

## A mobile device to reduce airborne particulate and prevent surgical site infections

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**Background:** Surgical Site Infections (SSI) are the second main cause of Hospital Acquired Infections (HAI) in Europe and in the United States (US). In US and Europe hospitals the overall annual medical costs of HAI is about \$40 billion and the SSI represent a relevant part of this spending. It is known that air particulate is a carrier of pathogen bacteria. The aim of this study is to verify if a mobile unit for air particle filtering can improve the environmental airborne conditions of an operating room (OR).

**Methods:** We carried out a cross sectional study in March 2018 in an Italian University Hospital. A novel mobile device (Illuvia, Aerobiotix USA) to purify air was tested during surgical procedures. It is provided with: an air decontamination-recirculation system unit; a patented crystalline ultraviolet C reactor; a highly efficient particulate air filtering. The environmental contamination has been monitored in the following phases: I) device off and OR at rest; II) device off and OR in operational; III) device on and OR in operational; IV) device off and OR in operational. We used a particle counter to measure airborne particles of different sizes: 0.3; 0.5; 1.0; 3.0; 5.0; 10  $\mu\text{m}$ . Air samples were withdrawn in four spots of the OR periphery. Wilcoxon rank test was used for the statistical analysis setting the significance level to 95% ( $p < 0.05$ ).

**Results:** From phase II (device off) to phase III (device on), there was a reduction of any particulate matter size, ranging from 50% to 73% ( $p < 0.05$ ). When the device has been turned off again (phase IV), particle dimensions of 0.3, 0.5, 1.0 and 3.0  $\mu\text{m}$  were lower in the percentage range of 51-62% ( $p < 0,05$ ). Particle dimensions of 5 and 10  $\mu\text{m}$  were also lower in the range of 56% and 76%, respectively.

**Conclusions:** During mobile device operation, the amount of particulate matter remains significantly lower, reducing the probability of SSI.