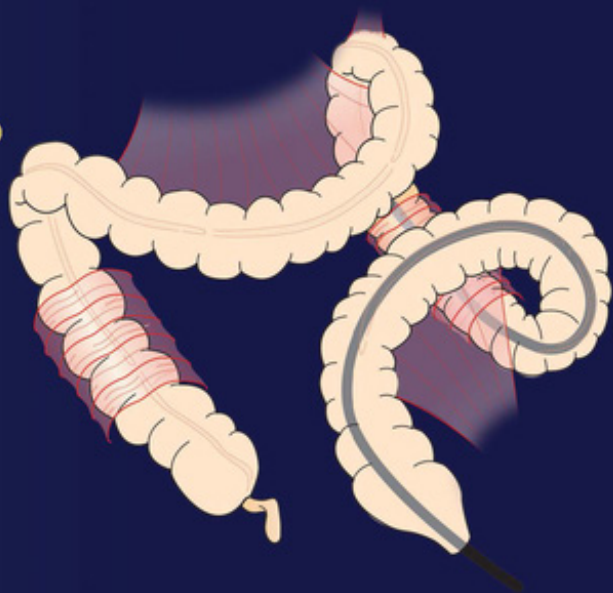
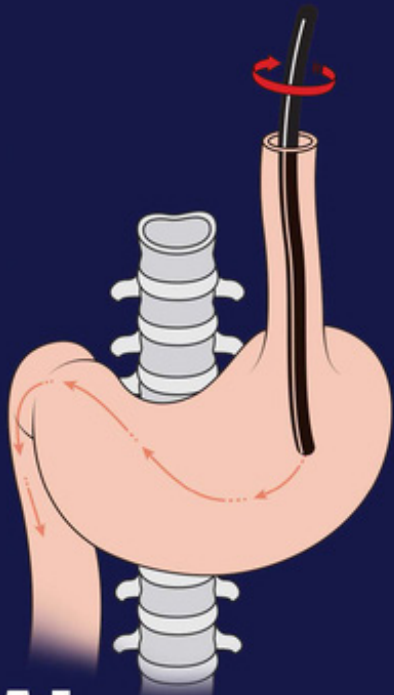


EIGHTH EDITION

**COTTON AND WILLIAMS'**  
**PRACTICAL**  
**GASTROINTESTINAL**  
**ENDOSCOPY**

**THE FUNDAMENTALS**

CATHARINE M. WALSH  
AHMIR AHMAD  
BRIAN P. SAUNDERS  
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PETER B. COTTON  
CHRISTOPHER B. WILLIAMS



**WILEY** Blackwell



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**Cotton and Williams'  
Practical Gastrointestinal Endoscopy  
The Fundamentals**



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# Cotton and Williams' Practical Gastrointestinal Endoscopy

## The Fundamentals

**Eighth Edition**

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# Preface to the Eighth Edition

In recent decades, there have been major advances in endoscopic techniques and technology. Improvements in endoscope resolution and image-enhancing modalities, as well as the emergence of artificial intelligence, are transforming endoscopic practice. The demand for endoscopy has never been greater. Yet, despite these changes, the fundamental principles of high-quality endoscopy remain constant.

Before exposing a patient to this invasive procedure, we must ensure that there is an appropriate indication and truly informed consent for it. Patient activity should be optimized to minimize any avoidable risk. The endoscopist should be skilled, or supervised if training, to ensure that accurate diagnosis and definitive therapy are performed with minimal patient discomfort or anxiety. When adverse events occur, they must be quickly recognized and appropriately managed.

It is a huge honor, and responsibility, to take forward the incredible legacy of Peter Cotton and Christopher Williams, the pioneering authors of this textbook first published in 1980. It is their commitment and dedication to the field of endoscopy that has made this text an invaluable resource for endoscopists all over the world. We are very grateful for their support, feedback and endorsement of this revised edition. The key word in the title, “Fundamentals,” encapsulates the essence and differentiating aspect of this book. For decades, it has served to guide novices through their early days of learning to perform high-quality endoscopy. It remains focused on helping those in their first few years of experience advance more quickly along the endoscopic learning curve through competency toward excellence.

In this eighth edition of *Practical Gastrointestinal Endoscopy: The Fundamentals*, we have made updates and enhancements to reflect current practice to ensure that the text remains relevant and accessible for future generations of endoscopists. In doing so, we hope to maintain the original vision of Peter Cotton and Christopher Williams to help make skillful endoscopy easier and safer, ultimately improving patient care.

October 2023  
Catharine M. Walsh  
Ahmir Ahmad  
Brian P. Saunders  
Jonathan Cohen

# Preface to the First Edition

This book is concerned with endoscopic techniques and says little about their clinical relevance. It does so unashamedly because no comparable manual was available at the time of its conception and because the explosive growth of endoscopy has far outstripped facilities for individual training in endoscopic technique. For the same reason we have made no mention of rigid endoscopes (oesophagoscopes, sigmoidoscopes and laparoscopes) which rightly remain popular tools in gastroenterology, nor have we discussed the great potential of the flexible endoscope in gastrointestinal research.

Our concentration on techniques should not be taken to denote a lack of interest in results and real indications. As gastroenterologists we believe that procedures can only be useful if they improve our clinical management; clever techniques are not indicated simply because they are possible, and some endoscopic procedures will become obsolete with improvements in less invasive methods. Indeed we are moving into a self-critical phase in which the main interest in gastrointestinal endoscopy is in the assessment of its real role and cost-effectiveness.

Gastrointestinal endoscopy should be only one of the tools of specialists trained in gastrointestinal disease—whether they are primarily physicians, surgeons or radiologists. Only with broad training and knowledge is it possible to place obscure endoscopic findings in their relevant clinical perspective, to make realistic judgements in the selection of complex investigations from different disciplines, and to balance the benefits and risks of new therapeutic applications. Some specialists will become more expert and committed than others, but we do not favor the widespread development of pure endoscopists or of endoscopy as a subspecialty.

Skillful endoscopy can often provide a definitive diagnosis and lead quickly to correct management, which may save patients from months or years of unnecessary illness or anxiety. We hope that this little book may help to make that process easier and safer.

*April 1979*

*Peter B. Cotton*

*Christopher B. Williams*

# Acknowledgments

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# About the Companion Website

This book is accompanied by a website:

[www.wiley.com/go/cottonwilliams8e](http://www.wiley.com/go/cottonwilliams8e)



The website includes:

- 40 videos showing procedures described in the book
- All videos are referenced in the text where you see this logo 
- A clinical photo imagebank





## CHAPTER 1

# Welcome to Endoscopy

If you are reading this book, you have likely just embarked on a journey to master the art and science of gastrointestinal endoscopy. Many of the experienced teachers you encounter along the way will sail through their examinations as if the scope is an extension of their hands, with a myriad of unconscious maneuvers and fast-thinking visual processing of what appears on the screen. They will make what appear to you to be near-instantaneous assessment and judgment calls as to how to respond to the information that comes into view. It can be easy for them to forget the wonderment of the first exposure to endoscopy that drew them into the field and now hopefully excites you to follow suit. At the same time, it is understandable for you to feel a bit overwhelmed by the apparent magnitude of the challenge you face to reach their level of proficiency.

Here are some reassuring thoughts to accompany your introduction to endoscopy. With time, practice, self-challenge, reflection, good role models, and feedback, you will be able to master what initially appears so daunting. By breaking down the many technical, cognitive, and non-technical skills into the components detailed in this book, and with equal doses of patience and persistence, becoming a high-quality endoscopist is well within your reach. Knowing that you will eventually develop the skills is comforting, but another source of support is the many resources available to you to make this learning trajectory far less bumpy and more expeditious. Several of these are listed at the end of this chapter. Hopefully, this book on the *fundamentals* of endoscopy will demystify the first steps of the learning process for you by clearly outlining the skills to learn and will make the path forward far less intimidating.

What general skills, knowledge, and mindset do you need to best set off to learn endoscopy? Contrary to common belief, you do not need to be a master video gamer or star athlete with already honed hand-eye coordination, although such skills may come in handy early in the learning curve for technical skills. Perhaps the most essential ingredient is having eagerness and motivation to learn. In doing so, you will also need to combine parallel threads of knowledge. This characteristic of endoscopy education is common to all medical specialties and highlights the importance of building one's fund of knowledge and making connections within it. You will no doubt have some of this understanding when you start to learn endoscopy, but the key to making progress is to use the circumstances

of each patient endoscopic encounter to augment your knowledge as it relates to the particular case at hand.

The technical skills required to navigate the endoscopic instruments and accessories, covered in detail in subsequent chapters in this book, are a second layer of knowledge that must be learned via observation, demonstration, deconstruction into component maneuvers, practice, feedback, reflection, and refinement. You will find this aspect to be novel and to require your full attention in the early phase of learning. A common mistake of teachers is to overload clinical training with lessons about visual image interpretation while a novice is focusing on mastering the basic manipulative physical aspects of performing endoscopy. Key to success in this effort is the attitude and understanding that progress is incremental, and one can *always* improve. Great teachers are themselves always striving to refine their skills and asking themselves the question “How can I do better?” Once you find yourself successfully completing components of the technical procedures without assistance, avoid complacency and push yourself to perform them better: more precise movements, less loop formation in the colon, smoother intubation of the oropharynx, etc. This will be the way to excel at endoscopy. Expertise is not innate; it is achieved by continually engaging in *deliberate* practice that is purposeful, feedback-informed, and conducted with the specific goal of improving performance.

The next major novel frontier for the student of endoscopy is re-learning how to look at images. By the time a prospective endoscopist passes an endoscope for the first time, the mechanics of assessing visual inputs has long since become automatic and immediate. For instance, imagine a hike through a forest. As you walk along the trail, you may notice some of the rocks and trees and the occasional bird as you pass by, but seldom do you stop and analyze the frames presented as you pass to truly notice patterns, assess the content, discern when something stands out as novel or atypical from the norm, decide what that unusual feature might signify, and choose whether to take a photo (or sample) or move on. Unless you happen to be a naturalist, you have probably become used to viewing your surroundings in a much more passive manner.

As you begin your endoscopy education, you will find it advantageous to consciously change the *way* you look. In the endoscopy suite, when your trainer asks you what you see on the screen, resist the temptation to blurt out a label or an interpretation, but rather start with a simple description. This requires you to notice and appreciate the features—the color, the contours, changes in the surface pattern, and the topography of the surface layer (bumpy or smooth, raised or depressed). Even when you learn the features associated with normal versus abnormal mucosa in various organs and with specific pathological diagnoses, pattern recognition begins with detailed observation and appreciation of the images that come into view. This is a learned skill that can be overlooked in the rush to label and correctly name what you see. Once you characterize the features, you will start to match what you are seeing to what you expect to find in a particular organ under normal circumstances and in

various common disease states. This analytical type of data collection and processing is no different from that used by a novice botany student learning to recognize and name the vegetation along a hike through the forest. With practice, you will rapidly be able to detect when something is abnormal and figure out what the abnormality is. You will learn, too, how to respond to what you see as you progress in your cognitive skill development. Just as important a habit to form at the beginning of your training is a meticulous tendency to inspect completely and leave no blind spots in your examinations. To some extent, this overlaps with the technical skills required to maneuver your endoscope to visualize any hard-to-reach areas. The chapters in this book will guide you in how best to do this. However, the diligence that drives you not to overlook any area, and to go back and reinspect regions that you did not get a great look at the first time around, is a critically important practice.

As you get your first exposure to patients undergoing endoscopy, whether initially as an observer or with scope in hand, be mindful of everything happening in the suite. When you are observing a case in which the instructor is handling the endoscope, the tendency is to stare intently at the video monitor to see what the scope is imaging. However, it is often equally or more important to notice what your teacher is doing with their hands. Another key aspect to appreciate is how they are communicating and interacting with the rest of the staff in the suite. We all learn by reading, watching, listening to verbal instructions, and manually practicing and refining skills by tactile feedback. Trainees rely on each of these modes of learning to varying extents. You will soon figure out what works best for you.

Once you come to appreciate the magnitude of the different technical, cognitive, and non-technical skills you must master to perform high-quality endoscopy, you may again become overwhelmed. You certainly cannot learn all the skills at once, and the concept of cognitive overload will be discussed later in this book. A good rule of thumb that will help keep you on track and avoid becoming disheartened is to ensure that each procedure in which you participate provides you with at least one take-home lesson or opportunity to improve one skill, technical, non-technical, cognitive, or otherwise. After each case, review in your mind or with your trainer what you have just learned. Focused feedback discussions are essential to promote learning. Before each case, ensure that you set one to two learning goals, which may need to be adjusted depending on what you encounter during the actual procedure. For example, if you hoped to work on passing a gastroscope into the duodenum, but the patient has a large ulcer in the stomach, the main lessons from the case will necessarily deviate from the original plan. You may still try to achieve duodenal intubation, but the educational value of the experience will shift according to the circumstances that arise. This opportunity-based education is in contrast to a didactic A-to-Z learning agenda and remains an exciting aspect of proctored live endoscopy performance as a principal teaching tool in endoscopy.

You will soon appreciate that learning to perform endoscopy is a highly iterative process. Repetition, reflection, assessment,

feedback, and monitoring progress are key features. You will notice that your best teachers will not only enjoy teaching but will themselves still be striving to continually improve and learn throughout their career. You will also see that they are always thinking about the patient and putting patient care first. Keeping these attitudes foremost in mind will serve you well, both as you learn to become an excellent endoscopist and as you progress throughout your professional career.

If this “welcome to endoscopy” seems to be more of a pep talk, well . . . that is what this is!

## Resources and links

### Websites

There is a huge amount of valuable material on the internet, posted largely by the main endoscopy societies around the world. These include many thoughtful guidelines for practice and training.

#### The main (Western) society resources are:

- American College of Gastroenterology (ACG): [www.gi.org](http://www.gi.org)
- American Gastroenterological Association (AGA): [www.gastro.org](http://www.gastro.org)
- American Society for Gastrointestinal Endoscopy (ASGE): [www.asge.org](http://www.asge.org)
- British Society of Gastroenterology (BSG): [www.bsg.org.uk](http://www.bsg.org.uk)
- Canadian Association of Gastroenterology (CAG): [www.cag-acg.org](http://www.cag-acg.org)
- European Society for Gastrointestinal Endoscopy (ESGE): [www.esge.com](http://www.esge.com)
- European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN): [www.espghan.org](http://www.espghan.org)
- North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN): [www.naspghan.org](http://www.naspghan.org)
- Society of American Gastrointestinal and Endoscopic Surgeons (SAGES): [www.sages.org](http://www.sages.org)
- World Endoscopy Organization (WEO): [www.worldendo.org](http://www.worldendo.org)

#### Online endoscopy educational resources include:

- American Society for Gastrointestinal Endoscopy (ASGE) core curricula: [www.asge.org](http://www.asge.org)
- European Society for Gastrointestinal Endoscopy (ESGE) core curricula: [www.esge.com](http://www.esge.com)
- ImageSIM (endoscopy image cognitive simulation tool): [www.imagesim.com](http://www.imagesim.com)
- The Gastrointestinal Endoscopy Quality and Safety (GIEQs) Foundation: [www.gieqs.com](http://www.gieqs.com)

### Endoscopy books

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### **Journals with major endoscopy focus**

- American Journal of Gastroenterology*. Official journal of the American College of Gastroenterology.
- Digestive Endoscopy*. Official journal of the Japan Gastroenterological Endoscopy Society.
- Endoscopy*. Official journal of the European Society of Gastrointestinal Endoscopy, and 20 affiliated national societies.
- Gastrointestinal Endoscopy*. The official journal of the American Society for Gastrointestinal Endoscopy.
- Gastrointestinal Endoscopy Clinics of North America*. Quarterly publication of state-of-the-art reviews on the use of endoscopic procedures for the diagnosis and treatment of digestive diseases.
- Gut*. Official journal of the British Society of Gastroenterology.
- Journal of Pediatric Gastroenterology and Nutrition*. Official journal of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition and European Society for Paediatric Gastroenterology, Hepatology and Nutrition.
- Surgical Endoscopy*. Official journal of the Society of American Gastrointestinal Endoscopic Surgeons and European Association for Endoscopic Surgery.

## CHAPTER 2

# The Endoscopy Unit, Staff, and Management

Most endoscopists, and especially beginners, focus on the individual endoscopic procedures and have little appreciation of the extensive infrastructure that is necessary for efficient and safe activity. From humble beginnings in adapted single rooms, most of us are lucky enough now to work in large units with multiple procedure rooms full of complex electronic equipment, with additional space dedicated to preparation, recovery, and reporting.

Endoscopy is a team activity, requiring the collaborative talents of many people with different backgrounds and training. It is difficult to overstate the importance of appropriate facilities and adequate professional support staff, to maintain patient comfort and safety, and to optimize clinical outcomes.

Endoscopic procedures can be performed almost anywhere when necessary (e.g. in an intensive care unit), but the vast majority take place in purpose-designed “endoscopy units.”

### Endoscopy units

Details of endoscopy unit design are beyond the scope of this book, but certain principles are important to understand.

There are two types of endoscopy units:

- **Stand-alone, office-based procedure facilities** (called ambulatory endoscopy or surgical centers in North America) that deal mainly with healthy (or relatively healthy) outpatients, and generally resemble cheerful modern dental suites.
- **Hospital-based units** which must also provide a safe environment for managing sick inpatients, more complex procedures, such as endoscopic retrograde cholangiopancreatography (ERCP), and the whole range of therapeutic techniques. These units more closely resemble operating suites.

### Functional planning

Units that serve both the above functions should be designed to separate patient flows as far as possible. The modern unit has areas designed for many different functions. Like a hotel or an airport (or a Victorian household), the endoscopy unit should

have a smart public face (“upstairs”), and a more functional back hall (“downstairs”). From the patient’s perspective, the suite consists of areas devoted to reception, preparation, procedure, recovery, and discharge. Supporting these activities are many other “back hall” functions, which include scheduling, endoscope reprocessing, preparation, maintenance and storage of equipment, reporting and archiving, education and training, and staff management.

There should be spheres of activity for the endoscopist and assistants, as well as clean and dirty regions. One side of the room should be dedicated to endoscopy assistants who have easy access to accessories, supplies, and medications in cabinets directly behind them. On the other side of the room, the endoscopist should have a hand-washing area and workstation available to them. If anesthesia is used, the associated medication and supplies should be located at the head of the bed.

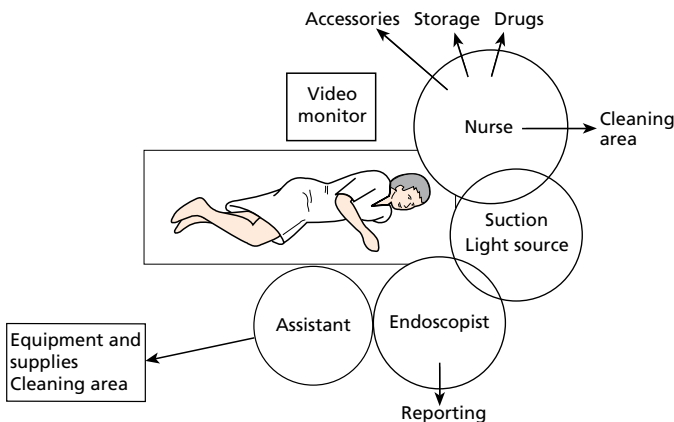
### Procedure rooms

The rooms used for endoscopic procedures should:

- **not be cluttered or intimidating** as most patients are not sedated when they enter, so it is better for the room to feel warm and comfortable rather than like an operating room.
- **be large enough** to allow a patient stretcher/trolley to be rotated on its axis, and to accommodate all of the equipment and staff (and any emergency team), but also compact enough for efficient function.
- **be laid out with function in mind**, keeping nursing, endoscopist, and anesthesiologist (when present) spheres of activity separate (Fig 2.1), and minimizing exposed trailing electrical cables and pipes (best by ceiling-mounted beams).

Each room should have:

- **pipex oxygen, CO<sub>2</sub> suction, a water supply, and electrical outlets for ancillary equipment;**



**Fig 2.1** Functional planning—showing logical separation of the spheres of activity for endoscopy team members.

- **lighting** planned to illuminate nursing activities but not over-stimulate the patient or disrupt the endoscopist's line of vision;
- **adjustable video monitors** placed ergonomically, directly in front of the endoscopist to allow for neutral neck and back postures, with adjustable height and location to accommodate varying heights and the endoscopist's preferred viewing distance, ideally one on each side of the patient to allow all staff to view and respond during the procedure and enable the patient to view, if wished;
- **adequate counter space** for accessories, with hand-washing facilities and a large sink or receptacle for dirty equipment;
- **storage space** for equipment, supplies, and medications required on a daily basis to assure items are available when needed;
- **systems of communication** with the charge nurse desk, and emergency call;
- **workstation with computer system** that enables data capture and management, recording and reporting of endoscopic procedures and audit of quality indicators, and, ideally, is integrated into the electronic health record system;
- **two doors** to allow for easy access and simultaneous entry of clean instruments and removal of used equipment;
- **disposal systems** for hazardous materials.

Units serving children should have age/size/weight-appropriate equipment and pediatric-specific, patient- and family-centered processes for pre-procedure and recovery phases of care with a goal to reduce anxiety and provide age-appropriate care.

### **Patient preparation and recovery areas**

Patients need a private place for initial preparation (undressing, safety checks, intravenous [IV] access), and a similar place in which to recover from any sedation or anesthesia. In some units these functions are separate, but can be combined to maximize flexibility. Many units have simple curtained bays, but rooms with solid side walls and a movable front curtain or door are preferable. They should be large enough to accommodate at least two people in addition to the patient on the stretcher, and all necessary monitoring equipment.

The "prep and/or recovery bays" should be adjacent to a central nursing workstation. Like the bridge of a ship, this is where the nurse captain of the day controls and steers the whole operation, and from which recovering patients can be monitored.

All units should have at least one private room for sensitive interviews/consultations before and after procedures.

Negative pressure rooms are preferred to help mitigate infection-related risks, particularly related to coronavirus disease 2019 (COVID-19), and to permit efficient air changeover between procedures. In resource-limited settings, industrial-grade high-efficiency particulate (HEPA) filters may be a reasonable alternative.

### **Equipment management and storage**

There must be designated areas for endoscope and accessory reprocessing, and storage of medications and all equipment, including an emergency resuscitation cart (or trolley). Many units also have