Article published online: 2023-04-17

Search better and you will find more: an important lesson in endoscope contamination

Authors
Koen van der Ploeg[1,2], Marco J. Bruno[1]

Institutions
1 Department of Gastroenterology and Hepatology, Erasmus MC University Medical Center, Rotterdam, The Netherlands
2 Department of Medical Microbiology and Infectious Diseases, Erasmus MC University Medical Center, Rotterdam, The Netherlands

Bibliography
Endosc Int Open 2023; 11: E366–E367
DOI 10.1055/a-2017-3933
ISSN 2364-3722

Georg Thieme Verlag KG, Rüdigerstraße 14, 70469 Stuttgart, Germany

Corresponding author
Marco J. Bruno, Erasmus Medical Center – Gastroenterology and Hepatology, 's Gravendijkwal 230, 3015 CE Rotterdam, Netherlands
Fax: +31-10-7030352
m.bruno@erasmusmc.nl

Endoscopy is an indispensable part of contemporary medical practice. The development of new diagnostic and therapeutic techniques has broadened its application, and the number of endoscopies continues to rise [1]. That is a trend that is very likely to continue.

Endoscopes are generally reusable devices and have to be reprocessed through high-level-disinfection. However, reprocessing of endoscopes is challenging as they have a complex design with multiple long channels with small diameters. In addition, gastrointestinal endoscopes in particular are exposed to a high load of bacteria. Studies have shown that 5 % to 30 % of ready-to-use endoscopes are still contaminated with microorganisms after reprocessing [2, 3]. The danger of these contaminated endoscopes is apparent from the published outbreaks of patient infections with mainly multi-resistant bacteria in various healthcare institutions across the United States and Europe [4]. If an infection is caused by transmission from a contaminated endoscope, it is referred to as an endoscope-associated infection (EAI). The exact risk of such an EAI is not known. For duodenoscope-associated infections, a bare minimum risk of 0.01 % has been calculated based on the three described outbreaks in the Netherlands [5]. However, EAIs are hard to recognize and are often not reported, so the actual risk is expected to be higher [4, 6, 7].

Endoscope contamination studies differ greatly in which type of endoscopes are investigated, sampling method, laboratory analyses, frequency of cultures, timing of cultures, sample size, and interpretation of results. This makes comparing studies challenging. However, the majority of studies point towards the overarching conclusion that current cleaning methods are not capable of reaching a zero contamination rate.

There are many factors that potentially play a role in endoscope contamination. However, surprisingly little is known about these risk factors. In the Netherlands, a risk analysis of nationwide studies found a contamination rate for duodenoscopes and linear echoendoscopes of 15 %, with no influence of endoscope age, endoscope type or usage. Also, no differences were found between reprocessing characteristics such as type of washer disinfectors, detergents or disinfectants [8]. Studies that did find differences in reprocessing characteristics were mainly performed in vitro and, therefore, might not reflect clinical practice [9–11].

In issue 3/2023 of Endoscopy International Open, Pineau analyzed 90,311 microbiological culture samples obtained from endoscopes from 490 different hospitals in France over a time period of 18 years [12]. The French guideline distinguishes between high-risk endoscopes that come into contact with a sterile environment such as choledoscopes, and endoscopes that come into contact with mucous membranes (gastrointestinal endoscopes and bronchoscopes) and the results of endoscope cultures are interpreted according to three categories: 1) "target level," no contamination or an acceptable level of contamination; 2) "alert level," no reason for an intervention yet, but an indication that reprocessing might not be performed properly; and 3) "action level," contamination with > 25 colony forming units (CFU) or presence of an indicator microorganisms includ-

ing *Enterobacteriaceae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa, Pseudomonas* species, *Stenotrophomonas maltophilia, Acinetobacter* species or *Candida* species [13].

The author found that the average ratio of endoscopes at "action level" in 2021 was 12.6 %, an improvement from 2004 (19.7 %). The number of cultures increased significantly from 223 samples in 2004 to 18,288 cultures in 2021. In 2018, the French guideline was updated pertaining the sampling methodology of duodenoscopes. In addition to the channels, cultures of the distal tip are also included [14]. The author already mentions that this change in the sampling protocol is a likely explanation for the observed increase of duodenoscopes at "action level" by 8.4 % from 2017 to 2018 [12].

The author is to be commended for a study with such a large sample size. The study strengthens the conclusion that contamination of endoscopes in general remains an issue and concern. It also shows some worrying trends, such as the increase of the contamination of linear echoendoscopes (+ 0.7 % per year). There are some methodological issues, however, that remain unanswered, which in all probability is partly due to the retrospective nature of the study. What was the adherence rate with regard to the frequency of culturing according to the guidelines, in particular in earlier years? It also remains unclear if and to what extent the same sampling method that was used between 2004 and 2007 differs from French guideline published in 2007 according to which all subsequent samples were collected. Although a universal sampling protocol was issued, how was the uniformity of execution verified in so many hospitals? Does the data include only regular surveillance cultures or also repetitive cultures from quarantined endoscopes? This signifies the important distinction between primary contamination and persistent contamination. In **Fig. 1**, the distribution of healthcare centers and their percentage of endoscopes at "target level" is depicted. Fifteen percent of healthcare centers have more than 90 % of their endoscopes at "target level." Consequently, 85 % do not reach such a level, which seems an important observation. What is the likely explanation for this observation by either inference or preferably data analysis and are there lessons to be learned by those who underperform? Details about which part of the endoscopes were found to be contaminated are not reported.

Despite these critical remarks, some important lessons can be drawn from this study. First and foremost, it reaffirms that endoscope contamination remains a clinically relevant issue. Although not unequivocally proven by the data in the manuscript, the update of the guideline in 2018 seems a plausible explanation for the sudden increase in the percentage of duodenoscope contamination. This suggests that indeed, implementation of a more careful and elaborate sampling protocol leads to identifying higher contamination rates. This is food for thought about how to value and interpret communications from centers that report very low contamination rates. Either those centers are centers of excellence with regard to scope cleaning and urgently need to reveal their secrets to those of us who seem ignorant, or their sampling and culture methodologies are below par and are in urgent need of revision.

In summary, this study reaffirms that endoscope contamination remains an important problem and challenge in everyday endoscopy practice. Risk factors for endoscope contamination could not be identified although the data are very suggestive of the good old adage, "If you search better, you will find more."

Competing interests

The authors declare that they have no conflict of interest.

References

[1] Peery AF, Crockett SD, Murphy CC et al. Burden and cost of gastrointestinal, liver, and pancreatic diseases in the United States: Update 2021. Gastroenterology 2022; 162: 621–644

[2] Okamoto N, Sczaniecka A, Hirano M et al. A prospective, multicenter, clinical study of duodenoscope contamination after reprocessing. Infect Control Hosp Epidemiol 2022; 43: 1901–1909

[3] Goyal H, Larsen S, Perisetti A et al. Gastrointestinal endoscope contamination rates – elevators are not only to blame: a systematic review and meta-analysis. Endosc Int Open 2022; 10: E840–E853

[4] Ofstead CL, Buro BL, Hopkins KM et al. Duodenoscope-associated infection prevention: A call for evidence-based decision making. Endosc Int Open 2020; 8: E1769–E1781

[5] Kwakman JA, Erler NS, Vos MC et al. Risk evaluation of duodenoscope-associated infections in the Netherlands calls for a heightened awareness of device-related infections: A systematic review. Endoscopy 2022; 54: 8–155

[6] Snauwaert C, Dekoninck X, Moreels T. Current ERCP practice in Belgium: the BSGIE survey. Acta Gastroenterol Belg 2021; 84: 73–77

[7] Gorse GJ, Messner RL. Infection control practices in gastrointestinal endoscopy in the United States: a national survey. Gastroenterol Nurs 1991; 14: 72–79

[8] Rauwers AW, Voor in 't holt AF, Buijs JG et al. Nationwide risk analysis of duodenoscope and linear echoendoscope contamination. Gastrointest Endosc 2020; 92: 681–691.e681

[9] Kircheis U, Martiny H. Comparison of the cleaning and disinfecting efficacy of four washer-disinfectors for flexible endoscopes. J Hosp Infect 2007; 66: 255–261

[10] Zuhlsdorf B, Floss H, Martiny H. Efficacy of 10 different cleaning processes in a washer-disinfector for flexible endoscopes. J Hosp Infect 2004; 56: 305–311

[11] Chenjiao W, Hongyan Z, Qing G et al. In-use evaluation of peracetic acid for high-level disinfection of endoscopes. Gastroenterol Nurs 2016; 39: 116–120

[12] Pineau L. Endoscope reprocessing: retrospective analysis of 90311 samples. Endosc Int Open 2023; 11: E1–E11

[13] Ministère de la santé et des solidarités. Eléments d'assurance qualité en hygiène relatifs au contrôle microbiologique des endoscopes et à la traçabilité en endoscopie. Conseil supérieur d'hygiène publique de France. https://solidarites-sante.gouv.fr/IMG/pdf/microbio_endoscopes-2.pdf

[14] Ministère des solidarités et de la santé. INSTRUCTION N° DGOS/PF2/DGS/VVS1/PP3/2018/195 du 2 août 2018 relative à l'actualisation du traitement des endoscopes souples thermosensibles à canaux de type duodénoscope au sein des structures de soins. https://www.legifrance.gouv.fr/download/pdf/circ?id=43880