to undigested food and liquids sitting in the esophagus. Weight loss is also a common presenting symptom. Diagnosis requires barium esophagogram, esophageal manometry (to assess the esophageal peristalsis and tone for the sphincter), and endoscopy (to rule out differential diagnoses). Treatment may include pneumatic dilation of the esophagus and gastroesophageal junction, myotomy or botulinum toxin injections to reduce the pressure of the lower esophageal sphincter (Boeckzstaens, Zaninotto, & Richter, 2014).

2.1.4 *Eosinophilic esophagitis*

Chronic inflammatory disorder of esophagitis characterized by an abnormal infiltration of eosinophils into the esophageal mucosa. Over time, transient or fixed circular rings and strictures can develop in the esophagus. This results in GERD, dyspepsia, recurrent dysphagia and food impaction within the esophagus. Diagnostic testing includes gastroscopy with biopsies in the proximal, mid and distal esophagus. Treatment involves routine surveillance, topical or systemic corticosteroids and esophageal dilation (Greenberger, 2016).

2.1.5 *Esophageal varices*

(See section 1.2.2.5)

2.2 Stomach

2.2.1 *Hiatal hernia*

A portion of the stomach prolapses up through the diaphragmatic hiatus, bulging into the chest cavity. The bulge can be stationary (remaining in the chest cavity at all times) or sliding (the gastroesophageal junction migrates above the diaphragm on inhalation but returns to the correct position on exhalation). While hiatal hernias can be asymptomatic, some patients report chest pain, GERD-like symptoms, dysphagia, nausea and bloating. Diagnosis is made using radiographs, CT scans or a gastroscopy procedure. Treatment involves symptom management and surgery (fundoplication) if hernia is severe (Kohn et al., 2013).

2.2.2 *Gastroparesis*

A prolonged or delayed emptying of gastric contents from the stomach into the small intestine. Associated causes include diabetes, post-surgery complication, neuromuscular disease and idiopathic ideology. Symptoms include nausea, vomiting, bloating, pain and reflux, leading to weight loss and electrolyte imbalances. Diagnosis requires a thorough physical assessment, radiological/MRI/CT imaging of the abdomen, endoscopy (to

rule out mechanical obstruction), and scintigraphy. Treatment plans are patient specific and may include dietary modifications, motility agents, management of associated chronic diseases and surgery (in severe cases) (Park & Camilleri, 2006; Parkman, Hasler, & Fisher, 2004).

2.2.3 *Bezoars*

A compact lump of partially digested food materials in the stomach that is unable to progress through the gastrointestinal tract without medical intervention. Bezoars frequently occur in patients with motility issues, behavioural issues, neuromuscular issues or anatomical changes of the gastrointestinal tract. While most are asymptomatic, abdominal pain, nausea, vomiting, fullness and anorexia may be reported. If left untreated, a bezoar can cause gastric outlet/intestinal obstructions, perforation, and ulceration. Diagnosis requires radiological imaging with endoscopy to confirm findings. Treatment includes chemical dissolution, endoscopic removal or, in severe cases, surgery (Bansal & Walfish, 2018).

2.2.4 *Peptic ulcer disease*

Alterations in the secretion of mucous, production of bicarbonate and impaired cellular repair occurs within the gastric and duodenal mucosa. This can be caused by drug use (Non-steroidal anti-inflammatories (NSAID) and aspirin) , alcohol use, smoking, anticoagulant/antiplatelet and helicobacter pylori. Diagnostic testing includes a urea breath test or

gastroscopy with stomach biopsies. Treatment includes lifestyle modification and pharmaceutical management. If left untreated, peptic ulcer disease can lead to gastrointestinal bleeding, gastric perforation, gastric cancer and gastric outlet obstruction (American College of Gastroenterology [ACG], 2015).

2.3 Small Intestine

2.3.1 *Crohn's disease*

Chronic inflammatory bowel disorder caused by an abundance of proinflammatory cytokines. It may involve the entire gastrointestinal tract with patches of diseased tissue scattered throughout. Presentation includes diarrhea, weight loss, abdominal pain and fever. Complications can include perforation, strictures and abscesses. Risk factors include smoking, diet rich in processed, sugary and fried food, stress, NSAID use, and geographical location. Diagnostic confirmation requires a colonoscopy. Pharmacological treatment, using immunosuppression, aims to reduce flares and prevent complications (Levine & Burakoff, 2016).

2.3.2 *Celiac disease*

Celiac disease is an intolerance to gluten, causing inflammation of the small intestine leading to malabsorption and poor digestion. If left untreated, there is an increased risk of developing gastrointestinal cancers

and enteropathy-associated T-cell lymphoma. It is considered an autoimmune disorder with genetic involvement. The gold standard for diagnosis is duodenal biopsies via gastroscopy (American Gastroenterological Association, 2006).

2.4 Large Intestine

2.4.1 *Colorectal cancer*

A change in intestinal cells, causing them to grow and function abnormally. Over time, the abnormal cells can form a cancer in the affected tissue and spread to other areas of the body. Colorectal cancer (CRC) is the third most commonly diagnosed cancer in Canada and the second cancer-related cause of death (Canadian Cancer Society, 2019). Risk factors include family history, genetic conditions, obesity, substance use, unhealthy dietary choices, comorbidities and lifestyle choices. While CRC can be asymptomatic, symptoms may include diarrhea, weight loss, change in stool appearance and habits, anemia, loss of appetite and abdominal pain. Recommendations for screening colonoscopy starting age 50 for all low-risk individuals and earlier for those with identified high risk factors. Diagnosis requires many stages of testing including history and physical, fecal immunochemical test, colonoscopy, biopsy, blood work, CT scans, MRI and X-rays. Treatment is heavily dependent on the location,

grading and staging of the CRC but may include chemotherapy, radiation, surgery and symptom management (Canadian Cancer Society, 2019).

2.4.2 *Ulcerative colitis*

Chronic inflammatory bowel disorder of the large intestine and rectum, presenting in flares and relapses with bloody, mucousy diarrhea which can progress to significant blood and weight loss, malnutrition and discomfort. There is a significant risk of colorectal cancer development in ulcerative colitis patients. Predisposing factors include smoking, processed, sugary, fried diet, stress, NSAID use, and geographical location. Diagnostic confirmation requires a flexible sigmoidoscopy or colonoscopy. Pharmacological treatment, using immunosuppression, aims to reduce flares and prevent complications (Abreu, 2007).

2.4.3 *Diverticular disease*

Diverticulosis is the outpouching of areas of the colon wall, usually found in the left (descending colon) but can occur anywhere in the small and large intestine. Risk factors include irritable bowel disease, irritable bowel syndrome, genetics, obesity, and smoking. Management includes high fibre diets, exercise and avoiding laxatives. Diverticulitis is the inflammation and infection of the outpouchings. Initial diagnostic testing for diverticulitis includes ultrasound and CT scans, followed by diet restriction and antibiotics. A colonoscopy may be completed 6 to 8 weeks

post diverticulitis to rule out malignancy and confirm diagnosis (Stollman, Smalley, Hirano, & AGA Institute Clinical Guidelines Committee, 2015).

2.4.4 *Irritable bowel syndrome (IBS)*

A functional disturbance of bowel motility characterized by a change in bowel habits, bloating, abdominal pain and frequently associated with anxiety and somatization. A gastroscopy and colonoscopy are done to rule out other causes of symptoms. Treatment includes symptom control and stress management (National Collaborating Centre for Nursing and Supportive Care, 2015).

2.5 Liver

2.5.1 *Cirrhosis*

The final stage of liver fibrosis progression due to repeated liver injury. Cirrhosis is present in two forms: compensated – when there are no complications present and the liver function is adequate and decompensated- when complications have occurred, and the liver cannot function adequately. Complications include ascites, hepatic encephalopathy, variceal development, variceal hemorrhage and hepatocellular carcinoma. Some causes include alcohol consumption, viral hepatitis and non-alcoholic steatohepatitis. Management of the disease aims to slow its progression and preserve function while preventing and

treating complications. This includes routine gastroscopy screening to manage varices and prevent bleeding (Goldberg & Chopra, 2015).

2.5.2 *Hepatitis*

An inflammatory response to a viral infection in the cells of the liver. This includes the hepatitis A, B, C, D and E viruses, all with slightly different modes of transmission. Infections can cause acute liver failure and/or chronic liver disease leading to cirrhosis or carcinoma. Treatment and management are cause dependent. Management can include ongoing bloodwork and imaging, abstinence from alcohol and acetaminophen, and a transplantation evaluation (Hanson, Pearson, & Kugelmas, 2015).

2.5.3 *Non-alcoholic steatohepatitis (NASH)*

A damaging liver syndrome that develops in non-alcoholic patients despite being histologically identical to alcoholic hepatitis. NASH involves fat accumulation in the liver, inflammation and fibrosis, leading to cirrhosis and portal hypertension. While patients are largely asymptomatic, risk factors for NASH include obesity, dyslipidemia, metabolic syndrome and glucose intolerance. Diagnosis requires serological testing and a liver biopsy. Treatment focuses on regulating or eliminating the contributing cause (Herrine, 2019).

2.5.4 *Primary biliary cirrhosis*

Chronic autoimmune disorder of the bile ducts affecting women more than men. Presentation includes pruritis, sicca syndrome, fatigue and jaundice. Complications manifest decades after initial development (Eaton, Talwalkar, & LaRusso, 2015).

2.5.5 *Esophageal and gastric varices*

Portal hypertension caused by scarring in the liver increases pressure in the portal venous system. This forces the veins of the lower esophagus and proximal stomach to enlarge, creating varices. While the varices remain primarily asymptomatic, there is a significant risk of severe bleeding, if portal venous pressure is not controlled and monitored. Symptoms of a variceal bleed include sudden, painless, massive, upper gastrointestinal bleeding. Diagnosis requires routine gastroscopy and coagulation monitoring. Treatment of stable varices involves maintaining blood pressure control. Treatment of high risk and bleeding varices require endoscopic banding, fluid restrictions, IV somatostatin and mechanical tamponade (in extreme cases) (Ansari, 2019).

2.6 Biliary System

2.6.1 *Cholelithiasis*

Gallstones are subdivided into two types: cholesterol stones (most common in western countries, contain >50% cholesterol monohydrate) and pigment stones (contain mostly calcium bilirubinate and <20% cholesterol). Contributing factors include age, obesity, gender, genetics, female sex hormones, pregnancy and cirrhosis (Kasper et al., 2016).

2.6.2 *Choledocholithiasis / cholangitis*

Presence of gallstones in the common bile duct. Symptoms include right upper quadrant pain, jaundice, fever (known as Charcot's triad). Diagnosis requires either an endoscopic retrograde cholangiopancreatography (ERCP) or ultrasound. Treatment includes ERCP, to perform a stone extraction and/or cholecystectomy, to remove the gallbladder (Kasper et al., 2016).

2.6.3 *Cholecystitis*

Acute and chronic cholecystitis occurs when a stone obstructs the cystic duct causing inflammation of the gallbladder. Symptoms include epigastric/right upper quadrant pain, nausea, vomiting, and fever. Treatment includes fasting, antibiotics and surgery (Kasper et al., 2016).

2.6.4 *Primary sclerosing cholangitis*

Chronic biliary disorder causing inflammation, fibrosis and the development of biliary strictures in the bile ducts. It is most common in men, aged 40 and those with inflammatory bowel diseases. Diagnostic procedures and treatment include ERCP. Chronic reoccurrence may require liver transplantation (Chapman et al., 2010).

2.7 Pathological Abnormalities

2.7.1 *Neoplasm*

The growth of new or abnormal tissue cells caused by a mutation in the cellular development, allowing uncontrolled growth, boundary invasion and creation of blood supply. A neoplasm is characterized as benign or malignant; benign neoplasms are localized, whereas malignant can invade other organs (Kemp, Burns, & Brown, 2008).

2.8 Infectious Diseases

2.8.1 *Clostridium difficile*

A highly contagious, diarrhea-causing bacteria causing inflammation in the colon. Symptoms include diarrhea, fever, anorexia, nausea and stomach pain. Risk factors include over 65 years old, hospitalization, antibiotic use, compromised immune system and previous infection. Diagnosis is performed through a stool sample. Treatment includes strong antibiotics

such as vancomycin or fidaxomicin (Centers for Disease Control and Prevention, 2018).

2.8.2 *Helicobacter pylori (H. pylori)*

A common bacterium present in the stomach, transmitted through oral to oral or fecal to oral contact, in 50% of the global population (Santacroce, 2018). Transmitted via oral to oral or fecal to oral contact, H. pylori can cause metaplastic changes in the tissue of the stomach if left untreated long term. The gold standard for diagnosis is a stomach tissue biopsy, obtained through gastroscopy procedure. Treatment is a course of antibiotics, paired with a proton pump inhibitor (Santacroce, 2018).

2.9 Hereditary Diseases and Conditions

2.9.1 *Wilson's disease*

Genetic autosomal recessive disorder in young patients, causing copper to accumulate in the liver leading to hepatotoxicity. The eyes, joints, blood cells, and kidneys can also be affected. Medication management with copper-chelating drugs and zinc is required. Liver transplantation is the cure (Bacon, 2015).

2.9.2 *Hemochromatosis*

A genetic disorder of the human factor engineering protein causing increased iron absorption and leads to an overload of iron in the pancreas,

kidneys and heart. Treatment includes phlebotomy/bloodletting (Bacon, Adams, Kowdley, Powell, & Tavil, 2011).

2.9.3 *Hereditary nonpolyposis colorectal cancer (Lynch syndrome)*

The most common hereditary colorectal cancer syndrome. While Lynch syndrome causes far fewer and subtler adenomas than familial adenomatous polyposis, there is a more rapid progression of the adenoma to cancer. The autosomal dominant syndrome also increases risk of developing other cancers. Diagnosis requires a thorough patient and family history and screening colonoscopy every 1-2 years for all family members starting at age 25 (McQuaid, 2019).

2.9.4 *Familial adenomatous polyposis*

A mutation of the APC gene causing hundreds of thousands of adenomatous polyps to develop in the large colon, small colon and stomach. Cancer is inevitable, occurring by age 40 in most patients, along with a variety of other benign extraintestinal manifestations. Diagnosis requires genetic testing and counseling extended to immediate family members. Treatment commonly requires a complete proctocolectomy with ileoanal anastomosis or colectomy. Frequent colonoscopies are required for surveillance in high risk individuals. Gastroscopies every 1-3 years are required for prophylactic adenoma and carcinoma surveillance (Buecher, 2016).

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Chapter 3: Conscious Sedation and Patient Monitoring

Objectives: By the end of this section, you will be able to:

- Identify common conscious sedation agents, their risk factors, dosages and special considerations.
- Perform a comprehensive pre-procedure patient assessment.
- Demonstrate appropriate patient monitoring during and post procedure.
- Explain post-procedure education, concerns and discharge procedures.

3 Background of Conscious Sedation

A drug-induced depression of consciousness where patients remain responsive to verbal and tactile stimulation, respiratory drive is preserved, adequate spontaneous ventilation are present and cardiovascular function is maintained without intervention (University Health Network [UHN], 2012). The purpose of sedation during endoscopic procedures is to improve patient satisfaction while minimizing anxiety, pain and preventing injury and drug-related side effects (Wiggins, Khan, & Winstead, 2010). It can be administered by a registered nurse (RN) in a controlled setting with the physician present, for the purpose of diagnostic and therapeutic procedures (UHN, 2012).

Levels of Sedation	Minimal Sedation	Moderate Sedation	Deep Sedation	General Anesthetic
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated verbal or painful stimulation	Unarousable even with painful stimulation
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Ventilation	Unaffected	Adequate	May be adequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

Moderate sedation is the target of conscious sedation for endoscopic procedures. It allows patients to purposefully respond to verbal and tactile stimulation, while maintaining a stable cardio-respiratory status (Wiggins et al., 2010).

3.1 Sedation Contraindications and Special Circumstances (UHN, 2012)

Sedation is hazardous or contraindicated in the presence of the listed conditions. Consultation to an anesthesia specialist may be required.

- Morbid obesity
- Sleep apnea
- Moderate to severe cardiorespiratory, hepatic or renal impairment
- Elderly patients
- Uncooperative, altered level of consciousness, increased intracranial pressure
- Second and third trimester of pregnancy
- Anticipated difficult ventilation and/or intubation
- High aspiration risk (bowel obstruction, full stomach)

3.2 Sedation and Analgesic Agents (UHN, 2012)

3.2.1 *Oropharyngeal anesthetic spray (ex. Lidocaine and xylocaine)*

Purpose*:* An oral anesthetic spray, used prior to a gastroscopy to reduce the gag reflex.

Management: The patient must remain NPO for two hours after administration of anesthetic spray.

Risks: Decreased gag reflux may potentiate the aspiration of saliva or stomach contents. Arrhythmia (lidocaine), Methemoglobinemia (benzocaine).

Contraindications: Do not use during emergency procedures, gastrointestinal bleeding or PEG tube insertion procedures.

3.2.2 *Benzodiazepine (ex. Midazolam)*

Effect: Anxiolytic, sedative, anti-convulsant, skeletal muscle relaxant and amnesic with anterograde amnesia properties. Binds to benzodiazepine receptors in spinal cord, brain stem, cerebellum, limbic system and cerebral cortex. Potentiates GABA inhibitor effects. Metabolized in the liver, excreted through the kidneys.

Dose: Initial 0.5-2mg IV then 0.5-1mg q2 minutes; Maximum dose by RN: 5mg in one hour. Initial dose 0.5mg IV for elderly patients (reduce full dose by 1/4).

Onset and peak: Onset 2 minutes, peak 5 minutes.

Duration: 60 to 90 minutes.

Reversal *agent:* Flumazenil

Side effects: Respiratory and cardiovascular depression, ventricular irritability, agitation, involuntary movement, blurred vision, nausea and vomiting, hiccups, hypotension and bradycardia.

Special considerations: Hypersensitivity in the elderly. Potential idiosyncratic reactions in some patients. Reduced clearance with impaired hepatic and renal function. Prolonged sedation when interacting with HIV antiretrovirals. Hypersensitivity in narrow angle glaucoma (contraindicated). Reduce dose by 1/3 in the presence of other CNS depressing drugs and obstructive sleep apnea.

3.2.3 *Opioid narcotic (ex. Fentanyl)*

Effect: Potent synthetic MU-receptor agonist analgesic. Possesses analgesic and sedative properties. 100 mcg of fentanyl = 10 mg of Morphine = 75 mg of Meperidine. Metabolized in the liver and excreted through the kidney.

Dose: Initial 25 to 50 mcg IV, subsequent 25-50mcg IV q5 minutes; Maximum dose by RN: 100mcg in a 30-minute period.

Onset and peak: Onset 1 to 2 minutes, peaks in 3 to 5 minutes.

Duration: 30 to 60 minutes, depending on dose.

Reversal Agent: Naloxone

Side effects: Respiratory depression, reduction in brain-stem response to hypercapnia and hypoxemia, “wooden chest” muscle rigidity (related to

high initial dose), decrease in systemic vascular resistance, cough suppression, itching, and orthostatic hypotension.

Special considerations: Dose reduction required for elderly patients, cachexia, and renal insufficiency. Reduce dose by 1/3 in the presence of other CNS depressing drugs and obstructive sleep apnea.

3.3 Antagonist Medication

3.3.1 *Flumazenil*

**Physician to administer via undiluted IV bolus.

Effect: Benzodiazepine antagonist, reversing sedation, psychomotor impairment, memory loss and respiratory depression

Dose: Initial – 0.2mg IV over 15 seconds; Follow up dose – 0.1 to 0.2mg every 60 seconds until patient alert or maximum dose of 1mg in 5 minutes is reached.

Usual total dose: 0.4 to 0.8mg; Can repeat above dosing in 20 minutes for re-sedation. Maximum 3 mg in a one-hour period.

Onset and peak: Onset 2 minutes; Peak 6 to 10 minutes.

Duration: 30 to 60 minutes.

Side effects: Seizures, visual disturbances, arrhythmias and diaphoresis.

Special considerations: Reverses the sedative properties of benzodiazepine but does not reverse respiratory depression. Monitor patient for re-sedation for 120 minutes after reversal.

3.3.2 *Naloxone*

**Physician to administer via diluted IV bolus.

Effect: Reversal antagonist of narcotics

Dose: 0.04mg IV; Repeat as needed at 1-minute intervals until desired response achieved. Usual dose up to 0.4mg.

Dilution: For IV bolus administration – dilute 1ml of 0.4mg concentration with 9ml of normal saline (final concentration = 0.04mg/ml)

Onset and peak: 1 to 2 minutes IV.

Duration:30 to 60 minutes.

Side effects: Pain, agitation, nausea, vomiting, ventricular tachycardia, arrhythmia, pulmonary edema and withdrawal symptoms

Special considerations: Patient requires constant monitoring for 2 hours post reversal agent administration.

3.4 Pre-Procedure Patient Assessment

The purpose of pre-procedure assessment is to obtain an accurate medical history of the patient and identify medical conditions that may adversely affect the sedation or endoscopic procedure (Wiggins et al., 2010). It is also important to confirm the patient has completed all necessary procedural preparation steps.

Patient identity: Confirm patient identity using two identifiers.

Allergies and allergic reactions

- Identify allergies and the experienced response
- Immune-related response:
- Allergic dermatitis
- Anaphylaxis: Nasal congestion, flushing, angioedema, pruritis, bronchospasm, nausea, diarrhea, urinary urgency, hypotension, death.
- Immune mimic :Mild itching, urticaria, red eyes, wheals, flushing, bronchospasm, dose-related hypotension.

Medical history: When collecting a medical history, it is important to recognize conditions that may impact the sedation or procedure such as:

<u>Respiratory:</u>

- COPD
- Home oxygen
- Tobacco abuse
- Asthma
- Active pulmonary tuberculosis
- Sleep apnea or stridor
- Airway patency

Cardiac:

- CHF
- Arrhythmia
- Recent MI/CVA
- Unstable angina
- Pacemaker or ICD
- Heart disease
- Previous cardiac surgery

Neurology-psychiatry:

- Seizures / Epilepsy
- Neuro-muscular disease
- Oro-pharyngeal dysphagia
- Panic disorder
- Neurosurgery
- Benzodiazepine / narcotic use
- Alcohol and drug abuse
- Level of consciousness
- Use of MAOI or SSRI

Other conditions:

- Infectious disease
- Diabetes
- Renal insufficiency +/- dialysis
- Cirrhosis
- Coagulopathy disorders
- Pregnancy
- Musculoskeletal diseases
- Mobility impairment
- Recent surgery
- Previous reaction to sedation

Pharmaceutical concerns

- Anticoagulant
- Antiplatelet
- Thienopyridines
- GP IIB/IIIa inhibitors
- Xa inhibitors
- Narcotics
- PAR-1 inhibitors
- Direct thrombin inhibitors
- Steroids
- NSAIDS
- Insulin / anti-diabetic medication
- Sedatives

Procedural preparations

- Confirm discharge escort is present
- Bowel preparation results
- Intravenous catheter insertion
- Presence of removable dental appliances/teeth, glasses, contacts, hearing aids and jewellery
- Fasting status (NPO – nothing by mouth)

    Pre-procedure fasting is required in effort to prevent pulmonary aspiration of stomach contents during procedure and while sedated. The American Society of Anesthesiologists (2014) guidelines recommend a minimum fast of 2 hours for clear liquids and 6 hours for food and all other liquids (Umar & Tul-Bushra, 2007). Failure to do so can increase risk of aspiration, pneumonia,

respiratory disabilities and related morbidities. See chart on next page.

Ingested Material	Minimum Fasting Period
Clear Liquids	2 hours
Non-human Milk	6 hours
Light Meal	6 hours
Heavy Meal	8 hours

3.5 Intra-Procedure Patient Monitoring

The assessment of a patient during an endoscopic procedure to detect and mitigate early signs of distress before vital signs are compromised and to prevent complications. Minimum standards of monitoring when using conscious sedation include heart rate and rhythm, respiratory rate and effort, blood pressure, oxygen saturation, neurological status, pain and capnography (if available).

3.5.1 *Patient assessment*

Reconfirm patient identify and briefly verify medical history, allergy and consent information obtained in pre assessment to ensure all information is obtained and correct.

3.5.2 *Risk stratification*

The American Society of Anesthesiologists (ASA) developed the ASA Physical Status Classification (PSC) system, as a risk stratification tool to objectively measure and communicate a patient's "degree of sickness" (ASA, 2014). The ASA classification should be determined by the physician and communicated to the participating medical team prior to the administration of sedation and/or initiation of a procedure. See chart one the next page, provided by ASA (2014), for classification breakdown.

ASA PS Classification	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), well-controlled DM/HTN, mild lung disease
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (< 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis
ASA V	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

**The addition of "E" denotes Emergency surgery: (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or*

ASA I to III are appropriate for an endoscopist or registered nurse to administer sedation. ASA classifications IV and V require consultation from an anaesthesia specialist (Wiggins et al., 2010).

3.5.3 *Pulse oximetry*

Transcutaneous measurement of heart rate and peripheral capillary oxygen saturation. Target range 92-100% for healthy patients and 88-92% for patients with COPD. Impaired reading can occur in patients with low core body temperature, vasoconstriction, hypotension, deep skin pigment, and nail polish. Pulse oximetry is delayed in detecting early desaturation; therefore, capnography and respiration observation are important. There is a risk of hypoxemia with a prolonged procedure, difficult intubation, comorbidities, endoscopic emergency cases and high body mass index (Wiggins et al., 2010).

3.5.4 *Respiratory status*

The number of breaths a person takes per minute, the effort required to breathe and the movement of their chest during each breath. The normal adult breathing rate is 12-20 breaths per minute. Respiratory rate is one of the first markers that can signal a change in health status and indicate a potential deterioration in patient stability (National Institute for Health and Care Excellence, 2007).

3.5.5 *Automated sphygmomanometer*

Measures the peak oscillation magnitude of arterial flow pressure. Measured every 3 to 5 minutes during an endoscopic procedure to assess circulatory status and the effects of the sedation. Hypertension and

tachycardia can suggest undersedation, whereas hypotension and bradycardia can suggest over sedation. It is important to choose the appropriate cuff size to prevent false readings. The average normal adult blood pressure is 120/80.

3.5.6 *Continuous electrocardiogram (ECG)*

Continuous display of the electrical activity in the heart using 3-lead electrode placement. Used to monitor rate, rhythm and activity of the heart in patients with significant cardiac disease, arrhythmias or severe hypertension. Elderly patients, those with pulmonary disorders and prolonged procedures also benefit from ECG tracing. Low-risk patients do not require continuous ECG monitoring (Wiggins et al., 2010). Reading can be affected by improper lead placement, poor skin contact, diaphoresis, hair and deep breathing.

3.5.7 *Capnography*

Quantifies exhaled carbon dioxide, providing a measure of ventilation function. Capnography is able to detect hypoventilation sooner than desaturation identified by pulse oximetry or chest rise observation (Wiggins et al., 2010).

3.5.8 *Ramsay Sedation Score*

The Ramsay Sedation Scale (RSS) is a subjective tool used to evaluate a patient's level of consciousness during titration of sedation (Sesslet, Grap, & Ramsay, 2008) using observational, behavioral, reflexive and responsive actions. It is structured into 6 levels of progressing sedation depth and degree of consciousness. The scale is provided below.

Level	Ramsay Sedation Score
1	Anxious and agitated
2	Cooperative and tranquil
3	Drowsy but responsive to command
4	Asleep but responsive to glabellar tap
5	Asleep with a sluggish response to tactile stimulation
6	Asleep and no response

3.5.9 *Documentation*

Documentation provides a clear and accurate description of events and actions taking place during a procedure. Consistency within documentation practices ensures communication of all necessary information and the completeness of patient care plans pertaining to endoscopy (Society of Gastroenterology Nurses and Associates (SGNA),

2013). Below is a breakdown off all vital information to include in the nursing intraprocedure documentation:

- Time patient arrives in room, scope insertion time, scope removal time and time of transfer to recovery
- Names of procedural team members present
- Equipment and accessories relevant to the procedure (scope identification number, electrocautery settings, grounding pad location)
- Baseline vital signs and every 5 minutes until transfer to recovery
- Name and dosage of all drugs and agents used (including oxygen and contrast media), time, route of administration, by whom, and patient response
- Endoscopic therapies utilized during procedure
- Adverse events
- Specimen collection
- Procedure performed/findings
- Disposition of patient and Ramsay sedation score
- Nurse signature(s), date, and time

3.6 Post-Procedure Care and Documentation

The period of time from the completion of the procedure to the patient's discharge. Nursing responsibilities include patient monitoring and post-procedure education.

- Document the arrival time of the patient to the recovery room.
- Post procedure vital sign monitoring: Blood pressure, oxygen, heart rate, respiratory rate, sedation level and pain.
    - Document vital signs and level of consciousness q15min.
    - Ween patient oxygen back to room air, unless otherwise indicated.
    - IV access must be maintained until patient has fully recovered.
- An escort must be present to accompany patient at discharge.
- Provide patient and escort with oral education and information pamphlet(s) explaining:
    - Procedure results
    - Follow up plan of care and specific discharge instructions written by physician.
    - Medication reconciliation
    - Expected side effects
    - Signs and symptoms of potential complications:
        - Shortness of breath

        - Chest pain
        - Nausea and vomiting
        - Weakness and dizziness
        - Passing of greater than 1 tbsp of black or red blood (oral/rectal) in 24 hours.
        - Pain, despite passing gas or belching
    - Diet and activity instructions:
        - Due to potential cognitive impairment, no driving, operating machinery, signing legal papers, drinking alcohol or taking sedative, tranquilizers or sleeping pills for 24 hours.
        - Maintain a light and bland diet for the first 24 hours, avoid heavy, gas-inducing foods.
        - Rest for 24 hours, resume normal activities the day after procedure.
- Criteria for discharge:
    - Escort present and transportation arranged
    - Return to within 20% of the pre-procedure vital sign baseline
    - Intravenous catheter removed
    - Education pamphlet and teaching provided
    - Personal belongings returned
- Time of discharge and signature of discharge nurse.

3.7 Sedation-Related Emergencies

The following factors increase the risk of sedation-related emergencies:

- Cardio-pulmonary complications
- Ischemic heart disease
- Pulmonary disease
- Hospitalized status
- Baseline oxygen saturation <95%
- Age > 70 years
- ASA III and greater
- Urgency of procedure
- Obesity
- Sleep apnea
- Altered level of consciousness

3.8 Emergency Resuscitation Equipment:

- Oxygen and delivery system: Ambu bag-and mask, oral and nasal airways.
- Suction source and accessories: Suction tubing, cannister, yanker and catheter .
- Intubation kit: Laryngoscope handle and blades, ET tubes, and laryngeal mask airway.
- Defibrillator
- Emergency medication: Atropine, diphenhydramine, epinephrine, ephedrine, flumazenil, glucose 50%, hydrocortisone, lidocaine, naloxone, sodium bicarbonate and adenosine.
- Intravenous access equipment and fluids.

3.9 Chapter Evaluation

Risk Stratification Questions

Determine the ASA score (I to V) for each patient, using the description provided:

1. 60-year-old with uncontrolled diabetes.
2. 28-year-old with no medical history.
3. 45-year-old with HTN, DLP and MI 2 months ago.
4. 37-year-old with well controlled type 1 diabetes.
5. 76-year-old with previous CVA, A fib and hemiplegia.
6. 90-year-old with DLP and a stent.

Medication Match-up

Match the agents to their antagonists:

1. Midazolam
2. Fentanyl
3. Xylocaine spray

a. No antagonist available
b. Naloxone
c. Fluconazole
d. Nitro Spray
e. Flumazenil

Pre-procedure Patient Assessment Case Study

In the Case Study, identify the important assessment information, concerning factors and issues that require informing the physician related to patient acuity, safety and sedation administration.

Mr. Wo is a 64-year-old, male originally from Korea with an appointment for a gastroscopy today. He speaks some English and tells the nurse his son is picking him up outside the hospital at 12:00pm. He also states he is allergic to lorazepam (Ativan).

The nurse places the blood pressure cuff on his left arm, above his fistula. As vital signs are taken, he tells her about the delicious coffee he had in the cafeteria one hour ago. His BP is 176/94, HR 91, RR 19, and sp02 96% on room air.

The nurse asks about his health history, he says "no" to her question about previous surgery. Although she notices a faint scar on his sternum, Mr. Wo insists he has had no previous surgery. Mr. Wo answers "yes" to being diagnosed with diabetes, ESRD and HTN. He gives her his list of medications and says he has taken them this morning at 6:00am. Among

the medications, she notes Amlodipine 10mg, ASA 81mg, Plavix 75mg, Zopiclone 7.5mg PRN.

3.10 Chapter Evaluation Answers

Risk Stratification

1. ASA III, 2. ASA I, 3. ASA IV, 4. ASA II, 5. ASA III, 6. ASA IV

Medication Match-up

1. e, 2. b, 3. a.

Pre-procedure Patient Assessment Case Study Answer

Mr. Wo is a 64-year-old, male originally from Korea with an appointment for a gastroscopy today. He speaks some English and tells the nurse his son is picking him up outside the hospital at 12:00pm. He also states he is allergic to lorazepam (Ativan).

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Rationale:

- Speaks some English - risk of inaccurate/incorrect history. Safest practice would be to utilize a translation service or call a family member to confirm answers. May also be able to confirm some information with previous medical records.
- Being picked up outside hospital – unacceptable escort. Patient cannot leave the care of recovery room until a responsible escort is present at their side. Arrangements need to be made by patient to achieve this or the procedure will be cancelled
- Allergy to Ativan – same drug family as the midazolam given in procedure. Notify physician to see if an alternative is available. Inquire about allergic reaction and when it occurred.
- Fistula on left arm – cannot use for blood pressure measurement. He also did not mention he was on dialysis. History ESRD supports likelihood of dialysis. Use other arm and ask patient about dialysis. If currently on dialysis schedule, find out next scheduled dialysis day. Notify physician.
- Delicious coffee 1 hour ago – Must wait 2 hours from time of clear liquid oral intake or 6 hours if the coffee included milk to reduce risks associated with aspiration. Procedure may be postponed one hour or rescheduled.

- BP 176/94 HR 91 despite taking BP med this morning – Uncontrolled HTN. Additional stress from procedure may negatively impact hemodynamic stability. Notify physician. Apply ECG monitoring during procedure.
- Scar on sternum – Potential cardiac surgery, possible language barrier. Check electronic medical records or with the physician. Apply ECG monitoring during procedure.
- History of diabetes – Check blood glucose before and after procedure. Inquire what medication they take to manage their diabetes and if it was taken this morning. Insulin should not be taken when fasting.
- ASA 81mg and Plavix 75mg – Risk of bleeding during procedure. Blood thinning medication should be stopped as per physicians' instructions prior to procedure. Procedure will be rescheduled.
- Zopiclone 7.5mg – Hypnotic agent used to aid sleep. Educate patient that sleeping medication and sedatives cannot be taken for 24 hours after sedation.

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Chapter 4: Endoscopy Equipment and Accessories

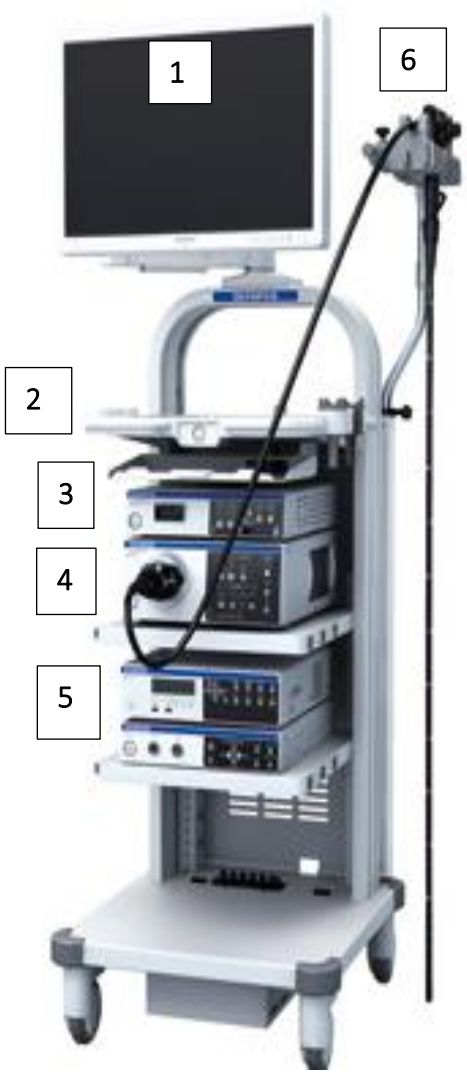
Objectives: By the end of this section, you will be able to:

- List all equipment present in the endoscopy suite and its purpose.
- Identify each endoscopy accessory and its function.

4 Endoscopy Equipment

4.1 Procedure Room

The endoscopy unit is utilized by three main medical teams at Toronto Western Hospital: gastroenterology, hepatology and the surgical services. The procedure room is a multi-purpose area, used primarily for endoscopic procedures, but also for patient admission, consultation, discharge and physician dictation.



4.1.1 *Endoscopy tower* (Olympus America, 2019)

The endoscopy tower houses multiple procedure components for function and visualization.

1) LCD viewing monitor: The procedure image is displayed during procedure.
2) Data entry keyboard
3) Video system center
4) Light source
5) Image management and scope accessories
6) Scope hanger

4.1.2 *Video equipment*

The video processor converts electrical signals from the scope into video signals and displays them on the monitor.

4.1.3 *Light source*

Uses xenon lamp to produce light, transmitted through the end of the scope. A pump for air insufflation and water is also incorporated into the unit.

4.1.4 *Air and water system*

Olympus UCR Carbon dioxide gas (CO2) insufflation: Provides abdominal distention to allow visualization and maneuvering inside the colon. CO2 gas reduces the discomfort of patients because it is absorbed by human tissue faster than conventional air (Olympus America, 2019).

ERBE EIP2 irrigation pump: Irrigates tissue for debris, bubbles, liquid and blood using a foot peddle. This improves visibility, allowing for more accurately targeted therapy (Erbe Elektromedizin GmbH, 2018).

4.1.5 *Electrosurgical generator unit (ESU)*

ESUs “facilitate therapeutic endoscopy by supplying high-frequency electrical current required for endoscopic accessories” (American Society of Gastroenterology Endoscopy, 2013, p. 97).

Electrical energy functions include cut, coagulate, monopolar and bipolar circuitry and argon plasma coagulation (Erbe Elektromedizin GmbH, 2018).

4.1.6 *Vital sign monitor*

The vital sign monitor displays heart rate, blood pressure, telemetry and oxygen saturation measurements during procedure. The monitor can be programmed to alarm when hemodynamic readings are out of an established range.

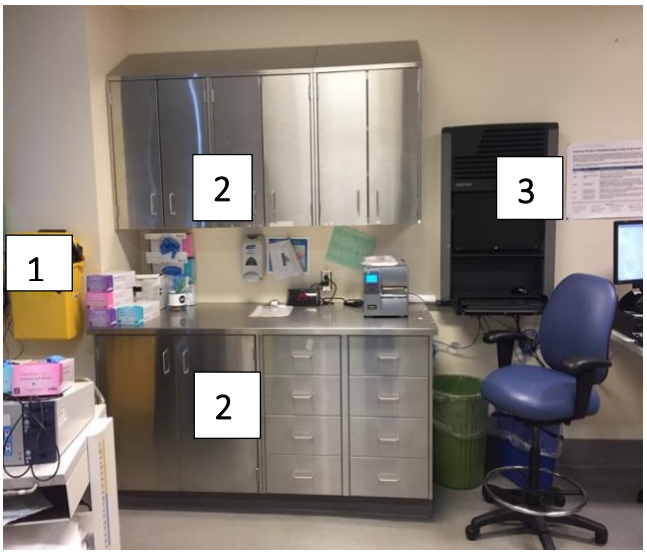
4.1.7 *Suction therapy equipment*

A dual suction is utilized in the endoscopy unit for two purposes. One suction cannister and yanker setup is used to clear secretions and liquids from the oral cavity of the patient during the procedure. The second suction cannister and tubing is connected to the scope umbilicus to allow the removal of air, liquid and small debris from inside the gastrointestinal cavity.

4.1.8 *Procedure room scope storage cart*

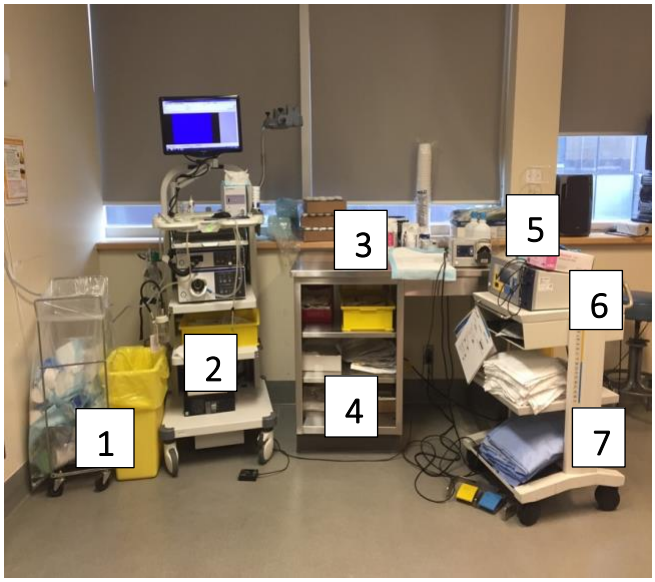
Additional scopes (in their individual scope bins) can be stored in the scope storage cart when completing a procedure requiring more than one endoscope.

4.1.9 *Nursing workstation*



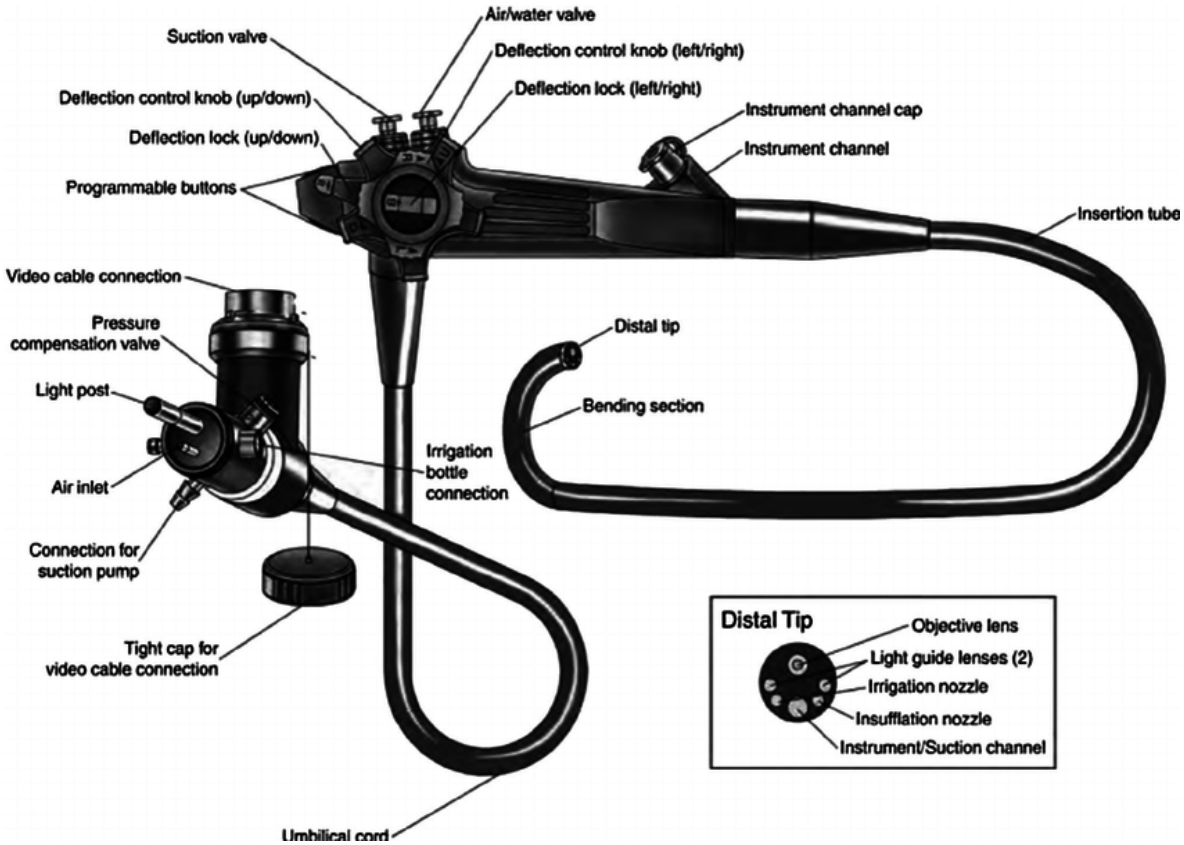
1. Biohazardous needle disposal
2. Endoscopy accessory storage
3. Nursing documentation station

4.1.10 *Procedure workstation*



1. Garbage and biohazard disposal bin
2. Endoscopy tower
3. Workstation
4. Endoscopy accessories
5. Waterjet
6. Electrosurgical unit
7. Clean linen

4.2 Endoscope



4.3 Types of Endoscopes

4.3.1 *Gastroscope*

Flexible fibreoptic scope with a light and four function channels (insufflation, suction, working channel and water jet) on the distal tip. Used to examine the esophagus, stomach and duodenum.

Length: 925 to 1100 mm

Diameter: 4.9 to 12.8 mm

4.3.2 *Duodenoscope*

Flexible fibreoptic scope with a light and three function channels (insufflation, suction, and working channel) on the distal tip. The distal tip is side viewing to facilitate endoscopic retrograde cholangiopancreatography.

Length: 1235 to 1250 mm

Diameter: 7.5 to 12.1 mm

4.3.3 *Colonoscope*

Flexible fibreoptic scope with a light and four function channels (insufflation, suction, working channel and water jet) on the distal tip. Used to examine the large intestine.

Length: 1330 to 1700 mm

Diameter: 11 to 15 mm

4.3.4 *Sigmoidoscope*

Flexible fibreoptic scope with a light and three function channels (insufflation, suction, and working channel) on the distal tip. Used to examine the sigmoid portion of the large intestine.

Length: 700 to 790 mm

Diameter: 11.3 to 12.8 mm

4.4 Endoscope Accessories (Boston Scientific, 2017)

4.4.1 *Hemostasis*

4.4.1.1 *Bipolar electrohemostasis catheter*

Indicated use: Probe catheter to provide transendoscopic electrohemostasis creating uniform burn, coagulation and tangential tamponade to bleeding and non-bleeding sites in the gastrointestinal tract. Examples include peptic ulcers, angiomata, Mallory-Weiss tears, watermelon stomach, angiodysplasia, esophageal tumors, and bleeding polyps.

Operator notes: Bipolar characteristic requires no grounding of the patient. Ensure probe's striations are outside the endoscopy channel to prevent scope damage. Ensure electrocautery unit is set to the bipolar power setting.

Contraindications: Non-focal bleeding sites, esophageal and gastric varices and diffuse lesions.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Not to be used in the presence of flammable liquid, oxygen rich environment and explosive gases. Possible safety risks and complications include gas embolism, perforation, bleeding, aspiration pneumonia, septicemia/infection, fulguration, burns, stimulation and cardiac arrhythmia.

4.4.1.2 *Needle injector*

Indicated use: Endoscopic injection into the mucosa and submucosa to inject sclerosing, vasoconstricting and solutions to control bleeding, assist in endoscopic mucosal resection, dissection and polypectomy procedures.

Operator notes: Ensure site is in direct view during injection to prevent improper location or deep injection.

Contraindications: Allergies to sclerosing or vasoconstricting

agents. Injection is contraindicated in the control of variceal bleeding.

Disposal: Clip off the needle tip, dispose in sharps container. Place remainder of accessory in biohazardous disposal bin due to the potential presence of tissue.

Special considerations: Risk of bleeding, perforation, pleural effusion, hepatic failure, chest pain, post-injection ulceration, esophageal stricture, aspiration pneumonia, dysphagia, and septicemia.

4.4.1.3 *Clipping devices*

Indicated use: Hemostasis clip used to treat active bleeding and/or reduce risk of delayed bleeding post polypectomy or resection. Clips can also be used for endoscopic marking.

Operator notes: The clip can be rotated 360 degrees by turning the ring below the handle. Have pliers available to cut the deployment

wire if clip cannot detach.

Contraindications: Do not use clips on areas not visually verifiable, on arteries greater than 2mm, polyps with a diameter greater than 1.5cm, mucosal defects greater than 3 cm.

Disposal: Suggest disposal of deployment wire in garbage.

Special considerations: Tangential angles, kinks and torturous paths may prevent the clip from deploying or causing it to dislodge from the wire. Straightening the endoscope may resolve this issue.

4.4.1.4 *Multiple band ligator*

Indicated use: Endoscopic ligation of esophageal varices and anorectal hemorrhoids for prophylactic or treatment homeostasis.

Operator notes: To be operated by a physician only.

Contraindications: Not recommended for use in patients with untreated bleeding disorder. Not recommended for use below the gastroesophageal junction.

Disposal: Suggest all components can be disposed of in the garbage.

Special considerations: Adverse events can include esophageal ulceration, retrosternal chest pain, bleeding secondary to banding or site ulceration, esophageal stricture, esophageal perforation, obstruction and pain if banded at the dentate line.

4.4.1.5 *Argon plasma coagulation (APC) probe (Erbe Elektromedizin GmbH, 2018)*

Indicated use: Hemostasis of bleeding due to tumor bleeding, post dilatation/ bougienage bleeding, and tissue devitalization.

Operator notes: Patient must be grounded using a neutral pad. Probe is to be operated by a physician only. The probe should not touch the tissue.

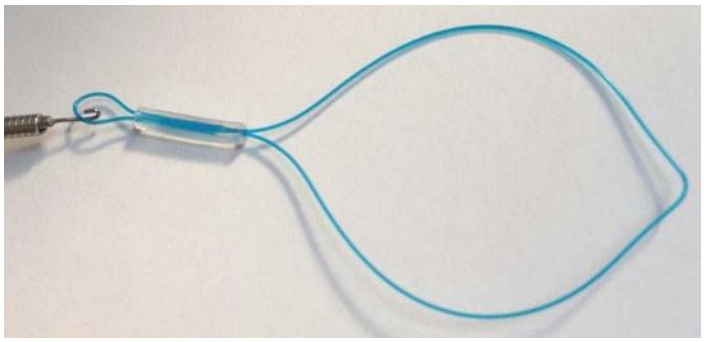
Contraindications: N/A

Disposal: Biohazardous disposal bin due to the potential presence

of tissue and blood.

Special considerations: Probe has built in filter to protect system from contamination. Probe tip comes in multiple beam directions (axial, side firing conical and circumferential). Minimizes risk of perforation, better wound healing, limited penetration depth.

4.4.1.6 *Endoloop ligator (Olympus Global, 2019)*



Indicated use: Used to snare and ligate polyps to minimize the risk of bleeding during polypectomy.

Operator notes: Once deployed, endoloop cannot be readjusted. A loop cutter is required on hand to remove an endoloop during emergency situations.

Contraindications: N/A

Disposal: Suggest deployment wire can be disposed of in the garbage.

Special considerations: None

4.4.2 *Biopsy*

4.4.2.1 *Hot biopsy forceps*

Indicated use: Single use; To cauterize and remove polyps and/or tissue specimens in the gastrointestinal tract.

Operator notes: Use protective gloves and universal protection equipment. Ensure patient is properly grounded prior to use. Fluids / flammable agents under, on the patient or in the body cavity must be removed prior to using electrocautery. The electrocautery unit should not be connected to forceps during insertion into endoscope.

Contraindications: Unable to obtain sample for histology if cautery function is used.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Biopsy forceps may cause bleeding, management plans should be in place prior to use.

4.4.2.2 *Multiple sample biopsy forceps*

Indicated use: Single use; To collect tissue biopsy samples for histological analysis, through an endoscope in the gastrointestinal system.

Operator notes: Use protective gloves and universal protection equipment.

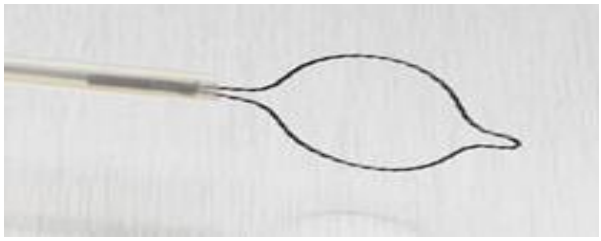
Contraindications: N/A

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Biopsy forceps may cause bleeding, management plans should be in place prior to use.

4.4.3 *Resection and retrieval devices*

4.4.3.1 *Cold snares*



Indicated use: Removal and resection of flat lesions, diminutive polyps, sessile polyps, pedunculated polyps and tissue from within the gastrointestinal tract without electrocautery.

Operator notes: Use protective gloves and universal protection equipment.

Contraindications: General risks associated with polyp and tissue resection.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: None

4.4.3.2 *Hot snares*

Indicated use: Removal and/or cauterization of diminutive polyps, sessile polyps, pedunculated polyps and tissue from within the gastrointestinal tract using monopolar electrocautery.

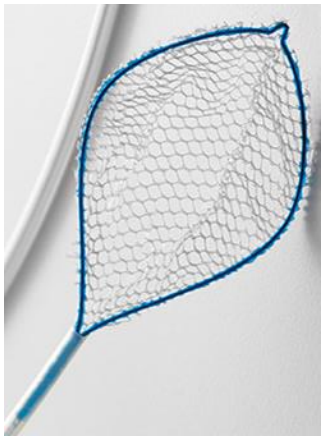
Operator notes: Use protective gloves and universal protection equipment. Ensure the patient is appropriately grounded with a neutral pad.

Contraindications: General risks associated with polyp and tissue resection.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Adverse event can include perforation, fulguration, hemorrhage and transmural burns.

4.4.3.3 *Retrieval basket*



Indicated use: Provides control and strength to facilitate foreign body retrieval, food bolus removal, tissue fragments and excised retrieval.

Operator notes: To remove contents of net, rinse in basin of water. Avoid picking material out of net.

Contraindications: Not recommended for retrieval of sharp objects.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Avoid passing device blindly past foreign objects.

4.4.3.4 *Retrieval grasping forceps*

Indicated use: Interlocking teeth facilitates grasping and retrieval of foreign objects and metal stents.

Operator notes: Maintain traction on forceps handle during retrieval to prevent object dislodging from the forceps into the trachea. Avoid grasping tissue or organs near retrieval site.

Contraindications: Not recommended for the retrieval of sharp objects.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood, if single use.

Special considerations: N/A

4.4.3.5 *Polyp trap)*

Indicated use: Retrieval of removed specimens and polyps through the suction channel.

Operator notes: Connect to suction hose before excising tissue/polyp to ensure retrieval.

Contraindications: N/A

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Specimen can be lost If the trap is

filled with liquid, floating the specimen up into the waste suction hose.

4.4.4 *Cytology brush*

Indicated use: Collect cell samples from the gastrointestinal mucosal wall.

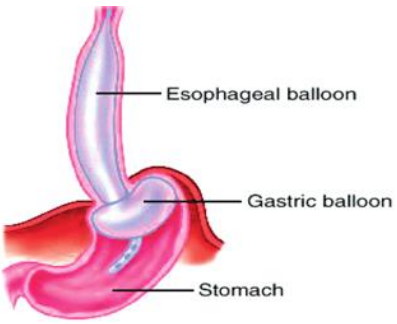
Operator notes: To brush, open and close using brush handle or pull/push catheter in and out of the biopsy channel. Ensure brush is closed before removing catheter. Using wire cutters, cut brush tip off metal wire and place in cytology brush.

Contraindications: High hemorrhage risk in patients with coagulation disorders or blood thinning medication.

Disposal: Biohazardous disposal bin due to the potential presence of tissue.

Special considerations: Potential complications include perforation, hemorrhage, infection.

4.4.5 *Balloon tamponade - Sengstaken-Blakemore tube*



Indicated use: To temporarily apply pressure to life threatening bleeding from esophageal or gastric varices, not responding to hemostasis or vasoconstrictive therapies. Bleeding can also be caused by peptic ulcers, Mallory-Weiss tears and neoplasms.

Operator notes: Admission to intensive care unit and intubation required. Insertion and inflation completed by physician. Have scissors available for emergency balloon decompression. Three ports on tube: gastric balloon port, gastric suction port and esophageal balloon port. Ensure gastric and esophageal lumens are clamped with 2 pairs of Kelly clamps each. Maintain 1-2lb of traction on system; can use IV bags as weight (500ml = 1.43lb, 1000ml= 2.6lbs). Suction oral airway, as needed. Elevate head of bed, if blood pressure allows. Cannot remain insitu for more than 24 hours.

Contraindications: Variceal bleeding that has stopped or slowed, recent surgery around the gastroesophageal junction, known esophageal

stricture.

Disposal: Biohazardous disposal bin due to the potential presence of tissue.

Special considerations: Complications can include aspiration, perforation, necrosis, pain, erosions, hiccups, and proximal airway occlusion.

4.4.6 *Dilation*

4.4.6.1 *Savary dilators (Riley & Attwood, 2004)*

Indicated use: Also known as a bougie, it is a flexible, tapered rubber tube with a short-tapered tip and a guidewire tunnel in the center. Available in a variety of sizes, used to dilate esophageal strictures under endoscopic wire placement.

Operator notes: For physician operation only.

Contraindications: Recent esophageal perforation or surgery, presence of malignancy or thoracic aneurysms.

Disposal: Wire and bougies are reusable and should be sent for

reprocessing.

Special considerations: N/A

4.4.6.2 *CRE Balloon dilatation catheters*

Indicated use: Endoscopic dilation of strictures in the alimentary tract.

Operator instructions: Requires dilation gun to operate. Reference tag on catheter for dilation measurements.

Contraindications: Compromised mucosal integrity, recent esophageal tear/perforation or surgery.

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: Adverse events include perforation, hemorrhage, hematoma, sepsis/infection and allergic reaction.

4.4.7 *Distal attachment cap*

Indicated use: Facilitate endoscope's view by maintaining a distance between the scope end and the mucosal membrane during therapeutic procedures.

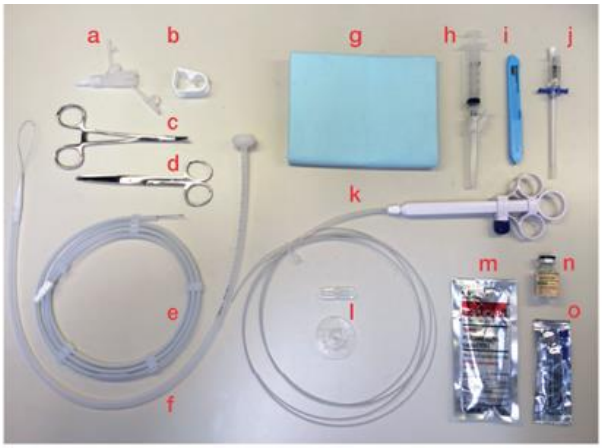
Operator notes: Place cap on distal end of scope prior to the beginning of the procedure.

Contraindications: Unknown

Disposal: May dispose of cap in garbage bin.

Special considerations: Due to the increase in the diameter of the scope end, it may increase intubation discomfort for patients.

4.4.8 *Percutaneous endoscopic gastrostomy (PEG) kit*



a. Y-Port
b. C-Clamp
c. Curved hemostat
d. Scissors
e. Guidewire
f. PEG tube
g. Drape
h. Syringe
i. Scalpel
j. Trocar cannula
k. Retrieval snare
l. External bolsters
m. Iodine swabs
n. Local anesthetic
o. Lubricating jelly

Indicated use: To provide nutrition or medication when the oral route is insufficient or unsafe. Tube is passed through the abdominal wall into the stomach.

Operator notes: Set up supplies on a sterile field. Assist physician in percutaneous endoscopic gastrostomy insertion.

Contraindications: Unknown

Disposal: Scalpel, scissors and trocar cannula should be disposed in sharps container. Any items with blood present must be disposed in the biohazard bin. All other items may be placed in the garbage.

Special considerations: Procedure is done under propofol sedation with the assistance of anesthesia team. A second nurse or medical assist is required. X-ray will be completed after procedure to confirm placement of tube.

4.4.9 *Gastric overtube* *(US endoscopy, 2018)*

Indicated use: Inserted into oral cavity with endoscope assistance to protect upper gastrointestinal tract during procedures. Examples of the procedures include removal of foreign body/sharp objects, stent removal, mucosal resection, gastroparesis, achalasia, active upper gastrointestinal bleeding, food bolus procedure and reducing risk of aspiration.

Operator notes: A 60Fr bite block is required. Ensure generous lubrication on both inner and outer surfaces of both tubes prior to insertion. Perform a baseline ECG prior to overtube insertion. Physician to insert and operate overtube. Attach insufflation cap once inner tube and scope are removed to prevent fluid backflow and maintain insufflation.

Contraindications: Unknown

Disposal: Biohazardous disposal bin due to the potential presence of tissue and blood.

Special considerations: N/A

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Chapter 5: Diagnostic Tests and Therapeutic Procedures

Objectives: By the end of this section, you will be able to:

- List all equipment required for each therapeutic procedure.
- Identify what procedure is required, based on a set of symptoms.

5 Diagnostic Tests and Therapeutic Procedures

5.1 Diagnostic Tests

5.1.1 *Colonoscopy*

Endoscopic examination of the lining of large intestine, using a long, fibreoptic colonoscope. Visualization of all portions of the large bowel, including anus, rectum, sigmoid colon, descending colon, transverse colon, ascending colon and cecum is achievable during this procedure. A complete bowel preparation is required prior to the procedure to facilitate visualization and mobilization. Sedation is provided during procedure to provide patient comfort. Procedural indications include investigation of abdominal pain, rectal bleeding, constipation, diarrhea, weight loss and colon cancer screening. To reduce the risk of aspiration during sedation, patients are required to fast for 8 hours before the procedure.

Equipment required: Colonoscope, procedure pad, lubricant, sterile water, intravenous sedation and the appropriate endoscopy accessory wires.

5.1.2 *Anoscopy* (London & Tichauer, 2019)

Examination of the anal sphincter, distal rectum, dentate line, anal glands and the columns of Morgagni. Procedural indications include rectal/anal pain and bleeding. Diagnostic findings can include internal hemorrhoids, proctitis, lacerations, fissures, sexually transmitted infections, trauma,

ulcers and anorectal masses. The procedure is inexpensive and requires no bowel preparation or sedation.

Equipment required: Anoscope, lubricant, procedure pad and the appropriate endoscopy accessories.

5.1.3 *Sigmoidoscopy*

An endoscopy procedure using a short, stiff endoscope to examine the anal canal, rectum, sigmoid colon and, in some cases, the descending colon. An enema is used to empty the rectum and sedation is optionally provided. Procedural indication includes rectal bleeding, changes in bowel habits, abdominal pain and weight loss.

Equipment required: Sigmoidoscope, procedure pad, lubricant, sterile water, intravenous sedation (optional), and the appropriate endoscopy accessory wires.

5.1.4 *Esophagogastroduodenoscopy (EGD)* (Dubé et al., 2016)

Endoscopic examination of the esophagus, stomach and proximal portion of the duodenum using a flexible, fibreoptic gastroscope. An EGD may be performed for diagnostic, surveillance or therapeutic purposes. Procedural indications include, upper abdominal symptoms, gastrointestinal bleeding, malignancy, pre/post-operative evaluation, facilitation of enteral feeding, genetic diseases, trauma and foreign body ingestion. To reduce the risk of aspiration during sedation, patients are required to fast for 8 hours before

the procedure.

Equipment required: Gastroscope, bite block, oral lidocaine spray, procedure pad, lubricant, sterile water, oral yanker, intravenous sedation and the appropriate endoscopy accessory wires.

5.1.5 *Small bowel capsule endoscopy* (Flemming & Cameron, 2018)

Examination of the small intestine using a pill-sized camera. The lining of the duodenum, jejunum and ileum, an unreachable area by traditional gastroscopy and colonoscopy, are inspected using a pill-sized video camera with built in light and photographic capabilities. After the pill is swallowed, it takes pictures which are then transmitted to a recording device worn by the patient. The most common procedural indication is bleeding, but it can also detect polyps, inflammatory processes, tumors and ulcers in the small intestine.

Equipment required: Video capsule, data recorder and belt, battery pack, 8 electrodes, a glass of water and simethicone.

5.1.6 *Endoscopic retrograde cholangiopancreatography (ERCP)* (American Society of Gastrointestinal Endoscopy, 2019)

A procedure utilizing endoscopy and fluoroscopy to evaluate, diagnosis and therapeutically treat biliary disorders of the gallbladder, pancreatic and biliary ducts. Examples of these include gallstone disease, inflammation, malignancy, strictures, leaks and dysfunction. With the

patient in the prone position, the scope is inserted through the mouth, into the esophagus, stomach and duodenum to the major duodenal papilla. Various wire guided accessories are introduced through the papilla to provide therapeutic treatment. To reduce the risk of aspiration during sedation, patients are required to fast for 8 hours before the procedure.

Equipment required: Duodenoscope, oral lidocaine spray, bite block, procedure pad, oral yanker, lubricant, sterile water, intravenous sedation, locking biopsy cap device and the appropriate ERCP accessory wires.

5.1.7 ***Enteroscopy*** (American Society of Gastrointestinal Endoscopy, 2014)

The advancement of a thin, long endoscope into the small intestine using a single or double balloon system. The balloon is sequentially inflated and deflated to advance the scope through the small intestine, gathering the bowel over an overtube. The procedure takes several hours and can be done from the upper or lower gastrointestinal tracts. Procedural indications include potential stricture, tumour, abnormal tissue, and unexplained bleeding. Sedation is administered during this procedure. To reduce the risk of aspiration during sedation, patients are required to fast for 8 hours before the procedure.

Equipment required: Enteroscope, oral lidocaine spray, bite block, procedure pad, oral yanker, lubricant, sterile water, intravenous sedation,

single or double balloon system, over tube and the appropriate endoscopy accessory wires.

5.2 Therapeutic Procedures

5.2.1 *Hemostasis and ablation* (Jacques, Legros, Chaussade, & Sautereau, 2014)

The action of maintaining or restoring hemostasis in tissue at risk for future or current bleeding. Bleeding is commonly related to ulcerations, esophageal and gastric varices, inflammation, Mallory-Weiss tears, malignant lesions, gastric antral vascular ectasia (GAVE) and arteriovenous malformations (AVM). There are four methods of achieving hemostasis, often used in combination with one another: clipping, injection, argon plasma coagulation and variceal band therapy.

5.2.1.1 *Clipping*

The use of a metal clip to bring the sides of the mucosa together and applying pressure to facilitate hemostasis. Clips are available in various sizes, lengths and capacities of rotation. Clipping is contraindicated in variceal-related bleeding.

Equipment required: All supplies required for a gastroscopy or colonoscopy, depending where the source of bleeding is located and endoclip device.

5.2.1.2 *Injection*

Injection of diluted epinephrine (1:10000) is the first line of treatment for most situations of hemorrhage. It achieves hemostasis by causing vasoconstriction, compression and platelet activation. Epinephrine injection is most effective in larger volumes or in combination with other hemostatic methods. If used alone, epinephrine injection holds a high risk of rebleeding.

Equipment required: All supplies required for a gastroscopy or colonoscopy, depending where the source of bleeding is locating. Injection needle, 1 ml epinephrine ampule, 10cc normal saline for injection.

5.2.1.3 *Argon plasma coagulation (APC)*

A non-contact thermal coagulation that "uses gas to deliver plasma of evenly distributed thermal energy to a field of tissue adjacent to the probe. The ionized gas seeks grounding in the nearest tissue and the energy penetrates at a depth of 2 to 3 mm in both linear and tangential directions" (Cohen, 2019, p. 1).

Equipment required: All supplies required for a gastroscopy or colonoscopy, depending where the source of bleeding is located. APC electrosurgical unit, grounding pad and APC probe.

5.2.1.4 *Variceal band therapy*

The application of rubber bands to esophageal variceal column to control active bleeding and/or prevent future bleeding. The band cuts off the blood flow through the enlarged vein, causing it to deflate and scar over with time as the band falls off. A repeat procedure is required in 4 to 6 weeks, to check for complications. There is a risk of ulceration, bleeding, obstruction and stricture development at the site of bands.

Equipment required: All supplies required for a gastroscopy and a variceal band ligator kit.

5.2.2 *Gastric lavage* *(Benson et al., 2013)*

Gastrointestinal decontamination to empty the stomach of toxic substances by repeatedly administering and aspirating small volumes of fluid through an orogastric tube. The procedure is seldomly practiced in current medicine for a number of reasons, primarily stemming from a lack of supportive efficacy evidence. The risk of complications are high, including aspiration, hypoxia, injury, hypothermia, and incomplete decontamination. Alternative treatments, such as specific toxin antidotes, are preferred as they offer a safer, more measurable and controllable outcome.

Equipment required: Gastric lavage tray contains normal saline, suction

tubing and equipment, 2 basins, 60 cc catheter tip syringe, orogastric tube, lubricant, and tape.

5.2.3 *Dilatation* (Victor, 2014a)

The process of mechanically stretching a narrowed or tightened area within the upper gastrointestinal tract to allow adequate passage of food and liquids into the stomach. Narrowing in the esophagus, lower esophageal sphincter or pyloric sphincter can be caused by achalasia, chemically or surgically induced strictures, webs and rings. There are four instruments that can be used to achieve dilatation: a) a balloon dilator, b) a mercury filled bougienage dilator, c) hollow polyvinyl Savary dilator and d) botulinum toxin injection. A) A balloon is inserted through a gastroscope or over a guide wire and inflated for 30 to 60 secs at the area of contraction; patients require multiple sessions, a number of weeks or months apart. B) Polyvinyl dilators and C) Mercury bougienage dilators are long graduated rods of varying diameters with a narrow tip. The dilator is advanced over a guide wire into the narrowed aspect of the esophagus. Patients often require multiple treatments to achieve long term dilation. Lastly, D) botulinum (Botox) toxin injection is the injection of Botox into the lower esophageal sphincter or pyloric sphincter to lower the contraction and pressure of the muscles, allowing food and fluid to pass through (Shim, 2014). Botox injection is not as effective as balloon and

dilator treatment and should be reserved for those with significant comorbidities or contraindications to other treatments (Shim, 2014).

Equipment required: Controlled radial expansion (CRE) - Dilatation balloon, dilatation syringe gun, sterile water. Savary dilatation – Savary or mercury dilators, guide wire, and lubricant. Botox injection- Botox medication and injection needle. Other equipment: Gastroscope, bite block, lidocaine spray, oral yanker, lubricant, procedure pad, and intravenous sedation.

5.2.4 *Stent insertion* (Sharaiha & Khashab, 2014)

The insertion of a metal or plastic stent into the esophagus, gastric sphincter or colon, for management of an obstruction, stricture, fistula, perforation or for palliative measures. Stents are available as metal mesh stent or silicone-covered, plastic stent and come in various lengths. They can also have a fully covered or partially/uncovered design, referencing the presence of an external coating. The uncovered property allow the stent to imbed itself into the tissue reducing the risk of migration. However, it is difficult to remove as tissue may grow though the mesh. The covered property offers a temporary, easily removal option, however, there is a risk the stent may migrate out of place.

Equipment required: All supplies required for a gastroscopy,

duodenoscopy or colonoscopy, depending on area of stent placement, and appropriate stent accessories.

5.2.5 *Percutaneous endoscopic gastrostomy/ transgastric jejunostomy tube* (Victor, 2014b)

Endoscopic placement of a semi-permanent gastrostomy feeding tube, used to deliver nutrition and/or medication into the stomach. An additional jejunostomy (J) tube can be inserted inside the gastric (G) tube to extend it into the jejunum. A needle is inserted through the abdominal wall into the stomach, guided by endoscopic transillumination. A guide wire is fed through the needle, into the stomach, then grasped by the gastroscope and pulled out through the mouth. The G tube is then fed over the guide wire, through the mouth, into the stomach and pulled out through the needle hole to complete the G tube placement. Indications for a gastrostomy tube include dysphagia (related to neurologic diseases, degenerative diseases, and trauma), esophageal obstruction, delivery of unpalatable medication and supplemental nutrition. A jejunostomy tube is indicated for abnormal gastric emptying and severe gastroesophageal reflux with aspiration.

Equipment required: Gastroscope, bite block, lidocaine spray, oral yanker, lubricant, procedure pad, PEG kit and/or J tube kit, biopsy forceps and intravenous sedation.

5.2.6 *Decompression* (American Society for Gastrointestinal Endoscopy, 2010)

Decompression is the removal of stool, liquid and gas from the colon through a colonoscopy procedure. An obstruction can occur, preventing the passing of stool and gas through the colon, creating a medical emergency. If left untreated, a colonic obstruction can cause a bowel perforation and require immediate surgery. An obstruction can be caused by a malignant mass, severe inflammation leading to narrowing (ex. Crohn's disease and diverticulitis), ischemic injury, volvulus, foreign body and intussusception. Pseudo-obstructions present with the same symptoms of a colonic obstruction in the absence of a physical impediment. The obstruction is due to nerve and muscle dysfunction, affecting the movement of stool, fluid and air through the bowel.

Equipment required: All colonoscopy supplies, drainage tube (optional), colonic stent (optional).

5.2.7 *Biopsy* (Gibson & Odze, 2019)

The collection of a small, superficial sample of mucosa and/or submucosa from the gastrointestinal tract for histopathologic evaluation. Biopsy samples can provide cellular information, differentiate malignancy, inflammatory processes, and infectious processes. It may also provide additional information when the gross appearance of the gastrointestinal tract is normal and can evaluate the effect of previous therapeutic

treatment (American Society of Gastrointestinal Endoscopy, 2006). Proper collection methods are required for accurate pathologic diagnosis. Placing tissue biopsy in a jar of fixation fluid decreases desiccation and preserves tissue architecture. Specimens requiring non-fixation should be handled with forceps not previously exposed to a fixative agent. It is suggested that specimen sampling device used to sample a potentially malignant tissue not be subsequently used to obtain other samples to avoid risk of malignant contamination. Some specimens may require specimen orientation as they can provide specific pathologic information (Gibson & Odze, 2019).

Equipment required: All supplies listed under gastroscopy or colonoscopy, biopsy forceps, sterile water and specimen container (formalin or cytology).

5.2.8 *Polypectomy* (Khashab, 2014)

The removal of a polyp, an abnormal tissue growth, from the upper or lower intestinal tract. A polyp has the potential to bleed, obstruct or become malignant over time, if not removed. Methods of removal include hot snare, cold snare, hot biopsy forceps, cold biopsy forceps, piecemeal resection and fulguration. Choice of method depends on patient and polyp factors. Patient factors include bleeding disorders and anticoagulant use. Polyp factors include size, location within the gastrointestinal tract,

type and shape of polyp, and accessibility. Surgery is sometimes required if a polyp is too large or has infiltrated deeper than the submucosal layer. Polyps have the potential to regrow if borders are not clearly removed. Certain genetic conditions also predispose patients to a higher likelihood of developing polyps.

Equipment required: All gastroscopy or colonoscopy supplies (depending on area of polypectomy), grounding pad, specimen trap, specimen container, hot snare, cold snare, biopsy forceps, injection wire, injection normal saline, electrosurgical unit. Hemostasis accessories should be made available, in case of emergency.

5.2.9 *Foreign body removal* (Gonzalez-Valez, 2014)

The endoscopic removal of an obstructing food bolus or ingested foreign body, usually from the mouth, esophagus, stomach or duodenum. X-ray imaging, patient presentation and history are used to determine endoscopic management. Specific details of importance include object positioning, size, quantity, shape, location, time of ingestion and urgency of case. Common objects include meat, breads, bones, coins, marbles, paper clips, toothpicks and batteries.

Equipment required: All gastroscopy supplies, overtube, grasping forceps, biopsy forceps, retrieval basket. Hemostasis equipment should also be made available, in case of mucosal/submucosal trauma.

5.2.10 *Fecal microbiota transplantation* (Kim & Gluck, 2019)

The transplantation of fecal microbiota (FMT) from a healthy donor into a recipient's colon, via nasogastric tube, oral capsule ingestion or routine colonoscopy, to establish a new gut microbiota community and promote normal gut function. The procedure has been used to treat recurrent clostridium difficile infections with great success. Research into FMT has expanded into its use in the treatment of inflammatory bowel diseases, metabolic disorders, and auto immune disorders.

Equipment required: All colonoscopy supplies, fecal transplant material and 7 slip tip 60cc syringes.

5.3 Specimen Collection

5.3.1 *10% Buffered formalin* (Gibson & Odze, 2019)

A fixative agent used in endoscopic specimen preparation by inhibiting the decay and autolysis of tissue samples, preserving the architectural integrity of the cells. 10% buffered formalin (4% formaldehyde in phosphate buffered saline) is the most commonly used solution at UHN, as it allows for tissue staining, molecular and other histological testing. Samples should be "fixed" (placed in 10% buffered formalin) as soon as reasonably possible after excision. Avoid crushing, manipulating or shaking the sample excessively when removing it from the biopsy forceps, as this

can damage its integrity. Personal protective equipment must be worn when handling 10% formalin because formaldehyde is a known carcinogen. Although the small amount of exposure in endoscopy settings does not require specialized ventilation, care should be taken when handling.

5.3.2 *Culture and sensitivity*

Culture and sensitivity testing determines the type of organism causing an infection and what medicine can be used to treat it. A sample is cultured (or grown) to obtain a pure sample of the organism, in order to identify the bacteria and obtain a bacterial count to differentiate bacterial colonization vs. infection. The pure culture is then grown on an agar plate saturated with an antibiotic, to determine which antibiotic the bacteria is sensitive to.

5.3.3 *Cytology* (Al-Abbadi, 2011)

The study of structures and functions of individual human cells. The goal of cytology is to provide a definitive diagnosis, detect early precursors to cancer, determine prognostic factors associated with staging and routine surveillance of a diagnosed disease. Endoscopy also uses the exfoliative cytology technique, where cells are gently exfoliated from the superficial mucosal surface using a cytology brush to detect viral infections, fungal infections and neoplasia.

5.3.4 *Ova and parasite* (Garcia et al., 2017)

An evaluation of a stool sample used to detect parasite presence in the lower gastrointestinal system, using macroscopic and microscopic characteristics instead of culturing. Ova and parasite is commonly ordered to determine the cause of persistent diarrhea. The sample needs to be collected in a clean specimen bottle; a sterile bottle is also suitable but not necessary. It is important the stool sample be collected before the administration of barium or bowel cleansing products. It must also be uncontaminated of urine or water. If the following products have been administered collection should be postponed for 5 to 10 days, as they may mask parasitic presence: caster/mineral oil, bismuth, antimalarial medication, antibiotics, barium and antidiarrheal agents.

5.4 Chapter Evaluation

1. What is the basic equipment required for an esophagogastroduodenoscopy?

2. During a duodenoscopy, what organ is being examined?

3. Which of these procedures is usually completed without sedation:

   a) Colonoscopy

   b) Gastroscopy

   c) ERCP

   d) Anoscopy

4. During a colonoscopy, what areas of the intestine are examined?

5. If a patient has been diagnosed with achalasia, what procedure can the nurse expect to be performed?

6. What method of hemostasis is only used in the upper gastrointestinal tract?

7. If a patient presents with dysphagia and requires supplemental nutrition, what procedure will they likely receive?

8. A patient has swallowed a battery, what procedure will be scheduled and what equipment will it require?

9. _____ is the removal of abnormal tissue in the colon or stomach, using a hot snare.

10. True or false, fecal microbiota transplantation can be administered through a colonoscopy or nasogastric tube.

a) True

b) False

11. To determine what antibiotic is effective in treating a bacterial infection, what type of specimen test should be completed?

12. True or false, when placing a biopsy specimen in 10% formalin, it is necessary to scrape it out of the forceps with a needle or shake the forceps vigorously inside the solution to dislodge the specimen.

a) True

b) False

13. Which specimen test requires the collection of a stool sample?

a) Cytology

b) Culture and sensitivity

c) Ova and parasite

d) Biopsy

5.5 Chapter Evaluation Answers:

1. Gastroscope, bite block, oral lidocaine spray, procedure pad, lubricant, sterile water, oral yanker, intravenous sedation and the appropriate endoscopy accessory wires.
2. Duodenum
3. D, anoscopy
4. Anus, rectum, sigmoid colon, descending colon, transverse colon, ascending colon and cecum
5. Dilatation
6. Variceal banding
7. Percutaneous endoscopic gastrostomy/transgastric jejunostomy tube
8. Foreign body removal. Supplies required include all gastroscopy supplies, overtube, grasping forceps, biopsy forceps, retrieval basket. Also have hemostasis equipment available, in case of mucosal/submucosal trauma.
9. Polypectomy
10. True
11. Culture and sensitivity
12. False
13. C, ova and parasite.

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Chapter 6: Endoscopy Adverse Events and Equipment Troubleshooting

Objectives: By the end of this section, you will be able to:

- List the potential adverse events of endoscopic procedures.
- Demonstrate knowledge of equipment through appropriate troubleshooting techniques.

6 Endoscopy Adverse Events

6.1 Colonoscopy-related Adverse Events (Kothari et al., 2019)

6.1.1 *Gas explosion*

A rare, but serious adverse event causing bowel perforation, occurring when combustible levels of hydrogen, methane and oxygen are present during the use of electrosurgical tools. Risk factors include incomplete or inadequate bowel preparation and the use of bowel preparation agents containing hydrogen (ex. lactulose, mannitol and enemas containing hydrogen).

6.1.2 *Infection*

Infection caused by the introduction of bacteria into the blood stream post polypectomy is extremely rare and a point of debate in the literature. Other sources of potential infection include ineffective reprocessing of endoscopy equipment, pneumonia (related to sedation and aspiration) and perirectal abscess. The use or prophylactic pre-procedure antibiotics are not recommended by the American Society of Gastrointestinal Endoscopy (Kothari et al., 2019).

6.1.3 *Abdominal discomfort and bloating*

Discomfort and bloating is a very common adverse event of a colonoscopy and may occur during and/or after the procedure. Causes include colonic spasm, gaseous instillation causing distention, and mechanical of barotrauma. Symptoms include pain, rigid and distended abdomen, diaphoresis, vasovagal episodes and cramping. Abdominal discomfort commonly resolves without intervention. Techniques to avoid or improve discomfort during procedure include using minimal air insufflation, using CO_2 insufflation instead of air insufflation, using water immersion instead of air or CO_2 insufflation and reducing endoscope looping inside the bowel.

6.1.4 *Post polypectomy electrocoagulation syndrome*

An injury caused by thermal damage from electrocoagulation during polypectomy and endoscopic mucosal resection. Types of injuries include bowel necrosis and delayed perforation. Symptoms include fever, abdominal pain, leukocytosis, and localized peritoneal signs.

6.1.5 *Sedation-related adverse events* (Goudra et al., 2017)

Sedation-related adverse events include aspiration, cardiorespiratory arrest, chest pain, arrhythmias, hypoxia, myocardial infarction, anaphylaxis, cognitive dysfunction, and seizures. Predictors of adverse events include body mass index (BMI), age at time of procedure, sedation

type, Mallampati airway class and type of procedure. Symptoms present during vital sign monitoring and patient observation.

6.1.6 *Hemorrhage*

Bleeding within the colon, usually related to a therapeutic intervention (most commonly a polypectomy) or mechanical scope trauma. A polypectomy site may hemorrhage immediately and up to 4 weeks after procedure. Symptoms include bright red blood in stool, melena, pain, abdominal distention, anemia and hemodynamic instability. The risk of bleeding increases with the number of polypectomies, areas of the colon and anticoagulation or antiplatelet therapy use.

6.1.7 *Perforation*

The creation of a tear of hole through some or all layers of the intestine wall, causing air and/or fluid to leak into the intraperitoneal or extraperitoneal space. Usually caused by mechanical force from the colonoscope against the bowel wall, or as a direct result of a therapeutic intervention. Symptoms include constant abdominal pain, abdominal distention, fever, nausea, vomiting and chills. Patient populations at increased risk for perforation include those with diverticulosis, inflammatory bowel disease and corticosteroid use.

6.1.8 *Mortality*

Colonoscopy-related mortality is extremely rare, with 0.003% (3 in 100 000) of patient deaths being directly attributed to the procedure (Kothari et al., 2019). Cause of death is usually related to a cardiopulmonary event occurring during colonoscopy procedure or bowel perforation repair surgery. Other causes include those related to comorbidities and not directly related to colonoscopy, including cardiopulmonary disease, cirrhosis, and neurological diseases.

6.2 Gastroscopy-related Adverse Events (American Society of Gastrointestinal Endoscopy, 2012)

6.2.1 *Hemorrhage*

Bleeding within the gastrointestinal tract, usually related to a therapeutic intervention or mechanical scope trauma. An intervention site may hemorrhage immediately and up to 4 weeks after procedure. Symptoms include melena, pain, abdominal distention, fever, shortness of breath, dysphagia, and hemodynamic instability. The risk of bleeding increases with the extensiveness of therapeutic procedure and anticoagulation or antiplatelet therapy use.

6.2.2 *Infection*

The introduction of bacteria into the body, causing an infection. This can be the result of a therapeutic procedure, the inadequate reprocessing of endoscopy equipment or aspiration. The use of prophylactic pre-procedure antibiotics are not recommended by the American Society of Gastrointestinal Endoscopy (Kothari et al., 2019).

6.2.3 *Perforation*

The creation of a tear or hole through some or all layers of the gastrointestinal tract wall, leading to air and/or fluid leaking into the intraperitoneal or extraperitoneal space. Usually caused by mechanical force, from the gastroscope, or as a direct result of a therapeutic intervention. Other predictors of increased risk include the presence of Zenker's diverticulum, esophageal stricture, malignancy and duodenal diverticulum. Symptoms include neck/chest/stomach pain, dysphagia, fever and shortness of breath.

6.2.4 *Aspiration*

The introduction of gastric contents and/or saliva into the lungs during a gastroscopy procedure. Aspiration can lead to the development of pneumonia. Predisposition includes the impairment of the gag reflex, use of intravenous sedation and splinting of the upper esophageal sphincter by the gastroscope. Elderly patients and those who are

immunocompromised or have a neurological condition are at increased risk for aspiration.

6.2.5 *Mallory-Weiss tear* (Kim, 2015)

"A linear non-perforating mucosal laceration at the lower part of the esophagus and/or upper part of the stomach" (Kim, 2015, p. 102). While a Mallory Weiss tear (MWT) usually occurs as a result of aggressive retching and vomiting, it can also occasionally occur with retching caused by a gastroscopy procedure. MWT cause bleeding and although it rarely requires intervention to resolve, the condition has the potential to be fatal if a severe case is not treated.

6.3 Equipment Troubleshooting

6.3.1 *Suction troubleshooting*

The suction pressure is weak or obstructed:

- Check the suction gauge is ON and pressurized.

  Solution: Turn switch to ON position and turn the gauge dial towards the INCREASE direction until desired pressure achieved.

- Check the suction cannister is snapped into place, and all valves on the lid are in place.

  Solution: Apply pressure to edges of cannister until a snap is heard. Press valves onto corresponding holes until a click is heard.

- Check if the contents of the suction cannister have reached the FILL line.

  Solution: Remove the full cannister, insert new cannister and reconnect tubing.

- Check that all suction tubing is connected to the appropriate suction cannister ports.

  Solution: Reconnect or tighten tubing connections.

- Check the suction tubing is connected to the scope suction outlet on the umbilicus.

  Solution: Reconnect or tighten tubing connections

- Check the suction cap for any debris lodged inside.

  Solution: Rinse cap or replace with new suction cap

- Check the biopsy cap is tightly in place over the biopsy channel and the valve is closed.

  Solution: Close biopsy cap valve and press into place on channel or replace with a new biopsy cap.

- The suction channel may be occluded with debris or thick liquid.

  Solution: Using a 60cc syringe filled with air or sterile water, irrigate through the biopsy channel, while the physician holds down the suction button. Reconnect suction tubing.

- The scope umbilicus suction port may be obstructed by debris.

  Solution: Using a 60cc syringe filled with air or sterile water, irrigate through the suction outlet on the scope umbilicus, while the physician holds down the suction button. Reconnect suction tubing.

- If all previous interventions are unsuccessful, replace all suction tubing and cannisters.

6.3.2 *Video capture troubleshooting*

There is no image transmission from the scope to the video screen:

- Check the computer towers (2) are ON.

  Solution: Press circular ON buttons on the top and bottom towers. The buttons will glow green when activated. Also, ensure the main cart power button is ON, evidenced by the glowing green ring around the ON button.

- Check the umbilicus is correctly inserted into the tower scope outlet.

  Solution: Remove the umbilicus, align the white dot on the top with the white dot on the rim of the tower scope outlet, insert the umbilicus prong straight until a click is heard.

- Check the umbilicus is not moist prior to insertion into the tower scope outlet.

  Solution: Remove the umbilicus and dry its surfaces. Dry the tower scope outlet thoroughly and reinsert the umbilicus.

- Check the computer program is responding correctly.

  Solution: Force close the program and restart the program. Alternatively, you can restart the computer or call the medical engineering department.

6.3.3 *Water jet troubleshooting*

The water jet is weak or malfunctioning:

- Check the sterile water bottle contains water.

  Solution: Replace empty bottle with a full sterile water bottle.

- Check the waterjet console is ON and water pressure level is set.

  Solution: Check wall electrical outlet plugs, turn console ON, set water pressure level between 80 and 100%.

- Check the water tubing is correctly inserted into the water console feeder.

  Solution: Place soft section of tubing through wheels of console feeder. The bottle connection should be on the right of the console and the scope connection on the left. Ensure the soft section of the tubing is not occluded by the edge of the lid when closed.

- Check the water tubing connection is tight.

  Solution: Tighten tubing connections

- Check the water tubing connection to the scope umbilicus.

  Solution: Tighten water tubing connection.

6.3.4 *Insufflation troubleshooting*

The insufflation air is weak or has malfunctioned:

- Check the CO_2 bottle connector is attached to the scope umbilicus correctly and tightly.

  Solution: Tighten tubing. Ensure the prongs on the umbilicus align correctly with the holes in the CO_2 bottle connector.

- Check the CO_2 tubing connection on the insufflation console is tight.

  Solution: Tighten tubing. Ensure the tag end of the tubing is connected to the CO_2 bottle and the other end is connected to the insufflation console.

- Check there is enough CO_2 in the tank by looking at the display bars on the insufflation console, as indicated by the presence of 4 display bars.

  Solution: If one or fewer bars - purge CO_2 tubing, close valve on CO_2 tank, detach hose and remove empty tank. Replace with a full tank, connect hose and open valve.

- Check the water level in the CO_2 bottle is between the indicator markings.

  Solution: Refill the water to a level between the two indicator markings.

- Check the CO_2 tubing connection to the water bottle is tight.

  Solution: Tighten the tubing. If the tubing connector spins despite being tightened, replace entire CO_2 bottle unit with a new one.

- Check the insufflation button is correctly inserted and tight.

  Solution: Tighten buttons until a click is heard. Alternatively, replace with a new button and press in until the insertion click is heard.

6.3.5 *Electrocautery troubleshooting*

The electrocautery unit is malfunctioning:

- Check the unit's power cord is plugged into the wall electrical outlet.

  Solution: Remove and reinsert power cord to wall electrical outlet. If unsuccessful, call the medical engineering department.

- Check the power cord is tightly connected to the back of the unit.

  Solution: Ensure metal coupling is tightened on the back of the electrocautery unit

- Check the monopolar cord is tightly connected to the main unit.

  Solution: Remove prong and reinsert into the monopolar outlet on the electrocautery unit. If unsuccessful, try the next bullet or replace cord.

- Check the monopolar cord is tightly connected to the electrocautery accessory.

  Solution: Remove plug and reconnect to the accessory. If unsuccessful, see previous bullet or try connection with a new accessory.

- Check the grounding pad cord is properly inserted to the neutral outlet on the main unit.

  Solution: Remove plug and reinsert it into outlet. If unsuccessful, see the next bullet.

- Check the grounding pads adhesion to the patient's body.

  Solution: Ensure pad is in full contact with the patient's skin. It must be placed on a flat, dry body surface. Avoid skin folds, hair, bony prominences and surgical scars/hardware. If still unsuccessful, remove existing pad and replace with new grounding pad.

- Check the electrocautery foot peddle is connected to the main unit.

  Solution: Tighten peddle power cord or call the biomedical engineering department.

6.3.6 *Vital sign monitor troubleshooting*

The monitor is not displaying vital sign measurements or a malfunction with the blood pressure cuff, SpO_2 probe or cardiac telemetry leads has occurred:

- Monitor will not turn ON.

  Solution: Check power cord at the back of the monitor and at the wall electrical outlet.

- Blood pressure cuff is not inflating.

  Solution: Check the blood pressure air tubing connection to the monitor. Check the two valves on the air tubing are correctly connected. Check if the cuff is inflating appropriately or if air escaping can be heard. Replace cuff and/or cuff tubing.

- SpO_2 probe is not capturing a reading.

  Solution: Check the probe connection to the monitor. Check the integrity of the probe cord for exposed electrical wires. Check the probe infrared light is functioning in the finger probe. If the waveform reading is weak, try a different finger, toe or ear to acquire a stronger reading. Replace SpO_2 finger probe cord.

- Cardiac telemetry leads display artifact tracing, or the tracing is absent.

Solution: Check lead connection to monitor. Check lead connection to electrodes on patient. Check contact of electrodes to patient's skin. Electrodes may be compromised by hair, moisture, skin integrity, motion and environmental factors. Replace electrodes and/or cardiac lead wires.

6.4 Chapter Evaluation

1. There is a risk of a gas explosion occurring during a _____ procedure, due to the presence and interaction of _____, _____, _____ and electrosurgical tools.
2. Prophylactic antibiotics are required prior to an endoscopic procedure to prevent potential infection.
    a. True
    b. False
3. Symptoms of a colonoscopy-related hemorrhage include:
    a. Melena, abdominal pain, fever, paralysis
    b. Bright red blood in stool, melena, abdominal pain and hypotension
    c. Brown stool, vomiting, dizziness, and drowsiness
    d. Red diarrhea, abdominal pain, and nausea
4. Manual decompression is required to relieve mild symptoms of abdominal discomfort.
    a. True
    b. False
5. A patient in liver failure is at an increased risk of mortality post-colonoscopy.
    a. True
    b. False

6. A perforation of the gastrointestinal tract is usually caused by which two actions?

   _____

   _____

7. The patient group at highest risk of developing an aspiration pneumonia post-gastroscopy include:

   a. Middle age males, BMI >30, patients without sedation and the elderly population.

   b. A patient receiving chemotherapy, an 82-year-old female and a young male with a traumatic brain injury.

   c. A 45-year-old woman with sleep apnea, a male with a history of gastritis and a 18-year-old woman with anxiety.

8. Can a Mallory-Weiss tear occur without a patient receiving a gastroscopy procedure?

   a. Yes

   b. No

9. If the scope umbilicus is moist, which system may it affect?

   _____

10. Which of the follow will result in reduced suction pressure:

    a. A liquid-filled suction cannister

    b. Suctioning large debris out of the colon

    c. A valve open on the lid of the suction cannister

    d. All of the above

11. The absence of waterjet pressure could indicate which of the following:

    a. The sterile water bottle is empty.

    b. The tubing is incorrectly connected

    c. The CO_2 bottle is empty

    d. Both a and b

12. What department should you contact if the video capture program is malfunctioning?

    _____

13. If the water level in the CO_2 bottle is below the indicator lines, what function will be impaired?

    a. Waterjet

    b. Air insufflation

    c. Suction

    d. Colon washing

14. Troubleshooting the electrocautery unit includes checking the _____ cord, _____ cord and _____ cord.

15. Five factors that can impact the strength of the cardiac telemetry reading are:

    a. Body hair, tattoos, piercings, consciousness and surgical scars

    b. Body temperature, weight, piercings, clothing and head positioning

    c. Room temperature, brainwaves, armpit moisture, melanin and dry skin.

    d. Moisture, body hair, environmental factors, motion and skin integrity

6.5 Chapter Evaluation Answers

1. Colonoscopy, hydrogen, methane and oxygen
2. False
3. B
4. B
5. A
6. Therapeutic intervention and mechanical scope force
7. B
8. A
9. Video capture
10. D
11. D
12. Biomedical engineering
13. B
14. Power cord, monopolar cord and grounding cord
15. D

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