Communication from the ASGE Technology Committee

TECHNOLOGY STATUS EVALUATION REPORT

Minimizing occupational hazards in endoscopy: personal protective equipment, radiation safety, and ergonomics

The ASGE Technology Committee provides reviews of existing, new, or emerging endoscopic technologies that have an impact on the practice of GI endoscopy. Evidence-based methodology is used, by using a MEDLINE literature search to identify pertinent clinical studies on the topic and a MAUDE (U.S. Food and Drug Administration Center for Devices and Radiological Health) database search to identify the reported complications of a given technology. Both are supplemented by accessing the "related articles" feature of PubMed and by scrutinizing pertinent references cited by the identified studies. Controlled clinical trials are emphasized, but in many cases, data from randomized, controlled trials are lacking. In such cases, large case series, preliminary clinical studies, and expert opinions are used. Technical data are gathered from traditional and Web-based publications, proprietary publications, and informal communications with pertinent vendors.

Technology Status Evaluation Reports are drafted by 1 or 2 members of the ASGE Technology Committee, reviewed and edited by the committee as a whole, and approved by the Governing Board of the ASGE. When financial guidance is indicated, the most recent coding data and list prices at the time of publication are provided. For this review, the MEDLINE database was searched through August 2009 for articles related to personal protection equipment by using the key words "personal protection equipment" (exp Protective Clothing/ or exp Protective Devices/ or exp Masks/ or exp Occupational Exposure/'') "infection control" paired with "Endoscopy." For the radiation section, the following key words were used: "radiation and endoscopy," "radiation and ERCP," and "radiation safety." For the ergonomics section, the following key words were used: "ergonomics of endoscopy," "endoscopist injury," "medical ergonomics," "endoscopy and musculoskeletal strain," "musculoskeletal injury and endoscopists," "occupational diseases and endoscopy," "cumulative trauma disorder and endoscopy," "repetitive strain injury and endoscopy."

Technology Status Evaluation Reports are scientific reviews provided solely for educational and informational purposes. Technology Status Evaluation Reports are not rules and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment or payment for such treatment.

0016-5107/$36.00
doi:10.1016/j.gie.2010.01.071

BACKGROUND

Personnel performing or present during GI endoscopy and individuals handling endoscopy equipment are exposed to many potential hazards. These include body fluid and chemical exposures, laser and radiation exposure, and musculoskeletal injuries. Protection for the endoscopic staff exposed to these hazards can best be accomplished by consistent application of safety practices. Regulatory guidelines established 2 by Occupational Safety Health Administration (OSHA) requires employers to evaluate the risk potential of each task, provide training and the necessary protective equipment and apparel, and ensure their appropriate use to protect employees from exposure to harmful substances and potentially infectious materials.[1] There are no endoscopy-specific requirements that have been published. The Centers for Disease Control and Prevention (CDC) provides guidance for the selection and use of personal protective equipment (PPE) (Table 1).[2] The Joint Commission on Accreditation of Healthcare Organizations does not have endoscopy-specific requirements but bases its standards on CDC guidance requiring a facility to have written infection prevention and control goals. The facility must implement these prevention measures and use standard precautions, including the use of personal protective equipment, to reduce the risk of infection.[3]

Infection control during GI endoscopy including the reprocessing of endoscopes and transmission of microorganisms by endoscopy has been reviewed in a separate American Society for Gastrointestinal Endoscopy practice guideline.[4] Another recent joint society guideline reviews radiation safety concerns for patients.[5]

TECHNICAL CONSIDERATIONS

PPE

PPE refers to a variety of barriers used alone or in combination to protect the skin, mucous membranes, airways, and clothing from contact with blood-borne pathogens and other potentially infectious materials (OPIMs).[2]

TABLE 1. Safety measures for endoscopists and assistants

Safety feature	Level of recommendation
PPE	OSHA required*/CDC recommended†
Gowns	
Gloves	
Eye protection/face shields	
Masks/face shields	
Radiation safety	
Lead aprons	Required‡
Thyroid shields/leaded eyeglasses	Optional‡
Ergonomics	
Adjustable monitor height	Optional
Adjustable procedure table height	Optional
Two-piece lead aprons	Optional

CDC, Centers for Disease Control and Prevention; OSHA, Occupational and Safety Health Administration; PPE, personal protective equipment.
*OSHA regulation 1910.1030(d)(3)if potential for exposure to blood-borne pathogen or OPIM from splashes, spray, spatter, or droplets.[1]
†CDC recommends features of PPE and process for use in care settings with blood borne pathogen or OPIM exposure anticipated.[2]
‡Regulated by individual state agencies.

OPIM relevant to GI procedures include saliva, gastric and pancreaticobiliary secretions, feces/colonic effluents, and ascitic fluid. PPE includes specialized gowns or aprons, gloves, masks, respirators, goggles, and face shields. It is important to note that general work clothes (uniforms, pants, shirts, surgical scrubs, lab coats) or personal clothing not intended to function as protection against a hazard are not considered PPE.

Universal precaution recommendations are now encompassed within and redefined as standard precautions that assume that every patient is potentially infected with an organism that could be transmitted in the health care setting. Consequently, infection control practices are necessary during the delivery of health care to all individuals.[2]

Gowns are recommended to protect the skin and clothing from contamination with blood and OPIMs during procedures. Recent testing standards (Association for the Advancement of Medical Instrumentation PB70) provide an objective measure of liquid barrier performance of gowns and their level of protection.[6] Adopted by the U.S. Food and Drug Administration (FDA) as a standard for product testing, this classification system determines 4 levels of fluid resistance from level 1 (least protective) to level 4 (most protective, fully impervious surgical gown). Any gown not classified at least as level 1 is deemed nonprotective. For most surgical procedures, at least an Association for the Advancement of Medical Instrumentation level 3 has been recommended by several manufacturers. As a consequence of possible heavy exposure to fluid in endoscopic procedures and a significant potential for fluid penetration of the gown, a higher level of protection (level 3 or higher) against moderate to heavy fluid contact is advisable. Both disposable and reusable gowns are available (Table 2). Disposable gowns may be made of plastic, paper, or a composite. Reusable gowns are usually made of fabric that is laundered between uses, although they are limited by a finite number of washings before the barrier is no longer effective.

Gloves should be worn during all procedures, handling patient care equipment, or touching contaminated environmental surfaces.[7] Among the factors in selecting gloves are barrier properties, patient allergies, staff allergies/sensitivities, comfort, and tactile sensitivity. Prolonged use of latex gloves may cause skin sensitivity, contact dermatitis, or de novo latex allergy.[8] Synthetic nonsterile disposable gloves are available in materials such as nitrile (Table 2). Vinyl gloves have a higher failure rate in clinical settings so they are not recommended by the CDC.[2] Because gloves may leak even without obvious damage, hand hygiene should always be performed immediately after removing PPE. The FDA provides guidance on minimum safety requirements for medical gloves.[9] This includes instructions for 510k specifications and the distinctions required for medical examination gloves, chemotherapy gloves, and surgeon's gloves. Because sterility is not required, most gloves used for PPE in endoscopy are medical examination or chemotherapy gloves.

In addition to the risk of direct splash to the eye, both conjunctivitis and systemic infection can also occur from touching the eyes with contaminated fingers or other objects.[10,11] Protective eyewear must meet certain minimum requirements under the OSHA standard. They should be designed to provide adequate protection against the particular hazards to which the employee is exposed. Eye protection must be comfortable, allow for sufficient peripheral vision, and must be adjustable to ensure a secure fit. It may be necessary to provide several different types, styles, and sizes to properly fit all endoscopy staff. Appropriately fitted, indirectly vented goggles or face shields with antifog coating provide the most reliable practical eye protection from splashes, sprays, and respiratory droplets likely to be encountered in GI endoscopy (Tables 1 and 2). An antifog feature improves the visual clarity. Personal eyeglasses and contact lenses are not considered adequate protection.

The mucous membranes of the mouth, nose, and eyes may act as portals of entry to infectious agents. The skin may also act as a portal when its integrity is compromised by trauma or disease (eg, acne, dermatitis). Masks should