INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

GUIDE TO INFECTION CONTROL IN THE HOSPITAL

CHAPTER 51:

Helicobacter pylori

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Topic Outline

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KEY ISSUES

Helicobacter pylori (*H. pylori*) is the most prevalent chronic bacterial infection in humans, colonizing the stomach of about half the world's population. Appropriate reprocessing procedures of endoscopes is mandatory to avoid nosocomial transmission. An effective vaccine against this infectious disease, followed by the optimization of the vaccine strategy would be the best public health measure to prevent the risk of *H. pylori* associated gastric cancer.

KNOWN FACTS

- *H. pylori* infection is the most common cause of chronic gastritis. It has been associated with peptic ulcer disease, dyspepsia, idiopathic thrombocytopenic purpura, iron deficiency anemia, low-grade gastric mucosa-associated lymphoid tissue (MALT) lymphoma, and gastric adenocarcinoma in all sites.
- Most persons infected with *H. pylori* are asymptomatic. However, according to Kyoto global consensus report, *H. pylori* infection is now considered an infectious disease, whether symptomatic or not.
- *H. pylori* is commonly acquired in childhood, and in under-resourced countries the prevalence of *H. pylori* infection is as high as 50% by the age of 5 years.
- *H. pylori* transmission from person to person is mostly vertical in urban areas (main risk factor is the infected mother) and horizontal in rural areas.
- The rate of acquisition is higher in developing countries. In industrialized countries, the prevalence of *H. pylori* is declining especially in children, but lower socioeconomic status and poor household hygiene practices are key factors leading to a higher prevalence of colonization.

- Recommendations for eradication differ for children and adults but treatment is strongly recommended in peptic ulcer disease and low-grade MALT lymphoma when *H. pylori* is present.
- Iatrogenic transmission of *H. pylori* by upper gastrointestinal endoscopy has been documented but is nowadays limited in developed countries due to the use of single-use biopsy forceps and traceability of reprocessing of the endoscopes.
- *H. pylori* is susceptible to most commonly used high level disinfectants and, therefore, iatrogenic inoculation of the bacterium by endoscopy is unlikely if appropriate reprocessing procedures are strictly adopted.
- New technologies for automated endoscope reprocessors have been developed.

Controversial Issues

- Humans are the natural reservoir of *H. pylori*. The pathogen is spread mainly through person-to-person transmission, either by gastro-oral, fecal-oral, or oral-oral routes. However, at least three other possible vectors have been suggested as possible routes of transmission: water, food, and animals.
- Risk factors for infection include overcrowded households, institutionalization, low education, poor sanitation, and poor water supply but both positive and negative studies have been published concerning these issues.
- Owing the benefits related to *H. pylori* eradication (reduction of transmission, avoidance of costs of management of the infection), eradication is more and more recommended, even for asymptomatic persons. Nevertheless, it is also reported that *H. pylori* colonization may confer protection against several disorders including gastro-esophageal reflux, esophageal cancer, obesity, asthma, and allergic disorders.
- In under-resourced countries, presumptive treatment seems to be followed by recurrence or re-infection in many cases.

- A meta-analysis including 15 studies demonstrated an increased risk of *H. pylori* infection among gastroenterology personnel.
- Active or passive immunization is important for future prevention efforts. A recent successful vaccine field trial has been reported in Chinese children.

SUGGESTED PRACTICE

- Endoscopes are complex medical devices which are usually heat sensitive and therefore will require chemical reprocessing.
- Training should be a priority for all the healthcare personnel in the endoscopy unit. Certification of such courses is recommended.
- Hand hygiene should be carried out prior to wearing and after removing, personal protective equipment.
- Wear personal protective equipment (gloves, gowns, mask, and protective eyewear) during potentially contaminating procedures, such as endoscopy, exposure to patient's secretions (feces, vomitus, gastric aspirates), and when handling possibly contaminated objects (syringes, biopsy forceps, pH electrodes).
- Strictly observe reprocessing procedures of endoscopes and biopsy forceps as well as endotherapy devices (if not single-use) between patients.
- Thoroughly wash instruments before disinfecting them.
- Use an appropriate disinfectant as recommended by the manufacturer so as not to damage the device.
- Leave endoscopes in the disinfectant as long as recommended by the manufacturer. The endoscope and its components should be completely immersed in the disinfectant. All channels must be perfused. The exposure time varies with guidelines but usually a 20-minute exposure time is recommended to achieve high-level disinfection.

- It is then necessary to rinse the instruments with preferably sterile water, internally and externally to remove all traces of disinfectant, as most chemical disinfectants can have serious side effects. If tap water is used, rinsing the external surface as well as all channels with 70% to 90% alcohol and thoroughly drying them with compressed air is recommended.
- If single-use biopsy forceps are not available, wash and clean them thoroughly before sterilization. Devices breaching the gastric mucosa, are regarded as critical items.
- Include quality control procedures to ensure that high level disinfection is successful.
- How medical equipment should be disinfected is detailed elsewhere in this guide, and only a few points related to upper gastrointestinal endoscopy will be described here:
    1. As the status of the patient is often not known, all patients should be considered as potentially contaminated and, hence, the material used to treat them should be subjected to the same procedure.
    2. Every endoscopic procedure should be performed with a clean, disinfected endoscope.
    3. Endoscopic units must have written guidelines for decontamination and traceability.
    4. Manual brushing of the endoscope surface, valves, all internal channels (they should be thoroughly flushed with water and detergent), and endoscopic or other accessories (biopsy forceps, pH electrodes) must be done immediately after each patient to prevent secretions from drying. This step is mandatory before the disinfection process (even if an automated washer is used). Water, mechanical action, and suitable detergents or enzymatic products are used.
    5. Appropriate disinfectant or sterilization technology (compatible with the endoscope based on manufacturer's guidelines) should be used.

- Alternatively, endoscope automatic washing machines can be used after manual brushing to wash, disinfect, and rinse the endoscopes.
- In all cases, drying the channels with compressed air will prevent bacteria from growing in a moist environment.
- The equipment should be stored with care and it is best to hang the endoscopes to drain any excess water in channels (especially in areas where forced air drying is not possible).
- Several international organizations recommend surveillance culturing as a quality assurance measure for the reprocessing process.

SUGGESTED PRACTICE IN UNDER-RESOURCED SETTINGS:

- Compliance with endoscope disinfection guidelines is the key factor determining endoscopy safety. While local circumstances, training and resources may vary, high standards of disinfection must always be maintained.
- The World Gastroenterology Organisation/World Endoscopy Organization publishes Global Guidelines on Resource Sensitive Approach to Endoscope Disinfection. These Guidelines are available in English, Mandarin, Protuguese, French, Russian, and Spanish and can be accessed at http://www.worldgastroenterology.org/guidelines/global-guidelines/endoscope-disinfection.

SUMMARY

- Overwhelming evidence confirms that *H. pylori* infection is a worldwide infectious disease that plays a major etiologic role in the development of chronic superficial gastritis and peptic ulcer disease. *H. pylori* infection is also strongly associated with MALT lymphoma and gastric adenocarcinoma (all sites of the stomach are now known to be

concerned). The bacterium colonizes 20 to 40% of the general population in developed countries while in most developing countries colonization rates can be as high as 80 to 90%, especially in poor socioeconomic and sanitary conditions. Most infected persons tend to be asymptomatic, with only a minority (3-15%) developing peptic ulceration and even fewer gastric cancers (<3%).

- How exactly *H. pylori* is transmitted and spreads in the community remains controversial. So far the human stomach is the only substantial reservoir of *H. pylori* that has been identified, and the bacterium is believed to spread through person-to-person transmission. Fecal-oral, gastro-oral, and oral-oral routes of transmission have been substantiated in different studies. On one hand, the fecal-oral route is supported by both the presence of *H. pylori* in feces, epidemiological evidence gathered in developing countries, and more recently a study highlighting the serologic evidence for fecal-oral transmission of *H. pylori* by leveraging its association with hepatitis A virus. On the other hand, the presence of the bacterium in gastric juice, dental plaque, oral mucosa, tongue, root canals, tonsil tissues, and saliva supports the assumption of oral-oral and gastro-oral transmission routes. Indeed, African mothers feeding their infants with pre-masticated food have been identified as a risk factor for *H. pylori* infection in young children and several studies showed an increasing risk of infection within gastroenterology personnel. Nevertheless, the survival of *H. pylori* in oral environment remains controversial.
- The three routes of transmission (fecal oral, gastro-oral, and oral-oral) may co-exist, and in addition, other potential reservoirs of *H. pylori* have been identified, such as nonhuman primates, cats, flies, and environmental sources such as water. Furthermore, iatrogenic inoculation of *H. pylori* strains from one patient to another through a contaminated endoscope remains another common route of transmission in developing countries.

- Fiberoptic endoscopic examination of the gastrointestinal tract is known to result in iatrogenic transmission of infectious agents, such as *Salmonella* spp, *Pseudomonas* spp, *Acinetobacter* spp, and viruses. Since the proportion of individuals positive for *H. pylori* is about half of the world's population, the potential for endoscopic contamination with *H. pylori* and further iatrogenic transmission is high. Several studies have shown that endoscopes and biopsy forceps readily become contaminated after endoscopic examination of *H. pylori*-positive patients. Iatrogenic transmission of the bacterium has been estimated to occur in 4/1000 endoscopies when the infection rate in the population is about 50% but reprocessing and traceability have improved. *H. pylori* has been found, *in vitro*, to be sensitive to high level chemical disinfectants within 15 to 30 seconds, but a strict minimum of 10 min immersion is recommended. It is important to note that cleaning with soap and water and rinsing with alcohol have proved to be insufficient to decontaminate endoscopes and biopsy forceps. Cleaning, followed by the use of 2% glutaraldehyde (or automated peracetic acid or chlorine dioxide 30 ppm) has been shown to prevent *H. pylori* transmission effectively.
- A number of guidelines for cleaning endoscopes have been published. Endoscopes are classified by Spaulding as semi-critical items, and should at least undergo high-level disinfection. Accessories such as biopsy forceps (if not single use) that breach the mucosa, are regarded as critical devices and therefore must be mechanically cleaned and sterilized after each use.
- Despite current regimens for *H. pylori* infection, there is a consensus that an effective vaccine is needed to limit the severity of this infection. Except for a recent one in China, several vaccines trials have been unsuccessful.

In conclusion, although much more understanding of the exact ways of transmission of *Helicobacter pylori* in the community is needed to develop

specific guidelines to limit the spread of the infection in the general population, it is clear already that thorough cleaning and disinfection schedules can prevent iatrogenic transmission of common bacterial (including *H. pylori*) and viral infections from one patient to the next through contaminated endoscopes. A recent successful *H. pylori* vaccine trial field should encourage future efforts for the concretization of large-scale vaccine implementation.

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