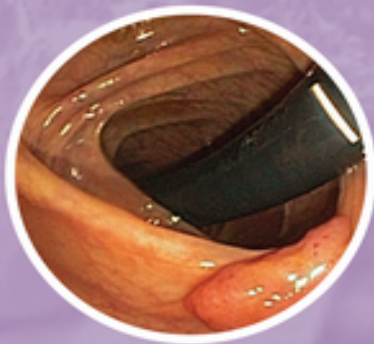


# PRACTICAL COLONOSCOPY

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



WILEY Blackwell



# Table of Contents

[Dedication](#)

[Title page](#)

[Copyright page](#)

[List of Video Clips](#)

[Preface](#)

[About the companion website](#)

## [SECTION 1: Pre-procedure](#)

[CHAPTER 1: The Endoscopy Unit,  
Colonoscope, and Accessories](#)

[Introduction](#)

[The procedure rooms](#)

[The non-procedure areas](#)

[The colonoscope](#)

[Endoscopic accessories](#)

[Summary](#)

[CHAPTER 2: The Role of the Endoscopy  
Assistant during Colonoscopy](#)

[Introduction](#)

[Certification and training](#)  
[Pre-colonoscopy tasks](#)  
[Intra-colonoscopy tasks](#)  
[Post-procedure tasks](#)

## [CHAPTER 3: Indications and Contraindications for Colonoscopy](#)

[Introduction](#)  
[Specific indications](#)  
[Pediatric colonoscopy](#)  
[Summary](#)

## [CHAPTER 4: Preparation for Colonoscopy](#)

[Introduction](#)  
[Management of standing medications](#)  
[Colon cleansing](#)  
[Informed consent](#)  
[Summary](#)

## [SECTION 2: Basic Procedure](#)

## [CHAPTER 5: Sedation for Colonoscopy](#)

[Introduction](#)  
[Levels of sedation](#)  
[Pharmacology of drugs](#)  
[Approaches to sedation for colonoscopy](#)  
[Pre-colonoscopy management](#)  
[Post-colonoscopy management](#)  
[Equipment for sedation](#)

Staffing and colonoscopic sedation  
Summary

## CHAPTER 6: Colonoscopy Technique: The Ins and Outs

Introduction

Preparation for scope insertion

Proper technique for holding the scope

Colonic intubation: segment by segment

Withdrawal phase of colonoscopy

Special techniques to increase visualization

Summary

## CHAPTER 7: Colonoscopic Findings

Colorectal cancer

Colorectal polyps

Anal carcinoma

Diverticulosis

Hemorrhoids

Ischemic colitis

Solitary rectal ulcer

Radiation colopathy and proctopathy

Diversion colitis

Inflammatory bowel disease

Endoscopy of ileal pouches

Vascular ectasias

Graft-versus-host disease

Infectious colitis

Dieulafoy lesions

Microscopic, lymphocytic, and collagenous colitis

## CHAPTER 8: Diagnostic Biopsy

Introduction

Equipment for biopsy

How to use biopsy forceps

What to do with the biopsy

When to take a biopsy

Biopsy in special settings

Summary

## SECTION 3: Operative Procedures

### CHAPTER 9: Thermal Techniques: Electrosurgery, Argon Plasma Coagulation, and Laser

Introduction

Electrosurgery

Instruments used for electrosurgery

Common uses of electrocautery

General precautions for electrosurgery

Argon plasma coagulation

Laser

Summary

### CHAPTER 10: Basic Principles and Techniques of Polypectomy

[Introduction](#)

[Polyp appearance, location, and prevalence](#)

[Polyp histopathology](#)

[Detecting polyps](#)

[General principles of polypectomy](#)

[Polypectomy: small polyps](#)

[Polypectomy: Pedunculated polyps](#)

[Summary](#)

## [CHAPTER 11: Difficult Polypectomy](#)

[Introduction](#)

[Options when encountering difficult polyps](#)

[Characteristics of the polyp](#)

[Characteristics of the procedure](#)

[Clinical status of the patient](#)

[The resources of the endoscopy facility](#)

[Expertise available locally](#)

[The characteristics of the colonoscopist](#)

[Colonoscopic resection of the difficult polyp:](#)

[Preparation](#)

[Colonoscopic resection of the difficult polyp:](#)

[Technique](#)

[Special situations and techniques](#)

[Summary](#)

## [CHAPTER 12: Management of Malignant Polyps](#)

[Introduction](#)

Can I recognize a malignant polyp by its gross appearance?

If I think it may be malignant, should I still undertake polypectomy?

Resection of a polyp that might be malignant

Marking the site

The unsuspected malignant polyp

Decision-making after resection of a malignant polyp

If biopsy of a polyp reveals malignancy, is there a role for colonoscopic resection?

Summary

## CHAPTER 13: Therapeutic Colonoscopy

Introduction

Relief of colonic obstruction

Treatment of pseudo-obstruction

Intralesional drug injection

Closure of perforation or fistula

Non-thermal treatment of bleeding sites

Removal of foreign body

Summary

## CHAPTER 14: Complications of Colonoscopy

Introduction

Cardiopulmonary complications

Perforation

Postpolypectomy coagulation syndrome

Hemorrhage

Rare complications of colonoscopy

Complications related to the bowel preparation

Immediate post-procedural abdominal pain due to intraluminal gas

Summary

## SECTION 4: Current and Future Considerations

### CHAPTER 15: Quality in Colonoscopy

Introduction

Specific quality metrics in colonoscopy

Endoscope reprocessing and infection control

The endoscopy report and flow sheet

Summary

### CHAPTER 16: Teaching and Training in Colonoscopy

Introduction and background

Costs of training: safety and economic issues

Principles for successful hands-on colonoscopy training

Continuing education

Other learning tools

Measuring competence

Summary

## CHAPTER 17: Computed Tomographic Colonography (“Virtual” Colonoscopy).

Introduction

The CTC procedure

CTC performance

Indications

Barium enema

Summary

## CHAPTER 18: Advanced Imaging Techniques

Introduction

Chromoendoscopy

Water method of colonoscopy

New technologies

Summary

## CHAPTER 19: The Future of Colonoscopy

Introduction

Toward a therapeutic procedure

Toward a better catharsis

Toward less or no anesthesia

Toward simpler tissue sampling

Toward decreasing the polyp miss rate

Toward decreasing incomplete resection

Toward “resect and discard”

Toward better identification of resectable malignant polyps

Toward tube-less colonoscopy

[Toward transmural surgery](#)  
[Toward other novel therapies](#)  
[Summary](#)

[Supplemental Images](#)

[Index](#)

The authors would like to dedicate the book to Marguerite (JDW), Suzanne (JA) and Liz, Jessica and Fern (PHR).

---

# Practical Colonoscopy

## **Jerome D. Waye, MD**

Director of Endoscopic Education  
Clinical Professor of Medicine  
Mount Sinai Medical Center  
New York, NY, USA

## **James Aisenberg, MD**

Clinical Professor of Medicine  
Mount Sinai Medical Center  
New York, NY, USA

## **Peter H. Rubin, MD**

Associate Clinical Professor of Medicine  
Mount Sinai Medical Center  
New York, NY, USA

With the assistance of Shannon Morales, MD

**WILEY** Blackwell





This edition first published 2013 © 2013 by John Wiley & Sons, Ltd.

Wiley-Blackwell is an imprint of John Wiley & Sons, formed by the merger of Wiley's global Scientific, Technical and Medical business with Blackwell Publishing.

*Registered office:* John Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

*Editorial offices:* 9600 Garsington Road, Oxford, OX4 2DQ, UK

The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

111 River Street, Hoboken, NJ 07030-5774, USA

For details of our global editorial offices, for customer services and for information about how to apply for permission to reuse the copyright material in this book please see our website at [www.wiley.com/wiley-blackwell](http://www.wiley.com/wiley-blackwell)

The right of the author to be identified as the author of this work has been asserted in accordance with the UK Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, except as permitted by the UK Copyright, Designs and Patents Act 1988, without the prior permission of the publisher.

Designations used by companies to distinguish their products are often claimed as trademarks. All brand names and product names used in this book are trade names, service marks, trademarks or registered trademarks of their respective owners. The publisher is not associated with any product or vendor mentioned in this book. This publication is designed to provide accurate and authoritative information

in regard to the subject matter covered. It is sold on the understanding that the publisher is not engaged in rendering professional services. If professional advice or other expert assistance is required, the services of a competent professional should be sought.

The contents of this work are intended to further general scientific research, understanding, and discussion only and are not intended and should not be relied upon as recommending or promoting a specific method, diagnosis, or treatment by physicians for any particular patient. The publisher and the author make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation any implied warranties of fitness for a particular purpose. In view of ongoing research, equipment modifications, changes in governmental regulations, and the constant flow of information relating to the use of medicines, equipment, and devices, the reader is urged to review and evaluate the information provided in the package insert or instructions for each medicine, equipment, or device for, among other things, any changes in the instructions or indication of usage and for added warnings and precautions. Readers should consult with a specialist where appropriate. The fact that an organization or Website is referred to in this work as a citation and/or a potential source of further information does not mean that the author or the publisher endorses the information the organization or Website may provide or recommendations it may make. Further, readers should be aware that Internet Websites listed in this work may have changed or disappeared between when this work was written and when it is read. No warranty may be created or extended by any promotional statements for this work. Neither the publisher nor the author shall be liable for any damages arising herefrom.

Library of Congress Cataloging-in-Publication Data

Waye, Jerome D., 1932-

Practical colonoscopy / Jerome D. Waye, James Aisenberg, Peter H. Rubin ; With the assistance of Shannon Morales.

p. ; cm.

Includes bibliographical references and index.

ISBN 978-0-470-67058-3 (hardback : alk. paper)

I. Aisenberg, James. II. Rubin, Peter H. III. Title.

[DNLM: 1. Colonoscopy-methods. 2. Colonic Diseases-diagnosis. 3. Colonic Diseases-surgery. WI 520]

616.3'407545-dc23

2012044841

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Cover image: Micrograph © iStockphoto/beholdingEye; all other images courtesy of the authors.

Cover design by Meaden Creative

# List of Video Clips

All videos are accompanied by audio commentary.

**Video Clip 7.1** Melanosis coli with polyp

An adenoma is hidden behind the ileocecal valve in the setting of melanosis coli.

**Video Clip 7.2** Squamous papillomas in the rectum

Multiple diminutive papules are seen near the dentate line during careful retroflex examination.

**Video Clip 7.3** Diverticular colitis

Prominent polypoid red folds seen in a patient with sigmoid colon diverticular disease.

**Video Clip 7.4** Segmental colonic ischemia

A segment of sigmoid colon is involved with moderate to severe ischemia.

**Video Clip 7.5** Solitary rectal ulcer syndrome

Endoscopic findings of solitary rectal ulcer syndrome include ulceration, erythema, edema, and exudate.

**Video Clip 7.6** Radiation proctopathy

Angioectasias in the rectum treated with argon plasma coagulation therapy.

**Video Clip 7.7** Cobble-stoning in chronic ulcerative colitis

Severe edema, erythema, and ulceration in a patient with active ulcerative colitis.

**Video Clip 7.8** Small carcinoma in chronic ulcerative colitis

Small carcinoma detected during surveillance in chronic ulcerative colitis. Extensive mucosal scarring is also seen.

**Video Clip 7.9** Large carcinoma in chronic colitis

Large carcinoma in colitis, mucosal bridging is seen and snare biopsy technique is used.

**Video Clip 7.10** Dysplasia in ulcerative colitis

The spray catheter is used for chromoendoscopy, which reveals a dysplastic plaque.

**Video Clip 7.11** Nodular carcinoma arising in ulcerative colitis

Small, nodular carcinoma detected during surveillance in patient with chronic ulcerative colitis.

**Video Clip 7.12** Chromoendoscopy in colitis surveillance

Areas of flat dysplasia are detected during chromoendoscopy in colitis surveillance.

**Video Clip 7.13** Sessile dysplasia in chronic ulcerative colitis

Large area of villiform, sessile dysplasia is seen in chronic ulcerative colitis.

**Video Clip 7.14** Giant inflammatory polyp

Giant inflammatory polyp identified in chronic colitis.

**Video Clip 7.15** Dysplastic polyp in ulcerative colitis

Identification and snare resection of flat, dysplastic polyp in chronic ulcerative colitis.

**Video Clip 7.16** Bleeding angioectasia

Detection and cauterization of ascending colon, bleeding angioectasia.

**Video Clip 7.17** Pinworms

Live pinworms seen during colonoscopy.

**Video Clip 7.18** *Ascaris*

Live *Ascaris* worm seen during colonoscopy.

**Video Clip 7.19** Flat adenoma in microscopic colitis

Large flat adenoma seen in ascending colon in a patient with microscopic colitis. The colitis has caused edema and a mosaic pattern, which is atypical for this disease.

**Video Clip 10.1** Sessile serrated adenoma/polyp

Multiple examples of identification and resection of sessile serrated adenomas/polyps are provided.

**Video Clip 10.2** Resection of sessile serrated polyp

Sessile serrated adenoma/polyp identified and resected with saline lift followed by piecemeal snare polypectomy.

**Video Clip 10.3** Giant lipoma

Giant, pedunculated lipoma with erythema related to trauma.

**Video Clip 10.4** Ileal carcinoid

Intubation of the ileum reveals a 1.5-cm submucosal carcinoid.

**Video Clip 11.1** Detachable loop and pedunculated polypectomy

The detachable loop is used to promote hemostasis before resection of this large, pedunculated polyp.

**Video Clip 11.2** Piecemeal polypectomy, argon plasma coagulation, and net retrieval of fragments

The sequence of saline injection, piecemeal polypectomy, and argon plasma coagulation and net retrieval of polyp fragments is used to eradicate this 3-cm adenoma.

**Video Clip 11.3** Piecemeal resection of sessile adenoma

Large sessile adenoma removed piecemeal following saline lift.

**Video Clip 11.4** Saline-assisted polypectomy

Multiple injection sites are used to elevate the polyp with methylene blue and saline.

**Video Clip 11.5** The non-lifting sign

This polyp does not lift with saline injection, suggesting the presence of malignancy.

**Video Clip 11.6** Giant villous adenoma

This enormous sigmoid adenoma occupied the entire lumen and is debulked. Water immersion is used to examine the defect for signs of residual polyp, which are ablated with the argon plasma coagulator.

**Video Clip 11.7** Cecal retroflexion with polypectomy

A large, right-colon polyp is hidden behind a fold and identified and removed in retroflexion.

**Video Clip 11.8** Flat right colon polyp

A flat right-colon polyp is seen and resected in retroflexion.

**Video Clip 12.1** Familial adenomatous polyposis

Innumerable adenomas seen in a patient with familial adenomatous polyposis.

**Video Clip 12.2** The Non-Lifting Sign

3 cm malignant polyp in ascending colon which exhibits the non-lifting sign upon sub-mucosal saline injection.

**Video Clip 12.3** Malignant sessile polyp

A 2-cm sessile malignant polyp removed with saline injection and snare polypectomy.

**Video Clip 13.1** Dilation of strictured anastomosis

Strictured ileocolic anastomosis dilated with a through-the-scope balloon.

**Video Clip 13.2** Foreign body in sigmoid

A chicken bone is identified embedded in the colon wall, and is removed with the snare.

**Video Clip 14.1** Giant rectal polyp with bleeding

Snare resection of giant rectal polyp complicated by post-polypectomy hemorrhage, managed colonoscopically.

**Video Clip 14.2** Immediate postpolypectomy bleeding: sessile polyp

Arterial bleeding seen following snare polypectomy. Clip placement used to achieve hemostasis.

**Video Clip 14.3** Immediate postpolypectomy bleeding: pedunculated polyp

Bleeding from pedicle of polyp is controlled with compression and with clip placement.

**Video Clip 14.4** Delayed postpolypectomy bleeding

Unprepped colonoscopy used for identification and treatment of bleeding site several days following ascending colon polypectomy.

**Video Clip 18.1** Narrow band imaging

Narrow band imaging is used extensively to enhance visualization during resection of this minimally elevated adenoma.

# 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.

*Jerome D. Waye, MD  
James Aisenberg, MD  
Peter H. Rubin, MD  
New York, NY  
May 2013*

# About the companion website

## Companion website

This book is accompanied by a website:

[www.wiley.com/go/waye/practicalcolonoscopy](http://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



# SECTION 1

## 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 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.

## 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

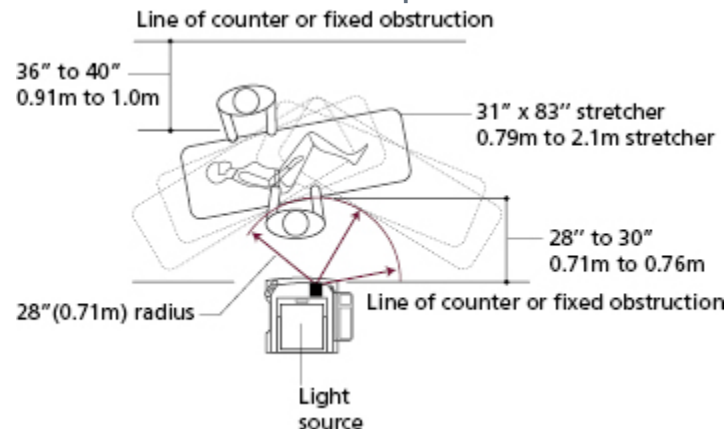
## The procedure rooms

In the USA, licensing laws generally mandate that the procedure room have a net area of at least 19 m<sup>2</sup>. 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.

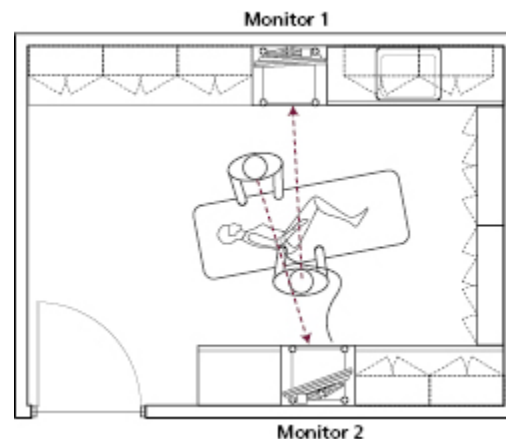
In a modern video-endoscopy room, the central architectural design point is the “physician tower,” which holds the endoscopic light source and image processor. The endoscope is plugged into the processor, and the endoscopist stands immediately in front of the tower. The patient stretcher must be within 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 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).

**Fig 1.1** Basic clearances in the procedure room.



**Fig 1.2** Position of monitors for the colonoscopist and assistant.



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.