

## Detection of SARS-CoV-2 on hospital surfaces

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**Abstract.** The COVID-19 pandemic, affecting 213 countries, with more than 10 million cases and over 500,000 deaths is still causing serious health, social and economic emergency worldwide. Italian Northern regions are among the most badly affected areas. Surfaces represent matrices to which particular attention should be paid for prevention and control of SARS-CoV-2 transmission. A few studies have highlighted virus presence on surfaces. We report the evidence of its presence on hospital surfaces, in a single room hosting a patient whose nose-pharyngeal swab resulted positive for SARS-CoV-2 RNA at the admission. The surfaces sampling was carried out using pre-wetted swabs followed by extraction and amplification of viral RNA by reverse Real-Time Polymerase Chain Reaction (rRT-PCR). A total of 4/15 (26.66%) surfaces were positive for SARS-CoV-2 RNA: the right bed rail, the call button, the bed trapeze bar, the stethoscope; moreover, the patient's inner surgical mask was positive, showing the emission of the virus from the patient. This study is a further confirmation that the surfaces represent a potential vehicle of transmission. This supports the need for strict adherence to hand and environmental hygiene. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** SARS-CoV-2, hospital environment, surface contamination, surface sampling

### Introduction

The COVID-19 pandemic caused by the new coronavirus SARS-CoV-2, affecting 213 countries, with more than 10 million cases and over 500,000 deaths, is still causing serious health, social and economic emergency (1). Italy is among the most badly affected countries, with a higher incidence and mortality in the Northern regions (2).

The mechanisms of transmission of the disease are not yet fully known, even if close contact through droplets, which can reach, directly or through contaminated surfaces, susceptible subjects, is considered determinant (3). Experimental studies have shown the presence for hours of infectious virus in droplets and for hours or days on surfaces, according to the type of material, the humidity and temperature (4). Air and

surfaces therefore represent matrices to which particular attention should be paid for the prevention and control of SARS-CoV-2 transmission. Identifying the presence of viable SARS-CoV-2 and knowing the degree of environmental viral contamination, through an appropriate monitoring of air and surfaces, is fundamental to the understanding of transmission mechanisms (5). World Health Organization underlines the importance of accessing the extent and persistence of surface contamination of SARS-CoV-2 and identifying environmental surfaces which may play a role in onwards transmission, and provides specific indications for surface sampling (6).

A few studies, in most cases performed in China, have highlighted the presence of the virus on surfaces. This study reports evidence of its presence on hospital room surfaces.

## Materials and Methods

The study was carried out in a single room hosting an elderly patient with fever, dyspnea and pneumonia, diagnosed by High Resolution Computerized Tomography, with nose-pharyngeal swab resulted positive for SARS-CoV-2 RNA (Cycle threshold value, Ct 20) at the admission. The surfaces sampling was carried out two days after the patient's second positive swab (Ct 24), seven days after hospitalization. The surfaces sampling was carried out two hours after cleaning and disinfection procedures using a FLOQSwab<sup>(R)</sup> pre-wetted with molecular water and stored in the eNAT<sup>(TM)</sup> medium (code 608CS01R Copan Italia S.p.A.). The following surfaces were sampled the two bed rails, the bedside table, the floor near the patient's bed, the head and the foot of the bed, the door handle, the call button, the chair, the wall behind the bed head, the side table, the bed trapeze bar, the air intake grille, the head of the patient's wheelchair, the diaphragm of the stethoscope dedicated to the patient. Moreover, the patient's inner surgical mask was sampled to verify the emission of the virus from the patient. The SARS-CoV-2 research included extraction and amplification of the viral RNA performed by reverse Real-Time Polymerase Chain Reaction (rRT-PCR) using primers and probes related to the E gene, with a detection limit of 5.2 copies of RNA/reaction (7).

## Results

A total of 4/15 (26.66%) of surfaces were positive for SARS-CoV-2 RNA: the right bed rail (Ct 31), the call button (Ct 31), the bed trapeze bar (Ct 31), the stethoscope (Ct 33). The surgical mask showed a Ct value of 35 registering the virus emission. Our results show the presence of viral RNA on some of the examined surfaces with Ct values slightly lower than that detected in the patient's nose-pharyngeal swab two days before.

## Conclusions

In this study SARS-CoV-2 RNA was identified on hospital surfaces; to our knowledge, in Italy, only

two studies have shown the presence of the virus on surfaces. In the first study, the virus was found on surfaces closely related to the patients (CPAP helmet) (8); in the second it was found on several inanimate surfaces, but the Ct values were not reported (9).

Our study is a further confirmation that surfaces are a potential vehicle of transmission. It is interesting to note that the surfaces tested positive were only those in the immediate vicinity of the patient, more frequently touched by hands, more probably by the patient. This supports the need to pay particular attention to adherence to hand and environmental hygiene. It should be considered that surfaces like the ones we found contaminated, can become contaminated very quickly, even though a cleaning and disinfecting procedure has been performed. Therefore, it is essential to educate also the patient to the behaviour contributing to the reduction of environmental contamination. Enforcement of hand hygiene in healthcare workers is also essential. The stethoscope has also been shown to harbour SARS-CoV-2 suggesting it to be a possible vehicle of infection.

The limitation of our study is to have conducted it in only one room with only a single sampling, without assessing its potential infectivity. This aspect, together with the verification of the homology between the environmental and patient viral strains, needs to be considered. Moreover, for a global understanding of the role of the environment in the virus transmission it will be also necessary to verify its presence in the air. A lot of efforts will be needed to standardize the sampling methods and the interpretation of data, in order to understand the role of the environment in the transmission of SARS-CoV-2 and to manage the infectious risk in healthcare settings.

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