Abstract Title: **Predicting the Efficacy of an Antimicrobial Surface Coating Utilizing X-Ray Fluorescence Spectroscopy (XRF)**

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Subject Category/Case Type
N5. The environment (e. g., source control and device processing)

Background
Contaminated surfaces are a critical risk factor for transmitting infectious disease. Current disinfection products provide short-term antimicrobial action; however, these surfaces can be re-contaminated within hours after cleaning. To address this limitation, long-lasting antimicrobial polymer coatings have been developed as an adjunct to traditional disinfecting and cleaning protocols. Due to the micro scale thickness and transparency of the coating, confirmation of its presence on surfaces is difficult with conventional methods; therefore, this study explores a novel approach to measuring durable polymer coatings on stainless steel coupons to validate their presence and relative antimicrobial activity.

Methods
In this study, we utilized a hand-held X-Ray Fluorescence Spectroscopy (XRF) analyzer to quantitatively evaluate the amount of antimicrobial polymer coating deposited on stainless steel test surfaces. Stainless steel surfaces with amounts of coating ranging from 0. 12 to 3. 60 mg/in2 were analyzed for their XRF profile using a hand-held spectrometer. Additionally, the relationship between the XRF spectra and antimicrobial activity was evaluated using a modified version of an existing sanitization protocol for hard surfaces using Staphylococcus epidermidis as the test organism.

Results
Comparison of the amount of antimicrobial polymer coating (in mg) and the XRF values (photon count) revealed a calibration curve with a high degree of linearity (R2 = 0. 993) especially for surfaces that had lower mass (Figure 1). In addition, the relationship between XRF values and antimicrobial efficacy also were found to be well-correlated with a logarithmic trend (RÇ = 0. 9308) (Figure 2).

Conclusion
The observed trends between coating mass, XRF value and antimicrobial efficacy suggests that these analytical techniques are viable options for determining the presence of invisible antimicrobial polymer coatings. Additionally, laboratory-based calibration curves based on XRF values can be used to predict the level of antimicrobial activity of surfaces that have been treated with polymer coatings. These findings suggest that the use of a hand-held XRF spectrometer can be a rapid and cost-effective method for assessing the presence and efficacy of polymer coatings.