

## LETTER TO THE EDITOR

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# Central line-associated bloodstream infections in hemodialysis patients in the COVID-19 era

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To the Editor:

The current coronavirus disease 2019 (COVID-19) pandemic has become a major public health challenge, raising attention to the necessity to implement preventive measures,<sup>1, 2</sup> mainly in a population at high mortality risk, such as hemodialysis patients.<sup>3</sup>

In this view, to minimize COVID-19 spread, since the beginning of March 2020, we introduced in our dialysis unit new prophylactic protocols.<sup>4</sup>

### A NEW ORGANIZATIONAL MODEL

At their arrival at the dialysis facility, the patients wash their hands and wait briefly in a communal area sitting far from each other, while wearing a surgical mask. Then, after a triage procedure, COVID-19 suspected patients are isolated and tested with a nasopharyngeal swab, while other patients access to the shared dialysis rooms. However, every patient, irrespective of COVID-19 clinical suspicion, wears surgical masks during all the dialysis time and is not allowed to eat.

Finally, at the end of dialysis, all the patients leave the Dialysis Center one at a time.

We also made some changes to dialysis management policy by educational meetings involving nurses, physicians, and healthcare personnel. So, compared to the pre-COVID period, when facial masks and sterile gloves were only used when handling central venous catheters (CVC), we established that every member of the dialysis staff should have worn a surgical mask during all the

dialysis time and washed the hands with antibacterial alcohol-containing gel or soap before and after each patient interaction (using sterile gloves for catheter handling).

However, we did not modify the routine catheter management by nurses. It consists of the use of chlorhexidine-impregnated transparent dressings that are changed once a week, scrubbing the hub at dressing change for about 15 seconds with a 2% chlorhexidine 70% ethanol solution, without the use of topical antibiotics or prophylactic antimicrobial locks. Similarly, no changes in medical and nurse staff shifts were introduced.

### EFFECTS ON CENTRAL VENOUS CATHETER INFECTIONS

Aiming to evaluate the impact of this protocol on daily practice, we performed a retrospective analysis to assess its effect on the incidence of central line-associated bloodstream infections (CLABSI), which represent the most common infections in hemodialysis patients.<sup>5,6</sup>

We evaluated patients in maintenance hemodialysis with tunneled CVC treated at our hospital-based dialysis unit during the period before (from November 2019 to February 2020, i.e., pre-COVID-19) and after (from March 2020 to June 2020, i.e., post-COVID-19) the introduction of our new anti-COVID 19 hygiene protocol. We collected data on the monthly number of patients with CVC, number and outcome of COVID-19 patients, CLABSI occurrence, pathogens, use of antibiotics, and hospitalization over the studied period. Data were collected retrospectively from the Medical Staff from an electronic database routinely used at our Center (Gepadial, La Traccia, Matera, Italy).

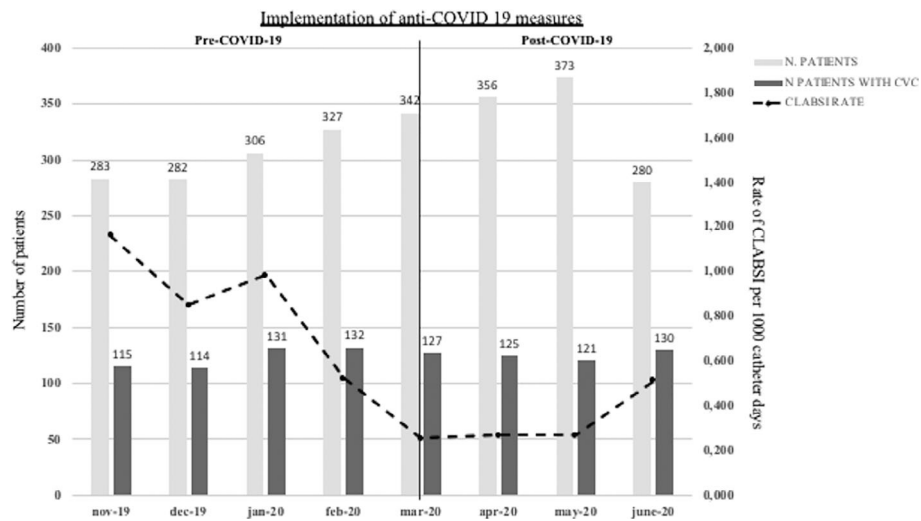
According to our policy, blood cultures were collected in case of clinical signs or symptoms or laboratory findings suspected of infections, such as fever (>38°C) or elevated white blood cells count. Paired blood samples were drawn from the catheter lumens and a peripheral vein,

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**Figure 1** Total number of maintenance hemodialysis patients treated at our Center (light gray columns), number of patients with tunneled catheter (gray columns) and time trend of the rate of central line-associated bloodstream infections (CLABSI) per 1000 catheter-days at each month during the study period. The months from November 2019 to February 2020 correspond to the pre-COVID-19 period, while the months from March 2020 to June 2020 correspond to the post-COVID-19 period. The first confirmed case of COVID-19 in Italy was reported on the 20th of February and the first legislative initiatives to contain the infection spread were taken at the beginning of March.

and, if not possible, two blood samples were collected through different catheter lumens.<sup>7</sup>

CLABSI was defined according to CDC criteria, that is, laboratory-confirmed bloodstream infection from one or more blood cultures, not related to an infection at another site.<sup>8</sup>

In case of positivity to common skin contaminants, such as coagulase-negative staphylococci, blood cultures were repeated the following dialysis session. In the case of negativity to the second culture or recognition of other causes of infection, the first positive blood cultures were considered contaminants.<sup>9</sup>

CLABSI incidence was expressed as new cases per 100 patients and the rate of infection per 1000 catheter days, evaluated both monthly and considering overall pre-COVID-19 vs. post-COVID-19 period. Quantitative variables were presented as mean  $\pm$  standard deviation. Differences among different periods were assessed by Student *t*-test or nonparametric Mann-Whitney test or analysis of variance (ANOVA) when appropriated. Comparisons of proportions were made using Fisher's exact test. The incidences of CLABSI between the different periods were compared through the calculation of the incidence rate ratio (IRR). A two-sided *P* value  $<0.05$  was considered statistically significant. Data analysis was performed with GraphPad Prism statistical package (version 8.00, GraphPad Software, San Diego, California, USA).

Due to the observational retrospective design of this report, specific approval by the Local Ethics Committee was not required. Data were collected and analyzed anonymously. All patients gave their informed consent to data utilization.

Among a monthly mean of 319 maintenance hemodialysis patients treated at our Center, 124 (38.8%) used a tunneled CVC. There were no significant differences in the total number of patients receiving dialysis at our Center throughout the study period (pre- vs. post-COVID-19 period, *P* = 0.3), such as in the number of patients with a tunneled catheter (Figure 1). Among patients with a tunneled CVC, nine were diagnosed with COVID-19 during the study period, corresponding to 11.2% of the mean number of patients with a tunneled catheter and 53% of the 17 patients diagnosed with COVID-19 at our center. Out of the nine COVID-19 patients with CVC, four (44%) died because of COVID-19, while there were three deaths among the remaining eight COVID-19 patients without CVC (37%). Overall, during the evaluated periods 22 CLABSI occurred, but four cases of coagulase-negative staphylococcus were excluded (i.e., 18% of the positive blood cultures) since considered as contaminants.<sup>10</sup> Among the 18 confirmed CLABSI episodes, 13 (72%) occurred in the pre-COVID period, and five (28%) in the post-COVID. Looking at different time points, we found that the mean incidence of CLABSI was

lower during the post-COVID-19 period than the pre-COVID-19 period ( $0.9 \pm 0.3\%$  vs.  $2.6 \pm 0.9\%$ ,  $P = 0.01$ ). Similarly, after the implementation of new hygiene protocols in the post-COVID-19 period, we observed a reduced incidence of CLABSI per 1000 catheter days, when compared to the pre-COVID-19 period (IRR = 0.37; 95% CI 0.13–1.03) (see Figure 1).

Regarding the treatment, we found that overall in the pre-COVID period 16 intravenous antibiotics were prescribed compared to the seven prescribed in the post-COVID period, corresponding to mean values of  $4.0 \pm 1.1$  vs.  $1.7 \pm 0.9$  drugs/month in the two periods, respectively,  $P = 0.024$ .

This difference was mainly attributed to the higher number of CLABSI episodes occurring in the pre-COVID period since the mean number of antibiotics required to treat each CLABSI episode resulted in almost the same during the study period (pre-  $1.25 \pm 0.2$  vs. post-COVID  $1.37 \pm 0.4$ , ns). Moreover, during the pre-COVID period in two cases, the ceftazidime-avibactam combination therapy was prescribed because of the recognition of multidrug-resistant *Pseudomonas aeruginosa*.

Finally, the number of CLABSI-related hospital admissions decreased from seven in the pre-COVID-19 period (corresponding to 1.4% of the total patients with a tunneled catheter in that period) to three in the post-COVID-19 period (0.6%,  $P = 0.2$ ).

## DISCUSSION

These data suggest that the COVID-19 pandemic has raised our sensibility to hygiene procedures changing our approach to infectious diseases. Interestingly, we found that better control of infectious diseases, which also implies reduced use of antibiotics and hospitalization, was achieved not by the implementation of new procedures, but mainly by reinforcing standard hygiene protocols, with broad use of facial masks and frequent hand washing. It is conceivable that the urgency to fight the pandemic and prevent COVID-19 spread in Italy, which was one of the first frontlines of the disease, strengthened the importance of improving adherence to hand hygiene and general hygiene protocols, including dialysis catheter care practice. Moreover, we think that additional relevant roles in reducing CLABSI incidence could have been played by the logistic reorganization of our dialysis unit and the direct patient empowerment. Interestingly, these data are in line with that found in the national epidemiological surveillance databases, which following the adoption of hygiene measures during the COVID-19

pandemic, revealed a significant decrease in cases of influenza, enterovirus, and all-cause pneumonia.<sup>11</sup>

We are aware that this report presents some limitations. First, it is a retrospective description of a phenomenon we observed in the clinical practice, not specifically designed to investigate the different aspects of infectious disease control and elucidate the causal relationship between single hygiene procedures and CLABSI incidence. Then, it is plausible that the low number of CLABSI episodes that occurred during the studied periods has not allowed to reach statistical significance in some parameters, such as reduction of CLABSI incidence and rate of hospitalization, as well as to evaluate the clinical outcome of these patients. Probably, multicenter longitudinal prospective studies are necessary to assess these different issues.

Nevertheless, we think that our experience may suggest that in hemodialysis patients an increased awareness and systematic use of simple measures, such as social distancing, facial masks, and handwashing,<sup>12</sup> may allow to prevent not only the COVID-19 spread but also other infections and reduce the burden of hospital care.

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