Patient Care during Gastrointestinal Radiographic Procedures

By Diane Newham
2012 Estimated US Cancer Deaths

- **Men**
  - Lung & bronchus: 29%, 301,820 deaths
  - Prostate: 9%
  - Colon & rectum: 9%
  - Pancreas: 6%
  - Liver & intrahepatic bile duct: 5%
  - Leukemia: 4%
  - Esophagus: 4%
  - Urinary bladder: 3%
  - Non-Hodgkin lymphoma: 3%
  - Kidney & renal pelvis: 3%
  - All other sites: 25%

- **Women**
  - Lung & bronchus: 26%, 275,370 deaths
  - Breast: 14%
  - Colon & rectum: 9%
  - Pancreas: 7%
  - Ovary: 6%
  - Leukemia: 4%
  - Non-Hodgkin lymphoma: 3%
  - Uterine corpus: 3%
  - Liver & intrahepatic bile duct: 2%
  - Brain/other nervous system: 2%
  - All other sites: 24%
Cancer Death Rates* by Sex, US, 1975-2008

*Age-adjusted to the 2000 US standard population.
Cancer Death Rates* Among Men, US, 1930-2008

*Age-adjusted to the 2000 US standard population.
National Center for Health Statistics, Centers for Disease Control and Prevention.
Cancer Death Rates* Among Women, US, 1930-2008

*Age-adjusted to the 2000 US standard population.

*Per 100,000, age-adjusted to the 2000 US standard population.
† Persons of Hispanic origin may be of any race.
Cancer Death Rates* by Sex and Race, US, 1975-2008

*Age-adjusted to the 2000 US standard population.
Source: Surveillance, Epidemiology, and End Results Program, 1975-2008, Division of Cancer Control and Population Sciences, National Cancer Institute, 2011.
Total Number of Cancer Deaths Avoided from 1991 to 2008 in Men and 1992 to 2008 in Women

The blue line represents the actual number of cancer deaths recorded each year and the red line represents the expected number of cancer deaths if cancer death rates had remained the same since 1990/1991.
2012 Estimated US Cancer Cases*

<table>
<thead>
<tr>
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<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td></td>
<td>848,170</td>
<td>790,740</td>
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<tr>
<td>Prostate</td>
<td>29%</td>
<td>29%</td>
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<tr>
<td>Lung &amp; bronchus</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>9%</td>
<td>9%</td>
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<tr>
<td>Urinary bladder</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Kidney &amp; renal pelvis</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>All Other Sites</td>
<td>18%</td>
<td>20%</td>
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</table>

Source: American Cancer Society, 2012

*Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.
Cancer Incidence Rates* by Sex, US, 1975-2008

*Age-adjusted to the 2000 US standard population and adjusted for delays in reporting.
Cancer Incidence Rates* Among Men, US, 1975-2008

*Age-adjusted to the 2000 US standard population and adjusted for delays in reporting.
Cancer Incidence Rates* Among Women, US, 1975-2008

*Age-adjusted to the 2000 US standard population and adjusted for delays in reporting.
X-ray and Other Imaging Contrast Studies
X-ray and other imaging contrast studies visualize the entire GI tract from pharynx to rectum and are most useful for detecting mass lesions and structural abnormalities (eg, tumors, strictures).
Single-contrast studies fill the lumen with radiopaque material, outlining the structure.
Better, more detailed images are obtained from double-contrast studies, in which a small amount of high-density barium coats the mucosal surface and gas distends the organ and enhances contrast.
The gas is given in pill form for Upper GI Procedures or injected by the operator in double-contrast barium enema, whereas in other studies, intrinsic GI tract gas is adequate. In all cases, patients turn themselves to properly distribute the gas and barium.
Fluoroscopy can monitor the progress of the contrast material.

Either video or plain films can be taken for documentation, but video is particularly useful when assessing motor disorders (eg, cricopharyngeal spasm, achalasia).
Single-contrast barium enemas are used for

1. potential obstruction,
2. diverticulitis,
3. fistulas, and
4. megacolon.

Double-contrast studies are preferred for detection of tumors.
The main contraindication to x-ray contrast studies is suspected perforation, because free barium is highly irritating to the mediastinum and peritoneum; water-soluble contrast is less irritating and may be used if perforation is possible.
Younger patients may need to be turned to properly distribute the barium and intraluminal gas.

Older patients may have difficulty turning themselves and require assistance to properly distribute the barium and intraluminal gas.
Patients having upper GI x-ray contrast studies must have nothing by mouth (npo) after midnight.

Patients having barium enema follow a clear liquid diet the day before, take an oral Na phosphate laxative in the afternoon, and take a bisacodyl suppository in the evening (be sure they remove the foil). Other laxative regimens are effective.
Complications are rare. Remember:
Perforation can occur with any part of the GI system.

An ulcer through the GI tissue.

Ruptured Diverticulum Improper insertion of enema tip.

If barium enema is done in a patient with toxic megacolon.
An upper GI examination is best done as a biphasic study beginning with a double-contrast examination of the esophagus, stomach, and duodenum, followed by a single-contrast study using low-density barium. Glucagon 0.5 mg IV can facilitate the examination by causing gastric hypotonia.
Barium impaction may be prevented by postprocedure oral fluids and sometimes laxatives.
A small-bowel meal is done by using fluoroscopy and provides a more detailed evaluation of the small bowel. Shortly before the examination, the patient is given metoclopramide 20 mg po to hasten transit of the contrast material.
Enteroclysis (small-bowel enema) provides still better visualization of the small bowel but requires intubation of the duodenum with a flexible, balloon-tipped catheter. A barium suspension is injected, followed by a solution of methylcellulose, which functions as a double-contrast agent that enhances visualization of the small-bowel mucosa.
CT scanning of the abdomen:

CT scanning using oral and IV contrast allows excellent visualization of both the small bowel and colon as well as of other intra-abdominal structures.
CT enterography provides optimal visualization of the small-bowel mucosa; it is preferably done by using a multidetector CT (MDCT) scanner. Patients are given a large volume (1350 mL) of 0.1% barium sulfate before imaging. For certain indications (eg, obscure GI bleeding, small-bowel tumors, chronic ischemia), a biphasic contrast-enhanced MDCT study is done.
CT colonography (virtual colonoscopy) generates 3D and 2D images of the colon by using MDCT and a combination of oral contrast and gas distention of the colon. Viewing the high-resolution 3D images somewhat simulates the appearance of optical endoscopy, hence the name.
Optimal CT colonography technique requires careful cleansing and distention of the colon.

Residual stool causes problems similar to those encountered with barium enema because it simulates polyps or masses. Three-dimensional endoluminal images are useful to confirm the presence of a lesion and to improve diagnostic confidence.
CT enterography and CT colonoscopy have largely supplanted standard small-bowel series and barium enema examinations.

Great online tutorial-----
Colon Cancer: A preventable disease

Klaus Gottlieb, MD, FACP, FACG
Spokane, WA

http://www.szote.usher.hu/radio/a6.htm
Colon Cancer in the US

- Estimated new cases in 2001: 135,400
- Estimated cancer deaths in 2001: 56,700
- Life time risk 6% males = females
- 2nd leading cause of cancer mortality

American Cancer Society Surveillance Data
Colon Cancer: Bridging the Gap

- Primary Prevention
- Secondary Prevention

- What can we do now:
  - For average risk individuals
  - For high risk individuals

- What may be possible in the future
The Adenoma-Carcinoma Sequence

Colon Carcinogenesis

- Normal Epithelium
- Hyper-proliferation
- Early Adenoma
- Intermediate Adenoma
- Late Adenoma
- Carcinoma
High Risk Individuals

- One first degree relative triples risk
- Members of HNPCC families have a tenfold increase in lifetime risk
- Familial Polyposis patients are almost certain to get colon cancer at a young age
- Ulcerative Colitis sufferers have an increased risk depending on the duration of the disease
Hereditary Non Polyposis Colon Cancer (HNPCC)

Amsterdam Criteria

- Three or more relatives with CRC (one must be first-degree relative of other two)
- Involves at least two generations
- One or more relatives with CRC before age 50
  - Endometrial cancer?
Cancers are early onset cancer, usually under age 50.
Colorectal cancers usually demonstrate tumor microsatellite instability (MSI).
Individuals with HNPCC develop polyps, but not in large numbers.
2/3 of colorectal cancers occur proximal to the splenic flexure of the colon (right sided).
Genetic Testing for HNPCC

- **Microsatellite Instability Testing in Identifying HNPCC**
  MSI analysis identifies a genetic alteration in colorectal cancer that is characteristic (although not diagnostic) of HNPCC. In families with a moderate history of cancer, the presence of MSI indicates the likelihood of HNPCC. Genetic testing is warranted because MSI is present in 15% of sporadic cancer.

- **Full sequencing for mutation analysis**
  A commercially available test determines whether or not a person has a mutation in the MLH1 or MSH2 gene.
Colon Cancer Prevention for Average Risk Individuals
FOBT: A personal view

- Somewhat effective because it randomizes people between colonoscopy and doing nothing

- The random event is the presence or absence of irritated hemorrhoids
Fecal occult blood screening for colorectal cancer. Is mortality reduced by chance selection for screening colonoscopy?

Lang CA, Ransohoff DF.
JAMA 1994 Apr 6;271(13):1011-3

• In the Minnesota Colon Cancer Control Study, annual fecal occult blood testing reduced mortality from colorectal cancer by at least 33.4%
• The high positivity rate of FOBT (about 10%) may have occurred for reasons other than a bleeding cancer or polyp
• Some of the benefit of FOBT screening may come from "chance" selection of persons for colonoscopic examination
• Authors used a simple mathematical model to simulate the course of a cohort of screened persons, incorporating published data including those from the Minnesota study
• Results suggest that one third to one half of the mortality reduction observed from FOBT screening in the Minnesota study may be attributable to chance selection for colonoscopy
Molecular Stool Tests
Detecting colorectal cancer in stool with the use of multiple genetic targets

- Stool samples from 51 colorectal cancer patients were collected before they underwent colectomy.
- Purified stool DNA samples were tested for three different genetic markers (TP53, BAT26 and K-RAS mutations).
- The three genetic markers together detected the majority — over 70 percent (36 of 51) — of the colorectal cancers.
Colonoscopy: The Gold Standard
Cumulative Incidence of Colorectal Cancer in the National Polyp Study Cohort


ASC0 1999
Prevalence and Location of Serious Neoplasia Found at Screening Colonoscopy

Methods: 3,195 asymptomatic individuals from 13 V.A. medical centers

Exclusion criteria: History of prior colonic disease, Prior endoscopic or barium examination of the colon

Serious neoplasia: Invasive cancer, carcinomas in situ, high-grade dysplasia

Prevalence of serious neoplasia: 2.57%

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<th>Distal Colon</th>
<th>Proximal Colon</th>
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<tbody>
<tr>
<td>CIS/HG</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td>Invasive Ca</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>58 (1.9%)</td>
<td>22 (0.7%)</td>
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12/22 with serious neoplasia did not have distal lesions

New Medicare Guidelines

- Average risk individuals are entitled to a screening colonoscopy every 10 years.
- If a Medicare beneficiary receives a screening sigmoidoscopy, the beneficiary must wait 48 months before becoming eligible for a screening colonoscopy.
- Applicable since July 1, 2001.
Barium Enemas

- Medical records of 2193 consecutive colorectal cancer cases identified in 20 central Indiana hospitals were reviewed. The sensitivity of colonoscopy for colorectal cancer (95%) was greater than that for barium enema (82.9%), with an odds ratio of 3.93 for a missed cancer by barium enema compared with colonoscopy.

- Colonoscopy performed by gastroenterologists was more sensitive (97.3%) for cancer than colonoscopy by non-gastroenterologists (87%), with an odds ratio of 5.36 for a missed cancer by a non-gastroenterologist compared with a gastroenterologist.

Rex DK Gastroenterology 1997 Jan;112(1):17-23
Sigmoidoscopy: Just say No

60 CM Flexible Sigmoidoscopy for Colorectal Cancer: how far do we really get

**Findings**
- Review of 11,531 flexible sigmoidoscopies performed by gastroenterologist: 1993-1998

**Results**
- Depth of 60 cms was achieved in 34% of exams: 24% of women and 40% of men (p<9.001).
- Examination > 40 cms was obtained in 63% of women and 82% of men
- Each successive decade was associated with a shorter depth
- At all ages, women had a significantly shorter depth of insertion, p=0.001

From: Jacobs, J. et al. Gastroenterology 119, G1874, 1999
Capsule Endoscopy
Virtual Colonoscopy

- Three dimensional rendering of CT or MRI data
- Breath holding and bowel prep required
- Time consuming reconstruction creating a ‘virtual fly-through’
Chemoprevention
Celebrex Polyp Trial
Randomized Study of Celecoxib for Prevention of New Sporadic Adenomatous Colorectal Polyps in Patients Who Have Undergone Polypectomy

- A randomized, double blind, placebo controlled study. Patients are entered on one of two treatment arms:
  - Arm I: Patients receive celecoxib twice a day for 3 years
  - Arm II: Patients receive placebo twice a day for 3 years.
- Patients are evaluated for adenomatous colorectal polyps at 1 and 3 years.
- Available in Spokane
Caring for Patients Needing Alternative Medical Treatments

- Types of Alternative Medical treatments
  - NG tube
  - Nasoenteric Tube
  - Trachea Tube
Nasogastric Tube Insertion

By inserting a nasogastric tube, you are gaining access to the stomach and its contents. This enables you to drain gastric contents, decompress the stomach, obtain a specimen of the gastric contents, or introduce a passage into the GI tract.

Reference: http://www.med.uottawa.ca/procedures/index.htm
This allows you to treat gastric immobility, and bowel obstruction. It will also allow for drainage and/or lavage in drug overdosage or poisoning. In trauma settings, NG tubes can be used to aid in the prevention of vomiting and aspiration, as well as for assessment of GI bleeding. NG tubes can also be used for enteral feeding initially.
Contraindications

- Nasogastric tubes are contraindicated in the presence of severe facial trauma (cribriform plate disruption),
- due to the possibility of inserting the tube intracranially. In this instance, an orogastric tube may be inserted.
The main complications of NG tube insertion include aspiration and tissue trauma. Placement of the catheter can induce gagging or vomiting, therefore suction should always be ready to use in the case of this happening. Poor NG tube placement may end up in bronchus or lungs.
Universal precautions:

- The potential for contact with a patient's blood/body fluids while starting an NG is present and increases with the inexperience of the operator. Gloves must be worn while starting an NG; and if the risk of vomiting is high, the operator should consider face and eye protection as well as a gown. Trauma protocol calls for all team members to wear gloves, face and eye protection and gowns.
Tracheotomy

- Completed tracheotomy:
  - 1 - Vocal folds
  - 2 - Thyroid cartilage
  - 3 - Cricoid cartilage
  - 4 - Tracheal rings
  - 5 - Balloon cuff
Indications

- In the acute setting, indications for tracheotomy include such conditions as severe facial trauma, head and neck cancers, large congenital tumors of the head and neck (e.g., branchial cleft cyst), and acute angioedema and inflammation of the head and neck. In the context of failed orotracheal or nasotracheal intubation, either tracheotomy or cricothyrotomy may be performed.
Indications

- In the chronic setting, indications for tracheotomy include the need for long-term mechanical ventilation and tracheal toilet (e.g. comatose patients, or extensive surgery involving the head and neck). In extreme cases, the procedure may be indicated as a treatment for severe Obstructive Sleep Apnea seen in patients intolerant of Continuous Positive Airway Pressure (CPAP) therapy.
Drainage [drānˈij] systematic withdrawal of fluids and discharges from a wound, sore, or cavity.

- **capillary drainage** that effected by strands of hair, surgical gut, spun glass, or other material of small caliber which acts by capillary attraction.

- **closed drainage** airtight or water-tight drainage of a cavity so that air or contaminants cannot enter; for example, drainage of an empyema cavity carried out by means of an intercostal drainage tube passing into an airtight receiving vessel.
Drainage [drānˈij] systematic withdrawal of fluids and discharges from a wound, sore, or cavity.

- **open drainage** drainage of a cavity through an opening in the chest wall into which one or more drainage tubes are inserted, the opening not being sealed against the entrance of outside air.

- **percutaneous drainage** drainage of an abscess or collection of fluid by means of a catheter inserted through the skin and positioned under the guidance of computed tomography or ultrasonography.
Drainage [drān´ij] systematic withdrawal of fluids and discharges from a wound, sore, or cavity.

- **postural drainage** postural drainage therapeutic drainage in bronchiectasis and lung abscess by placing the patient head downward so that the trachea will be inclined below the affected area.

- **tidal drainage** drainage of the urinary bladder by an apparatus that alternately fills the bladder to a predetermined pressure and empties it by a combination of siphonage and gravity flow.
Drains continue to be a common facet of the postoperative management of surgical patients. While they serve an important function they also are associated with complications, including hemorrhage, tissue inflammation, retrograde bacterial migration, drain entrapment or loss, pain, and fluid, electrolyte, and protein loss. Proper postoperative care from post-anesthesia care to hospital discharge can avoid complications, promote healing, and achieve a positive outcome.

http://www.perspectivesinnursing.org/pdfs/Perspectives16.pdf
Fistula Definition
A Fistula is a permanent abnormal passageway between two organs in the body or between an organ and the exterior of the body.

- **Description**
- Fistulas can arise in any part of the body, but they are most common in the digestive tract. They can also develop between blood vessels and in the urinary, reproductive, and lymphatic systems. Fistulas can occur at any age or can be present at birth (congenital). Some are life-threatening, others cause discomfort, while still others are benign and go undetected or cause few symptoms. Diabetics, individuals with compromised immune systems (AIDS, cancer) and individuals with certain gastrointestinal diseases (Crohn's disease, inflammatory bowel disease) are at increased risk of developing fistulas.

- Fistulas are categorized by the number of openings they have and whether they connect two internal organs or open through the skin. There are four common types:
  - **Blind fistulas** are open on one end only.
  - **Complete fistulas** have one internal opening and one opening on the skin.
  - **Horseshoe fistulas** are complex fistulas with more than one opening on the exterior of the body.
  - **Incomplete fistulas** are tubes of skin that are open on the outside but closed on the inside and do not connect to any internal structure.
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Judgment Situations
Situation 1
Mr. Jones has been brought to the imaging department for a gastrointestinal (GI) study. He was diagnosed with colon cancer and now has a colostomy. The exam is for a barium study via the stoma to check for leakage around the surgical site. You notice that Mr. Jones seems uncomfortable and embarrassed with his condition. How would you approach the situation?

Place an “M” next to the most appropriate response to this situation and an “L” next to the least appropriate response.

- 1. _____ You should be vague and brief during the procedure to help him get through his unfortunate dilemma. Getting personal with the patient can possibly make him feel worse.
- 2. _____ You should be caring and sensitive. Acknowledge that the patient may be going through a grieving process. Effective patient care is crucial to make the patient feel as comfortable as possible.
- 3. _____ Before removing the drainage pouch from the stoma, you locate a deodorant spray and spray the room to keep the odor away. You look at the patient and inform him that this will help expedite the procedure and make him feel more comfortable.
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Situation 2
You are assigned to assist a technologist with a barium enema on an in-patient. You are asked to bring the patient into the room while the technologist prepares the fluoroscopy room for the procedure. Once the patient is in the room and on the table, the technologist proceeds with instructions and an explanation of what will take place. While the technologist is tipping the patient, you read the x-ray order and you see under Clinical Comments that the exam has been ordered to rule out a perforated bowel, which is a contraindication for the use of barium. How should you approach the situation?

Place an “M” next to the most appropriate response to this situation and an “L” next to the least appropriate response.

- 1. _____ After the technologist comes out of the room, bring it to her attention and ask for clarification, so that the correct contrast can be administered.
- 2. _____ There is no need to say anything; after all, the technologist has a license and is the expert. Bringing this matter to her attention can be seen as disrespectful and out of line.
- 3. _____ Rather than inquiring with the technologist, you should ask your clinical instructor and inform him or her of what is taking place, so that the correct contrast can be administered.
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Situation 1
You have just received an order for a portable chest x-ray for a nasogastric tube placement on an ICU patient. Upon arrival to the patient’s room, the nurse approaches you and informs you of the patient’s delicate condition and that minimal movement is crucial. Based on your knowledge and the clinical information indicated on the x-ray order, how would you handle this situation?

Place an “M” next to the most appropriate response to this situation and an “L” next to the least appropriate response.

- 1. ____ To avoid compromising the patient’s condition, have the nurse assist you and place the image receptor as for a chest x-ray. However, place the image receptor about 4 inches lower to clip the apices of the lungs and visualize the NG tube’s location in the stomach.
- 2. ____ Clarify the x-ray order with the nurse. See if an abdominal x-ray is preferred since the stomach and NG tube are better visualized on an abdominal x-ray in terms of anatomy positioning and technical factors.
- 3. ____ Have the nurse assist you, and perform a routine portable chest x-ray as indicated on the requisition.
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- 3. __L__ Have the nurse assist you, and perform a routine portable chest x-ray as indicated on the requisition.
Situation 2
You are in the recovery room with another technologist waiting to perform a portable hip x-ray. The patient that is on the gurney next to your patient is showing signs of difficulty breathing due to excess mucus secretion in his throat. What action should take place? Place an “M” next to the most appropriate response to this situation and an “L” next to the least appropriate response.

- 1. _____ All of the nurses are busy with other patients; therefore, you take control of the situation by turning on the suction machine and suction the patient to help with his breathing.
- 2. _____ Call a “Code Blue” to ensure that the patient receives immediate attention.
- 3. _____ Get help immediately, notify a nurse, and assist if needed. It is not within your scope of practice to suction a patient.
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Enjoy your spring break!!!
Remember to have fun.