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ORIGINAL ARTICLE

ICU healthcare staff reconnecting with families during Covid-19: The ICU-open project

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Summary
Background. — The coronavirus disease of 2019 (Covid-19) pandemic led to strict visitation restrictions in Intensive Care Units (ICUs), negatively impacting patients, families, and healthcare workers (HCWs). The ICU-open project is a phased approach to engage with ICU patients' families and reintroduce family visits during the Covid-19 pandemic. The ICU-open project embodies the unwavering commitment to a family-centred approach of the Cà Foncello-Treviso Hospital's ICU staff. The present work reports the perception of the project amongst HCWs and provides a snapshot of the psychological well-being of the ICU staff after the project.
Methodology. — The 120 ICU HCWs who participated in the project from May 2020 to June 2021 were invited to answer an online survey. It assessed demographic information, project-related variables, attitudes towards family- and patient-centred care, and psycho-social variables, using ad-hoc items and validated measures including the Generalized Anxiety Disorder-7, Patient Health Questionnaire-9, Moral Injury Events Scale, and Post-Traumatic Growth Inventory.
Results/discussion. — Ninety-two HCWs (72% nurses; 65.5% female) completed the survey. HCWs highly valued the ICU-open project for both themselves and patients' families. Positive perception of the project phases was associated with reduced levels of perceived moral transgressions. One-third of the participants reported moderate to severe levels of anxiety and depression, with notable post-traumatic growth observed in various dimensions.

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Conclusion/perspectives. — The ICU-open project was perceived very positively by the ICU staff and demonstrates the potential benefits of collaborative initiatives in alleviating the adverse impacts of family visitation restrictions in ICUs. The project may have prompted a positive reappraisal of events and coping mechanisms among HCWs, highlighting the significance placed on family involvement by ICU staff. It underscores the need for maintaining communication between ICU staff and patients' families during emergencies.

Introduction

In recent decades, international recommendations have increasingly emphasised the significance of permitting family access to Intensive Care Units (ICUs), aligning with existing empirical evidence illustrating the potential benefits of family presence. This includes documented improvements in patients' well-being, treatment compliance, communication dynamics, and the fostering of trust among patients, families, and healthcare professionals [1]. Family engagement and visitation in ICU are positively considered by healthcare workers (HCWs) [2—4] and have been proven to be associated with positive outcomes such as increased satisfaction in staff and families [2,5]. Additionally, they are widely recognised as integral components in delivering high-quality, patient- and family-centred care within ICUs [6] and are indicated as a key element by the ABCDEF bundle which represents the currently most used evidence-based guide to approach organisational changes to optimise ICU patient recovery and outcomes [7].

When in March 2020, the World Health Organization officially declared the coronavirus disease of 2019 (Covid-19) pandemic, hospitals worldwide adopted strict measures to prevent virus transmission. Consequently, families' visits were denied in all hospital wards, including the ICU where Covid-19 patients in critical condition were being treated.

Covid-19-related restrictions on family visits have been reported to result in negative consequences for patients and their families such as decreased comprehension and increased distress, complicated grief, poor coping, and reduced quality of life [8—12]. Negative consequences for HCWs also emerged, such as peritraumatic dissociation, moral distress, feelings of guilt, anxiety, depression, burnout, and compassion fatigue [9,13—16]. These detrimental consequences resulting from restrictions on ICU visits exacerbated the pre-existing and well-documented psychological distress that the Covid-19 pandemic generated in HCWs with depression, anxiety, and sleep disturbances being the most frequently reported symptoms among frontline HCWs [17].

Throughout the Covid-19 pandemic, the encouragement and strong endorsement of family visits were emphasised by national and international intensive care organisations [18].

When addressing in-person ICU visiting restrictions during the Covid-19 pandemic, much research has focused on exploring alternative solutions in the realm of virtual visiting and telecritical care [19—22]. Additionally, studies have emphasised the importance of establishing dedicated communication teams to support families of ICU patients, providing essential updates and emotional support during difficult times [19,23]. These investigations have highlighted the efficacy of virtual communication tools in facilitating interactions between patients, families, and healthcare providers, thus addressing the challenges posed by physical distancing requirements. Overall, benefits associated with virtual visits include reductions in patient psychological distress, reorientation of patients with delirium, improvements in staff morale, restoring a sense of family unit, and enabling sense-making for the family. As reported by Xyrichis et al. [20], while virtual visits presented emotional challenges for many family members, they also served as a cathartic experience, helping individuals understand and process their emotions and experiences by providing a visual connection to their loved ones in the ICU. Common barriers to the widespread adoption of virtual visiting include challenges related to limited staff time, and rapid implementation of and unfamiliarity with videoconferencing technology. Furthermore, the inability to communicate due to the patient's status and lack of touch and physical presence were mentioned as limitations of virtual visiting [21]. When asked about possible improvements, family members expressed a desire for on-demand access, improved communication with the care team, and effective scheduling processes [21].

Numerous studies suggest that when conducted with proper adherence to personal protective equipment protocols, visits to ICUs pose no substantial risk to the safety of patients, visitors, or HCWs [24]. In alignment with this guidance, we present an inspirational case carried out at CàFoncello-Treviso Hospital, situated in one of the earliest and most impacted Italian regions affected by Covid-19. This work reports the perception of the ''ICU-open'' initiative amongst ICU healthcare workers and provides an overview of the psychological well-being of ICU staff 17 months post the Covid-19 outbreak and 15 months into the implementation of the ''ICU-open'' project.

This work aims to foster reflection on the potential benefit of collaborative initiatives, such as the ''ICU-open'' project, in alleviating the adverse impact of family visitation restrictions on ICU HCWs. It underscores the importance and practicality of maintaining communication between ICU staff and patients' families during emergencies and pandemics.

The ICU-open project

From March 2020 to June 2021, the General Intensive Care Unit at CàFoncello-Treviso Hospital admitted and treated 360 Covid-19-positive patients during a period of suspended visitor access. Prompted by the steadfast demand from ICU healthcare staff to re-establish contact with families, a progressive stepwise initiative termed the ''ICU-open project'' was initiated. This project unfolded across three distinct phases (timeline in Fig. 1):

- phase one (April — August 2020): personalised story letters were sent to the bereaved families. These letters conveyed poignant accounts of patients' end-of-life experiences and included messages from the ICU staff, offering reassurance that their loved ones were provided with care and companionship in their final moments;
- phase 2 (November 2020): a designated morgue room was established to facilitate family members' last moments to bid farewell to their departed relatives;
- phase 3 (December 2020 — June 2021): the ICU welcomed families for visitation. Notably, between January and May 2021, a total of 70 families availed themselves of this opportunity to visit the Hospital's ICU.

The ICU-open project stemmed from the resolute advocacy of the ICU staff who collaborated closely with the hospital institution in a cohesive effort to design and execute the project through a collaborative process. This process unfolded through coordinated online meetings facilitated by the hospital's psychology unit. These sessions served as forums where ICU healthcare workers (HCWs) were encouraged to articulate their needs, emotions, and aspirations concerning the restrictions on family access to the ICU. As for phase 3 of the project, possible venues for reopening were brainstormed, and practical and emotional barriers and challenges were considered under the psychologist's supervision and assistance. Feasible solutions were deliberated upon and presented to hospital management and the legal department for discussion and approval. Once operational protocols were established, scheduled family visits were organised, with healthcare personnel providing support and guidance to family members wearing personal protective equipment. Throughout phase 3, regular meetings were conducted between the ICU healthcare staff, project coordinators, and hospital psychologists. These meetings addressed practical and organisational facets of the project and offered emotional and relational support. The project structure has been described more thoroughly elsewhere [25]. Approval for this initiative was obtained from the Institutional Review Board and the Ethical Committee of CàFoncello-Treviso Hospital.

Methods

After phase 3, the 120 HCWs who served in the ICU of the Hospital of CàFoncello-Treviso between May 2020 and June 2021 were invited to take part in the study via institutional email and were asked to fill in an online questionnaire aiming to investigate their psychological well-being and opinions about the ICU-open project. Informed consent was obtained electronically by all participants. Data were collected between June and July 2021.

Measures

The questionnaire included: socio-demographic (gender, age, and relationship status); occupational information (professional role, whether participants were regular ICU workers or reassigned to ICU during the pandemic); three ad hoc developed items investigating participants' engagement in each of the three project phases; six items about participants' perception of the benefit of each phase for themselves and for family members on a 5-point Likert scale (0 — not at all useful to 4 — extremely useful); three statements on a 5-point Likert scale (0 — completely disagree to 5 — completely agree) exploring participants' attitudes towards family- and patient-centred care in ICU. Furthermore, the Italian version of the Generalized Anxiety Disorder-7 (GAD-7) [26] and the Italian version of the Patient Health Questionnaire-9 (PHQ-9) [27,28] were included to measure anxiety and depression symptoms, respectively. The Italian translation of the 9-item Moral Injury Events Scale (MIES) [29] measured moral injury, that is, the psychological distress that arises from actions, or the lack thereof, that transgress an individual's moral or ethical beliefs and values [30]; while the 21-item Italian version of the Post-Traumatic Growth Inventory (PTGI) [31,32] assessed post-traumatic growth, that is the positive psychological changes that individuals may experience as a result of coping with and adapting to significant adversity or trauma [33]. These changes can include greater personal strength, a deeper appreciation of life, enhanced interpersonal relationships, spiritual growth, and a heightened sense of purpose or meaning, which are the 5 sub-scales of the PTGI. The wording of certain items of MIES and PTGI was altered to ensure that moral injury and post-traumatic growth were measured in the context of working during the pandemic. In particular, instructions of the PTGI were modified such that the original ''as a result of my crisis'' was replaced with ''as a result of working during the Covid-19 pandemic''. Similarly, the items of the MIES were evaluated considering the working experience during the Covid-19 emergency.

The following scores were used to categorise participants as being high on each symptom: GAD-7 $\geq$ 10 [34], PHQ-9 $\geq$ 10 [35], and PTGI $\geq$ 46 [36]. As no established cut-off scores exist for the MIES, we used an approach similar to Haight et al. [35], whereby participants with an average score above 3 (i.e., the least amount of disagreement with each item) were considered to have a high moral injury. All questionnaires yielded good internal consistency in this study, with the following Cronbach's alpha values: GAD-7 ($\alpha = 0.938$), PHQ-9 ($\alpha = 0.891$), MIES ($\alpha = 0.855$), and PTGI ($\alpha = 0.970$).

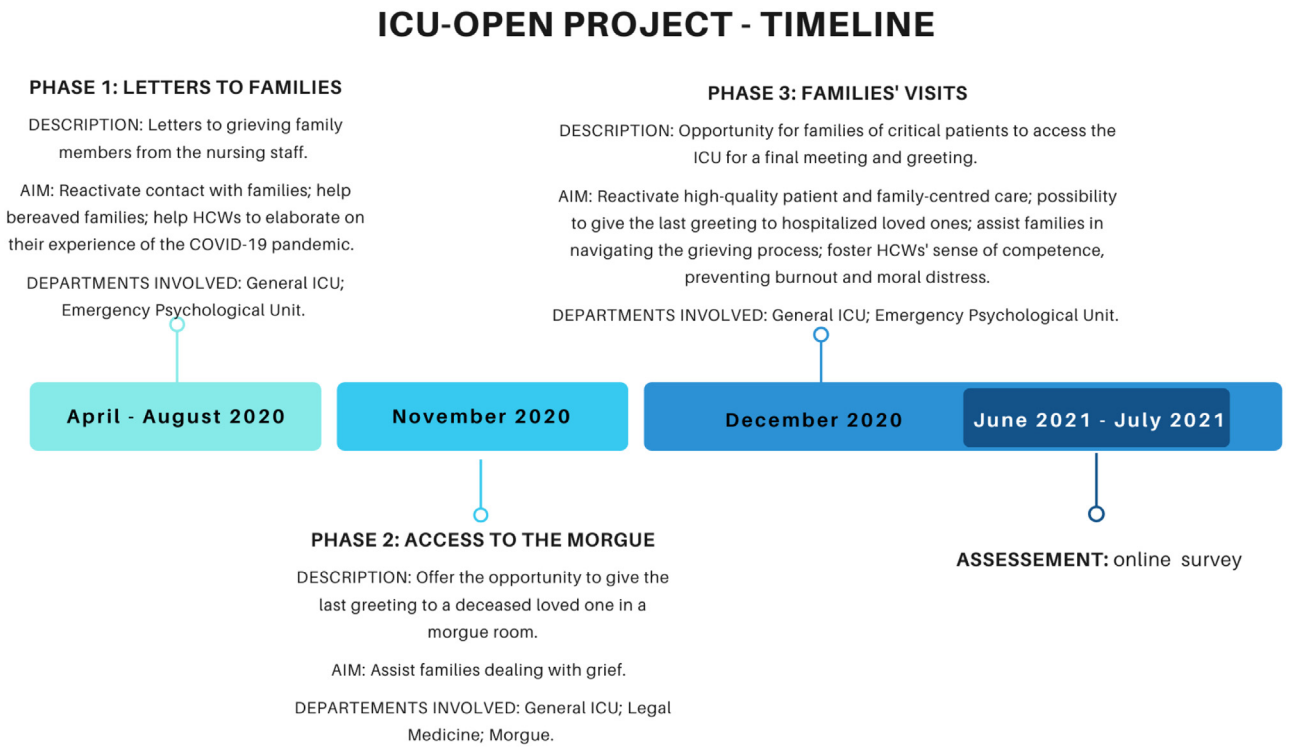

Figure 1. ICU-open project timeline.

Results

ICU HCWs' demographics, professional features, and perception of the project

Ninety-two healthcare professionals accepted to take part in the study and completed the online survey (response rate of 76.7%). Participants' demographics, professional features, attitudes towards patient-centred care in the ICU, and the ICU-open project-related variables are reported in Table 1. Participants found each of the three phases of the project highly useful for both patients' family members and themselves as HCWs. A Kruskal-Wallis H test indicated that there was a significant difference in the perception of the usefulness for families of the three project phases ($\chi^2(2) = 16.96$, $P < 0.001$) with a median score of 3.5 for phase 1 ($n = 70$), of 4 for phase 2 ($n = 68$), and of 4 for phase 3 ($n = 80$). Post-hoc Dunn's test using a Bonferroni corrected alpha of 0.017 indicated statistically significant differences in the usefulness-for-families scores between phase 1 and phase 2 ($P = 0.0072$) and between phase 1 and phase 3 ($P < 0.001$), but not between phase 2 and phase 3 ($P = 0.21$). As for the perception of the usefulness of the ICU-open project for HCWs, a Kruskal-Wallis H test indicated no significant difference in the perception of usefulness between the three phases of the project ($\chi^2(2) = 2.23$, $P = 0.329$), with a median score of 3.5 for phase 1, of 3 for phase 2, and of 4 for phase 3. When contrasting the perception of the value of the project by HCWs' level of involvement, a set of Kruskal-Wallis H tests pointed out that the distributions of usefulness perception scores were similar for all groups, and there was no statistically significant difference between groups for both usefulness for families (phase1 $\chi^2(3) = 1806$, $P = 0.619$; phase 2 $\chi^2(3) = 5375$, $P = 0.146$; phase 3 $\chi^2(3) = 4680$, $P = 0.197$) as well as for usefulness for HCWs (phase 1 $\chi^2(3) = 1916$, $P = 0.590$; phase 2 $\chi^2(3) = 5375$, $P = 0.146$; phase 3 $\chi^2(3) = 0.812$, $P = 0.847$).

A set of Mann-Whitney U tests explored whether active participation in a project phase affected the perception of its value. There is no statistically significant difference in the perceived usefulness of phase 1 for HCWs between HCWs actively engaged in the phase and those not involved, $U = 294.5$, $z = 0.042$, $P = 0.967$. A statistically significant difference emerged in the perception of usefulness for families of phase 1 with HCWs actively involved (mean rank = 41.26) scoring higher than those not actively involved (mean rank = 28.26), $U = 829$, $z = 2881$, $P = 0.004$. As for phase 2, no statistically significant difference emerged in perceived usefulness for HCWs ($U = 318$, $z = -0.151$, $P = 0.880$) as well as for families ($U = 537$, $z = 0.324$, $P = 0.746$) between actively and not actively involved HCWs. As for phase 3, HCWs actively involved reported a greater perception of the usefulness for families (mean rank = 43.02) than those HCWs who were not actively involved (mean rank = 32.10), $U = 628.5$, $z = 2399$, $P = 0.016$. No statistically significant difference in perceived usefulness for HCWs emerged ($U = 296.5$, $z = -1028$, $P = 0.304$).

Prevalence of distress symptoms, psychosocial variables, and associated factors

Psychological-related variables are reported in Table 2.

When looking at the association between variables, bivariate analyses highlighted a negative significant correlation between the moral injury dimension of perceived transgressions by others and the perceived benefit as a healthcare

Table 1 Participants' demographics, professional features, ICU project-related variables and attitudes towards patient-centred care in ICU ($n = 92$).

	n (%)
Age	44.28 ± 9.46 (25—62)
Gender	
Female	60 (65.2%)
Male	32 (34.8%)
Marital status	
Married/de facto with children	50 (54.3%)
Married/de facto no children	11 (12%)
Single/widow(er) with children	2 (2.2%)
Single/widow(er) no children	11 (12%)
Divorced with children	3 (3.3%)
In a relationship living alone	15 (16.3%)
Professional role	
Doctors and residents	9 (9.8%)
Nurses	67 (72.8%)
Auxiliary nurses and other	16 (17.4%)
Professional seniority	
1—5 years	15 (16.3%)
6—10 years	12 (13%)
11—15 years	14 (15.2%)
16—20 years	11 (12%)
≥ 21 years	40 (43.5%)
ICU experience	
Regular ICU worker	54 (58.7%)
No regular ICU worker	38 (41.3%)
Participation in phase 1 of the project — letters to the families	
I did not take an active part	51 (55.4%)
I took part	39 (42.4%)
Participation in phase 2 of the project — access to the morgue	
I did not take an active part	63 (68.5%)
I took part	24 (26.1%)
Participation in phase 3 of the project — families' visits	
I did not take an active part	26 (28.3%)
I took part	66 (71.7%)
Degree of involvement in the project	
Involved in all 3 phases of the project	15 (16.1%)
Involved in 2 phases of the project	24 (25.8%)
Involved in 1 phase of the project	36 (38.7%)
Not involved in any phase	18 (19.4%)
How useful/effective do you think the following project phases have been for family members (0 to 4)	
Letters to families (phase 1)	3.2 ± 0.97
Access to the morgue (phase 2)	3.57 ± 0.83
Family visits (phase 3)	3.7 ± 0.71
How useful/effective do you think the following project phases have been for you as a healthcare worker (0 to 4)	
Letters to families (phase 1)	3.13 ± 1.08
Access to the morgue (phase 2)	3.04 ± 1.2
Family visits (phase 3)	3.3 ± 1.05
Attitudes towards patient-centred care in ICU (0 to 4)	
In ICUs, the collaboration between family and healthcare personnel must be promoted	3.6 ± 0.61
There must be a continuous two-way exchange of information between family and healthcare professionals	3.62 ± 0.61
In ICUs, the collaboration between family and healthcare personnel must be promoted	3.36 ± 0.86

Table 2 Frequency and distribution of psychological variables in the study population ($n = 92$).

	Study sample ($n = 92$)
Generalized Anxiety Disorder-7 — GAD-7 (0 to 21)	7.86 ± 5.93
Low	62 (67.4%)
High	30 (32.6%)
Depression — PHQ-9 (0 to 23)	7.92 ± 6.22
Low	63(68.5%)
High	29 (31.5%)
Moral Injury Events Scale — MIES	
Transgression by other	5.48 ± 3.33
Transgression by self	6.16 ± 3.85
Betrayal	5.87 ± 3.29
Low	80 (85.11%)
High	14 (14.89%)
Post-Traumatic Growth Inventory — PTGI	
Relating to others	12.5 ± 9.59
New possibilities	9.61 ± 7.44
Personal strength	9 ± 6.13
Spiritual change	2.35 ± 2.71
Life appreciation	7.3 ± 4.39
Total PTG	40.75 ± 27.54
Low	50 (54.3%)
High	42 (45.7%)

worker of the phase 3 project (reopening ICU to family visit), r = —0.268, $P = 0.019$. For each of the dichotomised psychological distress symptoms, a set of point-biserial correlations and Cochran-Armitage tests of trend were run to explore associations with demographic, occupational, and project-related variables. No other significant correlation emerged.

Determinants of post-traumatic growth

A set of multiple regressions was run to explore the effect of demographic, professional, and psychological variables on PTG dimensions. In particular, we tested the effect of gender, age, experience in working in the ICU, level of anxiety and depression, and moral injury dimensions.

The regression models moderately predicted personal strength [$F(8, 83) = 3.87$, $P = 0.001$, adj.$R^2 = 0.20$] and new possibilities [$F(8, 83) = 3.46$, $P = 0.002$, adj.$R^2 = 0.18$] showing that greater PTG was associated with greater MIES-transgression by self and with being not a regular ICU worker.

As for the spiritual change dimension, the regression model statistically significantly predicted it [$F(8, 83) = 4.44$, $P < 0.001$, adj.$R^2 = 0.23$] with greater spiritual change being associated with higher levels of anxiety, greater MIES-transgression by self, lower MIES-transgression by other and with being older.

As for relating to others, the regression model was statistically significant [$F(8, 83) = 2.69$, $P = 0.011$, adj.$R^2 = 0.13$] with greater PTG being associated with greater MIES-transgression by self. Although only marginally greater life appreciation was associated with greater anxiety and with not being a regular ICU worker [$F(8, 83) = 4.10$, $P < 0.001$, adj.$R^2 = 0.21$]. Regression coefficients and standard errors are in Table 3.

Discussion

The objective of this study was to delineate the ICU healthcare staff's perception of the ''ICU-open'' project at Cà Foncello-Treviso Hospital, evaluating their psychological distress post the Covid-19 pandemic and following the conclusion of the ICU-open initiative.

Aligned with existing literature concerning the psychological impact of Covid-19 on frontline HCWs [15], findings indicated that one-third of participants reported moderate to severe levels of anxiety and depression, with approximately 15% reporting high levels of moral injury. Regarding post-traumatic growth (PTG), roughly 45% of participants reported high levels, significantly surpassing the 22% prevalence observed in a study among frontline healthcare workers in the United Kingdom [37]. Notably, the mean value among our HCWs was comparable to that reported in a population-based study in Canada and the United States of America [38]. Moreover, our analysis revealed an association between a positive perception of the benefits stemming from the reopening of the ICU to family visits during phase 3 and reduced levels of perceived moral transgressions (actions or behaviours that violate an individual's moral or ethical beliefs and values [30]) by others. The questionnaire items assessing patient- and family-centred attitudes revealed that CàFoncello-Treviso Hospital's ICU is notably committed to patient- and family-centric care. Within such an environment, the restrictions on family access to care wards may have greatly impacted the HCWs' professional and ethical mandate, potentially leading to moral injury linked to external agents. Phase 3 of the project appeared to be viewed as beneficial, potentially mitigating the perceived unfairness stemming from restricted family access. Given the strong support provided by the hospital management to realise the ICU-open project and, in particular, phase 3, it

Table 3 Multiple regression results for PTGI dimensions.

	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Relating to others							
Model						0.21	0.13*
Constant	−3.46	−16.17	9.24	6.39			
Gender	−.39	−4.46	3.67	2.05	−0.02		
Age	0.19	−0.030	0.40	0.11	0.18		
GAD-7	0.48	−0.07	1.03	0.28	0.30		
PHQ-9	−0.24	−0.77	0.29	0.27	−0.15		
MIES-transgression by other	−0.70	−1.51	0.11	0.41	−0.24		
MIES-transgression by self	1.02**	0.36	1.68	0.33	0.41**		
MIES-betrayal	−0.32	−1.07	0.44	0.38	−0.11		
ICU work history	4.13	−0.11	8.38	2.13	0.21		
New possibilities							
Model						0.25	0.18**
Constant	0.45	−9.12	10.04	4.82			
Gender	−0.94	−4.01	2.13	1.54	−0.06		
Age	0.08	−0.08	0.24	0.08	0.10		
GAD-7	0.20	−0.21	0.62	0.21	0.16		
PHQ-9	0.20	−0.20	0.60	0.20	0.16		
MIES-transgression by other	−0.32	−0.94	0.29	0.31	−0.14		
MIES-transgression by self	0.59*	0.09	1.08	0.25	0.30*		
MIES-betrayal	−0.49	−1.05	0.08	0.29	−0.21		
ICU work history	3.5	0.36	6.75	1.61	0.24*		
Personal strength							
Model						0.27	0.20**
Constant	−2.22	−9.99	5.55	3.91			
Gender	0.39	−2.10	2.88	1.25	0.03		
Age	0.09	−0.05	0.22	0.07	0.13		
GAD-7	0.29	−0.05	0.63	0.17	0.28		
PHQ-9	−0.02	−0.35	0.30	0.16	−0.02		
MIES-transgression by other	−0.36	−0.85	0.14	0.25	−0.19		
MIES-transgression by self	0.44*	0.03	0.84	0.20	0.27*		
MIES-betrayal	−0.28	−0.74	0.18	0.23	−0.15		
ICU work history	3.92**	1.33	6.52	1.30	0.32**		
Spiritual change							
Model	−3.12					0.3	0.23***
Constant		−6.49	0.24	1.7			
Gender	0.79	−0.29	1.86	0.54	0.14		
Age	0.07*	0.01	0.13	0.03	0.25*		
GAD-7	0.17*	0.03	0.32	0.07	0.38*		
PHQ-9	−0.04	−0.18	0.1	0.07	−0.10		
MIES-transgression by other	−0.25*	−0.46	−0.03	0.11	−0.30*		
MIES-transgression by self	0.21*	0.03	0.39	0.09	0.30*		
MIES-betrayal	−0.11	−0.31	0.09	0.10	−0.13		
ICU work history	0.51	−0.62	1.63	0.56	0.09		
Life appreciation							
Model						0.28	0.21***
Constant	1.66	−3.86	7.19	2.78			
Gender	0.35	−1.42	2.12	0.89	0.04		
Age	0.01	−0.08	0.10	0.05	0.02		
GAD-7	0.25*	0.01	0.49	0.12	0.34*		
PHQ-9	0.08	−0.15	0.32	0.12	0.12		
MIES-transgression by other	−0.10	−0.45	0.25	0.18	−0.07		
MIES-transgression by self	0.16	−0.12	0.45	0.14	0.14		

Table 3 (*Continued*)

	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
MIES-betrayal	−0.20	−0.53	0.13	0.16	−0.15		
ICU work history	1.9*	0.07	3.75	0.93	0.21*		

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

is plausible that the perceived benefits of this phase contributed to a decrease in perceived transgressions by external parties. As barriers to family visits were often of practical but also legal nature, the hospital management was responsible for enforcing the no-visiting policy. By having the hospital management working alongside them to find alternative solutions to facilitate daily visits, ICU staff may have perceived that external parties (the hospital organisation) were acting morally.

As for PTG in our sample, greater personal strength and new possibilities were moderately associated with a greater perception of moral and ethical violations by oneself. HCWs who perceived to have acted in ways that violated their moral values reported experiencing higher levels of PTG, feeling increased personal strength, and contemplating new possibilities in their lives.

It is plausible to speculate that involvement in the ICU-open project and participation in associated psychological support sessions may have facilitated the reassessment of perceived self-transgressions in a way that contributed to this observed phenomenon of PTG.

The study identified that being a non-regular ICU worker also correlated with higher levels of PTG, particularly in the dimensions of personal strength and new possibilities. These individuals, less acquainted with ICU procedures and the environment, might have experienced a sense of being ill-prepared compared to their more experienced colleagues when confronted with the demanding working conditions imposed by the Covid-19 pandemic. However, their successful navigation through these challenges potentially contributed to a significant enhancement of HCWs' self-confidence and personal capabilities. This newfound resilience likely facilitated the development of greater levels of personal strength and new possibility dimensions of PTG over the long term.

As for the spiritual change dimension of PTG, several factors were identified as associated contributors. These included older age, heightened anxiety levels, a self-reported increase in moral transgressions, and a lower perception of witnessed moral transgressions. The HCWs' struggles in facing the Covid-19 pandemic could have led to a strengthening of spiritual beliefs, especially for older staff and for those who experienced higher anxiety levels. Additionally, the inclination towards internal attribution of moral injury events (transgressions by self) as opposed to external attribution (transgressions by others) may characterise HCWs with heightened spiritual sensitivity or religious-oriented beliefs. Those who attribute moral transgressions internally might frequently employ coping strategies related to spirituality. Nurses (who represent 72% of our sample) have been reported to draw upon spirituality as a coping mechanism when faced with death [39]. Furthermore, morally injurious experiences are often interpreted and processed within a spiritual or religious framework [40].

The perception of having violated moral values emerged as a predictor of greater development in the relating to others dimension of PTG. HCWs who felt they had compromised their own moral or professional values during the Covid-19 pandemic reported placing increased importance on relationships. This aligns with existing research that underscores the significance of workplace and social support in facilitating self-forgiveness, moral healing, and subsequent PTG [38]. In other words, HCWs experiencing internal moral injury might seek reconnection with others to seek insight and support, benefiting from these social connections and resulting in greater relating to others PTG. Finally, a greater PTG in the life appreciation dimension was marginally associated with increased anxiety and being a non-regular ICU worker. This finding may be explained by considering that non-regular ICU HCWs, less accustomed to ICU procedures and less exposed to witnessing death compared to their colleagues, could have experienced a different perspective or appreciation for life due to their varied experiences within the ICU setting.

Conclusions

The response from ICU staff to the ICU-open project was extremely positive, showcasing the benefits of collaborative efforts in mitigating the negative effects of family visitation restrictions in ICUs. The ICU staff reported remarkable post-traumatic growth figures. Recognising the importance of family involvement to ICU staff, the ICU-open project likely encouraged HCWs to reassess events positively and adopt functional coping strategies. Indeed, the primary goal of the ICU-open project was to address the pressing demand of ICU staff for the resumption and maintenance of contact with patients' families, aiming to cultivate novel forms of human connection and care. This was achieved through initiatives such as sending personalised story letters to bereaved families, arranging dedicated family visits to the morgue, and facilitating supervised PPE family visits in the ICU. By facilitating these measures, the project sought to enhance problem-focused coping strategies among the ICU team generating alternative solutions to the no-

visitor policies. The ICU-open project also sought to assist ICU professionals in adjusting to a novel and highly stressful situation, potentially empowering them. Re-establishing contact between ICU staff and patients' families may have prompted HCWs to re-evaluate events positively, fostering constructive changes in their approach to adversity. The collaborative effort among various professional roles within the ICU, including psychologists and hospital management, was pivotal in shaping the strategies employed in the ICU-open project. This collective creative process wherein multiple stakeholders actively participate in the creation and refinement of healthcare practices or interventions holds the potential to enhance intervention acceptance, facilitate empowering processes, foster positive reinterpretation of distressing events, and serve as a platform for sharing experiences, needs, and concerns.

Compliance with ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Authorisation for this project was obtained by the Institutional Review Board of the Hospital of Treviso, Ca' Foncello. The Ethical Committee of the Hospital was informed and approved the project.

Human and animal rights

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individual participants included in the study.

Authors' contributions

Selena Russo: methodology, formal analysis, writing — original draft preparation, and visualization. Annalaura Ferrari: data curation, investigation, writing — original draft preparation, and visualization. Lorenza Menato: conceptualization, writing — reviewing and editing. Chiara Baldo: conceptualization, writing — reviewing and editing. Maria Grazia Strepparava: methodology, writing — original draft preparation. Mario Peta: conceptualization, supervision, writing — reviewing and editing. Alessandra Mauri: conceptualization, methodology, investigation, writing — original draft preparation and project administration.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) used the free version of *PaperPal* in order to check the manuscript for language issues before manuscript submission. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Disclosure of interest

The authors declare that they have no competing interest.

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