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LETTER TO THE EDITOR

Healthcare resource use among solid organ transplant recipients hospitalized with COVID-19

To the Editor:

While recent data demonstrate similar mortality among solid organ transplant recipients (SOTR) and non-transplant recipients with COVID-19,^{1,2} the magnitude of healthcare resource utilization by SOTR with COVID-19 is incompletely described. Knowledge of hospital length of stay (LOS), intensive care unit (ICU) LOS, and duration of mechanical ventilation (MV) is essential for transplant centers to make informed decisions on resource allocation during surges in COVID-19. Several studies have described these measures but are limited by small sample size, short or variable durations of follow-up, or single-center experiences.²⁻⁴ A recent multicenter study by Coll et al reports on hospital LOS in SOTR with COVID-19, but follow-up time was not standardized and neither MV duration nor ICU LOS was measured.⁴ To address these limitations, we performed analyses from data in a prospective, multicenter registry of 376 SOTR hospitalized with COVID-19 with standardized 28-day follow-up, which has been previously described.¹

Table 1 shows median hospital and ICU LOS, and duration of MV, stratified by transplanted organ and vital status at follow-up. Thirty-three patients (8.8%) remained hospitalized at the end of the 28-day follow-up. Of 147 (39.1%) patients admitted to the ICU, median ICU LOS was 11 days (IQR 5-19). Among the 376 hospitalized patients, 117 (31.1%) were mechanically ventilated for a median of 12 days (IQR 7-19). There were no significant differences in the rate of ICU admission, duration of MV, or hospital LOS among organ groups.

These data reflect a large, multicenter cohort of SOTR with standardized follow-up to 28 days and known final disposition for >90% of patients, thereby addressing limitations of prior studies. The median hospital LOS of 10 days (IQR 5-19) is slightly shorter to that reported in a large multicenter Spanish study (LOS of 12 days [IQR 7-21]).⁴ Another study of 98 SOTR hospitalized for COVID-19 with 28-day follow-up reported a median ICU LOS of 11 days, similar to our findings, and described a shorter median ventilation duration (9 vs 12 days in our study), but only examined the first 14 days after hospitalization.² The longer duration of MV reported here highlights the importance of adequate follow-up time on measures of resource utilization since estimates from the longest hospital courses would not be captured at shorter intervals.

Most studies of non-transplant patients hospitalized with COVID-19 have not used a standard 28-day follow-up design that was used here, precluding meaningful direct comparisons. In one

analysis using multistate models to estimate resource utilization in the first 28 days of illness after hospitalization for COVID-19 in the general population, the modeled ICU LOS was 15.05-19.62 days (vs the median of 11 days in this study) and expected duration of MV was 7.97-9.85 days (vs the median of 12 days in this study).⁵ Although indirect comparisons, these estimates suggest that resource utilization in SOTR may differ from non-transplant patients. Estimates in non-immunocompromised patients using standardized follow-up are needed; however, our results provide objective data for transplant centers planning for the impact of COVID-19 on hospital resources.

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CONFLICTS OF INTERESTS

MRH reports receiving speaking fees from Cigna LifeSource, outside the submitted work. JDG reports contracted research from Gilead Sciences and grants from Viracor and Merck, outside the submitted work. VH reports being co-investigator on a trial of leronlimab versus placebo for COVID and did not receive salary support for participation in this study; however, Montefiore Medical Center received payments for patients enrolled in the study. MGI reports advisory board fees from Shionogi, Celltrion, Genetech/Roche,

TABLE 1 Healthcare resource utilization among hospitalized solid organ transplant recipients with COVID-19

	Lung ^a	Kidney ^b	Liver ^c	Heart ^d	All SOTR ^e
Newly admitted, <i>n</i> (%)	24	255	47	47	376
Non-survivors	7 (29.2)	50 (19.7)	12 (25.5)	8 (17.0)	77 (20.5)
Survivors ^f	17 (70.8)	205 (80.4)	35 (74.5)	39 (83.0)	299 (79.5)
Median age (IQR), years	63.5 (54.3–68)	58 (46–66)	63 (55.5–68)	56 (48–71.5)	59 (47–67)
ICU, <i>n</i> (%) ^g	11 (45.8)	99 (38.8)	19 (40.4)	16 (34.0)	147 (39.1)
Non-survivors	6 (85.7)	40 (80.0)	7 (58.3)	5 (62.5)	58 (79.5)
Survivors	5 (29.4)	59 (28.9)	12 (34.3)	11 (28.2)	89 (29.8)
Mechanical ventilation, <i>n</i> (%) ^g	9 (37.5)	81 (31.9)	16 (34.0)	10 (21.3)	117 (31.1)
Non-survivors	5 (71.4)	37 (74.0)	9 (75.0)	3 (37.5)	54 (75.0)
Survivors	4 (23.5)	44 (21.6)	7 (20.0)	7 (18.0)	63 (21.1)
Median hospital LOS, days (IQR)	9 (4–16.5)	9 (5–18)	13.5 (6–20)	10.5 (5–19)	10 (5–19)
Non-survivors ^h	9 (6–12)	12 (6–16 ⁱ)	16 (7–19)	16 (6.3–23)	12 (6–18)
Survivors ⁱ	9 (4–20.3)	9 (5–18.5)	13 (7–20)	10 (5–15)	10 (5–19)
Median ICU LOS, days (IQR)	8.5 (7–12)	12 (5–20)	9 (5–15)	11 (3–26)	11 (5–19)
Non-survivors ^j	9 (8.3–11.3)	11 (5–14)	7 (5.5–12)	5 (5–19)	9 (5–14.5)
Survivors ^k	7 (5.5–8.8)	14 (7–24)	11 (8–17.3)	11 (3–25.8)	13 (5–24)
Median duration of ventilation, days (IQR)	10.5 (4.5–14)	12 (7–19)	9 (6–16)	16 (10–23)	12 (7–19)
Non-survivors ^l	11 (7.5–14.5)	11 (5–13)	7 (5.8–9.3)	15 (14.5–21)	10.5 (5–14)
Survivors ^m	9 (4.5–13)	14 (8–24)	14 (9–19)	16 (6–22)	14 (7.5–23.5)

Abbreviations: ICU, intensive care unit; IQR, interquartile range; LOS, length of stay; SOTR, solid organ transplant recipients.

^aIncludes 2 heart-lung recipients.

^bIncludes 6 kidney-pancreas recipients and 1 kidney-vascular composite recipient.

^cIncludes 11 liver-kidney recipients.

^dIncludes 5 heart-kidney recipients and 1 heart-kidney-small bowel recipient.

^eIncludes all lung, kidney, liver, and heart recipients plus 2 small bowel recipients (1 admitted to ICU, neither received mechanical ventilation, both survived) and 1 vascular composite recipient (admitted to ICU, received mechanical ventilation, survived).

^fSurvivors refer to patients alive on day 28 after COVID-19 diagnosis.

^gFor survivor and non-survivor groups, percentages refer to percent of all survivors or all non-survivors for each organ, respectively.

^hExcludes 1 kidney and 1 liver recipient for whom data were unavailable.

ⁱExcludes 2 kidney recipients for whom data were unavailable.

^kExcludes 1 lung, 8 kidney, and 1 heart recipient for whom data were unavailable.

^lExcludes 2 kidney and 1 liver recipient for whom data were unavailable.

^mExcludes 3 kidney and 1 heart recipient for whom data were unavailable.

^lExcludes 1 kidney and 1 heart recipient for whom data were unavailable.

Parameters for both survivors and non-survivors are in BOLD.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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