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Association of COVID-19 Acute Respiratory Distress Syndrome With Symptoms of Posttraumatic Stress Disorder in Family Members After ICU Discharge

Elie Azoulay, MD, PhD; Matthieu Resche-Rigon, MD, PhD; Bruno Megarbane, MD, PhD; Danielle Reuter, MD; Vincent Labbé, MD, PhD; Alain Cariou, MD, PhD; Guillaume Géri, MD, PhD; Guillaume Van der Meersch, MD; Achille Kouatchet, MD; Olivier Guisset, MD; Fabrice Bruneel, MD, PhD; Jean Reignier, MD, PhD; Virginie Souppart, RN; François Barbier, MD, PhD; Laurent Argaud, MD, PhD; Jean-Pierre Quenot, MD, PhD; Laurent Papazian, MD, PhD; Bertrand Guidet, MD, PhD; Guillaume Thiéry, MD; Kada Klouche, MD, PhD; Olivier Lesieur, MD, PhD; Alexandre Demoule, MD, PhD; Christophe Guitton, MD, PhD; Gilles Capellier, MD, PhD; Bruno Mourvillier, MD; Lucie Biard, MD, PhD; Frédéric Pochard, MD, PhD; Nancy Kentish-Barnes, PhD

IMPORTANCE Persistent physical and mental disorders are frequent in survivors of COVID-19–related acute respiratory distress syndrome (ARDS). However, data on these disorders among family members are scarce.

OBJECTIVE To determine the association between patient hospitalization for COVID-19 ARDS vs ARDS from other causes and the risk of posttraumatic stress disorder (PTSD)–related symptoms in family members.

DESIGN, SETTING, AND PARTICIPANTS Prospective cohort study in 23 intensive care units (ICUs) in France (January 2020 to June 2020 with final follow-up ending in October 2020). ARDS survivors and family members (1 family member per patient) were enrolled.

EXPOSURES Family members of patients hospitalized for ARDS due to COVID-19 vs ARDS due to other causes.

MAIN OUTCOMES AND MEASURES The primary outcome was family member symptoms of PTSD at 90 days after ICU discharge, measured by the Impact of Events Scale-Revised (score range, 0 [best] to 88 [worst]; presence of PTSD symptoms defined by score >22). Secondary outcomes were family member symptoms of anxiety and depression at 90 days assessed by the Hospital Anxiety and Depression Scale (score range, 0 [best] to 42 [worst]; presence of anxiety or depression symptoms defined by subscale scores ≥7). Multivariable logistic regression models were used to determine the association between COVID-19 status and outcomes.

RESULTS Among 602 family members and 307 patients prospectively enrolled, 517 (86%) family members (median [IQR] age, 51 [40-63] years; 72% women; 48% spouses; 26% bereaved because of the study patient's death; 303 [50%] family members of COVID-19 patients) and 273 (89%) patients (median [IQR] age, 61 [50-69] years; 34% women; 181 [59%] with COVID-19) completed the day-90 assessment. Compared with non–COVID-19 ARDS, family members of patients with COVID-19 ARDS had a significantly higher prevalence of symptoms of PTSD (35% [103/293] vs 19% [40/211]; difference, 16% [95% CI, 8%-24%]; $P < .001$), symptoms of anxiety (41% [121/294] vs 34% [70/207]; difference, 8% [95% CI, 0%-16%]; $P = .05$), and symptoms of depression (31% [91/291] vs 18% [37/209]; difference, 13% [95% CI, 6%-21%]; $P < .001$). In multivariable models adjusting for age, sex, and level of social support, COVID-19 ARDS was significantly associated with increased risk of PTSD-related symptoms in family members (odds ratio, 2.05 [95% CI, 1.30 to 3.23]).

CONCLUSIONS AND RELEVANCE Among family members of patients hospitalized in the ICU with ARDS, COVID-19 disease, as compared with other causes of ARDS, was significantly associated with increased risk of symptoms of PTSD at 90 days after ICU discharge.

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Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: Elie Azoulay, MD, PhD, Médecine Intensive et Réanimation, APHP, Hôpital Saint-Louis, Paris University, 1 Avenue Claude Vellefaux, 75010 Paris, France (elie.azoulay@aphp.fr).

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Among hospitalized patients with COVID-19, 1 in 5 require intensive care, often leading to physical, cognitive, and psychiatric symptoms among survivors.[1-3] Family members of patients with acute respiratory distress syndrome (ARDS) also experience an increased psychological burden,[4,5] including posttraumatic stress disorder (PTSD), anxiety, and depression. Yet, little is known about the specific experience of COVID-19 on family members' mental health.[6,7]

There are multiple mechanisms by which the intensive care experience during the pandemic could exacerbate the psychological outcomes of family members of patients with COVID-19. First, restricted or forbidden family visitation may have created new disruptions in the lives of patients and family members. Second, when visitation is possible, personal protective equipment may create barriers to effective communication between family members and their loved ones. Third, family members may experience fewer contacts with physicians, potentially affecting communication and trust. Fourth, survivors of COVID-19 intensive care may have a substantial care burden on families, compounded by pandemic-related societal factors such as financial insecurity, social distancing, or risk of job loss.[5,8]

To address this knowledge gap, a prospective multicenter study was conducted in 23 intensive care units (ICUs) in France to determine the risk-adjusted association between hospitalization with COVID-19 ARDS and symptoms of PTSD in family members compared with hospitalization for ARDS of other causes.

Key Points

Question Is the risk of posttraumatic stress disorder (PTSD) symptoms in family members of intensive care unit (ICU) patients with acute respiratory distress syndrome (ARDS) due to COVID-19 different from that of family members of patients with non–COVID-19 ARDS?

Findings In a prospective cohort study of 517 family members of ICU patients, PTSD-related symptoms at 90 days after ICU discharge were significantly more common in family members of patients with COVID-19 ARDS compared with non–COVID-19 ARDS (35% vs 19%). In a multivariable analysis adjusting for age, sex, and level of social support, COVID-19 ARDS was independently associated with PTSD-related symptoms in family members (odds ratio, 2.05).

Meaning ARDS due to COVID-19 was associated with a greater risk-adjusted rate of PTSD symptoms among family members compared with ARDS from other causes.

Methods

Participants

This study was conducted in 23 ICUs in France between January 2020 and October 2020. All of the ICUs are members of the FAMIREA study group—a multidisciplinary research network focused on understanding and improving the experience of family members of ICU patients.[9] Each participating ICU included 1 family member per adult patient admitted between January 2020 and June 2020 for ARDS requiring noninvasive ventilation, high-flow nasal oxygen, or endotracheal mechanical ventilation. All patients had a history of acute hypoxemic respiratory failure within 1 week of a known illness onset (ie, COVID-19, community-acquired pneumonia, or influenza), with a ratio of partial pressure of arterial oxygen to fraction of inspired oxygen (Pao_2/Fio_2) of less than 300 and bilateral opacities on chest radiograph not fully explained by cardiac failure or fluid overload. The family member included for each patient was the adult family member most involved in the patient's ICU stay. Family members of patients who died in the ICU were also invited to participate. When competent, patients were also included. The *CPP Sud Méditerranée* ethics committee approved this study in March 2020 (#2020-A00809-30; CNRIPH: 20.03.27.73019). Oral informed consent was obtained from all family members and patients.

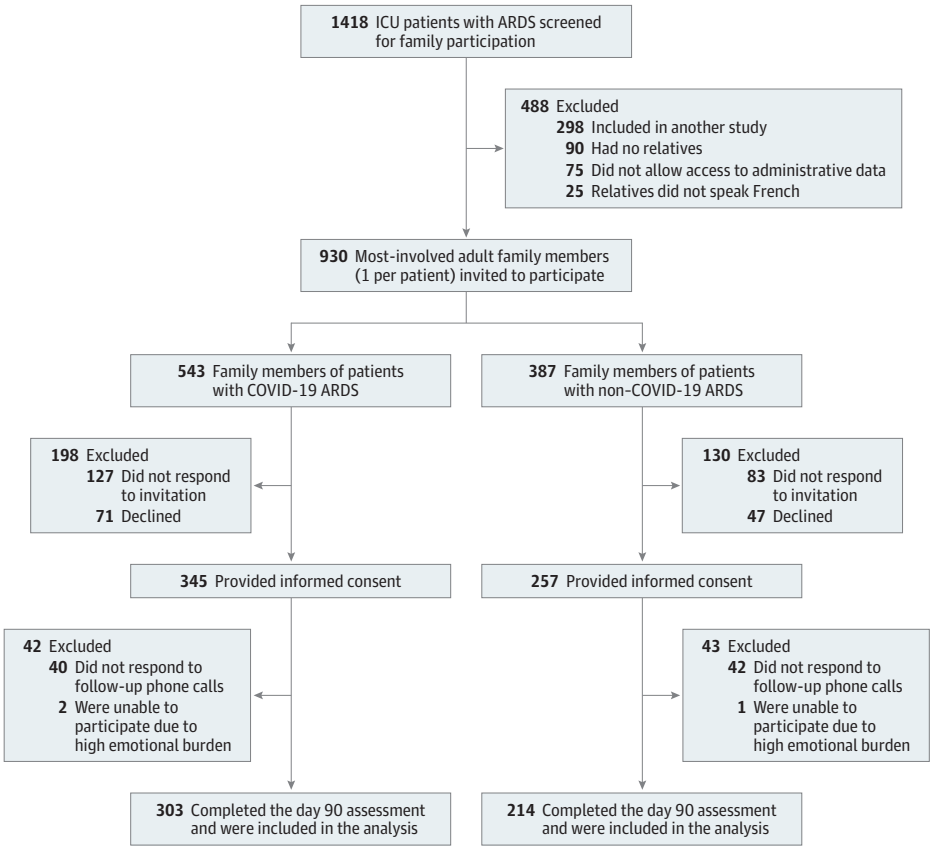
Study Procedures

Prior to the COVID-19 pandemic, the participating ICUs generally had a policy of unrestricted family visits, a routine family conference in a dedicated room soon after patient admission, and a routine end-of-life family conference for patients expected to die. Due to concern about SARS-CoV-2 transmission and staff shortages due to patient surge, these measures were altered based on institutional request to prohibit any family visit to the ICU unless the patient was dying.

Eligible family members and patients were contacted by post and telephone by 2 psychologists to obtain consent to participate in a telephone interview aimed at assessing their physical, mental, and emotional well-being and the potential burden generated by the ICU experience. Contact with participants occurred at least 1 month after ICU discharge. During this discussion and when respondents provided consent, a date was fixed for the research call, calculated at 90 (±) days after ICU discharge. Patients and family members who did not answer the first research call at day 90 were called again on different days and at different times. After 10 unsuccessful attempts, the person was considered lost to follow-up.

All interviews were conducted by 2 trained clinical psychologists supervised by a research nurse with extensive interviewing experience. During the telephone interviews, the patients and family members completed the Impact of Event Scale Revised (IES-R) to assess PTSD-related symptoms,[10] the Hospital Anxiety and Depression Scale (HADS),[11] and a questionnaire describing their experience during the patient's ICU hospitalization. The patients completed the IES-R and the HADS, as well as the 36-Item Short Form Health Survey (SF-36) to assess health-related quality of life.[12] The IES-R is not a tool for diagnosing PTSD but instead detects symptoms indicating a risk of PTSD (score range, 0-88 [>22 indicates the presence of PTSD-related symptoms that are of clinical concern]; minimal clinically important difference, 0.2). The HADS has a 7-item subscale for anxiety and a separate one for depression, with a score of 7 or greater on a 21-point scale indicating symptoms of anxiety or depression.[13] The SF-36 is a well-documented tool[12] that produces a Physical Component Summary (PCS) and Mental Component Summary (MCS) (score range, 0-100 with higher scores indicating better quality of life).

Figure 1. Screening and Selection of Family Member Cohorts for the Study



ARDS indicates acute respiratory distress syndrome; ICU, intensive care unit.

Each family member's characteristics and their experience in the ICU were also collected during the day 90 telephone interview, including their perception of the quality of the information provided and symptoms control and their feelings of loneliness, distress, and about how much they could contribute to the patient's well-being and comfort. In addition, visual analog scales (range, 0-10) were used to assess the intensity of unidimensional measures such as quality of the information provided, clinicians' behaviors, symptom control, feelings of loneliness or distress, and contribution to patient's well-being.

The patients were divided into 2 groups depending on whether the cause of ARDS was COVID-19–related or not (eFigure 1 and eFigure 2 in the Supplement). All the patients with COVID-19 ARDS had a positive reverse transcriptase-polymerase chain reaction for SARS-CoV-2 from upper or lower respiratory tract samples. Patients' characteristics were obtained from the medical files and entered into an electronic case-report form.

Outcomes

The primary study population was the family members. The primary outcome was the prevalence of PTSD-related symptoms among family members assessed by the IES-R.

The 2 secondary outcomes in family members were the prevalence of symptoms of anxiety and depression measured using the HADS symptom score (HADS; score range, 0 [best] to 42 [worst]; minimal clinically important difference, 1.5). The presence of symptoms of anxiety and depression were defined by a HADS anxiety subscale of 7 or greater and/or a HADS depression subscale of 7 or greater.

In ARDS survivors, symptoms of PTSD, anxiety, and depression were also assessed. Quality of life was assessed using norm-based measurements of the SF-36 (mean [SD], 50 [10]), after standardization using reference values for the French population subscores. Physical and mental SF-36 aggregate components (ie, PCS and MCS) were computed as recommended[14] and expressed on a normalized scale centered on 50 (representing the French population norm). Missing data in the individual SF-36 questions were imputed using the personal mean score approach.[15]

Statistical Analysis

Continuous variables are summarized as medians and IQRs and categorical variables as counts and percentages. Differences between COVID-19 and non-COVID-19 groups were assessed with the use of the Wilcoxon rank sum test for quantitative variables and the Fisher exact test for qualitative variables. The IES-R (cutoff 22),[16] anxiety subscale of the HADS (cutoff 7), and depression subscale of the HADS (cutoff 7) were dichotomized at specific thresholds for the presence of symptoms of PTSD, anxiety, and depression.[11] Correlations between PTSD,

Table 1. Family Member and Intensive Care Unit Stay Characteristics in a Study Evaluating Posttraumatic Stress in Family Members of Critically Ill Hospitalized Patients With ARDS[a]

Demographics	COVID-19, No. (%)[b]	
	Yes (n =303)[c]	No (n = 214)[c]
Women	224/300 (75)	144/213 (68)
Men	76/300 (25)	69/213 (32)
Age, median (IQR) [No.], y	50 (39-61) [294]	55 (43-66) [204]
Spouses of ICU patients	149/300 (50)	99/210 (47)
Unemployed	18/299 (6)	28 (13)
Medication history, daily intake[d]		
Medication	90/299 (30)	92/213 (43)
Anxiolytics	28/298 (9)	22/211 (10)
Characteristics of ICU stay		
Date of ICU admission, median (IQR)	April 13, 2020 (February 11-March 24)	March 3, 2020 (January 30-April 4)
Were allowed to be present during ICU admission	104/298 (35)	176/199 (88)
Could visit patient in the ICU	106/299 (35)	190 (89)
Tools used to remotely interact with the patient		
Telephone	106/300 (35)	85/203 (42)
Videoconferencing	27/300 (9)	2/203 (1)
Other[e]	15/300 (5)	6/203 (3)
None	152/300 (51)	110/203 (54)
Physicians and nurses wore personal protective equipment[f]	230/300 (77)	115/213 (54)
Information was provided[g]		
By incoming phone call	254/300 (84)	47/203 (20)
Family members called the ICU nurse	154/300 (51)	94/203 (46)
Family members called the ICU physician	117/300 (39)	48/203 (20)
During visits in the ICU	61/300 (20)	176/203 (87)
Family members' assessments (self-ratings) at day 90, median (IQR) [No.][h]		
Felt shunned by ICU physicians and nurses	1 (1-2) [205]	1 (1-1) [152]
Quality of the information provided during the whole ICU stay	8 (6-9) [299]	8 (7-10) [210]
Social support during the ICU stay	10 (8-10) [299]	9 (8-10) [n = 214]
Clinician's ability to deliver family-centered care during the ICU stay	9 (7-10) [297]	9 (8-10) [210]
Symptom control in patients during the ICU stay	9 (8-10) [241]	10 (9-10) [205]
Felt loneliness during the ICU stay	6 (1-10) [299]	1 (1-6) [212]
Felt distress during the ICU stay	10 (8-10) [299]	7 (5-10) [212]
Family member's contribution to patient's well-being and comfort during the ICU stay	7 (2-9) [205]	9 (7-10) [153]

Abbreviations: ARDS, acute respiratory distress syndrome; ICU, intensive care unit.

[a] Patient's characteristics are shown in eTable 3 in the Supplement.

[b] Values are reported as No. (%) unless otherwise indicated.

[c] For each patient, 1 family member was included.

[d] Indicates daily medication and anxiolytic intake at time of interview based on family member self-report. Any medication was included in daily medication. Anxiolytics were assessed by category (eg, "Do you take any medications for anxiety or nervousness?").

[e] Indicates various social media tools and apps.

[f] Participating ICUs generally required personal protective equipment consisting of a bodysuit, gloves, safety glasses, hat, and masks; however, details for each situation were not available, and there may have been some differences based on site or patient.

[g] Information could be provided by more than 1 method, and therefore, totals sum to more than 100%.

[h] Visual analog scales were used by family members to assess the intensity of unidimensional measures (score range, 0 [no symptom/lowest rating] to 10 [the most intense symptom/highest rating]).

anxiety, and depression scores in the patients and family members were assessed using Pearson correlation coefficients with 95% CIs.

To determine the association between COVID-19 status and outcomes, multivariable logistic regression models were used along with a LASSO penalty.[17] Variables included as confounders were as follows: (1) those known to be associated with the family experience; (2) those associated with an outcome with a *P* value less than .10; and (3) those with less than 20% missing data. For each outcome, the model selection involved the following steps: (1) 10-fold cross-validation to determine the λ value of the LASSO; (2) selection of the λ giving the most regularized model such that the cross-validated error is within 1 standard error of the minimum; and (3) application of the LASSO logistic regression model to obtain a set of variables associated with each outcome. COVID-19 status and all variables with a non-null coefficient in the latter model were included in the final model and calibration was measured using Hosmer-Lemeshow goodness-of-fit test.[18] Coefficients and odds ratios (ORs) with their 95% CIs are presented.

Several sensitivity analyses were performed. First, a random-effects model was used to account for site. Second, to account for missing data,[19] multiple imputation with chained equations was used to create 20 imputed data sets. Imputation models included all a priori potential confounders and the 3 outcomes of interest, and final model estimates were combined using Rubin rules.[20] Third, a different IES-R cutoff (IES-R score >26) was used.

Statistical tests were not adjusted for multiple comparisons. Because of the potential for type I error due to multiple comparisons, the findings for analyses of secondary end points should be interpreted as exploratory. All reported *P* values are

Table 2. 90-Day Outcomes in 517 Family Members of Patients With Respiratory Distress Hospitalized in the Intensive Care Unit[a]

	ARDS, No. (%)		Difference, mean or proportion (95% CI)	*P* value
	COVID-19–associated	Non–COVID-19–associated		
Family members, No.	303	214		
Primary end point				
IES-R score, median (IQR)[b]	15 [5-29]	9 [3-19]	6.4 (3.7-9.1)	<.001
Family members with PTSD-related symptoms, No./total (%)[b]	103/293 (35)	40/211 (19)	16% (8.0-24.0)	<.001
Secondary end points				
HADS anxiety subscale score, median (IQR)	5 [3-9]	5 [2-8]	0.9 (0.1-1.7)	.08
Family members with symptoms of anxiety, No./total (%)[c]	121/294 (41)	70/207 (34)	8% (0-16)	.05
HADS depression subscale score, median (IQR)	3 [1-8]	2 [1-5]	1.4 (0.6-2.2)	.02
Family members with symptoms of depression, No./total (%)[c]	91/291 (31)	37/209 (18)	13% (6-21)	<.001

Abbreviations: ARDS, acute respiratory distress syndrome; HADS, Hospital Anxiety and Depression Scale; IES-R, Impact of Event Scale Revised; PTSD, posttraumatic stress disorder.

[a] A sensitivity analysis of the differences between family members of COVID-19 and non–COVID-19 groups that analyzed a set of data after imputation of missing variables is reported in eTable 7 in the Supplement.

[b] The primary end point was the presence of PTSD-related symptoms as indicated by the proportion of family members with an IES-R score greater than 22. The IES-R assesses the subjective distress of a traumatic event using 22 self-reported items rated from 0 (not at all) to 4 (extremely), yielding a total score range of 0 to 88, with higher scores indicating greater distress.

[c] Symptoms of anxiety and depression were measured using the HADS symptom score which uses 14 self-reported items (7 for depression and 7 for anxiety) to produce a total score ranging from 0 to 42 with the subscales for depression and anxiety ranging from 0 (least) to 21 (most). Anxiety or depression were each considered present at a score of 7 or greater on the respective subscale.

2-sided; a *P* value of less than .05 was considered statistically significant. All analyses were performed using R version 4.0.4 (http://www.R-project.org/).

Results

Among the 1418 patients with ARDS at 23 participating ICUs (eTable 1 in the Supplement), 930 patients and family members were screened for eligibility. Among them, 307 patients (33%) and 602 family members (65%) provided informed consent for study participation. The primary reasons for noninclusion were lack of family response to the invitation or follow-up phone call to participate in the study (n = 292 [31%]) and family declining study participation (n = 118 [13%]). Among ARDS survivors, 23% declined study participation (**Figure 1**; eFigure 2 in the Supplement).

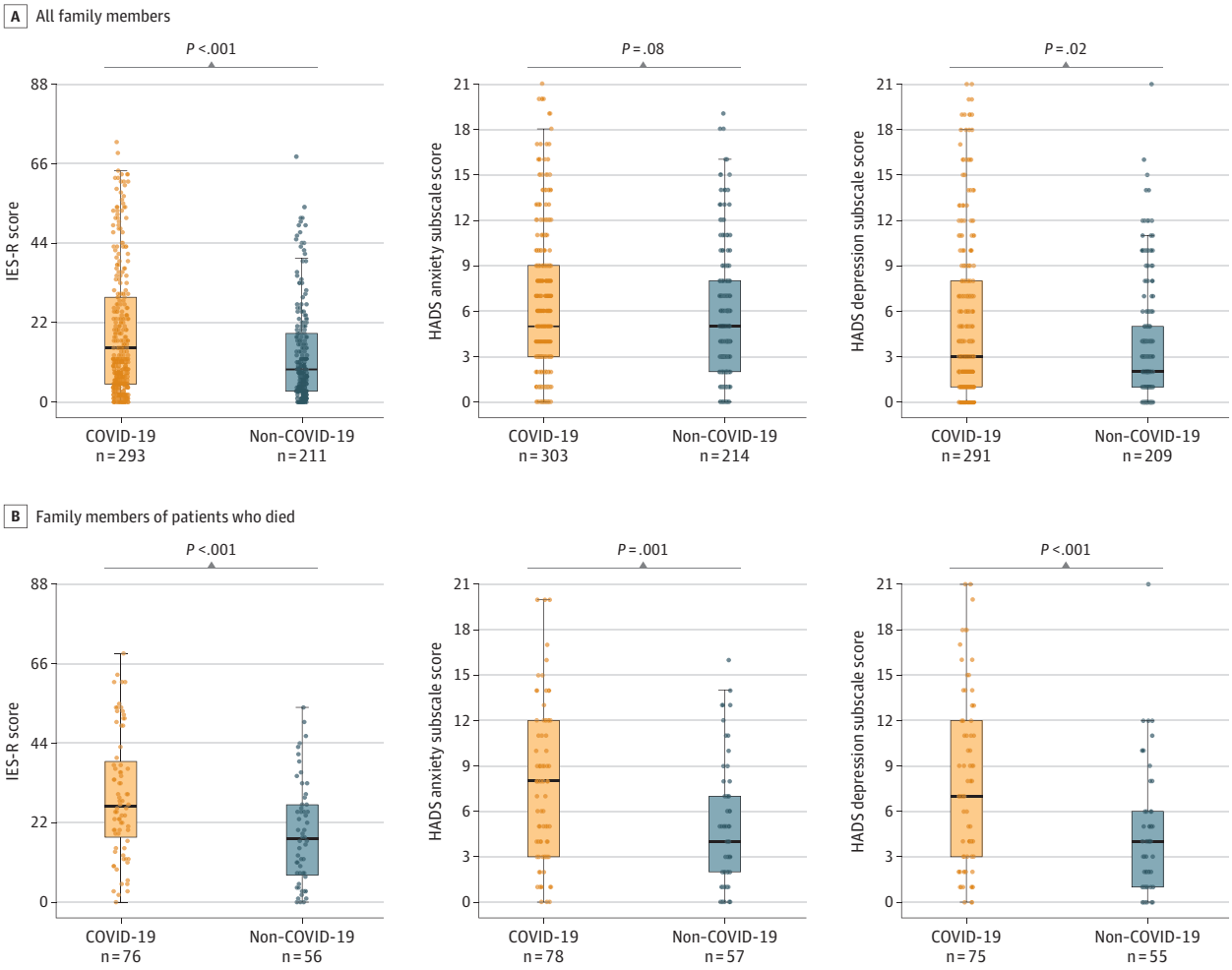
Family Members and Prevalence of Symptoms of PTSD, Anxiety, and Depression

Among the 602 participating family members, 517 (86%) completed the telephone interview (n = 303 in the COVID-19 group and n = 214 in the non–COVID-19 group) (Figure 1). Telephone assessments occurred at a median 112 days after ICU discharge (IQR, 90-147 days). On average, family members in the COVID-19 group were younger (median age, 50 vs 55 years), reportedly were less frequently allowed to visit the ICU (35% vs 88%), and more commonly received patient information by telephone call (84% vs 20%) compared with family members of non–COVID-19 ARDS patients (**Table 1**). Family members in the COVID-19 group self-rated (visual analog scale score range, 1 [no symptoms] to 10 [most intense symptoms]) more intense feelings of loneliness during the ICU stay (6 [1-10] vs 1 [1-6]) and distress (10 [8-10] vs 7 [5-10]) compared with family members of the non–COVID-19 group.

Among the 517 family members who completed interviews after ICU discharge, 143 (28%) exhibited symptoms of PTSD (**Table 2**; **Figure 2**). PTSD symptoms were significantly more common in family members of patients with COVID-19 than in those with non–COVID-19 ARDS (35% [103/293] vs 19% [40/211]; difference, 16% [95% CI, 8% to 24%]; $P < .001$). For anxiety, the occurrence of symptoms was significantly higher in the COVID-19 vs the non–COVID-19 group (41% [121/294] vs 34% [70/207]; difference, 8% [95% CI, 0% to 16%]; $P = .05$), and the occurrence of symptoms for depression were also higher in the COVID-19 group (31% [91/291] vs 18% [37/209]; difference, 13% [95% CI, 6% to 21%]; $P < .001$) (Table 2).

Among family members, 26% (135/517) of their relatives in this study died before the day-90 assessment (eTable 2 in the Supplement), and proportions were similar for patients with and without COVID-19 (difference, −1% [95% CI, −8% to 7%]; $P = .92$). The prevalence of symptoms of PTSD was significantly higher among the bereaved family members of patients who died from COVID-19 compared with non–COVID-19 ARDS (63% vs 39%; difference, 24% [95% CI, 7% to 40%]; $P = .008$) (Figure 2 and eTable 2 in the Supplement). In the COVID-19 group, significantly fewer family members reported having attended the funeral (77% vs 91%; difference, −14% [95% CI, −26% to −1%]; $P = .04$), and more family members reported that the funeral did not occur as they expected (57% vs 4%; difference, 53% [95% CI, 41% to 65%]; $P < .001$). Among bereaved family members, symptoms were also more common in family members of the COVID-19-group than in the non–COVID-19 group for anxiety (55% vs 32%; difference, 23% [95% CI, 7% to 39%]; $P = .009$) and for depression (55% vs 20%; difference, 35% [95% CI, 18% to 49%]; $P < .001$) (eTable 2 in the Supplement).

Figure 2. Symptoms of Posttraumatic Stress Disorder, Anxiety, and Depression in Family Members of Patients With COVID-19 ARDS vs Non–COVID-19 ARDS



Posttraumatic stress disorder (PTSD) symptoms were measured using the Impact of Event Scale Revised (IES-R; score range, 0 [best] to 88 [worst]; minimal clinically important difference, 0.2; sample sizes, n = 271 for the COVID-19 group and 198 for the non–COVID-19 group). Symptoms of anxiety and depression were measured using the Hospital Anxiety and Depression Scale (HADS) anxiety and depression subscales (score range for each, 0 [best] to 42 [worst]; minimal clinically important difference, 1.5; anxiety or depression considered present with a score of ≥7 [sample sizes for anxiety, n = 294 for the COVID-19 group and n = 207 for the non–COVID-19 group; sample sizes for depression, n = 291 for the COVID-19 group and n = 209 for the non–COVID-19 group]). Data are reported as median (solid horizontal lines) IQR (vertical height of boxes) scores, and the whiskers extend to the most extreme data point, which is no more than 1.5 times the IQR.

Factors Associated With PTSD Symptoms in Family Members of ARDS Patients

In multivariable models (**Figure 3**), COVID-19 ARDS was significantly associated with increased risk of PTSD-related symptoms in family members (OR, 2.05 [95% CI, 1.30 to 3.23]). Other factors independently associated with PTSD symptoms were male sex (OR, 0.39 [95% CI, 0.23 to 0.67]), age (OR, 0.83 per 10-year increase [95% CI, 0.72 to 0.96]), and level of social support (reported per additional point on a 10-point scale [0, extremely limited to 10, extremely effective] OR, 0.82 [95% CI, 0.74-0.90]).

Factors associated with anxiety included COVID-19 ARDS, age, male sex, and level of social support, while COVID-19 ARDS and level of social support were independently associated with depression ($P < .01$ for all, eTable 6 in the Supplement).

Sensitivity Analyses

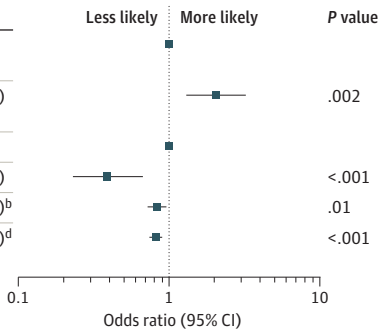
Multiple sensitivity analyses gave similar results (eTables 8-10 in the Supplement).The primary findings were not changed when accounting for site. When multiple imputation was used to account for missing data, COVID-19 ARDS remained significantly associated with greater odds of PTSD among family members (OR, 2.12 [95% CI, 1.37 to 3.27]) compared with non–COVID-19 ARDS. The primary findings were not changed in a model that used a cutoff of 26 for the IES-R.

Comparison Data Among ARDS Patients

Of the 307 surviving patients, 178 were admitted to the ICU for COVID-19 and 129 for non–COVID-19 ARDS (eTables 3 and 4 in the Supplement). Day 90 telephone interviews were completed by 273 (89%) patients (eFigure 2 in the Supplement).

Figure 3. Factors Independently Associated With the Presence of PTSD-Related Symptoms in Family Members of Patients With ARDS

Determinant	Univariate analysis of family members, No./total (%)[a]		Multivariable analysis of PTSD-related symptoms	
	With PTSD-related symptoms n = 143	Without PTSD-related symptoms n = 361	Difference (95% CI)	Odds ratio (95% CI)
Family member of a patient with non-COVID-19 ARDS	40/143 (28)	171/361 (47)		1 [Reference]
Family member of a patient with COVID-19 ARDS	103/143 (72)	190/361 (53)	19 (10 to 28)	2.05 (1.30 to 3.23)
Female family member	119/142 (84)	241/358 (67)		1 [Reference]
Male family member	23/142 (16)	117/358 (33)	-16 (-24 to -8)	0.39 (0.23 to 0.67)
Family member's age, median (IQR) y	47 [37-57]	52 [42-64]	-4.5 (-7.4 to -1.6)	0.83 (0.72 to 0.96)[b]
Level of social support[c]	9 [7-10]	10 [8-10]	-0.9 (-1.3 to -0.4)	0.82 (0.74 to 0.90)[d]



Variables considered for the LASSO step included sex, age, marital status, profession, and social support. For the Hosmer and Lemeshow goodness of fit test, $P = .26$. The sensitivity analyses took into account a center effect and another one that used a set of data after imputation of missing variables provided similar results and are reported in eTables 8 and 9 in the Supplement.

[a] Values are given according to posttraumatic stress disorder (PTSD) status, and values are reported as No./total (%) unless otherwise indicated.

[b] Indicates the odds ratio per 10-years increase.

[c] Level of social support was evaluated on a scale ranging from 0 (extremely limited) to 10 (extremely effective).

[d] Indicates the odds ratio per additional point of the social support scale.

Compared with non–COVID-19 ARDS, ICU survivors of COVID-19 ARDS had rates of symptoms that were not significantly different for PTSD (20% vs 15%; $P = .24$), anxiety (25% vs 35%; $P = .07$), or depression (22% vs 24%; $P = .65$). Neither the PCS nor the MCS SF-36 subscores were significantly different across the 2 groups (eFigures 3 and 4 in the Supplement). Compared with family members, ICU survivors reported fewer PTSD symptoms (eTable 5 in the Supplement; difference, 10% [95% CI, 4% to 16%]; $P = .001$), which were only weakly correlated (coefficient, 0.27 [95% CI, 0.14 to 0.39]).

Discussion

In a prospective cohort study in 23 ICUs in France, family members of patients with COVID-19 ARDS had a significantly higher prevalence of symptoms of PTSD, anxiety, and depression at 90 days after patients' discharge from the ICU than family members of patients with non–COVID-19 ARDS. In multivariable models adjusting for age, sex, and level of social support, COVID-19 ARDS was significantly associated with increased risk of PTSD-related symptoms in family members.

Prior research has demonstrated that hospitalization with ARDS is associated with a greater risk of patients and family members experiencing post-ICU psychological burden.[4,5,21,22] This study extends prior findings to show that the level of social support was associated with PTSD symptoms. There are many potential explanations for these findings including the need to comply with strict isolation measures to prevent viral transmission and the strain put on ICU staff due to the surge in patient numbers caused by the pandemic. When ICUs are perceived as closed departments, visitors may feel unwelcome, and these closed ICUs can generate stress and symptoms of anxiety, depression, or PTSD in the family members.[23]

These findings are consistent with other research. In a 2019 cross-sectional study of families of patients who required mechanical ventilation for more than 3 days, 65% of family members were at risk for anxiety, 76% for depression, and 68% for PTSD.[24] A survey study conducted in The Netherlands showed that individuals who had experienced a non–COVID-19-related loss within the past 5 months experienced more severe acute grief during the pandemic than before.[25] In the present study, the 62% prevalence of PTSD in bereaved family members of patients who died from COVID-19 was nearly twice as high than the 35% found in family members of survivors. The disruption produced by the pandemic may have adversely affected the post-ICU outcomes. For instance, depending on the group, 27% to 40% of family members were unable to say goodbye to their dying relative, a ritual that plays a key role in promoting healthy grieving.[8] Similarly, more bereaved family members in the COVID-19 group than in the non–COVID-19 group failed to attend the funeral, possibly due to concerns over transmitting the virus.

Perceived social support during the ICU stay was an important factor associated with family outcomes. Social support is the subjective perception of the extent to which family, friends, and other network members, as well as mental health specialists, are available and helpful. In a survey of 898 patients hospitalized with COVID-19 in China, poorer perceived social support was associated with anxiety, depression, and PTSD.[26] Interventions to improve well-being after traumatic events are warranted.[27]

Limitations

This study has several limitations. First, the patients were admitted during early 2020 in France. The results may not apply to subsequent seasons or to the resilience of family members later in the pandemic.

Second, all participating ICUs belonged to a research network with extensive experience investigating and improving family care in the ICU. These results may not apply to ICUs that do not place a strong focus on family care.

Third, all the participating hospitals are in France; this may limit generalizability of participants and results to countries that have different ICU staffing, COVID-related census, and cultural approaches to critical illness and death. However, this is mitigated to some extent by the inclusion of both university-affiliated and non-university-affiliated hospitals and the high consent rate and follow-up participation by family members.[8,28]

Fourth, not all the patients may have met the strict consensus criteria for ARDS. However, all patients had acute hypoxemic respiratory failure within 7 days, a Pao_2/Fio_2 ratio of less than 300, and bilateral opacities on chest radiography not fully explained by cardiac failure or fluid overload. Intubation rates were also similar comparing COVID-19 with non-COVID-19 patients.

Fifth, ICU clinical staff did not participate in the study, and they may have contributed to differential experiences of patients and family members after intensive care.

Conclusions

Among family members of patients hospitalized in the ICU with ARDS, COVID-19 disease, as compared with other causes of ARDS, was significantly associated with increased risk of symptoms of PTSD at 90 days after ICU discharge.

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Author Affiliations: Famirea Study Group, Medical Intensive Care Unit, APHP, Saint Louis University Hospital, Paris, France (Azoulay, Souppart, Kentish-Barnes); Clinical Research Unit, APHP, Saint Louis University Hospital, Paris, France (Resche-Rigon, Biard); Medical Intensive Care Unit, APHP, Lariboisière University Hospital, Paris, France (Megarbane); Medical-Surgical Intensive Care Unit, CH Sud Francilien, Corbeil, France (Reuter); Medical-Surgical Intensive Care Unit, APHP, Tenon University Hospital, Paris, France (Labbé); Medical Intensive Care Unit, Cochin University Hospital, APHP, Centre – Université de Paris, Paris, France (Cariou); Medical-Surgical Intensive Care Unit, APHP, Ambroise Paré University Hospital, Boulogne, France (Géri); Medical-Surgical Intensive Care Unit, APHP, Avicenne University Hospital, Bobigny, France (Van der Meersch); Medical Intensive Care Unit, Angers Teaching Hospital, Angers, France (Kouatchet); Medical Intensive Care Unit, Saint-André Hospital, Bordeaux, France (Guisset); Intensive Care Unit, André Mignot Hospital, Le Chesnay, France (Bruneel); Medical Intensive Care Unit, University Hospital Centre, Nantes, France. (Reignier); Medical Intensive Care Unit, La Source Hospital, CHR Orléans, Orléans, France (Barbier); Medical Intensive Care Department, Edouard Herriot Hospital, Hospices Civils de Lyon, Lyon, France (Argaud); Medical Intensive Care Department, University Hospital, Dijon, France (Quenot); Respiratory and Infectious Diseases Intensive Care Unit, APHM Hôpital Nord, Marseille, France (Papazian); Medical Intensive Care Unit, APHP, Saint-Antoine University Hospital, Paris, France (Guidet); Medical Intensive Care Unit, Saint-Etienne, University Hospital, Paris, France (Thiéry); Department of Intensive Care Medicine, Lapeyronie Hospital, Montpellier, France (Klouche); Medical-Surgical Intensive Care Unit, La Rochelle Hospital, La Rochelle, France (Lesieur); AP-HP, Groupe Hospitalier Universitaire APHP-Sorbonne Université, Pitié-Salpêtrière site, Service de Pneumologie, Médecine Intensive et Réanimation (Département R3S) and Sorbonne Université, INSERM, UMRS1158 Neurophysiologie Respiratoire Expérimentale et Clinique, F-75005 Paris, France (Demoule); Medical Intensive Care Unit, Le Mans Hospital, Le Mans, France (Guitton); Medical Intensive Care Unit, Besançon, University Hospital, Besançon, France (Capellier); Medical Intensive Care Unit, Reims University Hospital, Reims, France (Mourvillier); Psychiatry Department, Lariboisière Fernand-Widal University Hospital, Paris, France (Pochard).

Author Contributions: Drs Azoulay and Resche-Rigon had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Azoulay, Resche-Rigon, Geri, Quenot, Lesieur, Demoule, Guitton, Biard, Pochard, Kentish-Barnes.
Acquisition, analysis, or interpretation of data: Azoulay, Megarbane, Reuter, Labbé, Cariou, Geri, Van der Meersch, Kouatchet, Guisset, Bruneel, Reignier, Souppart, Barbier, Argaud, Quenot, Papazian, Guidet, Thiéry, Klouche, Lesieur, Demoule, Guitton, Capellier, Mourvillier, Biard, Pochard, Kentish-Barnes.
Drafting of the manuscript: Azoulay, Resche-Rigon, Quenot, Lesieur, Biard, Pochard, Kentish-Barnes.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Resche-Rigon, Lesieur, Demoule, Biard.
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Supervision: Azoulay, Guisset, Bruneel, Quenot, Guidet, Thiéry, Klouche, Lesieur, Guitton, Capellier, Mourvillier, Pochard, Kentish-Barnes.

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