Twenty years later, James Syme (1799-1870) was of a similar opinion[6]:

> "This hospital gangrene, as it is named, no doubt depends on the unwholesome atmosphere exciting preternatural irritability, and the treatment, therefore, essentially requires removal from the sphere of this deleterious influence. Other means will hardly be required if this be afforded, while the most careful administration of dressings will be of little avail so long as the great desiratum is withheld."[6]

Thirty years later, Billroth maintained that the first part in the treatment was the strict isolation of such patients, who should have their own special nurses, dressings, and instruments. If the process occurred in military hospitals near the field, it was sometimes necessary to vacate the area entirely and shift to another place.[3 (p310)]

With the advent of aseptic techniques in the operating rooms, the proper sterilization of instruments and equipment, and clean techniques on the wards, hospital gangrene slowly became a thing of the past.

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Bronchoscopy-Related Infections and Pseudoinfections

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The CDC recently reported the results of an investigation by the New York State Department of Health of three clusters of culture-positive bronchoscopy specimens obtained in 1996 and 1998 from patients at local healthcare facilities. The results of investigations of these clusters indicated involvement of *Mycobacterium tuberculosis, Mycobacterium intracellulare,* and imipenem-resistant *Pseudomonas aeruginosa* in bronchoscopy-related infections and pseudoinfections. Between patient uses, all bronchoscopes had been cleaned, visually inspected, leak tested, and processed by an automated reprocessing system (Steris System 1 processors, Steris Corp, Mentor, OH). The investigation of cluster 1, involving five patients with *M tuberculosis*-positive bronchial specimens (four pseudoinfections and one infection), revealed an inconsistency between the disinfection and sterilization procedures recommended by the manufacturer of the automated reprocessing machine (Steris System 1) and those followed by the facility personnel. The biopsy port cap was not replaced before loading for cleaning, as recommended by the manufacturer.

In cluster 2, there were seven cases of *Mycobacterium avium-intracellulare* (MAI)–positive bronchial specimens (without clinical evidence of MAI). The bronchoscope connectors were used for processing the bronchoscope in a Steris System 1 rather than the connector kit and methods specifically developed by Steris. In cluster 3, 18 patients at a healthcare facility had bronchial specimens that grew imipenem-resistant *P aeruginosa* (IRPA), with at least three patients developing persistent infection with IRPA with an associated clinical illness post-bronchoscopy. The two types of bronchoscopes used were not connected to the Steris System 1, in accordance with the Steris manufacturer's recommendations.

Most reported bronchoscopy-related outbreaks or pseudo-outbreaks have been associated with inadequate cleaning and disinfection procedures. The findings in this report identified additional problems related to using automated reprocessing machines. Conflicting recommendations for disinfection and sterilization exist between bronchoscope and reprocessor system manufacturers. Some individual bronchoscope models are not compatible with certain automated reprocessing systems. However, users may not be aware of these incompatibilities unless they make a device-specific inquiry to the manufacturers. Also, personnel using automated reprocessing machines in these clusters did not receive adequate device-specific training, and the wrong set up or connector systems were used.

These findings highlight the need for additional steps to reduce bronchoscopy-related infections or pseudoinfections, and include review of model-specific reprocessing protocols from both bronchoscope and automated reprocessing system manufacturers, collaboration of bronchoscope and reprocessor system manufacturers in development of validated device and model-specific protocols for high-level disinfection and sterilization, and additional on-site training to clarify device- and model-specific differences in procedures. In addition, there should be instruction manuals provided by both bronchoscopy equipment and automated reprocessing system manufacturers to address procedural differences among varying models of bronchoscopes and to highlight the proper connector system(s) to be used with their machine. Finally, quality-control procedures should be developed in each healthcare facility to include visual inspection of the bronchoscope, regular testing for bronchoscope integrity, maintenance, and surveillance for unusual clusters of organisms.

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