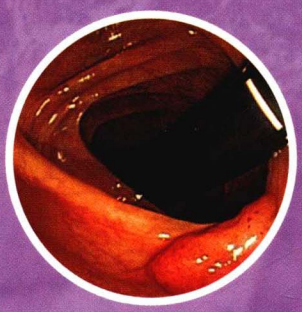
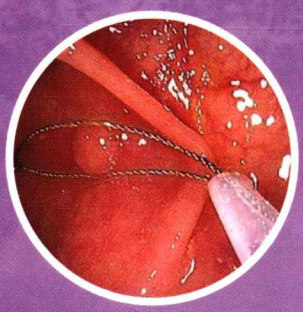
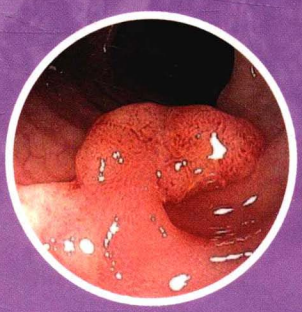
PRACTICAL COLONOSCOPY

Jerome D. Waye, James Aisenberg, Peter H. Rubin
with Shannon J. Morales

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World Endoscopy Organization

with video

Practical Colonoscopy

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List of Video Clips

All videos are accompanied by audio commentary.

Preface

Approximately 15 million colonoscopies are conducted annually in the USA. This widespread uptake, mirrored in other nations, reflects the power of colonoscopy as a diagnostic and therapeutic tool. Most notably, it is the leading means of preventing death from colorectal cancer, the second leading cause of cancer-related deaths in the USA, and is a first-line test in the management of gastrointestinal bleeding and colitis.

Colonoscopy continues to evolve, owing to enhancements in scope design, image processing, and data management that are offshoots of the modern technology revolution. Novel insights into colonic diseases from contemporary molecular and cell biology are also rapidly advancing the field.

Despite its attributes, colonoscopy remains imperfect. It is a costly, inconvenient, and unpopular procedure that carries some risk. In the USA, at least 50% of adults for whom screening colonoscopy for colon cancer is recommended never receive it, whereas others undergo colonoscopy more frequently than is recommended in expert guidelines. And "interval" colorectal cancer—i.e. cancer detected within 3 years of a "clearing" colonoscopy—is reported in some analyses to occur in as many as 1 in 150 individuals.

Recent studies have underscored the inconvenient truth that colonoscopy quality (safety and effectiveness) varies considerably among practitioners. Accordingly, leaders in the field are promoting quality enhancement measures such as mid-career provider education, implementation of validated quality benchmarks, continuous peer review, and implementation of financial incentives such as pay-for-performance.

Practical Colonoscopy is written with this context in mind. Our goal is to create a succinct, easily readable volume, enhanced by drawings, photos, and videos, which communicates the "nuts and bolts" of high-quality colonoscopy practice. Drawing from our collective experience of over 100 years in the private practice of colonoscopy and gastroenterology, we share the principles and "pearls" we have found most useful. We integrate ideas presented in the recently published, comprehensive, second edition of *Colonoscopy: Principles and Practice*. We share insights derived from our teaching and research as Professors of Medicine at The Mount Sinai Medical Center in New York. Finally, we present our expectations for forthcoming developments in colonoscopy. Of course, our ultimate hope is that readers will gain an enhanced ability to prevent and treat colonic diseases.

Practical Colonoscopy provides an overview of colonoscopy, while focusing on the practical aspects of quality, indications, and technique. Our objective during the planning and writing of this book was to bring new, practical information to trainees, mid-career colonoscopists, endoscopy assistants, nurses, pathologists, anesthesiologists, and to the motivated lay person who is curious about the science and art of our craft.

The authors wish to acknowledge the use and adaptation of images from Colonoscopy: Principles and Practice, edited by Jerome D. Waye, Douglas K. Rex, Christopher B. Williams. 2nd edition. Blackwell Publishing Ltd; 2009. We thank our medical and surgical colleagues, from whom we have learned so much, and especially the endoscopy staff at the Gastrointestinal Endoscopy Unit at The Mount Sinai Hospital in New York, the staff in our office endoscopy units, our practice partners, patients, and students. Ms. Rebecca Sweeney and Ms. Jennifer Kolb (Icahn School of Medicine at Mount Sinai, Class of 2014) provided invaluable assistance with preparation of the manuscript and videos. We are also grateful to our expert collaborators at Wiley-Blackwell, in particular Ms. Elisabeth Dodds, Mr. Oliver Walter, and Ms. Rebecca Huxley. We thank Jane Fallows and Roger Hulley who have expertly

redrawn all line drawings; and Aileen Castell for the help she provided during the production stage. Dr. Shannon Morales, then a 4th-year medical student, was a full collaborator in every aspect of the book, and maintained order in the input submitted at the weekly meetings of the three authors during the many months of drafts, discussions, and eventual agreements. We owe Shannon a special degree of gratitude.

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New York, NY
May 2013

About the companion website

Companion website

This book is accompanied by a website:

www.wiley.com/go/waye/practicalcolonoscopy

The website includes:

- 41 videos showing procedures described in the book
- All videos are referenced in the text where you see this logo

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Pre-procedure

CHAPTER 1

The Endoscopy Unit, Colonoscope, and Accessories

Introduction

Colonoscopy is performed in the hospital, the ambulatory surgical center, or the physician office. Endoscopy units range in size from 1 to 10 or more procedure rooms, and in staffing from one or two to over 50 persons. Regardless of size, staffing, and location, the endoscopy unit must promote safe, efficient, cost-effective, high-quality patient care. A pleasant, comfortable endoscopy facility promotes staff productivity and alleviates patient anxiety. The modern gastrointestinal endoscopy unit is constructed specifically for endoscopic procedures. Specific design concerns include: smooth patient flow; patient privacy; patient safety; spacious procedure rooms; adequate preparation and recovery space; and a pleasant, reassuring environment. The materials must be durable and sanitary, yet aesthetically attractive.

In broad terms, the facility is divided into the administrative area—which is used for patient intake, scheduling, billing, and record maintenance—and the clinical area—which contains the dressing rooms, the pre-procedure area, the procedure rooms, a clean equipment storage area, a cleaning and disinfection zone, and a recovery room. Amenities such as physician–patient consultation rooms, a procedure reporting area, and staff lounge and dressing rooms enhance the quality of the unit.

When building a facility, careful planning and close collaboration between the endoscopists and an architect who possesses expertise in endoscopy unit design is encouraged. The unit design should conform to the practice styles of the endoscopists and the procedure mix and demographics of the practice. Unit construction requires patience (it may take a year to design and construct a new unit), attention to detail, experience, foresight, and cost-sensitivity. As modern endoscopy units are increasingly digitized, specialized expertise in information technology, cabling, and connectivity is essential.

If the facility is built as an ambulatory surgical center or within a hospital, many of the specifics, such as the size of the rooms and

Practical Colonoscopy, First Edition. Jerome D. Waye, James Aisenberg, and Peter H. Rubin.

Optimizing the work environment

- Proper ventilation
- Appropriate temperature
- Adjustable lighting
- Free of trip hazards
- Workspace fastidiously cleaned between cases and especially at the end of the day
- Free of distractions such as sounds from other rooms
- Adequate workspace for each member of the team

corridors, will be regulated. Office-based endoscopy in many states must now meet the criteria of one of the national accrediting organizations. In general, a circular flow of patients works well: the patient moves from the waiting and intake area to the pre-procedure assessment/changing area, to the procedure room, to the recovery/dressing area, and then back to the intake area, where billing and/or new appointment scheduling is completed. The interdependent areas (e.g. procedure and recovery, procedure and scope washing) should be located close to each other. The number of procedure rooms should be projected from the procedure volume of the practice, and will drive the number of overall square feet and all other architectural decisions. The procedure rooms contain the complex, expensive equipment and are the most heavily staffed rooms in the unit. Therefore, the entire facility must be designed to keep the procedure rooms busy with active procedures, rather than also having to serve as recovery rooms.

The procedure rooms

In the USA, licensing laws generally mandate that the procedure room have a net area of at least 19 m^2. This excludes areas occupied by built-ins, such as cabinets or equipment towers, but not area occupied by movable equipment, such as an endoscopic equipment tower. The room must accommodate the equipment and the patient stretcher, and still allow free movement and clear sight lines for the physician, assistant, anesthesiologist and other participants. Because of the amount of equipment required for endoscopy, vertical arrangement of components on towers or carts or in built-in cabinets is generally desirable.

In a modern video-endoscopy room, the central architectural design point is the "physician tower," which holds the endoscopic light source and image processor. The endoscope is plugged into the processor, and the endoscopist stands immediately in front of the tower. The patient stretcher must be within easy reach of the endoscopist. The distance from the front of the tower to the edge of the patient stretcher should be between 66 and 81 cm, as determined by the length of the scope's universal cord (Fig 1.1). It

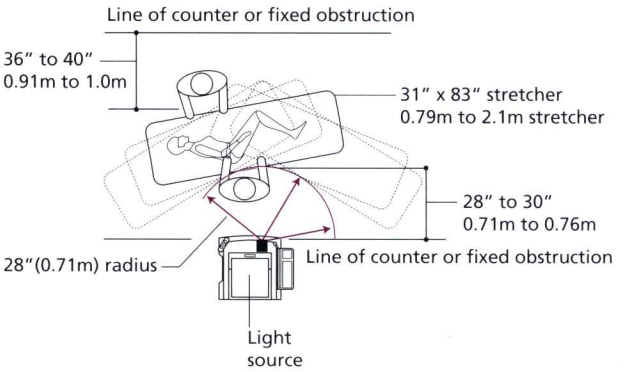

Fig 1.1 Basic clearances in the procedure room.

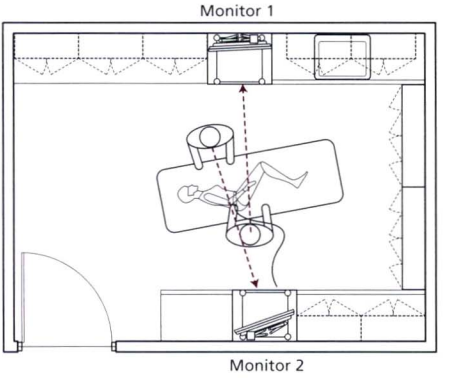

Fig 1.2 Position of monitors for the colonoscopist and assistant.

is most efficient for the assistant to stand on the opposite side of the stretcher from the endoscopist (Fig 1.2); this location promotes easy access to the patient (e.g. to give abdominal pressure and to monitor respirations), the endoscopist (e.g. to provide a snare for polypectomy), and the other equipment (e.g. the cautery device).

Once the positions of the tower and stretcher are established, then the other equipment is located. One video monitor is situated directly across from the endoscopist, establishing a comfortable, clear sight line. The monitor should be mounted at least 1.8 m above the floor. A second endoscopy video monitor is positioned behind the endoscopist for the assistant. The assistant should have clear visual access to the patient, the monitor, and the cardiopulmonary monitoring equipment.

An endoscopic reporting system is often integrated into the room design. This allows nurses and physicians to chart immediately, increasing both accuracy and efficiency. The equipment and electrical cabling must be laid out with forethought: it is unsafe and unkempt to have wires running across the floor. Often an overhead cabling conduit will keep the room tidy but a series of floating ceiling booms will also (expensively) solve the problem. The ancillary equipment should be carefully positioned and handy for the endoscopy assistant. Lighting must be purposeful: the patient's face and chest should be visible, allowing the assistant to monitor the patient's color and respiratory pattern, but the ambient lighting should be minimal, to encourage the team to focus on the endoscopic image. The room must be well ventilated with continuous air exchange and adequately soundproofed, and the temperature must be controlled by an independent thermostat.

Ancillary equipment and built-ins

- Suction machine (unless wall suction is available)
- Water irrigation pump
- Location to place the scope before and after the case
- Counter space for gloves, lubricant, and other accessories
- Cabinetry for accessories, medications, and miscellaneous small equipment such as catheters and saline
- Counter space for the assistant to process specimens and perform charting
- Ancillary monitoring devices, such as machines for obtaining vital signs (blood pressure and pulse), and perhaps capnography
- At least one sink
- Oxygen and perhaps CO_2 tanks

The non-procedure areas

The waiting and recovery areas also merit careful planning. The total number of required seats in the waiting area depends on the

projected case volume of the unit, as well as the procedure and recovery room turnover time. Each patient brings one or more companions; thus, for each patient, at least two seats are required in the waiting area. In general, at least six waiting spaces should be provided for every busy procedure room—two for the patient in recovery, two for the patient in the procedure, and two for the pre-procedure patient. The gastrointestinal endoscopy patient waiting area must be aesthetically pleasant, comfortable, and served by adequate, private bathroom facilities.

The patient changing and pre-procedure areas should be private, secure, and convenient to the procedure area. Depending on the workflow, this area may contain seating for a physician or staff member to perform the pre-procedure interview and obtain informed consent. In some units, the patient walks to the procedure room; in others, the patient lies on a stretcher in the pre-procedure room and intravenous access is obtained in this area.

The recovery bed capacity is a notorious bottleneck in endoscopy units. If colonoscopy takes 45 minutes and recovery takes 45 minutes, one recovery bed will be required per procedure room. In general, this ratio is desirable. The recovery room must permit close patient monitoring and be adequately served by restroom facilities. In some units, patients recover in individual rooms, whereas in others, patients recover in separate "bays" within a larger recovery room.

The administrative area should accommodate all reception, scheduling, filing and record-keeping, and billing/insurance functions. The reception area should promote face-to-face interactions between patients and staff, but also accommodate private conversations regarding sensitive matters. Adequate, well-marked toilet facilities must be nearby. Many waiting rooms include artwork, wi-fi access, telephones, television monitors, water coolers, reading materials, or music. Computer- and telephone-equipped staff workstations should be available. Staff foot traffic should move unimpeded. Cabinets for patient record storage should be adequate, although the transition to electronic records may diminish this requirement. Depending on the characteristics of the practice, an on-site billing area may be included.

The colonoscope

The modern video colonoscope combines state-of-the-art electronic imaging technology and sophisticated mechanical engineering. Its fragile components—glass illumination fibers, angulation cables, and suction and air/water channels—are packed within a water-tight tube that is 130–168 cm in length but only 9–13 mm in diameter. The column must be strong enough to permit the endoscopist to push it through the 1.8-m-long colon, flexible enough to bend around the sharp turns, and elastic enough to return to a straight shape when the scope is pulled back. It must transmit the hand actions of the endoscopist from the proximal shaft down to

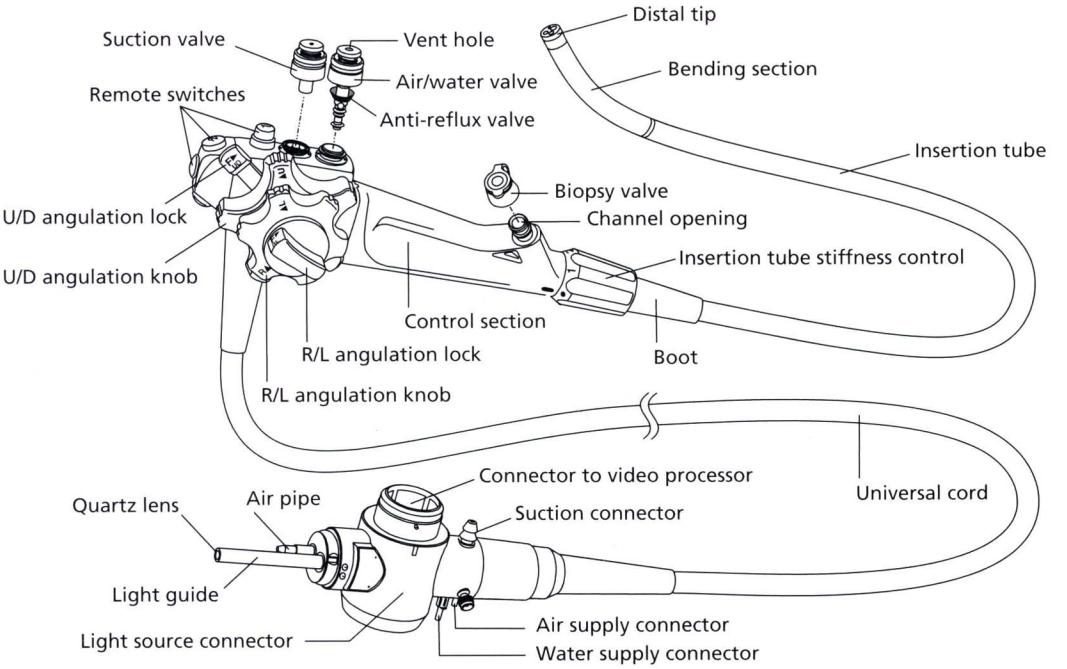

Fig 1.3 The design and parts of a typical video colonoscope.

the tip. The scope must be sturdy enough to withstand the repetitive and diverse stresses that occur during thousands of procedures and cleaning cycles, yet delicate enough to provide impeccable tip control and visualization.

The scope is divided into several sections (Fig 1.3). The long connector tube that runs from the scope head to the light source is called the "universal cord." The universal cord is plugged into the light source, which also has connections to the video processor, the suction, and the air/water supplies. The head of the instrument contains endoscopist-operated switches and valves that control many scope functions. The "insertion tube" is the long, straight tube that intubates the colon. At the distal end of the insertion tube is a 10-cm bending section, which is controlled by the angulation wires using two control wheels. The variable stiffness control, if present, is located at the junction where the control section meets the insertion tube. The distal scope tip contains the channel openings, the air–water nozzle that allows insufflation and lens cleaning, the objective lens, and the light guide lens. The charge-coupled device (CCD) is a small chip (camera) that is located just behind the objective lens and that electronically captures the images and transmits them through electrical wires to the video processor