



## Letter to the Editor

## Bacterial contamination of medical file folders in operating rooms

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## To the Editor

Medical file folders present in operating rooms are prone to contamination and could be vectors of nosocomial pathogens as they are in close contact with healthcare workers, patients and contaminated surfaces [1]. Bacteria and pathogens responsible for nosocomial infection such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Enterococcus hirae* can be transferred from paper back to hands and can be cultivated even 7 days after an initial transmission from hands to paper [2].

Several studies have reported contamination of inanimate surfaces such as cell phones, folders and charts by pathogens responsible for nosocomial infections but there is no study specifically investigating the contamination of file folders in operating rooms [1–3]. As surgical site infections are an important burden in healthcare systems and are responsible for 33% of the expenses related to overall nosocomial infections, we decided to investigate the contamination of medical file folders in operating rooms [4]. Our hypothesis was that these folders could potentially be contaminated by pathogens responsible for surgical site infections.

This study was performed in the operating rooms of a tertiary referral hospital. Fifty-eight consecutive patients admitted between December 2016 and March 2017 were included and

anonymized. One hundred and seventy-four file folders were analysed and included the main medical folder, the surgical folder and the anaesthesia folder. Every folder was sampled immediately after entering the operating room. Sampling was made with a Count-Tact Agar® plate (20 × 65 mm; Biomérieux, Craaponne, France) using a Count-Tact® standardized applicator and every sampling site was labelled for anonymization. Plates were inspected for detection and enumeration of bacteria, yeast and moulds using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF) (Microflex, Bruker, Billerica, MA, USA). This technique is currently becoming the gold standard for identification of clinical microorganisms as it is faster, more sensible and accurate than immunological and biochemical techniques previously used in similar studies [5]. Results were expressed as number of colonies forming units (CFU) per 25 cm<sup>2</sup>. Microorganisms were classified as pathogenic and non-pathogenic based on the *American Guide to the Elimination of Surgical Site Infections by the Association for Professionals in Infection Control and Epidemiology* and the *Practical Guide of Hospital-acquired Infections* by the World Health Organization [6,7].

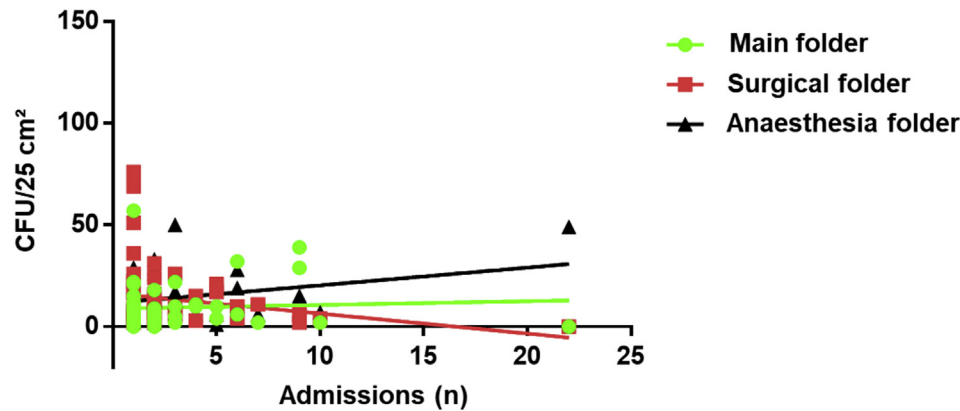
Other recorded parameters included the number of admissions and hospitalization length in the surgical unit and in the intensive care unit (ICU) and the CFU/25 cm<sup>2</sup> per patient and per folder. Correlation between CFU/25 cm<sup>2</sup> and the overall number of admissions, and hospitalization length in each unit were analysed.

We found that all patients had at least one contaminated folder. All 58 anaesthesia folders were contaminated with non-pathogenic microorganisms and 98% with pathogenic microorganisms including one contamination with *Staphylococcus aureus*. Eighty-three and 93% of main folders were contaminated with pathogenic and non-pathogenic microorganisms respectively. Eighty-one per cent of surgical folders were contaminated with pathogenic and 98% with non-pathogenic microorganisms. Four main folders (6.9%) and one surgical folder did not show any contamination.

Mean CFU/25 cm<sup>2</sup> per patient was 37 ± 2.9. Linear regression showed a positive and low correlation ( $\beta = 0.87$ ,  $R^2 = 7.4\%$ ) between number of admissions and contamination on anaesthesia folders. This correlation was tested significant ( $p = 0.04$ ) (Fig. 1). Anaesthesia folders had the highest CFU/25 cm<sup>2</sup> compared to surgical and main folders (14 ± 1.4 CFU/25 cm<sup>2</sup>, 14 ± 1.9 CFU/25 cm<sup>2</sup> and 9 ± 1.3 CFU/

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**Fig. 1.** Linear regression of the number of admissions and CFU/25 cm<sup>2</sup> per sampling site. There was a significant positive correlation between the CFU/25 cm<sup>2</sup> in the anaesthesia folders and the number of hospitalizations ( $\beta = 0.87$ ,  $R^2 = 7.4\%$ ,  $p < 0.05$ ). Other results were not statistically significant ( $p > 0.05$ ).

25 cm<sup>2</sup>, respectively) but this difference was not statistically significant ( $p = 0.75$ ).

Our results are consistent with previous studies that have found contamination rates between 83% and 100% of folders or charts in ICU and in other wards [1,3].

One anaesthesia folder was contaminated by *Staphylococcus aureus* and there was a significant correlation between number of admissions and CFU/25 cm<sup>2</sup> in anaesthesia folders. Loftus *et al.* argue that anaesthesia providers are often exposed to non-sterile and highly contaminated areas that explain the high contamination rates and pathogenic flora of their environment. In parallel, recent studies have shown that anaesthesiologists perform hand washing less than once per hour and are therefore highly prompt to contamination by *Staphylococcus aureus* [8]. Others studies have found higher contamination rates by *Staphylococcus aureus* on 4–13% of medical charts [3]. However, these studies analysed medical charts in ICUs, which are units recognized for their high pathogenic flora and contaminated surfaces compared with operating theatres.

In agreement with the WHO guidelines we recommend immediate hand disinfection before and after being in contact with surfaces. To date, this is the main method to reduce the risk of cross-contamination between files and hands, and therefore reduce healthcare-associated infections.

In conclusion, our study found high contamination rates by pathogenic and non-pathogenic microorganisms on medical file folders. We believe however that other sources of pathogenic contamination in operating rooms responsible of nosocomial infections must be considered. This study should induce awareness among healthcare givers regarding these sources of contamination and should be used to establish and reinforce international recommendations regarding hand cleaning, environmental

disinfection and reduction of the unanimated material present in operating rooms to prevent nosocomial infections.

#### Transparency declaration

On behalf of all authors, the corresponding author states that there is no conflict of interest. This study did not receive any funding.

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