

# Return to Work After Coronavirus Disease 2019 Acute Respiratory Distress Syndrome and Intensive Care Admission: Prospective, Case Series at 6 Months From Hospital Discharge\*

**OBJECTIVES:** Joblessness is common in survivors from critical care. Our aim was to describe rates of return to work versus unemployment following coronavirus disease 2019 acute respiratory distress syndrome requiring intensive care admission.

**DESIGN:** Single-center, prospective case series.

**SETTING:** Critical Care Follow-Up Clinic, Humanitas Clinical and Research Center–IRCCS, Rozzano, Italy.

**PATIENTS:** One hundred and one consecutive laboratory-confirmed coronavirus disease 2019 patients were discharged from our hospital following an ICU stay between March 1, 2020, and June 30, 2020. Twenty-five died in the ICU. Seventy-six were discharged alive from hospital. Two patients refused participation, while three were unreachable. The remaining 71 were alive at 6 months and interviewed.

**INTERVENTIONS:** Baseline and outcome healthcare data were extracted from the electronic patient records. Employment data were collected using a previously published structured interview instrument that included current and previous employment status, hours worked per week, and timing of return to work. Health-related quality of life status was assessed using the Italian EQ-5D-5L questionnaire.

**MEASUREMENTS AND MAIN RESULTS:** Of the 71 interviewed patients, 45 (63%) were employed prior to coronavirus disease 2019, of which 40 (89%) of them worked full-time. Thirty-three (73%) of the previously employed survivors had returned to work by 6 months, 10 (22%) were unemployed, and 2 (5%) were newly retired. Among those who returned to work, 20 (85%) of them reported reduced effectiveness at work. Those who did not return to work were either still on sick leave or lost their job as a consequence of coronavirus disease 2019. Reported quality of life of survivors not returning to work was worse than of those returning to work.

**CONCLUSIONS:** The majority of coronavirus disease 2019 survivors following ICU in our cohort had returned to work by 6 months of follow-up. However, most of them reported reduced work effectiveness. Prolonged sick leave and unemployment were common findings in those not returning.

**KEY WORDS:** acute respiratory distress syndrome; coronavirus disease 2019; joblessness; outcome; quality of life; return to work

New unemployment is common in survivors from critical care (1), and this is associated with long-term consequences that impact physical, psychological, and social dimensions (2, 3). A systematic review on return to work following critical illness found that up to two-thirds of patients

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discharged from ICU had a delayed return to work. Survivors who return to work often experience subsequent job loss, change in occupation, and worsening employment status (4). Measuring return to work is relevant to understand the possible long-term socioeconomic impact of coronavirus disease 2019 (COVID-19) on patients, family, and society (5). Our aim was to undertake a preliminary assessment of return to work and unemployment after COVID-19 acute respiratory distress syndrome (ARDS) requiring intensive care admission.

## METHODS

This is a single-center case series from Humanitas Clinical and Research Hospital Critical Care Follow-up clinic in Milan, Italy. Our institutional Ethics Committee approved this study (number 465/20). Written informed consent was obtained from patients before hospital discharge. Baseline healthcare data were extracted from electronic patient records and included: age, gender, comorbidities (age-adjusted Charlson Comorbidity Index), and baseline Clinical Frailty Score. ICU-related exposures included severity scores, mechanical ventilation, ICU and hospital length of stay, and discharge location (home, nursing home, or rehabilitation facility). Survivors' health-related quality of life status was assessed using the Italian EQ-5D-5L questionnaire. Employment data were collected using a structured interview instrument developed by Kamdar et al (6, 7), which included current and previous employment status, hours worked per week, and timing of return to work. The instrument is available at the Improve Long-Term Outcome project website (<https://www.improvelto.com/instruments/>). Quality of life and return to work were assessed at 6 months following hospital discharge. We used survival analysis methods to evaluate the primary outcome of timing of return to work after hospital discharge among patients who were employed before COVID-19. Patients who did not return to work were censored at 24 weeks. The timing of returning to work was explored using cumulative incidence functions. We included stratification for age and length of invasive mechanical ventilation (IMV) based on previous return to work after ARDS research (6, 7), and as highlighted in cited previous research, we used the median value of our population as threshold. Data are presented as median (interquartile range), mean  $\pm$  SD, and number (percentage), as appropriate. Data

processing, analyses, and plotting were made using R Version 3.6.1 (R Foundation for Statistical Computing, Vienna, Austria; <https://www.R-project.org/>).

## RESULTS

One hundred and one consecutive laboratory-confirmed COVID-19 patients were discharged from our hospital following an ICU stay of at least 72 hours between March 1, 2020, and June 30, 2020. Twenty-five died in the ICU. Seventy-six were discharged alive from hospital. Two patients declined participation, while three were unreachable by phone or email. The remaining 71 (70%) were alive at 6 months and interviewed. Among these, 63 (89%) received IMV, while the remaining 8 (11%) were treated with non-IMV. Following acute hospitalization, 37 (52%) were discharged home, while 33 (47%) went to a rehabilitation facility and one returned to a previous residency at a nursing home (**Table 1**).

Among the 45 patients (63%) employed prior to COVID-19, 40 (89%) worked full-time. At 6 months follow-up, all patients initially discharged to rehabilitation facilities had returned home, 33 (73%) of the previously employed survivors had returned to work, 10 (22%) were jobless, and 2 (5%) were newly retired. Their median age was 57 years (51–61 yr), and they received a median 14 days (5–26 d) of IMV. The 6-month cumulative incidence of returning to work was similar among patients less than 57 and greater than or equal to 57 years old, 76% and 74%, respectively. When stratified by duration of IMV, it was 85% and 67% for those receiving less than 14 and greater than or equal to 14 days (**Fig. 1**). When divided by work type: management (6/6 [100%]), office-based work (7/9 [78%]), manual work (9/13 [69%]), healthcare (7/9 [78%]), education (0/1 [0%]), and protective services (4/5 [80%]) returned to work.

Among the 33 previously employed survivors ever returning to work, only six (18%) reported having to make significant changes in their work duties because of the ICU stay. However, 20 (85%) of them reported reduced effectiveness at work (self-reported effectiveness score, 85%  $\pm$  22%); no one who returned to work subsequently lost their job during follow-up.

Among the 10 survivors who were unemployed at 6 months and were still on paid sick leave, four were unemployed, of which only one of them was actively searching for a job. Survivors who never versus ever returned to

**TABLE 1.**  
**Baseline and Intensive Care Data by Return to Work Status**

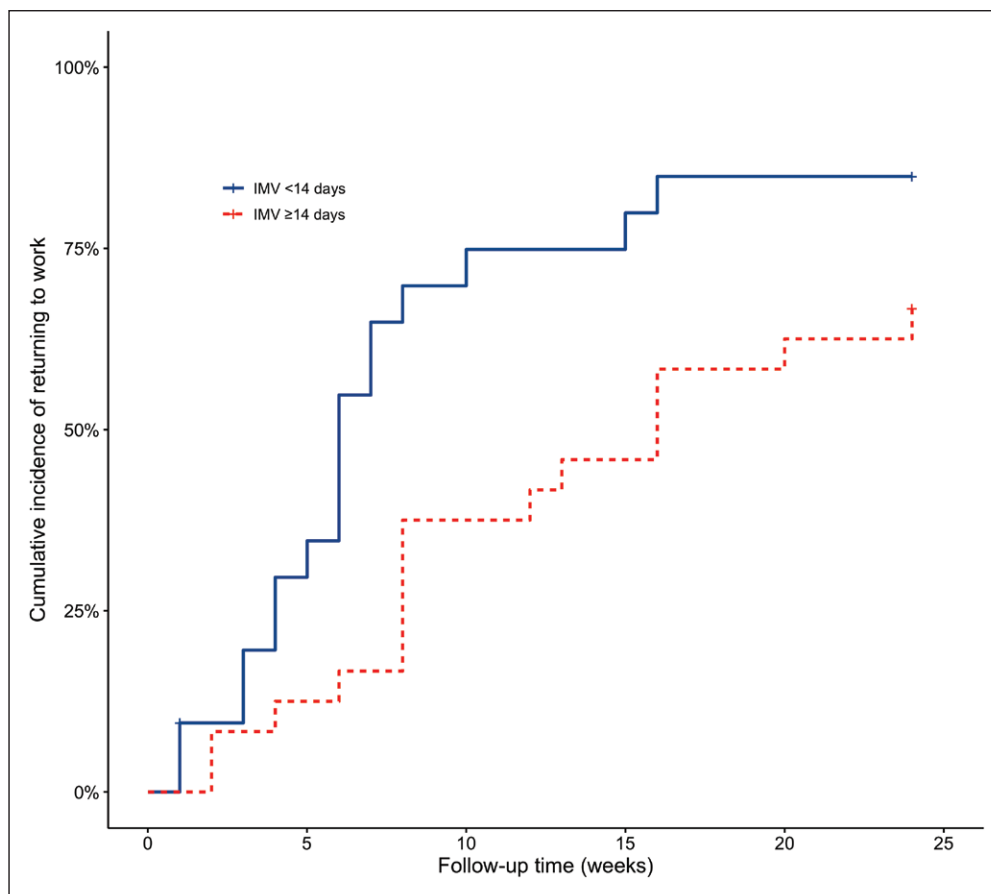
Variable	Not Working Prior to COVID-19	Working Prior to COVID-19			
		All Patients	Ever Return to Work	Never Return to Work	Retired
<i>n</i>	26	45	33	10	2
Age, yr, median (IQR)	66.5 (61.3–71.5)	57 (51–62)	57 (51–61)	56.5 (50.5–57.8)	72 (70.5–73.5)
Male, <i>n</i> (%)	16 (62)	40 (89)	31 (94)	7 (70)	2 (100)
Body mass index, median (IQR)	27.0 (24.0–28.0)	27.8 (24.9–34.5)	27.8 (25.3–34.6)	29.4 (26.8–33.3)	21.6 (21.2–22.1)
Acute Physiology and Chronic Health Evaluation II score, median (IQR)	8 (7–9.75)	6 (5–10)	6 (5–11)	5.5 (4–6)	10.5 (8.75–12.25)
Sequential Organ Failure Assessment score, median (IQR)	5 (3.25–6)	4 (3–6)	3 (3–5)	6.5 (5.25–9)	3 (2.5–3.5)
Charlson Comorbidity Index (age corrected), median (IQR)	3 (2–4)	1 (1–2)	1 (1–2)	1 (1–2)	3.5 (3.25–3.75)
Clinical Frailty Scale, median (IQR)	3 (2–3)	2 (2–3)	2 (2–3)	3 (2–3)	2.5 (2.25–2.75)
Tracheostomy, <i>n</i> (%)	3 (11.5)	9 (20.0)	5 (15.2)	3 (30.0)	1 (50.0)
Acute kidney injury, <i>n</i> (%)					
No acute kidney injury	22 (84.6)	35 (77.8)	27 (81.8)	6 (60.0)	2 (100.0)
Stage 1	1 (3.8)	4 (8.9)	1 (3.0)	3 (30.0)	0 (0.0)
Stage 2	1 (3.8)	4 (8.9)	3 (9.1)	1 (10.0)	0 (0.0)
Stage 3	2 (7.7)	2 (4.4)	2 (6.1)	0 (0.0)	0 (0.0)
Worst PaO <sub>2</sub> /Fio <sub>2</sub> at admission, median (IQR)	116 (94–150)	127 (104–147)	130 (108–148)	109 (78–129)	117 (110–123)
Days on neuromuscular blocking agent infusion, median (IQR)	4 (2–5)	4 (1–10)	3 (1–8)	6 (2–12)	8 (7–9)
Prone positioning, <i>n</i> (%)	8 (31)	16 (36)	9 (27)	5 (50)	2 (100)
Receiving vasopressors, <i>n</i> (%)	16 (62)	29 (64)	18 (55)	9 (90)	2 (100)
Days on invasive mechanical ventilation, median (IQR)	12 (6–19)	14 (5–26)	13 (5–22)	20 (11–34)	22 (17–27)
ICU LOS, d, median (IQR)	14 (7–21)	17 (9–29)	15 (6–24)	22 (10–54)	33 (25–41)
Hospital LOS, d, median (IQR)	28 (23–42)	31 (19–56)	30 (17–39)	37 (21–69)	69 (63–74)
Discharged to rehabilitation facility, <i>n</i> (%)	14 (54)	19 (42)	12 (36)	5 (50)	2 (100)

COVID-19 = coronavirus disease 2019, IQR = interquartile range, LOS = length of stay.

work at 6 months reported worse health-related quality of life, EQ-visual analogue scale of 70 (60–76) versus 85 (80–90) (out of 100), respectively. Those who did not work prior to COVID-19 reported 80 (75–85) (out of 100).

## DISCUSSION

This is one of the first reports specifically exploring return to work after critical illness due to COVID-19 respiratory failure. At 6 months, 73% of previously



**Figure 1.** Cumulative incidence of return to work after severe coronavirus disease 2019 stratified by days of invasive mechanical ventilation (IMV).

employed COVID-19 survivors had returned to work. In our cohort, more survivors were able to return to work at 6 months compared with patients surviving other forms of ARDS (55%) (6) as well as general ICU survivors (8).

A small cohort of COVID-19 survivors similarly reported an improved return to work (9).

In survival analysis, there were no differences observed between age groups, but those who did not return to work showed a trend toward longer duration of mechanical ventilation. In addition, these patients presented with higher illness severity as defined by admission severity scores, longer ICU and hospital length of stays, and greater use of proning and vasopressors compared with those who did return to work. This is suggestive of the fact that patients not returning to work at 6 months may have experienced a disease with greater degree of multiple organ involvement and longer or more prevalent needs for organ support. When compared with other studies in the field, there is no unique evidence in the

literature about the role of organ failures and severity scores and long-term outcomes (6, 7, 10). These exploratory findings warrant further investigation in larger multicenter studies. Specific causes of reduced perceived work effectiveness were not investigated in the present study but are likely multifactorial. Reports suggest patients recovering from COVID-19 have been diagnosed with chronic fatigue (11), musculoskeletal (12), and mental health (post-traumatic stress) disorders (13). Dedicated post-COVID-19 workplace-based return-to-work interventions may be needed to best accommodate the returning workforce (14). Finally, only

42% of the cohort of those previously employed was discharged to a rehabilitation facility. There is no clear evidence on the effectiveness of rehabilitation on time to recovery from critical illness (15), but early rehabilitation may improve the ability to return to work (16). With more patients reaching hospital discharge after critical illness, there is a likely need for an increase in rehabilitation “surge” capacity.

Quality of life was lower for patients not returning to work, a consistent finding in previous return to work research after ARDS (5, 6). The ability to return to and function normally at work (perceived effectiveness) is an important component of quality of life for patients. An inability to return to work can have negative psychophysical effects on quality of life and ultimately cause or exacerbate psychologic distress, anxiety, depression, and post-traumatic stress symptoms. Measuring return to work and health-related quality of life is essential to identify subjects at risk and design and deliver interventions to target long-term unmet health needs. A strength

of this study is the homogenous cohort of relatively young patients with a severe form of respiratory failure, requiring prolonged ICU admission, and with good initial performance status and limited comorbidity (17). Limitations are the small sample size, employment status determined by self-reports, and limited generalizability of the findings to other populations with severe preexisting comorbidities, worse baseline functional status, and from non-white ethnicities such as Black, Asian, and Minority Ethnic backgrounds.

When compared with previous literature on return to work, COVID-19 poses unique challenges. Return to work of this cohort was happening between two national lockdowns that could have affected patient's ability to return to work. COVID-19 critically ill survivors seeking to return to work face environmental factors such as the possible need for further quarantine until fully virologically negative and the significant effect that said lockdowns might have on businesses and their job. In addition to the long-term health implications of prolonged ICU stays, growing evidence on the persistent health complications directly related to COVID-19 infection (18) may additionally affect quality of life, and as shown in this study, a large proportion of them can experience reduced effectiveness at work. Recovery from the COVID-19 pandemic will need to involve the full spectrum of clinicians and post-ICU networks to address the unmet clinical needs of such cohorts to prevent post-critical care joblessness and reduce the impact on long-term social and health-related quality of life and to favor their reintroduction in the workforce.

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