



# Remote patient monitoring in peritoneal dialysis helps reduce risk of hospitalization during Covid-19 pandemic

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On 31st December, 2019, a novel coronavirus, later named SARS-CoV-2, and whose clinical disease was to be named COVID-19, was isolated in China.

First in Italy and then all over the world, viral circulation rapidly increased to a pandemic level, as defined by WHO on March 11th, 2020.

In Italy, one of the most affected countries, where over 35,000 deaths have been recorded, lockdown was the only efficacious containment measure [1]. Unfortunately, hospitals soon became reservoirs of contagion [2].

In the northern Italian district of Piacenza in Emilia-Romagna, heavily hit by the shock wave of the virus, 1894 patients were hospitalized due to COVID-19 during March–April, 2020; dialysis patients were immediately identified as particularly frail.

Home dialysis is the only means to allow dialysis patients to respect the lockdown, minimizing exposure to the hospital setting. In this regard, we would like to comment on our experience, from a center with a highly developed system of home dialysis. Indeed, patients on home dialysis (peritoneal dialysis [PD] and home hemodialysis [HHD]) represent 18% of our dialysis population (36/210 patients), a high figure by European standards.

Our experience with home dialysis may be of particular interest, since we recorded a very high incidence of COVID-19 in patients on in-center hemodialysis (49/210 patients, 23%) [2], much higher than the overall incidence in Italy (about 3%), as recently reported by a survey of the Italian Society of Nephrology (available at: <https://sinitaly.org/wp-content/uploads/2020/05/2-Survey-Covid-19-SIN-1.pdf>, accessed on July 13th, 2020) involving 30,129 hemodialysis patients: among them, 1027 patients (3.41%) resulted affected by COVID-19.

The home dialysis network needed to be adjusted to the pandemic: after the first cases were recorded at our center, we decided to suspend non-essential procedures in PD (such as PET, clearances, etc.) and PD nurses verified that patients had enough PD supplies for at least 21 days. Moreover, we decided to further develop our remote patient monitoring (RPM) system. We did so by acquiring three remote home stations (eViSUS, Tesisquare®) inclusive of video camera, monitor, microphone, technological connectivity box, and a control station for our center, with the possibility of managing up to six audio–video connections simultaneously, entrusting a device to the patients who, in our opinion, were unsure of the manoeuvres or were still being trained for PD (Fig. 1).

The idea was to support especially frail patients or those not fully confident in PD management. The remote modality allowed virtual clinical video and audio examination, thus avoiding the need to travel to the center and reducing the risk of COVID-19 for patients, families and health care workers.

We selected five frail patients, the most insecure or with incomplete PD training, to be followed by RPM. The tele-visits allowed us to examine the effluent bag for signs of peritonitis, the catheter exit-site, and to control compliance with drugs and dialysis prescriptions, body weight, blood pressure and other parameters in lieu of face-to-face visits.

Between March 1st and April 30th, 2020, we performed at least one daily weekday tele-visit with our patients on PD for a total of about 300 connections over the 2 months for five patients.

This tool was important in the achievement of a remarkable result: of the 36 PD patients, only one (not followed by RPM) was diagnosed with COVID-19, presumably infected by his wife, a resident in a retirement home. He had mild to moderate symptoms and was isolated at home, continuing his PD treatment as usual, without the need for hospitalization. During the lockdown period none of our patients developed peritonitis.

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**Fig. 1** The authors and the control station

Quite surprisingly, RPM was immediately accepted by the patients, despite their old age and lack of confidence with video-tele-connections, as reported below in the patients' own words: "in the early days of the lock-down it was very reassuring to know that at any time I could talk to you and see you almost like you were here ... it gave me a feeling of protection".

"If we had not had the video-tele connection after my father's femur fracture it would have been much more complicated ... in such a delicate moment when my father was very frail and the problems were many. Being able to rely on video dialysis saved us from tiring trips and made us feel very cared for. This is a great advantage for those of us who live 70 km away from the center"

In the last years several studies [3, 4] have highlighted the role of RPM in supporting patients who live far from the hospital, showing how this approach may reduce travel time and costs, with high levels of satisfaction and a positive impact on quality of life.

The importance of home dialysis in the COVID-19 pandemic has recently been underlined by the ERA-EDTA Working Group and by ISPD [5], highlighting the importance of telemedicine support.

During the pandemic, physicians were forced to find new solutions or improve current practices: COVID-19 transformed the healthcare system and the role of telemedicine rapidly increased. The advantages offered by RPM are enhanced during outbreaks. As recently described by Hollander et al. "telemedicine allows patients to be efficiently screened, is both patient-centered and conducive to self-quarantine, and it protects patients, clinicians, and the community from exposure, allowing patients to be treated in their homes, with higher-level medical support provided virtually" [6].

In conclusion, the pandemic clearly highlighted the need for developing efficient tools for safe out-of-hospital management, reserving only the most complicated cases for hospital care. Video-telemedicine or RPM may help increase the number of home dialysis patients by safely supporting them remotely. Such tools combine optimal clinical control and assistance and avoid isolation, allowing the respect of social distancing and protecting against COVID-19.

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### Compliance with ethical standards

**Conflict of interest** The authors declare no conflict of interest; this material has not been published in whole or in part elsewhere; the manuscript is not currently being considered for publication in another journal; all authors have been personally and actively involved in substantive work leading to the manuscript.

**Ethical approval** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

**Informed consent** Informed consent was obtained from all patients for being included in the study.

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