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Endoscopy supply water and final rinse testing: five years of experience

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SUMMARY

Background: The penultimate stage in endoscope reprocessing is the final rinse with water following terminal disinfection. This requires a degree of microbiological and chemical control of the quality of the final rinse water.
Aim: To report experience gained over five years of testing, reporting and managing the quality of final rinse water for endoscopic devices.
Methods: Three endoscope reprocessing units, each comprising five endoscope washer-disinfectors (EWDs) supplied by two reverse osmosis (RO) water units, were subjected to weekly monitoring and control of final rinse water quality. EWDs were subjected to nightly thermal self-disinfection, and RO units were subjected to periodic sanitization with peracetic acid. Final rinse water samples were processed periodically for total viable counts (TVCs), *Pseudomonas* spp., endotoxins, conductivity, environmental mycobacteria and *Legionella* spp.
Findings: Over the five-year study period (2008–2013), no *Pseudomonas* spp., environmental mycobacteria or *Legionella* spp. were isolated from endoscopy rinse water. All conductivity readings were below 30 μs/cm. Endotoxin levels fluctuated over the recommended cut-off of 0.25 EU/mL, with no correlation with TVCs. Trend analysis of TVCs established alert and action limits. Apart from the supply water of one EWD becoming contaminated with *Aspergillus* spp., there have been no interruptions to operational capacity of the endoscope reprocessing units.
Conclusions: Quality control principles coupled with appropriate thermal and chemical disinfection of EWDs resulted in the achievement of microbiological standards for final rinse water. A co-ordinated team approach between the microbiology department,

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infection control department, endoscope unit managers and estates department is required to achieve this degree of success.

Introduction

Of all medical devices, endoscopes are most commonly associated with cross-infection events.[1] This is thought to be due to a number of factors including: inability to tolerate thermal disinfection or sterilization processes; difficulties in accessing contaminated long, narrow lumens for cleaning, inspection and disinfection; maintenance in an aseptic state following disinfection; and cross-infection from the endoscope cleaning/disinfecting devices [endoscope washer-disinfectors (EWDs)]. Other factors contributing to the challenges in endoscope reprocessing include: increased pressure from clinical services to maintain a high throughput of endoscopic procedures; high cost of individual scopes; revised national standards and regional guidelines; and absence of systematic records of adverse event reporting.

The nature of the endoscope disinfection process results in a smaller margin for error compared with steam sterilization, even when high-level disinfectants are used. It is considered vital in national standards[2] and good manufacturing practice to ensure that all critical control points of endoscope reprocessing are subject to quality control. The penultimate stage in endoscope reprocessing is the final rinse with water following terminal disinfection. In addition to removing biological and chemical residues introduced during reprocessing, it is essential that the high-level disinfected endoscope is not recontaminated by the reprocessing system. This requires a degree of microbiological and chemical control of the quality of the final rinse water. The potential for adverse patient events[3,4] linked to biofouling of final rinse water and subsequent endoscope contamination have included fungi,[5] *Legionella* spp.,[6] environmental mycobacteria,[7] *Pseudomonas* spp.[4] and *Salmonella* spp.[8] Further clinical problems have arisen from contamination of rinse water causing pseudo-outbreaks.[6,7]

There is much controversy linked to the provision of purified water for the final rinse stage of endoscope reprocessing, with views questioning the rationale of the need for purified water[9] to the use of 'bacteria-free' water.[12] This article will report the authors' experiences of maintaining endoscope rinse water quality to meet the requirements of BS EN ISO 15883 and Scottish guidance.[10]

Methods

Following a review of endoscope reprocessing in NHS Greater Glasgow and Clyde in 2007–2008 and increasing demands for greater productivity from endoscopy services, the endoscope reprocessing facilities at several hospital sites were rationalized and centralized to a smaller number of larger dedicated endoscope reprocessing units. These units were constructed and phased in operationally over a 12-month period. This article reports the authors' experiences of managing the quality of endoscope final rinse water at three endoscope reprocessing units (Table I).

Overview of endoscope reprocessing facilities

Each of the three endoscope reprocessing units had a similar set up in terms of water purification system and endoscope reprocessing machines (Table I). Critical to the establishment of each new site was the role of a multi-disciplinary procurement and planning team involved in the delivery of compliant endoscope reprocessing facilities. This was facilitated by reference to national guidance.[10,11] Each endoscope reprocessing unit undertakes reprocessing activity for a full range of clinical procedures, and endoscopes such as upper and lower gastroscopes, endoscopes used for retrograde cholangiopancreatography, bronchoscopes and ear, nose and throat endoscopes. Approximately 1100 scopes are reprocessed each week by the three endoscope reprocessing units. Briefly, each unit comprises two reverse osmosis (RO) units (Biopure; Elga LabWater, High Wycombe, UK) supplying five double-bath EWDs (WD440PT; Wassenburg Ltd, Sheffield, UK). The sanitization protocols for the RO units and EWDs are outlined in Table I. The RO units are subjected to the manufacturer's

Table I
Water purification systems, endoscope reprocessing units and disinfection processes used

Site	Water purification system (*N*)	Water sanitization protocol	EWDs (*N*)	EWD sanitization protocol	Approximate number of scopes reprocessed per week
Stobhill	Elga Biopure-300 Reverse osmosis (2)	Elgalite disinfectant (22% hydrogen peroxide/4.5% peroxyacetic acid), weekly	Wassenburg WD440PT (5)	Thermal, nightly	340 scopes per week
Victoria	Elga Biopure-300 Reverse osmosis (2)	Elgalite disinfectant (22% hydrogen peroxide/4.5% peroxyacetic acid), weekly	Wassenburg WD440PT (5)	Thermal, nightly	400 scopes per week
Glasgow Royal Infirmary	Elga Biopure-300 Reverse osmosis (2)	Elgalite disinfectant (22% hydrogen peroxide/4.5% peroxyacetic acid), weekly	Wassenburg WD440PT (5)	Thermal, nightly	350 scopes per week

EWD, endoscope washer-disinfector.