

Coronavirus Disease 2019 Immediately Increases Burnout Symptoms in ICU Professionals: A Longitudinal Cohort Study*

OBJECTIVES: ICU professionals are at risk of developing burnout due to coronavirus disease 2019. This study assesses the prevalence and incidence of burnout symptoms and moral distress in ICU professionals before and during the coronavirus disease 2019 crisis.

DESIGN: This is a longitudinal open cohort study.

SETTING: Five ICUs based in a single university medical center plus another adult ICU based on a separate teaching hospital in the Netherlands.

SUBJECTS: All ICU professionals were sent a baseline survey in October–December 2019 (252 respondents, response rate: 53%), and a follow-up survey was sent in May–June 2020 (233 respondents, response rate: 50%).

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: Burnout symptoms and moral distress measured with the Maslach Burnout Inventory and the Moral Distress Scale, respectively. The prevalence of burnout symptoms was 23.0% before coronavirus disease 2019 and 36.1% at postpeak time, with higher rates in nurses (38.0%) than in physicians (28.6%). Reversely, the incidence rate of new burnout cases among physicians was higher (26.7%) than nurses (21.9%). Higher prevalence of burnout symptoms was observed in the postpeak coronavirus disease 2019 period (odds ratio, 1.83; 95% CI, 1.32–2.53), for nurses (odds ratio, 1.77; 95% CI, 1.03–3.04), for professionals working overtime (odds ratio 2.11; 95% CI, 1.48–3.02), and for professionals directly engaged with care for coronavirus disease 2019 patients (odds ratio, 1.87; 95% CI, 1.35–2.60). Physicians were more likely than nurses to develop burnout symptoms due to coronavirus disease 2019 (odds ratio, 3.56; 95% CI, 1.06–12.21).

CONCLUSIONS: This study shows that overburdening of ICU professionals during an extended period of time leads to symptoms of burnout. Working long hours and under conditions of scarcity of staff, time, and resources comes at the price of ICU professionals' mental health.

KEY WORDS: burnout; coronavirus disease 2019; intensive care; moral distress; professional

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The catastrophic outbreak of the coronavirus disease 2019 (COVID-19) confronts ICUs worldwide. ICU professionals have been bearing additional psychologic and moral burdens due to the pandemic. They risk exposure to the virus, have concerns about infecting loved ones, face longer work hours, are involved in emotionally and ethically fraught decisions, and

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either have to adjust to shortages of resources and personnel (1, 2) or are subject to the continuous looming shortages of personal protective equipment (3, 4). Working in healthcare during the pandemic has been likened to running an arduous marathon (5).

Feelings of powerlessness, a lack of control, and being unable to help patients adequately have been identified as psychopathological symptoms (6–9). Such feelings are paradigmatic of moral distress (10–12) and are consistently associated with burnout symptoms (13). There is widespread concern that many healthcare professionals will have an even harder time coping with subsequent waves of COVID-19 patients and that those crisis would certainly lead them to become overworked or burned out (6). On the level of healthcare systems, this is a perilous state of affairs, as the pandemic is eating away at the workforce that is called upon to provide care and cure for those affected by it.

Cross-sectional studies already showed signs of the above. They depict that healthcare professionals that were engaged in direct diagnosis, treatment, or care of COVID-19 patients are at higher risk for adverse mental health outcomes (6–8). However, to our knowledge, there is as of yet no published before-after comparison of how burnout and moral distress have developed during and as an immediate result of the COVID-19 pandemic in the same cohort. This study has three aims: first, to estimate the prevalence and incidence of burnout symptoms in ICU professionals before and immediately after COVID-19; second, to assess how moral distress developed through time and how COVID-19 indirectly impacted burnout through moral distress; and third, to assess which respondent characteristics were associated with burnout and whether the impact of COVID-19 on burnout was different for physicians and nurses.

MATERIALS AND METHODS

Study Design and Setting

This is a longitudinal open cohort study using survey data collected in ICUs of a university medical center and a large teaching hospital in the Netherlands shortly before COVID-19 and postpeak COVID-19. Only professionals with an ICU employment contract received a survey. In the Netherlands, the number of COVID-19 patients on the ICU reached peak levels in early April. Baseline data were gathered in October–December

2019 and a follow-up survey was conducted in May–June 2020, a period called postpeak COVID-19. All professionals involved provided written informed consent. The setup of the study has been approved by the regional ethics committee region Arnhem-Nijmegen (2018-4346).

Outcome Measures and Data Collection

Burnout was measured using the validated Dutch translation of the Maslach Burnout Inventory (MBI). The MBI measures three components of burnout: emotional exhaustion, depersonalization, and personal accomplishment on 0–6 Likert scales ranging from never (0) to daily (6). The Dutch version of the MBI consists of 20 items, instead of the 22 items in the original version as a result of a factor analysis conducted by the translators (14). There are several methods to ascertain burnout. For this study, a commonly used cutoff score is applied to classify symptoms of burnout in respondents (MBI of > -9) (6, 15–20). After correcting for the two omitted items, this method is used to calculate the prevalence and incidence rates of burnout symptoms. Prevalence estimates are given at both times and incidence rates at postpeak time. Incidence rates were calculated by dividing the amount of new cases of burnout symptoms by the number of individuals who did not show any symptoms of burnout in the pre-COVID-19 period.

Moral distress was measured using the 21-item Moral Distress Scale (MDS) (21). Respondents rated the frequency and intensity of morally distressing events on 0–4 scales. A composite score for each item is calculated by multiplying frequency by intensity, resulting in 0–16 scales. These scales are presented on all 21 morally distressing events pre- and postpeak COVID-19.

Missing Data

Due to the open cohort design, new unique respondents replied to the follow-up survey, whereas there was also loss to follow-up. The percentage of missing data for respondent characteristics was less than 1.0%. At both times together, the percentage of missing data for items of moral distress ranged from an item with 4.1% missing data to one item with 6.6% missing data. If a respondent had missing datapoints, he/she was dropped from the analysis.

Data Analysis

To evaluate the difference between the burnout prevalences, pre- and postpeak COVID-19, differences between physicians and nurses, and whether physicians and nurses were differently impacted through time, generalized estimating equations (GEEs) were used in order to account for repeated measurements within one respondent. GEE is a common approach in panel data analysis, and analysis is conducted on the aggregate data of responses on multiple surveys by the same respondents. GEE takes into account that changes in a single respondent over time are correlated with each other. We analyzed the interaction between measurement time and profession to test whether COVID-19 had a different impact on physicians and nurses. We analyze respondent characteristics with univariate and multivariable GEEs. Situations that were significantly more morally distressing postpeak COVID-19, such as experiencing scarcity of time, resources, or staffing, were included in the multivariable GEE.

To evaluate the indirect effects of COVID-19 on burnout through moral distress, mediational analysis was performed using GEEs to first assess the association between time and the morally distressing event, and then the association between the morally distressing event and burnout controlled for time. Only morally distressing situations that became significantly “more” prevalent are selected for mediational analysis. If the associations between time and the morally distressing event and subsequently the morally distressing event and burnout were statistically significant—which indicates an indirect effect—the Sobel test was conducted to assess the significance of the indirect effect. Statistical significance is assumed for $p < 0.05$. Statistical analyses were performed using the SPSS Version 25 (IBM Corp., New York, NY).

RESULTS

The baseline survey was sent to 471 ICU professionals of whom 252 replied, resulting in a response rate of 53.3%. The follow-up survey was sent to 468 ICU professionals of whom 233 replied, leading to a response rate of 50.0%. There were 153 professionals who responded to both surveys and there were 332 unique respondents in the dataset. Sociodemographic characteristics of the respondents are reported in **Table 1**. Most respondents were engaged in direct diagnosis,

treatment, or care of COVID-19 patients (88.7%), whereas a small percentage was not.

Before COVID-19, 23.0% of the respondents ($n = 252$) had burnout symptoms. The overall burnout percentage increased to 36.0% immediately after the COVID-19 peak ($n = 233$). The overall incidence rate of new burnout cases post-COVID-19 was 22.9%.

TABLE 1.
Characteristics of Respondents in Both Study Periods

Variable	pre-COVID-19 ($n = 252$)	Postpeak COVID-19 ($n = 233$)
Sex, n (%)		
Male	66 (26.2)	65 (27.9)
Female	186 (73.8)	168 (72.1)
Profession, n (%)		
Physician	53 (21.0)	49 (21.0)
Nurse	199 (79.0)	184 (79.0)
Age (yr), mean (SD)	42.6 (11.5)	41.8 (10.7)
Job experience (yr), median (IQR)	10.0 (4.0–19.0)	9.0 (3.0–19.0)
Hospital, n (%)		
University medical center	197 (78.2)	185 (79.0)
Teaching hospital	55 (21.8)	49 (21.0)
Compared with contract, respondents actually worked, n (%)		
The same amount of hours	–	97 (41.6)
More hours	–	130 (55.8)
Less hours	–	6 (2.6)
Engaged in direct diagnosis, treatment or care of COVID-19 patients, n (%)		
Yes	–	204 (87.6)
No	–	26 (11.3)
Unknown	–	3 (1.3)

COVID-19 = coronavirus disease 2019, IQR = interquartile range.

Differences between physicians and nurses are shown in **Table 2**. For physicians, prevalence of burnout symptoms increased from 13.2% to 28.6%. For nurses, burnout was at a higher rate at both times, increasing from 25.5% to 38.0%. Reversely, the postpeak incidence rate of new burnout cases among physicians is higher (26.7%) than that among nurses (21.7%).

Mean values of morally distressing events are presented in **Figure 1**, ranked in order of severity at postpeak COVID-19 time. Three events became significantly more distressing postpeak time: distress due to scarcity of resources, time, or staff, having to work with colleagues believed not be skilled enough and having to work with colleagues believed to work unsafely. Statistical significance was found for indirect effects of postpeak COVID-19 time on burnout symptoms through scarcity ($p = 0.02$) and having to work with colleagues believed to work unsafely ($p = 0.01$).

Postpeak COVID-19 time, working as a nurse, and working overtime, being directly involved in diagnosis, treatment, or care of COVID-19 patients and moral distress, significantly increased the odds ratio (OR) of burnout symptoms, as shown in **Table 3**.

The multivariable analysis showed that control for the other variables, working as a nurse, has the highest significant increase in OR (2.63) of burnout ($p = 0.05$) regardless of measurement time. However, the interaction between time and profession is significant ($p = 0.04$), meaning that COVID-19 impacted burnout symptoms differently for physicians and nurses: the effect of COVID-19 on burnout symptoms was less likely to occur in the nursing population (OR.28). If the reference category is reversed, there is an OR of 3.56 (95% CI, 1.06–12.21) of physicians having burnout

symptoms relative to nurses at postpeak time. Finally, scarcity and the perception that colleagues act unsafely are both found to increase the odds of burnout symptoms in the multivariable analysis.

DISCUSSION

The COVID-19 surge has immediately increased burnout symptoms in ICU professionals. Prevalence rose from 23.0% before COVID-19 to 36.1% at postpeak time. Even though prevalence of burnout symptoms is higher among nurses, COVID-19 was more likely to lead to burnout symptoms in physicians than in nurses. A cross-sectional study of burnout in ICU professionals from April to May 2020, using the same cutoff method, reports a 20–40% prevalence estimate of burnout in Middle and Northern-Europe (6). This suggests that the findings from this study are fairly generalizable.

Unadjusted for confounders, working overtime in the COVID-19 period doubled the odds of developing burnout symptoms. More than 55% of the respondents at postpeak time indicated that they worked more hours during the first COVID peak than stipulated in their employment contracts. ICU management and the government should be aware that increasing the working hours due to crisis is going hand in hand with an increasing risk for dropout of personnel due to burnout. It is inevitable in crisis situations to rely upon nurses and physicians; however, overburdening personnel has adverse mental consequences. Personnel from other departments who are not primarily qualified to deliver ICU care are called upon. However, as the findings showed, having to work with colleagues

TABLE 2.
Prevalence of Burnout Symptoms and Mean Values and SD of Burnout Components

Burnout Symptoms	Physicians		Nurses	
	Pre-COVID-19 (n = 53)	Post-COVID-19 (n = 49)	Pre-COVID-19 (n = 199)	Post-COVID-19 (n = 184)
Burnout prevalence, n (%)	7 (13.2%)	14 (28.6%)	51 (25.6%)	70 (38.0%)
Emotional exhaustion, mean ± SD	1.19 ± 0.78	1.27 ± 0.70	1.24 ± 0.83	1.57 ± 1.05
Depersonalization, mean ± SD	1.11 ± 0.78	1.30 ± 0.79	.78 ± 0.67	1.10 ± 0.82
Personal accomplishment, mean ± SD	4.60 ± 0.62	4.29 ± 0.68	4.28 ± 0.83	4.24 ± 0.86

COVID-19 = coronavirus disease 2019.

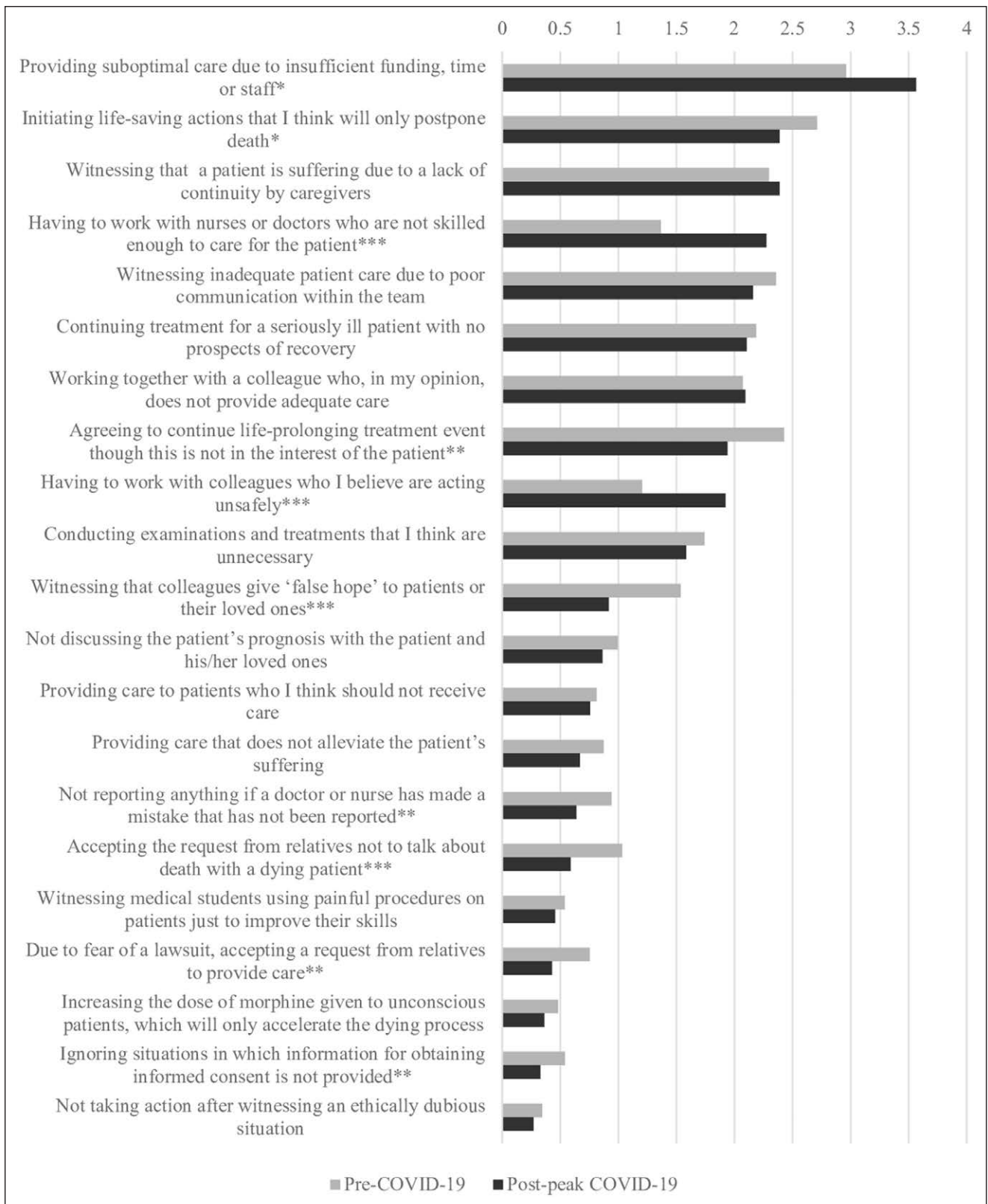


Figure 1. Mean values morally distressing situations pre- and postpeak coronavirus disease 2019 (COVID-19). Some items have been slightly shortened for presentation purposes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 3.
Generalized Estimating Equation of Associations Among Time, Respondent Characteristics, and Burnout Symptoms

Variables	Univariate Analysis		Multivariable Analysis (n = 436)	
	OR (95% CI)	p	OR (95% CI)	p
Time (reference = pre-COVID-19)	1.83 (1.32–2.53)	0.00	3.01 (0.82–11.01)	0.10
Profession (reference = physician)	1.77 (1.03–3.04)	0.04	2.63 (1.00–6.89)	0.05
Interaction between time and profession ^a	0.63 (0.22–1.76)	0.38	0.28 (0.08–0.94)	0.04
Working overtime, more hours than in contract	2.11 (1.48–3.02)	0.00	1.75 (0.91–3.35)	0.09
Engaged in direct diagnosis, treatment, and/or care of COVID-19 patients (reference = no)	1.87 (1.35–2.60)	0.00	0.93 (0.36–2.38)	0.88
Moral distress				
Scarcity—resources, time, and staff	1.29 (1.19–1.40)	0.00	1.25 (1.14–1.37)	0.00
Colleague believed not skilled enough	1.21 (1.11–1.32)	0.00	0.98 (0.83–1.16)	0.82
Colleague believed to act unsafely	1.23 (1.12–1.34)	0.00	1.16 (1.00–1.35)	0.05
Intercept			0.24 (0.07–0.85)	0.03

COVID-19 = coronavirus disease 2019, OR = odds ratio.

^aTo assess the interaction between time and profession, these variables were multiplied by each other.

Boldface values indicate significant *p* values (*p* < 0.001).

who are believed to act unsafely is morally distressing and increased symptoms of burnout.

Additionally, COVID-19 significantly increased moral distress from scarcity of resources, time, and staff. Scarcity was subsequently associated with burnout symptoms. There was the constantly impending dilemma of safe working conditions versus high quality of care. Due to the high volume of patients, the responsibilities of physicians and nurses were greatly increased (22, 23). Increasing patient-to-professional ratios has previously been shown to increase odds of developing high emotional exhaustion (24). During COVID-19, professionals' span of control was stretched by trading off the quality of care provided to the quantity of patients treated, which resulted in moral distress from providing suboptimal care.

Many countries have expanded their base ICU capacity to differing degrees in reaction to the pandemic by adding beds and mobilizing volunteers or retired healthcare workers (25). However, this study shows that upscaling ICU capacity and, at the same time, relieving some duties by volunteers who are less trained in ICU

care (e.g. personnel from the departments of surgery or anesthesiology) and pensioners, will still lead to overburdening of ICU professionals for prolonged periods of time, which will leave marks on the mental health of ICU professionals. Political proposals to even further increase ICU capacity, which goes hand in hand with higher patient-to-professional ratios and extended responsibility for less-skilled colleagues, border on the absurd. Such proposals will only accelerate the process by which the COVID-19 pandemic eats away at the highly qualified workforce that is needed to provide care and cure for those affected by COVID-19.

Some morally distressing issues became significantly less morally distressing in the postpeak COVID-19 period, for instance, “initiating life-saving actions that I think will only postpone death.” The MDS was made to assess the frequency and intensity of moral distress in “normal ICU practice.” It is possible that a variety of items have become less distressing, because as a practice, working on an ICU itself has become much more homogeneous, with most COVID-19 patients requiring the same sort of care, thus preventing a variety of

ethical situations, which more easily arise in “normal practice” from occurring.

The pandemic seems to leave most ICU professionals with little time on or off duty to devote to any added measures to decrease the incidence of burnout and moral distress. Awareness of mental health problems and moral issues has led the ICUs that participated in this research to set up a peer support system, as well as to stimulate grassroots small-group ethical deliberations on what is morally required of professionals in pandemic times. Although this study describes several potentially amenable factors to protect ICU professionals from burnout symptoms, it is unavoidable that the mental health of several ICU professionals will be negatively impacted by COVID-19. During system shocks like COVID-19, several causes of burnout and moral distress simply cannot be addressed immediately, neither by the state, nor by ICU management, nor by ICU professionals themselves. The pandemic is pervasive in its disruptiveness: everyday, there is the significant existential stress associated with the loss of patients, colleagues, or loved ones (26); there is the anonymity of patients treated in the face-down position; there is the balancing of family responsibilities and loyalty to work and colleagues; there is the reduction of quality of care to increase quantity. Until there is a working vaccine, none of this will be much different during subsequent waves of COVID-19.

Increases in burnout symptoms and moral distress may have consequences for patient safety and quality of care. Burnout has been associated with more conflicts in the workplace (27). Additionally, burnout and moral distress may lead to untoward and maladaptive coping methods, such as excessive alcohol intake, isolation, and withdrawal from personal health and fitness regimens. Other prospects include depression and increased rates of suicidal ideation (27–29).

This study is unique by providing a pre- and post-measurements of COVID-19 burnout rates in ICU professionals. This study provides a more careful estimate of the amount of burnout symptoms attributable to COVID-19 than cross-sectional studies do: the postpeak prevalence rate of 36% is seen in light of the rate of 23% before COVID-19. Furthermore, incidence rates give us a more precise picture of differences between physicians and nurses. This study also had a consistent, high response rate, even at postpeak time. It included ICU professionals from both a university medical center and a teaching hospital. This limited

potential bias. In addition, analysis of moral distress on item-level allows for a more precise inquiry into the events from practice that are morally distressing for ICU physicians and nurses. In addition, the study includes both physicians and nurses, thereby allowing for a comparison between these groups.

The limitations of this study included that was an open cohort study, in which not all respondents returned both surveys. Burnout studies tend to suffer a bias known as the “healthy worker effect,” where individuals with burnout on average return less surveys (30). At the same time, there is a possibility of self-selection bias where ICU professionals that relate to the topics of burnout and moral distress respond at higher rates. Both biases could be in play in this study. We sent surveys to all ICU personnel—even if professionals were on sick leave.

Another limitation is that, as in any prepost comparison, confounding by time can be present. In addition, there was no COVID-19 naïve group to compare the findings with. Though not all respondents in this survey were directly involved in care or cure of COVID-19 patients, all were somehow affected by the consequences of COVID-19. In addition, this study did not assess the downstream consequences of increases in burnout symptoms and moral distress on ICU professionals themselves, on their families nor on their patients. As burnout symptoms increase and moral distress is magnified, the out-of-hospital impact on personal and family dynamics is important to consider and should be studied in future studies.

Finally, Dutch society has shown great appreciation for and admiration of ICU professionals during the first wave of COVID-19. This was expressed, for instance, through nightly applauding, painting heroic portraits of caregivers in the media or delivering gifts to ICU professionals in the workplace. During the current surge, societal support for ICU professionals has deteriorated somewhat, even to the point of civilian aggression toward healthcare workers, which may give rise to feelings among ICU professionals that the public is not aware of their plight. Hence, professionals’ perceived societal support could have confounded the results in this study.

CONCLUSIONS

This study shows that overburdening of ICU professionals during an extended period of time leads to

symptoms of burnout. All ICU professionals, physicians, and nurses are at risk. Working long hours and under conditions of scarcity of staff, time, and resources come at the prize of ICU professionals' mental health.

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