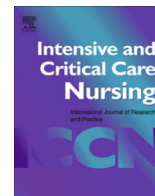




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Research Article

The impact of the first COVID-19 surge on the mental well-being of ICU nurses: A nationwide survey study

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ABSTRACT

Objectives: To determine the impact of the first COVID-19 surge (March through June 2020) on mental well-being and associated risk factors among intensive care unit nurses.

Research methodology: In September 2020, a nationwide cross-sectional survey study among Dutch intensive care nurses was carried out to measure prevalence rates of symptoms of anxiety, depression, posttraumatic stress disorder, and need for recovery (NFR), objectified by the HADS-A, HADS-D, IES-6 and NFR questionnaires, respectively. Associated risk factors were determined using multivariate logistic regression analyses.

Results: Symptoms of anxiety, depression, and post traumatic stress disorder were reported by 27.0%, 18.6% and 22.2% of the 726 respondents, respectively. The NFR was positive, meaning not being recovered from work, in 41.7%. Working in an academic hospital, being afraid of infecting relatives and experiencing insufficient numbers of colleagues were associated with more mental symptoms, while having been on holiday was associated with reduced depression symptoms and need for recovery.

Conclusion: The first COVID-19 surge had a high impact on the mental well-being of intensive care nurses, increasing the risk for drop out and jeopardising the continuity of care. Effort should be made to optimize working conditions and decrease workload to guarantee care in the next months of the COVID-19 pandemic.

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Implications for clinical practice

- Due to the high prevalence of mental distress, psychological well-being of intensive care nurses should be monitored frequently during and after the COVID-19 pandemic.
- Nurses at risk for mental distress should be provided with adequate support, both at work and at home.
- Effort should be made to optimize working conditions and decrease workload to guarantee care in the continuation of the COVID-19 pandemic.

Introduction

Intensive care unit (ICU) nurses, responsible for the care of critically ill patients, are used to a challenging work environment. Since the early days of intensive care medicine, it is recognized that ICU nurses are exposed to work-related stress, leading to relatively

high prevalence of symptoms of mental distress (Newlin, 1984). In ICU nurses, previous reported prevalence rates of symptoms of anxiety, depression or posttraumatic stress disorder (PTSD) are 18%, 11% and 21%, respectively (Karantikola et al., 2015).

Poor life expectancy or death of a patient, absence of patient contact, dissatisfaction from patients' relatives, medical errors and not having a fixed working schedule are found to be associated with these mental health problems (Andolhe et al., 2015; Kawano, 2008). In addition, risk factors specific for depression and anxiety

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are an effort-reward imbalance and a high administrative burden, whereas factors specific for PTSD are verbal abuse from relatives, high patient-to-nurse ratio and poor relationship with co-workers or supervisor (Hays et al., 2006; Salmon and Morehead, 2019).

The COVID-19 pandemic, however, confronted ICU nurses with an even greater, unprecedented, challenge and exposed them to these risk factors to great extent, most likely having a profound psychological impact. ICU nurses had to deal with numerous end-of-life decisions, shortage of ICU beds and adequate Personal Protective Equipment (PPE), the fear of getting infected or infecting others and visiting restrictions for family (El-Hage et al., 2020; Finkenzeller et al., 2020; Öztürk Birge and Bedük, 2018; Pattison, 2020). In addition, there were not enough properly trained ICU nurses, leading to increased work hours and shifts among certified ICU nurses (RIVM). In previous viral outbreaks, ICU nurses were exposed to a high psychological burden, resulting in an increase of symptoms of anxiety, depression and PTSD (Bukhari et al., 2016; Nickell et al., 2004; Wong et al., 2005). The COVID-19 pandemic will underline the impact on mental well-being of these situations even more (Kniffin et al., 2020). Prevalence rates of symptoms of anxiety, depression and PTSD in general, none-ICU nurses during the COVID-19 pandemic are 25.8%, 30.3%, and 36%, respectively (Lai et al., 2020; Pappa et al., 2020), which was higher compared to reported rates before the pandemic (Mealer et al., 2009). Since these mental symptoms are associated with burnout in ICU nurses, monitoring the psychological burden, identifying ICU nurses at risk and manage potential risk factors is of great importance (Colville et al., 2017; Vasconcelos et al., 2018).

Therefore, the aim of the present study was to measure prevalence of symptoms of anxiety, depression and PTSD, and work fatigue after the first COVID-19 surge, to objectify the impact on the mental well-being of ICU nurses. Second aim was to determine associated risk factors with these mental outcomes, especially to be able to focus preventive strategies on the actual needs of ICU nurses in crisis situations.

Methods

Setting and sample

A national cross-sectional survey study was carried out, in accordance to the STROBE guidelines (von Elm et al., 2007) and approved by the regional ethics committee (CMO region Arnhem-Nijmegen 2020-6939). An online survey (LimeSurvey) was distributed, using an open link. All ICU nurses in the Netherlands were approached via the Dutch association for ICU nurses (V&VN-IC) and a non-profit organisation focusing on education of healthcare workers (HCW) in the critical care medicine (Venticare). Both organizations mentioned the study in their newsletters, on their websites and social media, including a reminder two weeks later. Participants could complete the survey anonymously which was considered as informed consent. All questions were mandatory to avoid missing data.

In the Netherlands, the peak of the surge was on April 7th 2020 with 1314 admitted COVID-19 ICU patients, after which the number decreased, with <100 admitted patients between June 12th and September 21st, to the lowest number of admitted patients of 17 on July 25th and 26th (NICE). To objectify the aftermath of the first COVID-19 surge (March through June 2020), the survey was available from August 28th until September 20th (RIVM).

Mental health outcomes

The impact on mental health was measured with validated questionnaires for anxiety, depression, PTSD symptoms, and work

fatigue. Symptoms of anxiety and depression were measured using the Hospital Anxiety and Depression Scale (HADS) consisting of 14 questions with different 4-point scales (0 to 3 points), for example 'not at all' to 'most of the time' (Zigmond and Snaith, 1983). The HADS is divided into two subscales to differentiate between symptoms of anxiety (HADS-A) and depression (HADS-D), each consisting of 7 questions. Cut-off value used for both subscales is a score ≥ 8 , indicating the presence of symptoms of anxiety or depression, which has been validated in several studies and used in ICU nurses before (Bjelland et al., 2002; Mealer et al., 2007).

PTSD was measured using the Impact of Event Scale – 6 (IES-6), with six questions on a 5-point Likert scale ranging from "not at all (0)" to "extremely (4)", and has already been used among nurses (Si et al., 2020; Thoresen et al., 2010). A validated cut-off value of 1.75 as mean over all questions separately was used, which has already been used in the general population during the COVID-19 pandemic (Czeisler et al., 2020; Hosey et al., 2019).

Work fatigue and the coherent risk of psychological symptoms were measured using the Need for Recovery after work Scale (NFR) (Graham et al., 2020; Moriguchi et al., 2012; van Veldhoven and Broersen, 2003). The NFR consist out of 11 questions with dichotomous outcomes (yes/no) and indicates a high risk of future absence when ≥ 6 answers are positive for work-related fatigue, with a sensitivity of 72% and specificity of 79% in a large sample of the Dutch workforce (Broersen et al., 2004).

ICU nurse characteristics

The survey included questions about demographics, normal working conditions, and work and private circumstances during the first COVID-19 surge, varying from dichotomous scales (yes/no) to multiple categories, for example a 5-point scale ranging from 'very much' to 'not at all'. In addition, a numeric rating scale (NRS)-stress score, ranging from 'no stress at all (0)' to 'the worst stress imaginable (100)', was used to, retrospectively, objectify stress before, during (March through June 2020) and after the first COVID-19 surge. A change in perceived stress was calculated by subtracting the NRS-stress score during the surge by the NRS-stress score before the pandemic.

Statistical analysis

Only completed surveys were used for analyses. Descriptive data are presented as mean (standard deviation [SD]), median (first and third quartile [IQR]) for continuous variables, or as number and percentage for categorical variables. Differences in NRS-stress scores, being non-normally distributed, were tested using the nonparametric Wilcoxon test. Logistic regression analyses were used to determine associations of independent risk factors with the dependent dichotomized symptoms of anxiety, depression, PTSD and a positive NFR. First, univariate logistic regression analyses were performed for all potential risk factors on each outcome. Explanatory variables with a P-value of < 0.05 in one or < 0.25 in at least two outcome variables in univariate analyses, were subsequently used in a multivariate logistic regression analyses with stepwise backward selection resulting in odds ratios (ORs) with 95% confidence intervals (CIs). Multicollinearity was accounted for using the Pearson correlation coefficient and Variance Influence Factor (VIF), excluding variables with a $R > 0.7$ or $VIF > 3$, respectively, from multivariate analyses. All statistical tests are 2-sided and statistical significance is defined as a $P < 0.05$. Data were analysed using IBM SPSS version 25 (Chicago, IL, USA).

Results

Characteristics study population

In total 801 ICU nurses started, of whom 726 (90.6%) completed the survey. Participants who completed the survey had a mean age of 45 year (SD 11.4), 73.8% was female and had an average work experience of 16.2 years (SD 11.3) (Table 1), which is a representative reflection of Dutch ICU nurses (NIVEL, 2008). A total of 272 (37.5%) ICU nurses worked in an academic hospital, and 586 (80.7%) worked more hours than normal during the first surge. Among the 726 participants, 207 (28.5%) considered or is considering leaving their job and the majority (58.7%) indicated the work-related situation had a negative impact on social life. However, 493 (67.9%) reported equal or higher job satisfaction compared to before the pandemic and the vast majority experienced a pleasant collaboration with other ICU nurses (96.8%) and HCW (90.4%). In total 220 (30.3%) ICU nurses were afraid of getting infected, whereas 381 (52.5%) were afraid infecting a family member. Numeric rating scale-stress scores varied significantly in time ($p < 0.001$): before, during and after the surge a median score of 20 [IQR 10–30], 70 [IQR 42–81], and 30 [IQR 14–50], respectively.

Mental health outcomes

Prevalence rates of symptoms of anxiety, depression, and PTSD were 27.0%, 18.6% and 22.2%, respectively. The NFR was positive, meaning a high work fatigue, for 41.7% of the respondents. Symptoms of at least one outcome, i.e. anxiety, depression or PTSD, were present in 256 (35.3%) of the ICU nurses and symptoms or a positive NFR in 378 (52.1%) (Table 2).

Risk factors

Of the 24 included factors (demographics, normal working conditions, and conditions and experiences during the first COVID-19 surge) univariate analyses indicated 18 potential risks factors. These factors were used in the multivariate analyses, except for number of ICU beds due to multicollinearity with hospital type (Supplemental Table 1).

Multivariate analyses indicated that working in an academical hospital, fear of infecting relatives and insufficient number of trained personnel were significantly associated with increased risk for symptoms of anxiety, depression, PTSD and NFR. Having been on holiday after the first surge was associated with reduced symptoms of depression and work fatigue (Table 3).

Discussion

The first surge of the COVID-19 pandemic had a profound impact on the mental well-being ICU nurses. One in five had symptoms of depression or PTSD, one in four had symptoms of anxiety and even two in five suffered from work fatigue indicating a high risk of future absence. Additionally, over half of the participating ICU nurses had symptoms of at least one of these mental health outcomes or a positive NFR. A clear association with the surge is seen in stress levels, as experienced stress was 2.5 times higher than before the pandemic and remained elevated after the surge. Because the current limitation in increasing standard available ICU beds are the number of ICU nurses, preserving at least the current work forces is of great essence. Therefore, monitoring their mental well-being, especially of those at risk due to the presence of several risk factors, is crucial for appropriate and timely interventions.

Table 1

Characteristics of ICU nurses and their experiences during the first COVID-19 surge.

	ICU nurses (N = 726)
Characteristics	
Age in years, mean (SD)	45.0 (11.4)
Female, n (%)	536 (73.8)
Experience as ICU nurse in years, mean (SD)	16.2 (11.3)
Hospital type, n (%):	
- Academic	272 (37.5)
- Non-academic	454 (62.5)
Normal weekly working hours, mean (SD)	30.4 (4.9)
During the COVID-19 surge:	
- Worked more hours in total, n (%)	586 (80.7)
- Worked longer shifts, n (%)	174 (24.0)
- If so, duration in weeks, median (IQR)	8 (5–12)
- Shift duration in hours, median (IQR)	8 (8–8)
Number of ICU nurses:	
- Registered ICU nurses, n (%)	626 (86.2)
- Trainee ICU nurse, n (%)	37 (5.1)
- Other, however worked in the ICU during the first surge, n (%)	63 (8.7)
Number of hospital ICU beds, n (%)	
Before the pandemic	
≤32	587 (80.9)
>32	139 (19.1)
During the pandemic	
≤32	394 (54.3)
>32	331 (45.7)
Experiences during first COVID-19 surge	
Worked in a COVID-19 ICU unit, Yes, n (%)	689 (94.9)
Received supplementary training focussed on COVID-19, Yes, n (%)	204 (28.1)
Visiting ICU was allowed for family members, Yes n (%)	283 (39.0)
Considered or considering quitting, Yes, n (%)	207 (28.5)
Been on holiday since the first surge, Yes, n (%)	574 (79.1)
Job satisfaction compared to before the pandemic, n (%)	
- More, n (%)	53 (7.3)
- Equal, n (%)	440 (60.6)
- Less, n (%)	233 (32.1)
Afraid of getting infected, Yes, n (%)	220 (30.3)
Afraid of infecting a family member, Yes, n (%)	381 (52.5)
Dreading a second surge, Yes, n (%)	358 (49.3)
Working conditions during the first COVID-19 surge	
Working with other ICU nurses went well, Agree, n (%)	703 (96.8)
There was enough qualified personnel, Agree, n (%)	422 (58.1)
There was enough adequate PPE, Agree, n (%)	548 (75.5)
The collaboration with other HCW went well, Agree, n (%)	656 (90.4)
I felt supported by my supervisor, Agree, n (%)	579 (79.8)
There was enough (logistic) support with admissions and transfers, Agree, n (%)	557 (76.7)
Communication with relatives went well, Agree, n (%)	568 (78.2)
Private circumstances during the first COVID-19 surge	
I took enough rest during my days off, Agree, n (%)	568 (78.2)
I was confident everything was going to be fine, Agree, n (%)	538 (74.1)
I was able to find the right balance between work and social life, Agree, n (%)	404 (55.6)
I felt supported by family and friends, Agree, n (%)	703 (96.8)
I noticed the situation at work had a negative impact on my social life, Agree, n (%)	426 (58.7)
Experienced stress (NRS stress score 0–100), median (IQR)	
- Before the pandemic	20 (10–30)
- During the first surge	70 (42–81) ^a
- After the first surge	30 (14–50) ^{a,b}

Abbreviations: ICU, Intensive Care Unit; COVID-19, coronavirus disease of 2019; PPE, personal protective equipment; HCW, health care workers.

- a. Significantly different compared to before the pandemic ($p < 0.001$).
- b. Significantly different compared to during the pandemic ($p < 0.0001$).

Comparability between studies greatly depends on the timing of the survey. The strain on ICU's worldwide is changing constantly, most likely causing a great variation in prevalence of symptoms over time. A longitudinal study in China on nurses in

Table 2
Mental health outcomes.

	ICU nurses (N = 726)
Symptoms of anxiety	
- HADS-anxiety score, median (IQR)	5 (2–8)
- Prevalence, n (%)	196 (27.0)
Symptoms of depression	
- HADS-depression score, median (IQR)	3 (1–6)
- Prevalence, n (%)	135 (18.6)
Symptoms of PTSD	
- Average IES-6 score over all questions, median (IQR)	1.0 (0.5–1.7)
- Prevalence, n (%)	161 (22.2)
Need for recovery	
- NFR score, median (IQR)	5 (2–8)
- Prevalence, n (%)	303 (41.7)
Symptoms of anxiety, depression and/or PTSD, n (%)	256 (35.3)
Symptoms of anxiety, depression, PTSD and/or positive NFR, n (%)	378 (52.1)

Abbreviations: HADS, Hospital Anxiety and Depression Scale; IES-6, Impact of Event Scale-6; PTSD, Posttraumatic stress disorder; NFR, Need For Recovery.

Table 3
Factors associated with mental health outcomes in a multivariate regression model.

	OR(95% C.I.)	P-value
Anxiety (adjusted R ² = 0.161)		
- Female	1.44 (0.09–2.20)	0.09
- Academic hospital	1.78 (1.25–2.55)	<0.01
- Fear of infecting relatives	2.22 (1.61–3.39)	<0.001
- Insufficient number of personnel	1.99 (1.39–2.85)	<0.001
- Change in NRS-stress score	1.01 (1.01–1.02)	0.001
Depression (adjusted R ² = 0.143)		
- Academic hospital	1.78 (1.19–2.67)	<0.01
- Fear of infecting relatives	2.21 (1.45–3.37)	<0.001
- Been on holiday	0.62 (0.40–0.98)	0.04
- Insufficient number of personnel	2.16 (1.43–3.26)	<0.001
- Inadequate support supervisor	1.86 (1.20–2.90)	<0.01
PTSD (adjusted R ² = 0.199)		
- Academic hospital	1.58 (1.06–2.34)	0.02
- Worked in a COVID-19 ICU	3.62 (1.04–12.57)	0.04
- Fear of getting infected	1.50 (0.96–2.36)	0.08
- Fear of infecting relatives	1.61 (1.02–2.58)	0.04
- Insufficient number of personnel	1.67 (1.12–2.48)	0.01
- Inadequate collaboration with other HCW	0.55 (0.28–1.05)	0.07
- Hours worked per shift	0.887 (0.77–1.02)	0.10
- Change in NRS-stress score	1.03 (1.02–1.04)	<0.001
Need For Recovery (adjusted R ² = 0.181)		
- Female	1.44 (0.99–2.21)	0.06
- Academic hospital	1.58 (1.13–2.21)	<0.01
- Fear of infecting relatives	1.43 (1.03–1.98)	0.04
- Been on holiday	0.51 (0.34–0.76)	0.001
- Insufficient number of personnel	1.54 (1.10–2.15)	0.01
- Inadequate support supervisor	1.80 (1.20–2.69)	<0.01
- Change in NRS-stress score	1.02 (1.01–1.03)	<0.001

Abbreviations: ICU, Intensive Care Unit; COVID-19, coronavirus disease of 2019; HCW, health care worker; PTSD, Posttraumatic stress disorder; NFR, Need For Recovery.

general, comparing psychological symptoms during the outbreak to the following stable period, found a significant decrease in symptoms of anxiety (46.9% to 38.7%), depression (52.8% to 46.4%) and PTSD (26% to 19.3%) over time (Cai et al., 2020). This study indicated a higher prevalence's of anxiety and depression, however, the Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) were used, both known to report higher prevalence rates compared to the HADS-A (Baker et al., 2018) and HADS-D (Cameron et al., 2008). Prevalence of PTSD symptoms is similar with our results, both using derived scales from the IES (Hosey et al., 2019). In another comparable study conducted in French ICUs, which used the same questionnaire (HADS),

again higher prevalence of symptoms of anxiety (50.0%) and depression (31.6%) were reported in ICU nurses (Azoulay et al., 2020). However, this study started sooner after the first peak of the pandemic, namely after 20 days. We started our survey approximately one month after the lowest number of admitted COVID-19 ICU patients since the peak of the surge. According to the DSM-V, an acute stress disorder can be present up to one-month, after which distress after a traumatic event can potentially be classified as PTSD (American Psychiatric Association, 2013). Additionally, PTSD symptoms seem to diminish over time, so timing is crucial and probably explanatory for differences in prevalence rates (Santiago et al., 2013).

Associated risk factors found in this study correspond with previous conducted studies (Cabarkapa et al., 2020; González-Gil et al., 2021; Kisely et al., 2020). However, contrary results were found in the already mentioned study conducted in France for working in an academic hospital, reporting a protective effect, providing no clear explanation (Azoulay et al., 2020). Additionally, a global study found no correlation between hospital type and their mental health outcome, i.e. anxiety, in HCW who worked with COVID-19 patients (Cag et al., 2021). We can only speculate on this, but probably the fact that the more severely ill patients, for example including patients with more co-morbidities are more often admitted or transferred to academic hospitals, increasing the workload on ICU nurses together with the higher mortality rate in these patients, might be explanatory for our results.

Limitations

Some limitations of this study need to be addressed. First, this was a national study, providing reliable information only on Dutch ICU nurses. Differences between countries could be expected given the differences in number of COVID-19 infections, the available materials, e.g. ICU beds and PPE, and national policies. A previously mentioned global study, however, reported there is no correlation between the number of COVID-19 deaths per country and anxiety in HCW (Cag et al., 2021). Additionally, we only explored the impact on ICU nurses, being crucial for day-to-day care and the current limitation for increasing ICU capacity. However, the impact on other ICU professionals, for example physicians, was not investigated and could be of great importance as well. Secondly, there is no control group or baseline to compare prevalence of symptoms with. To the best of our knowledge, there is no reliable information on the prevalence rates of our outcomes in Dutch ICU nurses before the COVID-19 pandemic. Earlier mentioned prevalence rates of symptoms of anxiety (18%) and depression (11%) and PTSD (21%) were found in countries other than the Netherlands and could therefore not be compared directly (Karanikola et al., 2015). Additionally, in the general population, psychological symptoms are also likely to be increased because of the uncertainty and extraordinary situation we live in (Torales et al., 2020). We also found a high number of participants who considered or were considering quitting working as ICU nurse. It is very likely ICU nurses already dropped out during or shortly after the first surge and did therefore not participate, leading to an underestimation of the actual impact.

Recommendations for clinical practice

Effort should be made to optimize working conditions and decrease workload as much as possible. Contrary to having worked more hours or longer shifts, having enough trained personnel and well-perceived supervision were significantly associated with less mental burden. Therefore interventions should focus on the actual working conditions during a shift, for instance by decreasing the patient-to-nurse ratio, for example by pairing an ICU nurse with

a non-ICU nurse or with a former ICU nurse; i.e. ICU buddies (Schneider and Schneider, 2020). To minimize fear of getting infected but especially the fear of infecting relatives, enough adequate PPE should be available and measures should be taken to prevent burden from PPE (Foster et al., 2020). Additionally, nurses should be provided with clear and up-to-date information and should receive proper training and education to minimize unfounded concerns (Mubarak et al., 2020). For example, a recent study found that HCW were not the main transmission risk for relatives, since infection rates were higher for the relatives than the HCW themselves (Lorenzo and Carrisi, 2020). Having been on holiday after the first surge, for recharging the battery, did protect ICU nurses against depression and an increased work fatigue and therefore supervisors should try to enable ICU nurses to take some days off.

Since the experienced stress is associated with increased anxiety, PTSD and NFR, prevention strategies should focus on reducing it, for example making psychological help easily accessible and organizing regular peer support meetings, especially for those who worked in a COVID-19 cohort ICU (Crowe et al., 2020; Georger et al., 2020; Shen et al., 2020). In addition to support at work, social support from friends and family, for instance support with childcare, seems vital for the mental well-being of ICU nurses (Labrague and De Los Santos, 2020; Shanafelt et al., 2020).

Conclusion

The first COVID-19 surge had a great impact on the mental well-being of Dutch ICU nurses, with many at risk for dropping out, jeopardizing the continuity of care. Effort should be made to optimize working conditions, including enabling nurses to recharge the battery and decrease workload, to guarantee optimal nursing ICU care in the future.

Ethical approval

The study was reviewed and approved by the medical ethical committee of Arnhem-Nijmegen, the Netherlands (CMO) (CMO-number 2020/6939).

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.iccn.2021.103034>.

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