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Letter to the Editor

COVID-19 pandemic — let's not forget surfaces

Sir,

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), responsible for the current pandemic, is spread by droplet transmission and is not thought to be airborne. In indoor environments, there is growing concern over how the virus can circulate within a space. Due to droplet transmission, a 2-m distance has been implemented in the UK. While droplet transmission in air must be considered, and is a critical component to the safety of healthcare workers interacting with patients, it is also important to consider the role of surfaces.

The current guidance states that surface cleaning should be undertaken a minimum of 20 min following an aerosol-generating procedure (AGP) on a SARS-CoV-2-positive patient [1]; however, there is little guidance on general surface cleaning in other contexts. SARS-CoV-2 remains viable for up to 72 h on plastic and steel surfaces, and for up to 8 h on copper and cardboard surfaces [2]. Without effective surface cleaning, this can represent an important risk for surface-mediated transmission. Now more than ever, Moment 5 of the 'Five Moments for Hand Hygiene' (i.e. hand hygiene after contact with surrounding surfaces) must be followed [3]. This is vital in clinical areas, and also in non-clinical environments due to asymptomatic carriage in adults.

A DNA oligonucleotide surrogate for contaminated bodily fluid based on the cauliflower mosaic virus (AB863139.1) was used to determine how SARS-CoV-2 would spread within a clinical surface environment. One hundred microlitres containing 1.15E+09 copies of oligonucleotide were inoculated on to a bed rail within an isolation room on a paediatric ward on a Monday morning. Samples were taken from ward surfaces that evening and the following four evenings using cotton swabs to assess dispersal. Swabs were transferred into molecular grade water and processed by quantitative polymerase chain reaction (efficiency= 103%, R^2= 0.99). In total, 44 samples were taken each day: 20 from the immediate bedspace environment, eight from the wider bedspace environment (e.g. cubicle door handles), seven from clinical areas (e.g. height and weight room) and nine from general ward areas (e.g. reception). This surrogate was readily removed with handwashing adhering to the 'Five Moments'. A single wipe (Clinell Universal or PDI alcohol wipe) was demonstrated to remove 98.88–99.84% of surrogate dried on to a surface. Samples were not taken from the original inoculation site to prevent removal of the inoculation material.

The results showed that within 10 h, the surrogate had moved from the isolation room and transferred to 41% of all surfaces sampled within the ward, with a peak at 52% on Day 3 (Figure 1). The surrogate DNA persisted throughout the sampling period.

When considering postive sites in relation to distance from the initial inoculation site and area sampled, it is clear that both of these factors play a role. Most positive sites were recovered from surfaces near the isolation room. The immediate bedspace environment and clinical areas had, overall, the most positive sites, reaching peaks of 60% and 86% positive sites, respectively. Most positive sites came from bed rails, classified as an immediate bedspace site, within a nearby four-bed bay, highlighting risk to other patients.

The results from this study show the importance of surface-mediated transmission, particularly in light of the current outbreak. The surrogate DNA persisted on surfaces, with 41% positive sites on Day 5, implying a combination of poor cleaning, movement of patients, carers not adhering to the 'Five Moments', and potential re-inoculation of the surrogate DNA following patient movement between the isolation room and clinical areas. Locating the surrogate DNA outside the isolation room highlights how easily surfaces play a role in transmitting infectious agents, even from rooms designed to help containment.

The surrogate DNA was inoculated once to a single site, while patients infected with SARS-CoV-2 will introduce continual shedding of the virus through touching surfaces and coughing. Healthcare workers cannot prevent the spread of the virus during AGPs and contact with infected patients unless strict hand hygene, careful donning and doffing of personal protective equipment, and consistent cleaning is undertaken [4].

Sputum viral load has been widely investigated and can be as high as 10^8 viral copies in 1 mL of sputum [5]. However, no data are available for the potential viral load on hands after patient contact or touching surfaces [6]. While this study makes no comparisons between positive site and copy numbers required for infectious dose, the speedy and consistent spread of the surrogate DNA has important implications for infection control. As a high-risk area, the isolation room where the bed rail was inoculated had a different cleaning regimen to the rest of the ward; however, its wide dissemination indicates cleaning failure. As the surrogate is removed readily with good hand hygiene, this also indicated hand hygiene failure.

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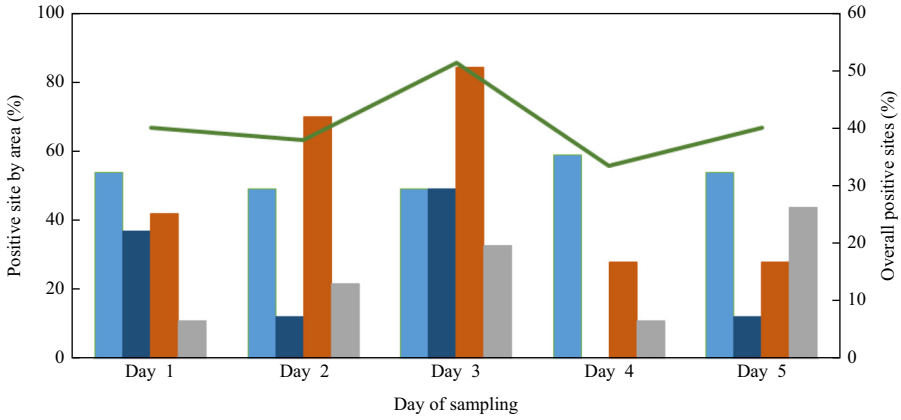

Figure 1. Percentage of positive sites overall and in different areas following daily ward sampling of 44 sites. Light blue bars, immediate bedspace; dark blue bars, wider bedspace; orange bars, clinical areas; grey bars, general ward; green line, overall percentage positive.

It is important to consider all methods of transmission, including the risk from surfaces. To reduce the risk, the first line of defence for preventing the spread of SARS-CoV-2, and other potential pathogens, is effective cleaning. SARS-CoV-2 is an enveloped virus; as such, it is very susceptible to most cleaning agents, which destroys the envelope and deactivates the virus [7]. This study highlights the role of surfaces as a reservoir of pathogens and the need to address requirements for surface cleaning.

Conflict of interest statement
None declared.

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