Hydrophobic textiles in hospital design – a study on the cleaning and disinfection possibilities of coated textiles in hospital interior design

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**Abstract**

Based on the overall design concept *healing architecture*, hospitals are constructed throughout Europe, and research studies show that design affects the patients’ levels of stress and thereby their process of healing. However, despite this focus on the patients’ design experience, the use of traditional textiles in hospital interiors is decreasing due to rational concerns of more efficient cleaning processes. Textiles are therefore replaced by polyurethane upholstery, which allows for easy cleaning and disinfection, but these plastic materials lack aesthetic design qualities, relating to the visions of healing architecture. At the same time, the Nordic countries caution against the use of antibacterial textiles due to the risks of increased bacteria resistance. From these perspectives, there is a strong need to design new textile solutions to the hospital interior. The development of new hydrophobic textiles for the hospital interior is thus seen as a significant future market opportunity, which may balance the rational concerns for efficient cleaning with the design qualities relating to healing architecture.

To address focus on the potentials of using hydrophobic textiles in hospital interiors, the purpose of this study is three-fold. To use textiles in hospitals, the materials need to be 1) easy to clean, 2) possible to disinfect, and 3) durable for the use in a public environment. Through three experimental studies, the study thus explores these different aspects by testing 3 different types of hydrophobic coatings (Trevira CS textile (Gabriel A/S, Step) coated with: NanoPool GmbH - SiO2 coating; Repellan by Pulcra Chemicals – Paraffin; zeroF by CHT/Bezema - Paraffin).

To test the cleaning possibilities, the hydrophobic textiles are stained with protein-based soil (swine blood); water-based soil (coffee); and fatty soil (swine fat mixed with carbon as colour indication). 1 ml of the different soils was placed on the surface, before the textiles was cleaned using the standard hospital cleaning method (wiping the surface with a damp cloth containing a pH neutral cleaning agent).

The SonoSteam technology (combination of steam and ultrasound, FORCE Technology) was then used to test the ability to disinfect the textiles. 1 ml of TVC bacteria was inoculated on the textiles before disinfection, and evaluation of the bacteria level through microbiological analysis. Finally, the durability of the coatings was evaluated by combing the water/alcohol solution resistance test (ISO 23232) with the Martindale method (ISO 12947-2).
The three different studies show that the water-based and protein-based soils can be removed from all the hydrophobic coatings with a standard cleaning method, and that the textiles can be disinfected by the SonoSteam method (>99.66 % bacteria reduction). The durability of the coatings is between 40,000 – 60,000 Martindale, which is above the minimum requirement for use in the hospital interior. In summary the study indicates that textiles with hydrophobic coatings can be used in hospital interiors, and based on the results new studies are suggested to further progress the development of new market opportunities for hydrophobic textiles.

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