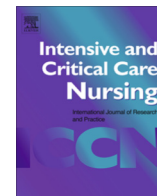




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Research Article

The effects of the reorganisation of an intensive care unit due to COVID-19 on nurses' wellbeing: An observational cross-sectional study

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ABSTRACT

Objectives: To evaluate the effects of the reorganisation of an intensive care unit for COVID-19 patients in the context of the SARS-CoV-2 pandemic on wellbeing perceived by nurses.

Methods: An observational cross-sectional study was conducted to evaluate wellbeing perceived by nurses who during the study were on duty in the COVID-19 intensive care unit. The "Covid-19-Nurse Well-being at Work (NWB) scale" questionnaire consisting of 72 items divided into 13 sections, was validated and used to collect data.

Results: The level of wellbeing perceived by the nurses was very good (4.77; SD 0.83). Differences in the level of perceived wellbeing were found for "years of experience" and the various levels of competence. We found a positive correlation between "female gender" and "nurses' togetherness and collaboration", a negative correlation between "male gender" and "satisfactory practical organisation of work, and a negative correlation between "work experience" and the overall "level of wellbeing at work".

Conclusions: The reorganisation had positive effects in terms of wellbeing perceived by the nurses. The factors that contributed mostly to the perception of wellbeing were in the area of "support", "communication, and "socializing with colleagues". It is appropriate to consider "gender differences", "work experience" and "levels of competence" when implementing this type of reorganisation to respond to a pandemic or a health emergency.

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Implications for clinical practice

- The reorganisation of an ICU dedicated to COVID-19 patients had positive effects in terms of wellbeing perceived by nurses
- The elements included in the COVID-19-Nurses Well-being at Work scale questionnaire facilitate wellbeing for nurses even during a pandemic or a healthcare emergency
- It is appropriate to consider gender differences, work experience and the levels of competence when implementing this type of reorganization

Introduction

Coronaviruses are a large family of respiratory viruses that may cause mild to moderate conditions. They are common in many animal species (e.g. camels and bats), but in rare cases they may evolve and infect human beings and spread extensively (CDC,

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2019). On the 9th January 2020, the World Health Organisation declared that the Chinese health authorities identified a new coronavirus strain never found in human beings before, temporarily named 2019-nCoV and later officially classified as SARS-CoV-2 (Zhu et al., 2020). By February 2020, the SARS-CoV-2 virus had spread all over the world (WHO, 2020a). On the 11th February 2020, the WHO announced that the respiratory disease caused by the new coronavirus had been called COVID-19 (Corona Virus Disease) (WHO, 2020b). Especially during the first few months of 2020, there were many uncertainties, including the speed with which SARS-CoV-2 spread from one person to another (She et al., 2020). In addition, to date limited information is available to characterize the spectrum of clinical diseases associated with SARS-CoV-2 (Grasselli et al., 2020; Y. Wang et al., 2020b).

In Italy, the first case of COVID-19 was reported on the 20th February 2020 in the Region of Lombardy. By the end of June 2020, the total number of positive cases throughout Italy was 237,000 and 34,400 deaths (Italian Civil Protection Department et al., 2020).

The first studies conducted at the end of 2019 in China reported a high incidence of the acute respiratory distress syndrome (ARDS) (17–29%) and critical conditions (23–32%) in hospitalized patients (Chen et al., 2020; D. Wang et al., 2020). Incidence rates of critical conditions equal to 16% were observed also in Lombardy and Northern Italy (Distante et al., 2020; Grasselli et al., 2020).

COVID-19 patients who were seriously ill due to the development of ARDS, needed to be admitted the intensive care unit to ensure life-saving mechanical ventilation and support vital functions, as recommended by scientific guidelines and evidence (Alhazzani et al., 2020).

To cope with this emergency in Italy, as in the rest of the world, as well as introducing urgent measures to stop the virus from spreading, hospitals specially dedicated to patients affected by COVID-19 were rapidly set up and the number of beds in intensive care units were increased considerably.

A University Hospital in Central Italy responded to this emergency by reorganizing its premises, services and personnel, and by dedicating an entire intensive care unit solely to patients affected by SARS-CoV-2 and by increasing its number of beds. This type of reorganisation in an extremely limited amount of time, during the first week of February 2020, with additional healthcare staff, was implemented with the intention to improve the quality of care and the wellbeing of the healthcare personnel.

The higher number of beds in the intensive care unit required more human resources. With the reduction in the number of beds dedicated to planned admissions, nurses who were experts in critical care were moved to the COVID-19 intensive care unit. On the basis of the personnel files, it was possible to identify which nurses to assign to the intensive care units for COVID-19 patients. In addition, since the nurses employed by the teaching hospital were not enough, 122 new nurses were hired.

In this way, various nursing teams were set up, which had a carefully balanced pool of characteristics and competencies with a ratio between expert and novice nurses (Benner, 1982) not higher than 1:1. Each group had its charge nurse. Nurses who were experts of critical care and educational and organizational processes were selected so that they could act as facilitators among the various members of the team, promptly identify any kind of clinical, healthcare and organizational issue, and support novice nurses or nurses with limited experience in the field of critical care.

As a result of the reorganisation, all COVID-19 patients who presented to the hospital were admitted. We then decided to investigate the effects on nurses' wellbeing when the emergency was over.

The significant workload differences experienced by health care workers who cared for COVID-19 patients compared with those

who were not caring for COVID-19 patients have been reported in the literature. Higher workloads have resulted in greater mental pressure, frustration and time pressure. Among health professionals there were increased levels of depression and anxiety, bad mood, and of fear of being victims of violence (Li et al., 2020). Limited access to personal protective equipment (PPE) has been experienced by acute care nurses during the COVID-19 pandemic generating feelings of fear, anger, betrayal, grief and helplessness, as well as being overwhelmed and exhausted (Iheduru-Anderson, 2021). Before the pandemic, the intensive care unit was already defined as an environment at risk of chronic work stress where the promotion of resilience and the management of individual and systemic factors were considered essential for the prevention of burnout (Rushton and Pappas, 2020). Berlanda et al. (2020) identified the risk factors and protective factors of wellbeing at work, such as working conditions, emotional responses to work, competence and professional growth. In the light of these factors, our study is based on the theoretical model of wellbeing developed by Utriainen et al. in 2011, which identifies the key concepts of the interaction among nurses, nurses and patients, patient centred care, and the organisation of nurses' work.

The aim of this study was to evaluate the effects, in terms of wellbeing perceived by nurses, of the reorganisation (both in terms of staffing and work environment) of the intensive care unit in the context of the pandemic and the general global health emergency generated by the COVID-19.

Methods:

Study design and data source

An observational cross-sectional study was conducted to evaluate the effects of the reorganisation of a COVID-19 intensive care unit in terms of wellbeing perceived by the nurses. This study followed the STROBE guidelines for observational studies (von Elm et al., 2007).

This study was conducted in an intensive care unit of a teaching hospital in Central Italy, between February–April 2020.

The study population

The study population included nurses and nurse assistants who during the period of the study were on duty in the COVID-19 intensive care unit.

Nurses and nurse assistants who had worked for less than one week in the intensive care unit dedicated to patients positive to SARS-CoV-2 were excluded from this study. It would have been too brief for them to evaluate the perception of wellbeing and the influencing factors (Utriainen et al., 2011).

In our analysis, we considered the following participants' characteristics: age, sex, type of job contract (i.e., permanent, fixed-term, temporary), years of work experience in the field of healthcare (first experience, 0–2, 3–5, 6–8, 9–11 years, >11 years), department of origin (i.e., intensive care, operating theatre, emergency medicine, specialized medicine, general medicine, specialized surgery, general surgery, etc.).

Instrument description

There was the need to design an instrument that measured the level of wellbeing as perceived by nurses in the Italian context during the COVID-19 and identify the factors influenced their perception. On the basis of the theoretical model of wellbeing developed by Utriainen et al. in 2011, we adapted the 'Nurses' well-being at work-scale' (NWB) (Päätaalo and Kyngäs, 2016) to the Italian con-

text and to achieve the purpose of this study. We introduced a section with specific items regarding nurses' perception about their safety.

After obtaining permission from the authors to translate and use the original questionnaire, a backtranslation was performed to ensure that the Italian version was semantically and conceptually equivalent to the original one (White and Elander, 1992). The NWB scale was translated from English into Italian by two Italian researchers. Then, the Italian version was translated back into English by two researchers who had not seen the original questionnaire. Finally, the back-translated version was reviewed by the authors of the original instrument to check the accuracy of the translation. A group of experts in nursing management and occupational nursing adapted some items to the Italian hospital context and added a question to evaluate the level of wellbeing and specific items about nurses' perception of the level of safety.

The new instrument, called "Covid-19-NWB", consisted of a first question that evaluated the level of wellbeing during the nurse's experience in the COVID-19 intensive care unit and 72 items focusing on the factors that influence wellbeing, subdivided into 13 sections: patients' experience of high quality care (8 items); assistance and support among nurses (9 items); nurses' togetherness and collaboration (10 items); satisfactory practical organisation of work (7 items); stimulating and significant work (6 items); freedom to express different feelings in the working community (4 items); well-provided daily nursing care (6 items); status related to the work itself (7 items); fair and supportive leadership (3 items); opportunities for professional development (3 item); fluent communication with other professionals (3 items); being together with colleagues in an informal way (2 items); and feeling confident when practicing nursing (4 items). In the first question, the level of wellbeing at work is scored on a 5-point Likert scale (where 5 stands for excellent wellbeing, and 1 for poor wellbeing). To express the level of agreement or disagreement with the influencing elements, a wellbeing score of 5 means that it is "extremely influential", whereas 1 means that it is "not at all influential".

Instrument validity and reliability

A pilot test with a sample of 30 participants was conducted to test the validity and reliability of the adapted instrument according to specific guidelines (Iarossi, 2006; Lyberg and Biemer, 2011). The internal consistency of the questionnaire was measured by calculating Cronbach's Alpha, which was higher than 0.70 in all the sections of the questionnaire and therefore optimal (Table 1).

Table 1
Cronbach alphas of COVID-19-NWB.

	Items	Cronbach's alpha
Perceived level of wellbeing at work	1	0.867
Patients' experience of high-quality care	8	0.915
Assistance and support among nurses	9	0.897
Nurses' togetherness and collaboration	10	0.973
Satisfying practical organization of work	7	0.817
Challenging and meaningful work	6	0.794
Freedom to express diverse feelings in work community	4	0.893
Well-conducted everyday nursing	6	0.873
Status related to the work itself	7	0.926
Fair and supportive leadership	3	0.859
Opportunities for professional development	3	0.818
Fluent communication with other professionals	3	0.901
Being together with colleagues in an informal way	2	0.877
Feeling safe in nursing practice	4	0.926

Construct validity was tested through exploratory factor analysis. The results of the questionnaire, in the form of 73 subscales, underwent factor analysis, followed by Varimax rotation. The factors were estimated by using eigenvalues; the lowest acceptable value was 1. This enabled the extraction of 13 factors. Twelve of these confirmed the groupings of elements inside the various subscales, as the previous study by Päätao and Kyngäs (2016). A new factor emerged, which consisted of four elements (factor 13). One element with a low factor loading was included inside a reasonable factor (factor 7) on the basis of the importance of the content. No elements were eliminated due to low eigenvalues. The final instrument consisted of 13 factors.

Data collection

Participants were contacted via email. The survey was sent to each professional through the web platform "Sondaggio-Online.com - Enuvo GmbH - Zurich". The software of this platform enabled the information about the study to be emailed, the password to limit access to the survey, response uniqueness, and the link to use to access and respond to the survey. Starting from the date the email was sent, participants had 15 days to complete the survey and enable the software to subsequently automatically save the survey. At the end of this period, the data present in the server were transferred into a database created by the web platform, ready to be analysed.

Data analysis

The Statistical Package for Social Science version 21.0 (SPSS Inc., Chicago, IL, USA) was used for our analyses. A preliminary data analysis was conducted to evaluate the reliability of the instrument. The internal consistency of the Italian version of the questionnaire COVID-19-NWB was measured using Cronbach's α , which if > 0.70 , its reliability is acceptable. Factor analysis of the survey results was conducted using the SPSS package version 21 and the "Monte Carlo PCA software for parallel analysis", with Eigen values > 1 . The results of the questionnaire under the form of 13 subscales underwent principal component analysis followed by Varimax rotation.

For the nominal variables we conducted descriptive analyses by using frequencies and percentages. The normally distributed continuous variables were analysed using means (M) and standard deviations (\pm). The ordinal variables were analysed by using medians (MED) and interquartile intervals (IQR). To compare the results obtained according to the characteristics of the participants, the F-test for variance analysis (one-way ANOVA) was used with post-hoc multiple comparisons. The correlations between the two quantitative variables were analysed using Pearson's coefficient (normal distribution of both variables) or Spearman's coefficient (one or both of the variables not normally distributed).

Correlation power was interpreted as follows: $|r| \geq 0.9$ – very strong correlation, $0.7 \leq |r| < 0.9$ – strong correlation, $0.5 \leq |r| < 0.7$ – moderately strong correlation, $0.3 \leq |r| < 0.5$ – weak correlation, $|r| \geq 0.3$ – very weak correlation (negligible). Statistical significance was set at $p < 0.05$.

Ethical aspects

The research protocol was approved by the Ethics Committee of the Teaching Hospital (Approval number 061.2020). The anonymity of the respondents was ensured by the software of the online system adopted to send out and collect the questionnaires, which filed the completed questionnaires without keeping track of the identity of the respondents. Invited participants were free to decide whether to take part in this study by completing the survey

Table 2
Participant characteristics.

	Participants (n = 245)
Age	Median (IQR) 35 (20)
Age	n (%)
18–30	94 (38%)
31–40	51 (21%)
41–50	67 (27%)
51–60	33 (13%)
Gender	n (%)
Male	75 (31%)
Female	170 (69%)
Work situation	n (%)
Permanent staff	174 (71%)
Fixed term staff	14 (6%)
Temporary staff	57 (23%)
Work experience	n (%)
First experience	122 (50%)
1–2	28 (11%)
3–5	11 (4%)
6–8	7 (3%)
9–11	15 (6%)
>11	62 (25%)
Level of proficiency	n (%)
novice	122 (50%)
competent	66 (27%)
expert	57 (23%)

N, frequency; IQR, interquartile range.

or to refuse by simply not completing the survey. By completing and submitting the survey, respondents provided their consent to participate in the study.

Results

Sample characteristics

Throughout the period of this study, a total of 213 nurses and 37 nurse assistants were employed at the COVID-19 intensive care unit, who were all contacted via email and invited to participate in the study. A total of 245 (98%) responded and completed the questionnaire. Three (1.2%) chose not to participate and two did not fully complete the questionnaire, so they were excluded. The median age of the participants was 35 years (IQR 20) and the majority were aged between 18 and 30 years (38%), 69% (n = 170) of the participants were females and 31% (n = 75) males. With regard to the type of job contract, 71% (n = 174) of the participants had a full-time permanent contract; 50% (n = 122) were newly employed and was their first experience in the COVID-19 intensive care unit. In terms of level of proficiency, the novice health workers were 122, equal to 50% of the participants (full details are shown in Table 2).

Evaluations of well-being at work and influencing factors

Participants were asked to evaluate the level of wellbeing perceived during the COVID-19 pandemic, by responding to the COVID-19-NWB questionnaire. The general results are shown in Table 3. The level of wellbeing perceived by the nurses was very good, with a mean value of 4.77 (SD 0.83). For each of the 13 factors, the mean score attributed to each of the items was calculated. Factors 1 (“Patients’ experience of high-quality care”) and 10 (“Opportunities for professional development”) obtained the lowest mean scores, 2.13 (SD 0.36) and 2.96 (SD 1.07) respectively. Instead, the factors that obtained the highest mean scores were factor 2 (“Assistance and support among nurses”) 4.91 (SD 0.81), factor 3 (“Nurses’ togetherness and collaboration”) 4.73 (SD

0.77), factor 6 (“Freedom to express diverse feelings in work community”) 4.87 (SD 0.91), factor 9 (“Fair and supportive leadership”) 4.58 (SD 0.79), factor 11 (“Fluent communication with other professionals”) 4.73 (SD 0.84), factor 12 (“Being together with colleagues in an informal way”) 4.81 (SD 1.02) and factor 13 (“Feeling safe in nursing practice”) 4.75 (SD 0.71).

According to the participants’ characteristics, we checked if there were any differences in terms of level of perceived wellbeing. The F-test for variance analysis (one-way ANOVA) did not show any significant differences between males and females (f = 2.11; p = 0.23), age groups (f = 3.72; p = 0.14), or type of job contract (f = 1.75; p = 0.69). Significant differences were found for years of experience (f = 6.27; p = 0.03) and the various levels of competence (f = 4.16; p = 0.02). For these characteristics it was necessary to examine if there were any differences between specific pairs of groups through post-hoc multiple comparisons. Through Bonferroni’s t-test, we found that the group “first experience” and the group “1–2 years of work experience” scored significantly higher for perceptions of wellbeing than the group “9–11 years of work experience” (p = 0.03 and p = 0.02 respectively), and than the group “>11 years of work experience” (p = 0.07 and p = 0.01 respectively) (Table 4). In addition, Bonferroni’s t-test showed that the “novice competence” group of nurses reported significantly higher levels of wellbeing than the “competent” group (p = 0.04) and the “expert” group (p = 0.01) (Table 5).

Based on our results, we also hypothesised a series of various possible correlations between the factors of the COVID-19-NWB questionnaire, the overall level of wellbeing and the participants’ characteristics, and we tested its strength with Spearman’s correlation coefficient (Table 6). Our analysis identified a weak positive correlation between “female gender” and the factor “Nurses’ togetherness and collaboration” (rho = 0.451, p = 0.012), a moderate negative correlation between “male gender” and the factor “Satisfying practical organisation of work” (rho = - 0.639, p = 0.003), and a strong negative correlation between “Work experience” and the overall “Level of well-being at work” (rho = -0.691, p = 0.001).

Discussion

The level of participation of the nurses and nurse assistants in the dedicated COVID-19 intensive care unit was very high, showing their sensitivity for the topic and the aim of this study. With regard to the composition of the nursing team, the organisation maintained equal numbers of expert (or competent) and novice health workers.

The validation process of the COVID-19-NWB instrument obtained an optimal internal consistency score, similar to other previous studies in other contexts (Päätaalo and Kyngäs, 2016). Through the exploratory factor analysis, 13 factors were identified, thus adding a new one compared to the original instrument.

The overall level of wellbeing perceived by the nurses was very good. The illusion that the emergency would soon end may have influenced this very high perception of wellbeing.

The factor “Patients’ experience of high-quality care”, by obtaining a medium–low score, shows how this contributed only marginally to the wellbeing perceived by the nurses. In fact, as well as not obtaining an immediate feedback from patients who had been mainly sedated and mechanically ventilated, the impossibility to meet and share the caring process with the family members of the patients admitted to the intensive care unit, due to the social distancing measures and quarantine implemented across the nation, have reduced the activities eliminating almost totally any feedback regarding the quality of care perceived by the patients. In addition, the factor “Opportunities for professional develop-

Table 3
Evaluation of COVID-19-nurse's wellbeing at work.

	1 Poor	2 Fair	3 Good	4 Very good	5 Excellent	N	M	SD
Level of well-being at work							4.77	0.83
1. Defining well-being at work as "the worker's experience of the safety and healthiness of work, good leadership, competence, change management and the organization of work, the support of the work community to the individual, and how meaningful and rewarding the person finds work", how do you assess the level of your wellbeing at work during your experience in intensive care in managing the SARS-COV2 pandemic?	0 (0.00%)	2(0.82%)	12(4.90%)	26(10.61%)	205(83.67%)	245	4.77	0.83
	1 not at all influential	2 slightly influential	3 somewhat influential	4 very influential	5 extremely influential	N	M	SD
1. Patients' experience of high-quality care							2.13	0.36
Patient's satisfaction with their care	4 (1.63%)	168 (68.57%)	21 (8.57%)	29 (11.84%)	23 (9.39%)	245	2.62	1.04
Positive feedback and acknowledgement given by patients	17 (6.94%)	154 (62.86%)	37 (15.10%)	22 (8.98%)	15 (6.12%)	245	2.44	0.69
Patient's experience of receiving help from the nurse	6 (2.45%)	101 (41.22%)	64 (26.12%)	49 (20.00%)	25 (10.20%)	245	2.71	0.80
Patient's experience of receiving high-quality care	11 (4.49%)	176 (71.84%)	31 (12.65%)	17 (6.94%)	10 (4.08%)	245	2.34	0.93
Being able to ensure the best possible condition for patients	2 (0.82%)	41 (16.73%)	23 (9.39%)	78 (31.84%)	101 (41.22%)	245	3.96	0.63
Meeting patients at work	52 (21.22%)	106 (43.27%)	57 (23.27%)	21 (8.57%)	9 (3.67%)	245	2.30	0.49
Meeting relatives at work	241 (98.37%)	4 (1.63%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	245	1.02	0.21
Helping people through nursing work	1 (0.41%)	2 (0.82%)	3 (1.22%)	11 (4.49%)	228 (93.06%)	245	4.89	0.21
2. Assistance and support among nurses							4.91	0.81
Helping other nurses to cope by sharing work tasks	1 (0.41%)	1 (0.41%)	2 (0.82%)	31 (12.65%)	210 (85.71%)	245	4.83	0.62
Considerate attitude towards other nurses	0 (0.00%)	1 (0.41%)	1 (0.41%)	23 (9.39%)	220 (89.80%)	245	4.89	0.56
Receiving support from other nurses (i.e. in unfamiliar situations)	0 (0.00%)	0 (0.00%)	2 (0.82%)	4 (1.63%)	239 (97.55%)	245	4.96	0.66
Receiving practical help with your own work tasks	0 (0.00%)	0 (0.00%)	0 (0.00%)	11 (4.49%)	234 (95.51%)	245	4.96	0.52
Giving practical help to colleagues	1 (0.41%)	0 (0.00%)	1 (0.41%)	17 (6.94%)	226 (92.24%)	245	4.91	0.88
Helping each other in the daily work	0 (0.00%)	1 (0.41%)	1 (0.41%)	7 (2.86%)	236 (96.33%)	245	4.95	0.90
Appreciating colleagues of different ages	2 (0.82%)	0 (0.00%)	1 (0.41%)	32 (13.06%)	210 (85.71%)	245	4.83	0.78
Sharing thoughts about work among nurses	0 (0.00%)	0 (0.00%)	6 (2.45%)	22 (8.98%)	217 (88.57%)	245	4.86	1.01
Good cooperation with your pair or work group	3 (1.22%)	2 (0.82%)	2 (0.82%)	13 (5.31%)	225 (91.84%)	245	4.86	0.89
3. Nurses' togetherness and collaboration							4.73	0.77
Avoiding talking behind others' backs	33 (13.47%)	45 (18.37%)	68 (27.76%)	38 (15.51%)	61 (24.90%)	245	3.20	0.65
Cooperation among nurses	2 (0.82%)	0 (0.00%)	0 (0.00%)	39 (15.92%)	204 (83.27%)	245	4.81	0.49
No conflicts between nurses	0 (0.00%)	0 (0.00%)	0 (0.00%)	41 (16.73%)	204 (83.27%)	245	4.83	0.89
Working relationships between nurses	1 (0.41%)	0 (0.00%)	0 (0.00%)	12 (4.90%)	232 (94.69%)	245	4.93	0.34
Kindness towards other nurses	3 (1.22%)	7 (2.86%)	1 (0.41%)	56 (22.86%)	178 (72.65%)	245	4.63	0.73
Caring climate in work community	3 (1.22%)	1 (0.41%)	6 (2.45%)	32 (13.06%)	203 (82.86%)	245	4.76	0.56
A feeling of nurses' togetherness	0 (0.00%)	0 (0.00%)	1 (0.41%)	12 (4.90%)	232 (94.69%)	245	4.94	0.82
Good personal chemistry between nurses	3 (1.22%)	5 (2.04%)	2 (0.82%)	61 (24.90%)	174 (71.02%)	245	4.62	0.74
Seamlessness and functionality of nurses' collaboration	0 (0.00%)	0 (0.00%)	2 (0.82%)	57 (23.27%)	186 (75.92%)	245	4.75	1.06
Good work atmosphere	0 (0.00%)	1 (0.41%)	0 (0.00%)	21 (8.57%)	223 (91.02%)	245	4.90	0.23
4. Satisfying practical organization of work							4.21	0.56
High-quality physical circumstances at work	2 (0.82%)	0 (0.00%)	61 (24.90%)	101 (41.22%)	81 (33.06%)	245	4.06	0.38
Well-balanced workload	6 (2.45%)	11 (4.49%)	23 (9.39%)	107 (43.67%)	98 (40.00%)	245	4.14	0.82
Sufficient amount of staff on the ward	2 (0.82%)	1 (0.41%)	4 (1.63%)	27 (11.02%)	211 (86.12%)	245	4.81	0.65
Enough time to do your work	9 (3.67%)	11 (4.49%)	22 (8.98%)	171 (69.80%)	32 (13.06%)	245	3.84	0.67
Satisfaction with salary	0 (0.00%)	0 (0.00%)	11 (4.49%)	71 (28.98%)	163 (66.53%)	245	4.62	0.62
Possibility to affect work shifts	1 (0.41%)	3 (1.22%)	8 (3.27%)	17 (6.94%)	216 (88.16%)	245	4.81	0.81
Possibility for appropriate breaks during a workday	0 (0.00%)	6 (2.45%)	2 (0.82%)	3 (1.22%)	234 (95.51%)	245	4.90	0.49
5. Stimulating and significant work							4.45	0.84
Stability of employment	61 (24.90%)	13 (5.31%)	2 (0.82%)	21 (8.57%)	148 (60.41%)	245	3.74	0.99
Variability at work	4 (1.63%)	7 (2.86%)	32 (13.06%)	65 (26.53%)	137 (55.92%)	245	4.32	1.08
Autonomy at work	0 (0.00%)	0 (0.00%)	3 (1.22%)	64 (26.12%)	178 (72.65%)	245	4.71	0.73
Challenging work	5 (2.04%)	2 (0.82%)	7 (2.86%)	81 (33.06%)	150 (61.22%)	245	4.51	0.81
Interesting work	1 (0.41%)	3 (1.22%)	6 (2.45%)	62 (25.31%)	173 (70.61%)	245	4.64	0.92
Meaningfulness of work	0 (0.00%)	0 (0.00%)	0 (0.00%)	60 (24.49%)	185 (75.51%)	245	4.76	0.47

(continued on next page)

Table 3 (continued)

	1 Poor	2 Fair	3 Good	4 Very good	5 Excellent	N	M	SD
6. Freedom to express diverse feelings in work community							4.87	0.91
Feeling of having the right to express your own thoughts	0 (0.00%)	0 (0.00%)	4 (1.63%)	27 (11.02%)	214 (87.35%)	245	4.86	0.88
Right to be yourself in the work community	2 (0.82%)	1 (0.41%)	4 (1.63%)	33 (13.47%)	205 (83.67%)	245	4.79	0.84
Freedom and openness to express different feelings in the work community	3 (1.22%)	1 (0.41%)	4 (1.63%)	17 (6.94%)	220 (89.80%)	245	4.84	0.74
Possibility to perform work tasks in your own way	0 (0.00%)	0 (0.00%)	12 (4.90%)	25 (10.20%)	208 (84.90%)	245	4.80	0.86
7. Well-provided daily nursing care							3.46	1.02
Success in nurse's work tasks	8 (3.27%)	5 (2.04%)	21 (8.57%)	145 (59.18%)	66 (26.94%)	245	4.04	1.10
Possibility to do work well	11 (4.49%)	4 (1.63%)	160 (65.31%)	11 (4.49%)	59 (24.08%)	245	3.42	0.83
Feeling of work well done after working day	12 (4.90%)	23 (9.39%)	55 (22.45%)	81 (33.06%)	74 (30.20%)	245	3.74	0.98
Well done and high-quality nursing work	7 (2.86%)	10 (4.08%)	23 (9.39%)	109 (44.49%)	96 (39.18%)	245	4.13	0.37
Getting work tasks done during a work shift	3 (1.22%)	5 (2.04%)	124 (50.61%)	17 (6.94%)	96 (39.18%)	245	3.81	0.58
High-quality nursing care despite the obstacles due to personal protective equipment (PPE)	33 (13.47%)	24 (9.80%)	88 (35.92%)	98 (40.00%)	2 (0.82%)	245	3.05	1.06
8. Status related to the work itself							4.03	0.88
Feeling of importance of nurse's work	0 (0.00%)	0 (0.00%)	10 (4.08%)	38 (15.51%)	197 (80.41%)	245	4.76	1.25
Feeling of being heard in the work community	2 (0.82%)	7 (2.86%)	13 (5.31%)	99 (40.41%)	124 (50.61%)	245	4.37	0.99
Possibility to impact your own work	0 (0.00%)	0 (0.00%)	7 (2.86%)	81 (33.06%)	157 (64.08%)	245	4.61	0.74
Possibility to impact on things related to work	13 (5.31%)	7 (2.86%)	84 (34.29%)	121 (49.39%)	20 (8.16%)	245	3.52	0.81
Feeling of having found your own place at work	29 (11.84%)	94 (38.37%)	88 (35.92%)	34 (13.88%)	0 (0.00%)	245	2.52	0.94
Possibility to make independent decisions and plan your own work	5 (2.04%)	6 (2.45%)	45 (18.37%)	86 (35.10%)	103 (42.04%)	245	4.13	1.07
Permission from head nurse for nurses to implement their own ideas	0 (0.00%)	0 (0.00%)	17 (6.94%)	131 (53.47%)	97 (39.59%)	245	4.33	1.26
9. Fair and supportive leadership							4.58	0.79
Fairness of head nurse	0 (0.00%)	0 (0.00%)	3 (1.22%)	20 (8.16%)	222 (90.61%)	245	4.89	0.75
Receiving support from head nurse	1 (0.41%)	1 (0.41%)	38 (15.51%)	101 (41.22%)	104 (42.45%)	245	4.25	0.85
Consulting conversation between head nurses and nurses	6 (2.45%)	4 (1.63%)	17 (6.94%)	111 (45.31%)	107 (43.67%)	245	4.26	0.83
10. Opportunities for professional development							2.96	1.07
Opportunity for professional development	13 (5.31%)	18 (7.35%)	121 (49.39%)	61 (24.90%)	32 (13.06%)	245	3.33	0.47
Support for education	3 (1.22%)	6 (2.45%)	11 (4.49%)	180 (73.47%)	45 (18.37%)	245	4.05	0.84
Possibility to progress in career	101 (41.22%)	85 (34.69%)	41 (16.73%)	13 (5.31%)	5 (2.04%)	245	1.92	0.99
11. Fluent communication with other professionals							4.73	0.84
Functioning relationships between nurses and doctors	0 (0.00%)	0 (0.00%)	4 (1.63%)	14 (5.71%)	227 (92.65%)	245	4.91	1.06
Fluent communication between nurses and doctors	0 (0.00%)	0 (0.00%)	2 (0.82%)	16 (6.53%)	227 (92.65%)	245	4.92	0.74
Fluent communication between nurses	1 (0.41%)	12 (4.90%)	27 (11.02%)	93 (37.96%)	112 (45.71%)	245	4.24	0.83
12. Being together with colleagues in an informal way							4.81	1.02
Common coffee break conversations	0 (0.00%)	0 (0.00%)	0 (0.00%)	34 (13.88%)	211 (86.12%)	245	4.86	1.09
Humorous atmosphere at work	2 (0.82%)	2 (0.82%)	0 (0.00%)	88 (35.92%)	153 (62.45%)	245	4.58	0.95
13. Feeling safe feeling confident when practicing nursing							4.75	0.71
Sense of protection from the hospital organization	7 (2.86%)	4 (1.63%)	11 (4.49%)	106 (43.27%)	117 (47.76%)	245	4.31	0.74
Availability of personal protective equipment (PPE)	5 (2.04%)	1 (0.41%)	13 (5.31%)	95 (38.78%)	131 (53.47%)	245	4.41	0.35
Feeling safe in nursing practice	0 (0.00%)	1 (0.41%)	14 (5.71%)	27 (11.02%)	203 (82.86%)	245	4.76	0.51
Feeling safe during wearing and removing personal protective equipment (PPE) procedures	3 (1.22%)	1 (0.41%)	21 (8.57%)	14 (5.71%)	206 (84.08%)	245	4.71	0.49

N. frequency; M. mean; SD. standard deviation.

Table 4
Post hoc Analysis of Level of wellbeing at work with Bonferroni's *t* test.

Work experience (years)	Mean difference	Significance
First experience		
1-2	1.29	0.19
3-5	2.61	0.41
6-8	1.77	0.36
9-11	1.65	0.03
>11	2.13	0.07
1-2		
First experience	-1.29	0.19
3-5	0.98	0.48
6-8	1.12	1.01
9-11	1.61	0.02
>11	1.37	0.01
3-5		
First experience	-2.61	0.41
1-2	-0.98	0.48
6-8	0.77	1.01
9-11	1.04	0.98
>11	0.85	0.66
6-8		
First experience	-1.77	0.36
1-2	-1.12	1.01
3-5	-0.77	1.01
9-11	1.01	0.56
>11	0.89	0.77
9-11		
First experience	-1.65	0.03
1-2	-1.61	0.02
3-5	-1.04	0.98
6-8	-1.01	0.56
>11	0.63	0.88
>11		
First experience	-2.13	0.07
1-2	-1.37	0.01
3-5	-0.85	0.66
6-8	-0.89	0.77
9-11	-0.63	0.88

ment” obtained a medium–low score, and therefore did not contribute strongly to a perception of wellbeing.

Considering the particular nature of the emergency situation, many participants had the opportunity to be employed for the limited period of time and with temporary job contracts, within the context described by this study, since they did not expect future professional developments in that specific context.

The factors that contributed most to a perception of wellbeing were related to the areas of support, communication, and socializing with colleagues. They included: “Assistance and support among nurses”; “Nurses’ togetherness and collaboration”; “Freedom to express diverse feelings in the work community” and “Being together with colleagues in an informal way”. The sense of belonging to a professional community, the sharing of common objectives and mutual support, played an important role in creating wellbeing, thus confirming the results already described in the literature (Boyle et al., 2006; Kovner et al., 2006; Ruggiero, 2005; Utriainen et al., 2011).

Table 5
Post hoc Analysis of Level of wellbeing at work with Bonferroni's *t* test.

Level of proficiency	Mean difference	Significance
novice		
competent	1.06	0.04
expert	1.71	0.01
competent		
novice	-1.06	0.04
expert	0.98	0.68
expert		
novice	-1.71	0.01
competent	-0.98	0.68

Despite the lack of personal protective equipment, both in Italy (Bagnasco et al., 2020) and in the rest of the world (Iacobucci, 2020), the controlled availability of masks, and disposable coveralls and gloves in the hospital enabled all health workers to be adequately equipped and constantly protected when caring for SARS-CoV-2 patients. Courses on how to dress and undress, and how to correctly use PPE were offered to all health workers. These interventions could have contributed greatly to “Feeling safe in nursing practice” and to building perceived wellbeing.

The nurses at their first work experience on this occasion, or who had <2 years of experience, perceived significantly higher levels of wellbeing than those with more years of work experience, as well as those who were novices, compared to competent or expert nurses. The hospital administration’s greater attention paid to supporting nurses with less experience and less competencies, by including nurses who acted as group leaders and facilitators, could have increased the perception of wellbeing, as also reported by Sheppard et al. (2018) and Faraz (2019).

The correlations identified between gender and factors that contributed to perceived wellbeing confirmed the major attention and influence of the psychosocial aspects in females, and the technical and organizational aspects for males. These differences between males and females have also been reported elsewhere (Giusti et al., 2019; Smiley and McCarthy, 2016).

The negative correlation between work experience and the overall level of perceived wellbeing, underlines once again the positive results deriving from the support provided by the hospital administration and expert nurses who supported novice and less competent nurses. However, the more expert and competent nurses often felt overwhelmed by the double responsibility of supporting their younger colleagues and their clinical practice. Although recent studies have shown a greater workload for health care workers exposed to COVID-19 (Shoja, 2020), the new job organization produced the perception that the workload was well-balanced. This may have contributed to reduced symptoms of depression and anxiety, discontent and risk of violence in the workplace, as identified and reported in the study by Li et al. (2020). Likewise, working conditions, peer interactions and competence, as highlighted by Berlanda et al. (2020), have been the sources of wellbeing in the workplace.

Limitations

This study adopted a quantitative design, however further research that uses in-depth interviews could be important to further explore and understand the experiences of nurses working in intensive care units dedicated to COVID-19 patients as shown in a first study by Iheduru-Anderson (2021) and other ongoing studies. A qualitative perspective could also be useful to highlight other factors or expectations that may contribute to wellbeing during a pandemic or a health emergency, and to further develop currently available quantitative instruments for data collection in similar contexts.

The passing of time and new knowledge in the field of COVID-19 might diminish the impact of this study. A new survey after one year and the comparison of the results with current research could be interesting to understand if the perception of the nurses has changed over time.

Conclusions

The reorganisation of the staff and the environment of a COVID-19 ICU produced positive results in terms of wellbeing perceived by nurses. The elements developed and included in the COVID-19-NWB instrument facilitated wellbeing for nurses even during

Table 6
Spearman's correlation analysis for COVID-19-NWB factors on the Level of wellbeing at work and participant characteristics.

	Patients' experience of high-quality care	Assistance and support among nurses	Nurses' togetherness and collaboration	Satisfying practical organization of work	Challenging and meaningful work	Freedom to express diverse feelings in work community	Well-conducted everyday nursing	Status related to the work itself	Fair and supportive leadership	Opportunities for professional development	Fluent communication with other professionals	Being together with colleagues in an informal way	Feeling safe in nursing practice	Level of wellbeing at work
Male gender														
Spearman r	0.013	- 0.001	0.027	- 0.639	- 0.059	0.084	0.031	- 0.087	0.063	0.081	- 0.075	0.094	0.094	0.019
p value	0.582	0.592	0.841	0.003	0.961	0.739	0.943	0.644	0.759	0.801	0.471	0.087	0.754	0.741
direction				negative										
strength				moderate										
Female gender														
Spearman r	- 0.084	0.063	0.451	- 0.051	0.072	- 0.049	0.045	0.074	- 0.011	0.061	0.051	0.021	- 0.079	0.036
p value	0.801	0.759	0.012	0.953	0.795	0.881	0.391	0.599	0.953	0.523	0.816	0.872	0.193	0.174
direction			positive											
strength			weak											
Work situation														
Spearman r	- 0.029	- 0.011	0.071	- 0.037	0.081	0.044	- 0.044	0.071	0.064	- 0.058	0.091	- 0.069	0.016	0.058
p value	0.968	0.953	0.839	0.693	0.938	0.896	0.739	0.278	0.693	0.625	0.071	0.173	0.111	0.551
direction														
strength														
Work experience														
Spearman r	0.083	0.064	0.002	0.073	0.031	0.089	0.555	0.074	0.013	- 0.523	0.053	0.095	0.021	- 0.691
p value	0.950	0.693	0.843	0.451	0.335	0.973	0.937	0.522	0.582	0.941	0.391	0.792	0.301	0.001
direction														negative
strength														strong
Level of proficiency														
Spearman r	- 0.032	0.049	0.091	0.064	- 0.071	0.072	- 0.749	0.094	0.071	0.027	- 0.071	0.064	- 0.041	0.069
p value	0.743	0.253	0.493	0.739	0.395	0.877	0.561	0.371	0.731	0.496	0.831	0.753	0.480	0.261
direction														
strength														

the pandemic or a healthcare emergency. The factors that contributed mostly to a perception of wellbeing were related to the area of support, communication, and socializing with colleagues. The sense of belonging to a professional community, the sharing of common objectives and mutual support, played an important role in creating wellbeing. In particular, it is appropriate to consider gender differences, work experience and the levels of competence when implementing this type of reorganisation to respond to a pandemic or a health emergency. Support, protection and facilitation of novice or less competent health workers enables higher levels of perceived wellbeing, despite the difficulties and challenges generated by the first work experiences and the context of the pandemic.

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CRedit authorship contribution statement

Nicola Pagnucci: Conceptualization, Writing - original draft. **Monica Scateni:** Visualization, Investigation. **Nunzio De Feo:** Investigation, Writing - original draft. **Massimo Elisei:** Visualization, Validation. **Salvatore Pagliaro:** Formal analysis. **Antonio Falacara:** Investigation, Methodology. **Francesco Forfori:** Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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