

## Endoscopy: Planning Specialty Outpatient Surgery Departments

Endoscopy is a broad classification for visual examination and treatment of the interior of the body by inserting an endoscope through a natural body opening or a small incision. An endoscope is a medical probe of variable length, flexibility and diameter. Scopes are either rigid or flexible. Rigid scopes are generally used for extensive surgery such as arthroscopy and laparoscopy, and usually involve an incision. Flexible scopes are used to diagnose and treat conditions of the upper and lower gastrointestinal tract and respiratory systems.

The business of endoscopy is estimated to be worth about \$1.1 billion annually, with an average annual growth rate of 15%. There were approximately 7,500 sites in the U.S. in 1997, with 75% located on acute care hospital campuses and 25% in off-site settings such as clinics, physician offices and specialty surgery centers. It is estimated that, by the year 2000, there will be approximately 2,000 new sites built – 75% of which will be in the off-site market: only 25% new departments being added to existing acute care hospitals. The majority of new campus-based departments will be the result of hospital consolidation, mergers and expansions. ASC's and EASC's is a driving force in ambulatory care. Seventy percent of outpatient surgical procedures will be done in a freestanding clinic by the year 2000, due primarily to the leveling of reimbursement for acute care based vs. ASC procedures.

Flexible endoscopes tend to be used for examinations and less complicated surgeries that are minimally invasive. Today's discussion will be in the area of flexible scopes that are most often used in non-invasive surgery and diagnostics. Flexible endoscopes include the bronchoscope to view the lungs, gastroscope to view the upper gastrointestinal (GI) tract, cystoscope to view the bladder, and colonoscope to view the colon (the lower GI tract). Both upper and lower procedures are performed for diagnosis, biopsy, removal of polyps, control of bleeding, dilation of strictures, laser ablation, and removal of foreign bodies.

Upper GI endoscopy is a direct examination of the esophagus (food pipe), stomach, and a portion of the small bowel (duodenum). It is clinically referred to as esophagogastroduodenoscopy (EGD). Lower GI endoscopy is a direct examination of the large bowel (colon), using a flexible colonoscope. Colonoscopy is the examination of the entire colon, while sigmoidoscopy is an exam of only a short portion of the colon.

ERCP stands for endoscopic retrograde cholangiopancreatography, a diagnostic procedure where dye is injected into the bile and pancreatic ducts using a flexible, fiber optic endoscope. Then, x-rays are taken to outline the ducts and to diagnose and treat disorders. Since ERCP procedures involve x-ray, they must be performed in an x-ray room with lead-lined walls, such as in a radiology department. Fluoroscopy is "real time" imaging done with the assist of dye, to perform cardiac catheterizations and to do IVP (kidney stones). Bronchoscopy is done by ear, nose and throat specialists to examine the upper respiratory system.

The equipment used in these procedures starts with either a rigid or flexible endoscope, or "scope". We will focus on the flexible scope. The flexible endoscope can be directed and moved around inside the body. A thin, glass fiber optic bundle or computer chip, collects light at one tip of the scope and, regardless of how it is angled, transmits the image to the other viewing end.

The light source is a piece of equipment that attaches to the endoscope to provide the power and light for the fiber optics. It acts as a "flashlight", sending light down the glass, threadlike, fiber-optic strands to the tip of the insertion tube.

The insertion tube is the viewing component that allows sight of the scoped area. An open channel in the scope allows other instruments to be passed through it to perform biopsies, remove polyps, or inject solutions. The distal tube is the lighting component that connects to a light source and illuminates the area. Most endoscopic systems now also

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include a video system to transmit the image onto a monitor screen for easy viewing. Endoscopes and the related equipment and supplies are very expensive and fragile. They must be handled, cleaned, stored and transported with care.

Dilators are long, tube like apparatus, made of heavy rubber, with one tapered end. They vary in diameter and come in sets of approximately twenty different sizes. They are used in dilation procedures within the endoscopy department, and don't always involve the use of a scope. Patients with constricted airways or esophagus' come in intermittently for dilation. First, the patients' throat is anesthetized with topical anesthetic. Then, the smallest diameter dilator is swallowed until the throat is dilated. The patient then swallows the next largest dilator, and so on. This procedure is common among patients who have had radiation to the esophagus.

Why is endoscopy used? In the emergency department, scopes are used to view and extract foreign bodies swallowed by small children. It is used to perform emergency cauterization when internal bleed occurs in the ED or critical care unit. It is used to dilate constricted airways and to remove pre-cancerous polyps from the small intestine. Prior to endoscopy technology, these procedures were done only with invasive surgery.

Where do endoscopy procedures occur? In an increasing number and variety of settings. Routine, scheduled outpatient procedures are done in Ambulatory Surgery Centers, GI departments of large hospitals, ERCP's are done in special ERCP rooms of the endoscopy departments in large hospitals and in most every radiology department. Rigid scopes are used in laparoscopic and arthroscopic surgeries in the department of surgery. Sigmoidoscopy is performed routinely in private physician offices and clinics. Inpatient procedures are done in the hospitals GI department. Non-scheduled or emergency procedures occur in emergency departments, critical care units, surgery, and pediatric procedure rooms.

**Let's take a look at the typical patient and work flow within the endoscopy department.**

For scheduled procedures, patients pre-register by phone or register at the reception desk in the department. Pre-registration and pre-procedure preparation expedites the registration process. Ancillary physician orders (lab) are processed and the patient's chart is prepared. Nursing is notified and the patient is escorted to the GI lab.

Ancillary lab tests are ordered in the pre-op holding area. Nursing takes a patient medical history and does initial assessments. Content forms are signed, while baseline vital signs are taken. The patient is gowned, IV's and meds (if indicated) are started, while the nurse educates the patient about the upcoming procedure.

The patient is taken to the procedure room on a stretcher. Vital sign monitoring equipment and blood pressure equipment is set up, while procedural and ancillary equipment is positioned. When the physician arrives, everything should be ready to go. Oxygen and suction equipment should be available and adequate levels of supplies should be well organized and accessible prior to the start of the procedure. Topical analgesic, IV sedation, and EKG leads should be applied in advance.

Procedure rooms are set up well in advance with all the relevant equipment and supplies for the next procedure. A modified "case cart" system can be used to stock all the necessary supplies and equipment for the days' cases, decreasing room set-up and prep time. Supplies are laid out on a "back table" with one RN or technician near the supply cart or station, on the same side of the patient as the physician. This person is ready to assist with the equipment and supplies. An additional nurse or technician will chart and monitor the patient on the opposite side of the stretcher. Video monitors are generally placed on the opposite side of the patient from the physician, supplies and video equipment. Depending on the level of automatic documentation, a place for charting will be required close to the patient.

The recovery process will vary, depending on the type of procedure, level of anesthetic, in-patient or outpatient cases and level of education required. Upper GI procedures require approximately 30-35 minutes recovery; colonoscopies require 60-90 minute recovery time. In recovery, nurses continue to monitor the patients' vital signs, assess their progress and condition and disconnect the IV. Outpatients require additional recovery time called "step down" recovery sitting upright on a recliner. This ensures the patient is capable of safely walking unassisted and that their "gag" reflex has returned, if they've had an upper procedure.

For non-scheduled procedures, the condition under which set up is done is much more intense. Since time is critical and space conditions are less than optimal, careful planning and organization of supplies and equipment is critical. Immediate access to supplies and visibility of equipment is of utmost

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importance. The procedure area may be a cramped patient room or a busy emergency room. Safe and efficient transport of equipment and supplies must be available to skeleton staff levels, even during off-hours. The ability to quickly, easily and safely transport as much as \$100,000 in specialized equipment to distant areas of the hospital must be available.

After a procedure, the room is cleaned up and prepared for the next procedure. The speed with which this can be done is critical to the efficiency of the unit and productivity of the department. Transporting the patient into the recovery area, reprocessing the scope and accessories, restocking carts and supplies and removing contaminants from the room all must be done prior to the arrival of the next case. Pre-cleaning of the scope is sometimes done in the room before transporting the soiled scope into the reprocessing room. Care must be taken to contain the dirty scope between the procedure area and the cleaning room.

The scope and reprocessables will be taken to an adjacent cleaning room. The turn around time for scopes will depend, to a great extent, on the method of cleaning used. The average turn around time to complete total reprocessing includes pre-cleaning, leakage testing, mechanical cleaning and high level disinfection or sterilization. Does the hospital use manual or automated cleaning? How many scopes can be processed at one time? Is there other equipment such as ultrasonic cleaners, tabletop autoclaves, Glutaraldehyde ventilation systems available? How many scopes does the unit have? The number of scopes they will need depends on the number of procedures performed, types of procedures, turn around time and scope damage/repair history. Does the hospital utilize disposable instruments or do they reprocess them?

What do you need to know in order to plan an effective endoscopy department? You should have an understanding of the functions, procedures, staffing and patient requirements unique to this department.

**In the average GI department, there are three types of zones: family, patient care and equipment/supply storage.**

The family zone includes reception, waiting and consultation rooms. The reception/waiting area is the point of entry for all outpatients and their families. Ideally, this should be separate from the entry point for inpatients on stretchers. If preadmission information is taken prior to the day of the procedure, patients will proceed directly to the pre-op area

faster. In this case, less seating in the waiting area will be necessary. Comfortable seating for family members should be provided, since an average procedure can take 45-60 minutes and recovery times are equally as long. A visible registration station, with chart storage is also required. Family consultation rooms should be located out of the path of patients/clinical workflow. They should be large enough to accommodate both the physician and the patients family members.

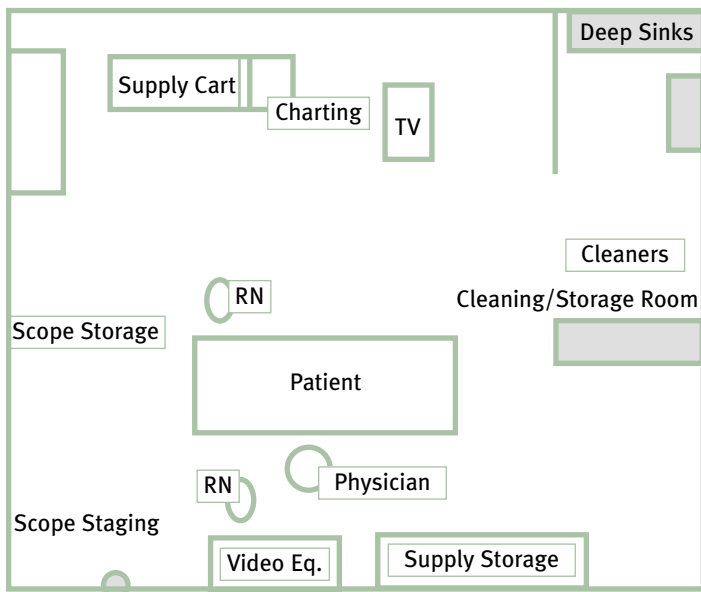
Patients proceed to a changing area. where changing rooms and locked storage units with keys are accessible. Ample lavatories should be included for patients only in all GI labs. Separate staff and visiting lavatories are also recommended.

Next, patients are taken into the pre-op/holding area. There, ancillary lab tests, EKG's are taken and read. Nursing staff takes a medical history and does initial assessments. Consent forms are signed and baseline vital signs are recorded. If indicated, the patients' IV's and medications are started. Medication areas should be provided with an area for an ice machine and nourishment. Patients are educated about the procedure and what to expect. After the procedure, the patients return to this area. Post-op recovery areas should be separate, if possible, from pre-op holding to separate recovering from incoming patients. Recovery departments with a high percentage of ambulatory outpatients should have secondary recovery areas with recliners to allow patients to sit up and regain their "gag" reflex after upper GI procedures, prior to being discharged. Mobile patient bedside units provide storage space for small supplies and, in some cases, personal belongings.

Patients arrive in the procedure room on a gurney. It is there that vital signs are again checked. Vital sign equipment, IV's and blood pressure cuffs stay on the patient throughout the procedure. The procedure room should be large enough to allow complete circulation of staff, including the physician, one or two nurses and/or an endoscopy technician. In addition, teaching hospitals require more square footage to accommodate any number of medical students and residents observing procedures. Placement of video equipment is made, generally on a mobile cart or equipment stand, between the physician and the patient. The (TV) video monitor is ideally placed across the patient from the physician for easy viewing during the procedure. This may be mounted from the wall/ceiling (permanently) or on a separate video "stand" (mobile). If the department has one monitor dedicated to each room, they may be mounted to the architecture. If, however, they need to share monitors

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between rooms and/or use them during emergency procedures outside the department, they are best placed on movable carts.



On the opposite side of the patient, there will be an additional nurse whose role is to monitor the patient and document the procedure on the chart. Patient supplies such as topical anesthetics, swabs, lubricants, suction canisters and medications are kept on the supply cart adjacent to this nurse. A flip-up worksurface on the supply cart is a convenient place for the nurse to place the patient chart; a task light over the flip up shelf aids in charting during procedures which require the dimly lit rooms (such as ERCP's).

Stationary storage in endoscopy procedure rooms includes bulk supply storage for large items such as linens, suction containers and dilators. Scopes may or may not be stored permanently in the procedure room depending upon the extent to which the rooms are designated for specific procedures. Scope staging is done outside patient sight lines, sometimes coiled on a procedure cart worksurface or suspended on a mobile stand.

Mobile equipment within the procedure room may include: mobile back or "work" tables, mobile video equipment carts, mobile monitor stands, IV stands, mobile blood pressure machines, procedure/supply carts and dilator carts. Video carts accommodate specialty endoscopy equipment such as: a light source, processor, mavigraph (printer), electrocautery equipment, VCR recorder and keyboard.

Occasionally, travel emergency carts may be stored in the procedure room or corridors stocked and ready to go in the event of an emergency. Bronchoscopy carts, travel carts, endo emergency carts, mobile video carts are all variations of carts used to respond to emergency situations throughout the hospital. In critical care, endoscopy specialists may be called upon to perform upper GI procedures to locate sources of internal bleeding in in-patients. In the ED, scopes are used to diagnosis internal bleeding, cauterize bleeding and locate and remove foreign bodies in the esophagus and stomach. In pediatrics, endoscopy frequently travels to a pediatric procedure room on the patient unit to perform procedures, rather than transporting children down to the endoscopy unit. If the hospital performs up to date video procedures as opposed to the older ocular procedures at the bedside, a video monitor will also need to be transported. Carts for this purpose must be small in their footprint, so as to fit in tight spaces in treatment bays or patient rooms. Maximum maneuverability, security and safety are important considerations in an endo emergency cart. Fluoroscopy-based procedures such as ERCP's must be performed in specially lead lined procedure rooms. In most small and medium and even some large hospitals, these procedures are done in the department of radiology. Specialized endoscopy equipment must be transported, on a scheduled basis, to and from radiology once a day. ERCP's require the transport of a larger amount and wider variety of accessories and supplies than emergency procedures. For this reason, carts are usually larger, and involve the transport of a video monitor. Carts with an "open" design allow the user to see in front of them while maneuvering the cart down the corridor and give the visual access necessary during ERCP's.

After a routine endoscopy procedure, the patient is returned to the recovery area, where they are carefully monitored by nurses working from a control station. While individual recovery rooms are nice for patients, open "bay" type recovery stations are better for nurses, who need complete visual access into this area. Clean and soiled utility/storage rooms, equipment storage rooms and supply rooms are usually nearby. Standard emergency or "crash" carts with defibrillators are always stored in this area. Outside in the corridors portable imaging equipment and travel carts may be parked for quick access. Primary recovery areas are equipped with patient support systems and gurneys; secondary recovery areas are for patients after they become conscious and ambulatory. These areas are equipped with patient recliners. An average recovery time for patients is approximately 1 - 1 1/2 hours, but may be longer depending upon the extent of the procedure and level of sedation.

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While the patient is recovering, procedure rooms are quickly being processed for quick turn around. Room turnaround time is critical to overall unit efficiency, especially in the busy morning hours. The degree to which efficiency and mobility is designed into the procedure room, will determine how quickly contaminated and soiled equipment and supplies can be vacated from the room and restocked for the next procedure. The most preferred layout by nurses is two procedure rooms sharing an adjoining cleaning/storage room. Travel distances are minimized and soiled equipment need not travel through public and patient corridors. The flow of instrumentation and number of available clean scopes also has a direct effect on turnaround time. Keeping scopes protected, functional and in service will also keep efficiencies high. When scopes are damaged, either during transport, storage or cleaning, the departments ability to stay on schedule will be impacted. Protecting scopes, which average \$20,000 each and cost \$5,000 to repair, is very important.

The scope processing or cleaning area should have at least two deep sinks with no overhead storage to obstruct hanging scopes during manual cleaning. Gross matter is wiped off scopes either in the procedure room, prior to removal, or in the cleaning room, prior to being placed in an automatic scope cleaner. One handwashing sink, in addition to the cleaning sinks, should be provided. Space for automatic scope cleaners, either tabletop or freestanding and their associated monitors, which display the “wash” cycle, should be provided. Outlets for hospital grade air and vacuum are essential for blowing air through freshly washed tube channels.

Care must be taken not to forcefully bend the insertion and distal tubes of scopes. These fragile tubes contain hundreds of fiber optic threads and microprocessors susceptible to breakage. Light source connectors located at the end of the distal tube should be hung up, to prevent its weight from wearing on the fiber optic threads.

Storage areas for large containers of chemicals and cleaners should be provided. Minimal cracks and crevices in all storage in this moist area should be inherent. Ample work surface and countertop space should be planned for the areas surrounding the sinks.

Equipment and supply storage rooms may be integrated into one room or separated. Most endoscopy departments store their own supplies within the department due to the

specialized and fragile nature of the supplies, as well as expense. Scope storage cabinets may also be in the supply storage room; they may also be in dedicated scope storage rooms, if the department has large numbers of scopes. Some special procedure scopes, may be stored in the procedure room. The degree to which these are stored in a central area or in procedure rooms will vary. Scope accessories, guide wires, protective gowns/masks, dilators and other special uniquely sized, shaped and packaged supplies needs to be planned in advance. A clean, secure and protective solution will be necessary to prevent damage and theft. Extensive linen storage is required in endoscopy; more so than in most other units.

Regardless of where they are stored, scopes should never be stored by being hung on open hooks or stored coiled up in drawers. Lack of enclosure subjects the scopes to damage if knocked off and unsanitary conditions. More and more, regulatory bodies, such as JCAHO, are monitoring the cleaning, handling and storage of endoscopes as it is learned that they may potentially harbor and transmit harmful bacteria.

Specially designed brackets, which give consideration to the fragility of the scope head, should be used. Density of storage in tight storage spaces, as well as conserving limited square footage and footprint is also important. Enclosed cabinets should always be used for sanitary, security and safety reasons. Limited cracks and crevices will prevent bacteria from growing, drip pans at the bottom should be seamless, removable and cleanable. Cabinets should be securely fastened to the wall, but easy to relocate. Provisions should be made for both upper (shorter) and lower (longer) scopes, various methods of hanging light source connectors and an ability to add on to the storage area. Doors should be easy to reach, lockable and cleanable and without hinges that can pinch the fragile insertion and distal tubes. Hinged doors also require additional square footage in order to open – for this reason tambour doors are preferred. Scope accessories and supplies are generally not stored below scopes, since liquid dripping from the channels of damp scopes could potentially contaminate the packaging.

Dilators are also fragile, but very heavy items that require careful and deliberate planning in order to safely store. Most dilators come in sets, contained in a specially designed suitcase. Many departments store them in a central storage room in the original container. Since they are flexible rubber,

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and have a natural memory, they must be stored straight, without bending. Their weight requires heavy-duty storage shelving or drawers. During procedures, it is difficult for the nurse to predict which size dilator will be required. Frequently, it is necessary to retrieve an additional dilator from storage, during a procedure, after the clinician is gowned up. In order to access an additional single dilator, the contaminated-gloved hand, must never come into contact with an adjacent dilator. If this retrieval is necessary, the nurse must remove his/her gloves, retrieve the dilator and re-glove to return to the patient. For this reason, dilators need to be separated from one another in the storage drawer or container. Some older dilators have string loops on the opposite end from the tapered end, and are designed to be hung on hooks; however, the mercury in the tips makes them extremely heavy and difficult to secure in a hanging orientation.

Accessory storage is usually in the central supply room. Whether disposable or reprocessable, most scope accessories are packaged in 12" x 12" pull packs. They need to be organized by type and size and must be easily identifiable for quick retrieval.

Our research indicated there are three major areas that present unique challenges in the endoscopy department. First, the care and "feeding" of expensive technology – specifically scopes. These highly fragile instruments require special handling and storage. They are cumbersome to transport, clean and store; yet it is critical that these expensive tools not be damaged so as to take them out of service.

Second, the supplies used in non-invasive procedures are by their nature, long in size. Since they are inserted through natural body openings instead of incisions, the length of the instrument, catheters, wires and other supplies is longer than in traditional procedures. This creates unique packaging and storage challenges. Since these supplies are specialized and are used only in certain procedures, they are expensive and difficult to store.

Third, endoscopy is a department that services both the inpatient and outpatient population, within the department and throughout the hospital, as well. Procedures are performed on a scheduled basis inside and outside the department; but also in an emergency department in the critical care units, pediatric floors and emergency departments. Expensive, specialized equipment must be positioned and ready to go on carts that maneuver easily over elevator

thresholds, around corners, up ramps and into tight patient care spaces. Carts must hold heavy weight loads, lots of supplies and be accessible from all sides. Nurses must be able to see around/through them down corridors and push them alone, if necessary. Storage drawers must be lockable, yet supplies must be easily reached during procedures. For safety sake, wires and cables associated with the video equipment must be managed and contained, while remaining visible and accessible. Nurses should have ample workspace and an adequate space for charting.

Overall, space in most endoscopy departments is extremely limited. Many are former OR's or patient care areas. Most are utilizing former closets as storage rooms, with 70% living with built-in storage left over from a prior department. The majority of hospitals adapt existing storage and cart systems to meet their immediate needs, but lack an ability to anticipate tomorrow's new technology, procedure and patient mix. A limited offering of solutions specifically for endoscopy has driven many hospitals to "fend for themselves" in solving their unique problems.

The continued growth projections for endoscopy over the next 3-5 years, both in the acute care and ambulatory sectors, along with renovation and expansion plans of existing sites means an increased demand for architects and planners who understand not only the space planning and aesthetic goals of the hospital, but also an intimate understanding of the equipment, supplies, clinical work process and staffing models deployed in delivering care. Many other non-invasive, diagnostic and therapeutic departments such as imaging/radiology, nuclear medicine and outpatient surgery centers also offer enormous growth opportunities for hospital planners who take the time to fully understand the patient experience, staff problems and technology issues facing this, the largest growth segment of the healthcare industry, non-invasive, ambulatory diagnosis and treatment centers.