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Critical care nurses' health and their description of a healthy and sustainable work environment in intensive care units in Sweden: A cross-sectional study

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Abstract

Intensive care units are stressful environments and can bring negative psychological outcomes among critical care nurses. The aim of the present study is to describe critical care nurses' characteristics and perceptions of health in relation to sex, and also provide their description of a healthy and sustainable work environment in intensive care units using a person-centred practice framework. A cross-sectional design was employed with 136 participants who responded to a questionnaire. Descriptive statistics and qualitative content analysis were used. Regardless of sex, critical care nurses perceived their current health to be significantly lower than their health before the COVID-19 pandemic. They described effective staff relationships and a supportive organization as being essential for a healthy and sustainable work environment. Critical care nurses have recovered to their perceived pre-pandemic health to some degree. Well-functioning teams and a supportive organizational system might nurture a healthy and sustainable work environment.

Keywords

environment, person-centred care, sex

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Introduction

The work environment of acute healthcare nurses[1] and the role of critical care nurses (CCNs) in intensive care units (ICUs) has been studied,[2,3] not least during the COVID-19 pandemic.[4–6] Among its other effects, the COVID-19 pandemic increased CCNs' risk of suffering from psychological symptoms of psychiatric disorders, including burnout and post-traumatic stress.[5–7] It is necessary to investigate CCNs' health and well-being post-pandemic and it is also necessary to clarify how CCNs in ICUs describe a healthy and sustainable work environments in ICUs.

Nordenfeldt[8] describes health in a holistic manner as a state of well-being and balance between an individual's ability to act and their ability to attain essential goals. During the COVID-19 pandemic, the prevalence of CCNs' suffering stress-related health concerns increased[5–7] and characteristics and traits such as youth and limited professional experiences, and even being a woman, emerged as predictors of post-traumatic stress.[7] However, the primary risk factors for stress-related health issues among healthcare workers are linked to the work environment, such as high workload, insufficient support, lack of control over one's tasks, and an imbalance between work and recovery.[7,9,10]

The World Health Organization defines a healthy work environment as one where organizational member collaborate to continually improve processes that protect and promote well-being and organizational success.[11] A healthy work environment is more than a physical structure and requires positive relationships.[12] Such healthy sustainable workplaces can also enable CCNs to achieve personal satisfaction at work and allow them to realize their full potential.[13,14] Among CCNs in ICUs in particular, a healthier work environment is associated with higher job satisfaction and less intention to leave the profession.[14] Several factors of CCNs' working environment, including a sense of control over the environment, good nurse–physician relationships, and support from the organization and leadership, have been identified to be significantly associated with nurses' intention to keep working in acute healthcare in a systematic review.[1] After all, CCNs' job satisfaction in ICUs fluctuates over time, and specific

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employment-related factors of such fluctuations include not only working rotating shifts, stress, emotional exhaustion and organizational factors,[3] but also the quality of care, staffing adequacy, competent colleagues, support with education and person-centredness.[15]

Person-centredness embodies the principles of humanistic care,[16] and person-centred practice is globally acknowledged as a hallmark of good practice and quality of care.[17] Seeking to operationalize person-centredness, McCormack and McCance's[16] Person-Centred Practice Framework consists of four primary domains: prerequisites related to staff attributes (five subdomains); the care environment, which captures the complexity of healthcare contexts (seven subdomains); person-centred processes, which emphasize the methods of engagement needed to build connections between people (five domains); and the outcomes from implementing effective person-centred practice.

Person-centred practice might improve outcomes among healthcare workers[18] and their intention to continue working in the field.[18,19] Among other reasons, a person-centred work environment grants nurses greater control over their tasks and allows them to provide nursing care specifically aligned with patients' needs and preferences.[20,21] In a recent study, Andersson et al.[22] detected a positive relationship between CCNs' health and the work environment in ICUs.

Different characteristics such as age, sex, years of work experience and stress-related concerns might also influence nurses' experiences at work and satisfaction with their jobs.[23] CCNs' transitions from ICUs to non-critical areas of care, and factors such as sex and being in one's first year in an ICU, were shown to impact those transitions.[24] Moreover, among CCNs, women were more likely than men to transition to different clinical areas, which led to the recommendation of examining factors of women CCNs' work transitions and addressing their needs. However, in their systematic review, Dilig-Ruiz et al.[3] found no association between CCNs' sex, age and job satisfaction.

Altogether, the literature shows that person-centred practice might operationalize a healthy, sustainable environment in ICUs in light of factors such as interpersonal relations, communication, cooperation, decision-making, personnel support and leadership. Despite extensive knowledge about CCNs' work situation and environment before and during the COVID-19 pandemic, knowledge about their health subsequent to the pandemic and what they describe as a healthy, sustainable work environment remains slim. Traditionally, research on the topic has focused on nurses' intentions to leave the profession; more recently, however, the focus has shifted to their intention to remain in their profession.[25] Instead of asking CCNs questions about their intentions to leave their current positions, researchers should ask them why they stay and what is important for a healthy, sustainable work environment and, in turn, about their decisions to stay. That knowledge is pivotal to continue the work of developing healthy, sustainable work environments in ICUs.

Therefore, the present study aims to describe CCNs' characteristics and perceptions of health in relation to sex, and also provide their description of a healthy and sustainable work environment in intensive care units using a person-centred practice framework.

Methods

Design

Our cross-sectional study was a follow-up study of previous research aimed at exploring challenges faced by CCNs, nurse managers and specialist nursing students in ICUs during the COVID-19 pandemic.[4,22,26–30] The follow-up study included the questionnaire package used in previous research[4,22,26–30] and, of those, the Self-Rated Exhaustion Disorder instrument (ISM)[31] was used. One new open-ended question was added. The reporting in this study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies.[32]

Setting

General ICUs (n = 9) in university, county and municipal hospitals in mid- and northern Sweden were involved. The ICUs were selected based on the previous research project and ICUs in which 10 or more CCNs had participated.

Sample

Of 460 consecutively invited CCNs, 138 participated in this follow-up study (response rate 30%) and 136 answered the question about sex.

Data collection

We collected data regarding various characteristics of participants, namely sex, age, postgraduate education in intensive care, household composition, years of experience in ICUs, work status in ICUs in 2020–2022, change(s) in position in 2020 or later and intention to leave their current position.

Participants' perceptions of their current health, health during the COVID-19 pandemic and health before the pandemic were measured using a five-point Likert scale, from "1" indicating poor health and "5" indicating excellent health. Additionally, health was assessed through four items from the ISM,[31] including one item with six subitems that covered various symptoms of exhaustion disorder. Three of the four items were yes-or-no questions, whereas the fourth was answered with "Yes, to a great extent", "Yes, somewhat" or "No, not at all".

Participants' descriptions of a healthy, sustainable work environment were gathered using the open-ended question "What is important for a healthy, sustainable work environment for you?" Participants could answer that question by freely describing their perception without any word limit.

Nurse managers or CCNs appointed by nurse managers in ICUs provided information orally to the participating CCNs. Each CCN was given a questionnaire with a stamped and addressed envelope, along with written information about the follow-up study and confirmation that participation was voluntary and that their identity would be kept confidential. Two email reminders were sent to the appointed CCN, who then posted reminders on each ICU's notice board.

Data analysis

Participants' health and characteristics were examined using descriptive statistics; namely, Student's t-test and Pearson's chi-squared test to examine differences between women CCNs and men CCNs in terms of their health and characteristics other than sex. One-way repeated-measures analysis of variance was used to compare their current health (i.e., Time 1), health during COVID-19 (i.e., Time 2) and health before 2020 (i.e., Time 3) in relation to sex. The Mann–Whitney U-test was used to compare differences between women's and men's current health and free-text answers to the open-ended questions.

We analysed the free-text answers in manifest deductive content analysis following the method of Elo and Kyngäs[33] and the quantification of text units.[34,35] The unit of analysis was participants' free-text answers containing their descriptions of what a healthy, sustainable work environment is, and we used the Person-Centred Practice Framework[16] as an explanatory background to guide our interpretation and understanding of their answers. The analysis was performed in tree steps. First, the free-text answers were read several times to obtain a sense of the whole. Second, an analysis matrix was developed according to McCormack and McCance's[16] Person-Centred Practice Framework. Third and last, the free-text answers were coded using the analysis matrix (Table 1). Of all participants, 108 (78%) provided at least one but often several answers in free text.

Table 1. Domains in the person-centred practice framework (PCPF) with free-text answers given by critical care nurses (CCNs) (n = 136).

Domains in PCPF with free-text answers	Women CCNs Free-text answers, n (%)	Men CCNs Free-text answers, n (%)
Prerequisites		
– Professional competence	4 (5.0)	3 (15.0)
– Developed interpersonal skills	–	–
– Commitment to the job	10 (12.3)	6 (30.0)
– Clarity of beliefs and values	9 (11.3)	2 (10.0)
– Knowledge of self	14 (17.5)	3 (15.0)
Care environment		
– Skills mix	8 (10.1)	3 (15.0)
– Shared decision-making system	13 (16.5)	3 (15.0)
– Effective staff relationships	40 (50.6)	11 (55.0)
– Power sharing	22 (27.8)	3 (15.0)
– Potential for innovation and risk taking	12 (15.2)	5 (25.0)
– Physical environment	8 (10.1)	4 (20.0)
– Supportive organization system	56 (70.9)	14 (70.0)
Care processes		
– Working with patients' beliefs and values	–	1 (5.0)
– Shared decision-making	–	1 (5.0)
– Engagement	–	–
– Sympathetic presence	–	–
– Providing holistic care	–	–
Outcomes	–	–

Ethical considerations

Ethical approval for conducting the study was granted by the Ethics Review Authority (reg.no. 2020-04428). Participants were granted anonymity and were provided with detailed written information regarding the study's aim and procedures. They were informed of their voluntary participation rights and the option to withdraw at any time. Returning the questionnaire indicated informed consent. All data were stored on devices with code locks to ensure that only the authors had access. Data collection was performed in October 2023.

Results

Most of the CCNs were women (78.6%) and there was no statistically significant difference in age between women CCNs and men CCNs. There were also no differences in household composition, and majority of women CCNs (99%) and men CCNs (93%) had advanced education in intensive care. On average, CCNs had between 13.53 to 14.76 years of ICU experience, and no significant sex-based differences in such experience emerged. Almost every woman CCN (94.4%) and man CCN (96.6%) worked in an ICU during the years of the COVID-19 pandemic (2020–2022). Of the CCNs, 21.5% of the women and 20.7% of men had changed their positions since 2020, and they had no intention to leave their professions right now (Table 2).

Health

No significant differences between sex emerged in current health, health during the COVID-19 pandemic or health before 2020. However, the mean value for women CCNs' current health (3.50) was significantly higher ($p < .001$) than their health during the COVID-19 pandemic (2.72), but significantly lower ($p < .001$) than their health before 2020 (3.87). Meanwhile, men CCNs' current health (3.66) was significantly higher ($p < .001$) than their health during the COVID-19 pandemic (3.07), but significantly lower ($p < .001$) than their health before it (4.14) (Table 2).

No significant sex-based differences appeared with respect to exhaustion disorder (Table 3).

A healthy, sustainable work environment

To organize our findings, we used the four domains of the Person-Centred Practice Framework.[16] In total, 108 CCNs, 90 women CCNs and 18 men CCNs answered the open-ended question. The proportions of women CCNs' and men CCNs' answers are presented in numbers and percentages divided by domain and subdomains. There were no free-text answers in the outcome domain (Table 1).

Prerequisites for a healthy, sustainable work environment included being allowed to be a novice CCN, not having to take more responsibility than the professional role demands and, most broadly, providing nursing care to patients requiring intensive care. CCNs described being committed to the job due to wanting to ensure that nursing care was optimal, to make a difference for patients and relatives, to have a meaningful job, to feel satisfied, and to enjoy working. They also described a

Table 2. Characteristics and health of critical care nurses (CCNs) (n = 136) by sex.

Variable	Women CCNs		Men CCNs		
	n (%)	Mean (SD)	n (%)	Mean (SD)	*p*-value
Number of participants	107 (78.6)		29 (21.4)		
Age (years)		46.93 (10.69)		47.34 (10.02)	.850[b]
Household composition					.951[c]
• Single without children	10 (9.3)		3 (10.3)		
• Single with children	9 (8.9)		3 (10.3)		
• Cohabiting without children	28 (26.2)		7 (24.1)		
• Cohabiting with children	58 (54.2)		16 (55.2)		
Post-graduate education in intensive care?					.053[c]
• Yes	106 (99.1)		27 (93.1)		
• No	1 (0.9)		2 (6.9)		
Years of experience in ICUs		13.53 (9.17)		14.76 (10.52)	.536[b]
Work in ICUs during 2000–2022					.641[c]
• Yes	101 (94.4)		28 (96.6)		
• No	6 (5.6)		1 (3.4)		
Change position since 2020					.925[c]
• Yes	23 (21.5)		6 (20.7)		
• No	84 (78.5)		23 (79.3)		
Intention to leave the profession					.861[c]
• Yes	16 (15.1)		4 (13.8)		
• No	90 (84.9)		25 (86.2)		
Current health[a]		3.50 (0.92)		3.66 (0.77)	.391[b]
Health during COVID-19 pandemic 2020–2022[a]		2.72 (1.13)		3.07 (1.25)	.152[b]
Health before 2020[a]		3.87 (0.77)		4.14 (0.69)	.090[b]

[a]Scale ranges from 1 (poor) to 5 (excellent).
[b]Student's *t*-test with significance at $p < .05$.
[c]Chi-squared test with significance at $p < .05$.
Abbreviation: ICU = intensive care unit.

healthy, sustainable work environment as a workplace in which ethical discussions are prioritized by the organization and goals for intensive care are clear. Many free-text answers concerned the need for reflection and feedback at the end of shifts or in the case of situations characterized by being both physically and mentally demanding. No answers from the CCNs concerned developing interpersonal skills:

> To feel that the work I do is of good quality and that I can manage the expectations placed on me in my professional role. To feel proud of my work and workplace.

Care environment. In total, 70 answers concerned the supportiveness of the organization's system, and many addressed possibilities to recover between shifts and flexible shift scheduling. In that context, CCNs described supportive leadership, workforce stability, adequate staffing, reasonable workloads and opportunities for skills development as being important for a healthy, sustainable work environment.

Effective staff relationships were another subdomain in which CCNs had numerous answers. The answers related to well-functioning teams; for example, that every team member worked according to predetermined goals and to develop and improve the quality of care. Collegial support, an understanding of different tasks and responsibilities on the team, and good collaboration between CCNs, physicians and enrolled nurses were also described as being important for a healthy, sustainable work environment.

CCNs described that, in a healthy, sustainable work environment, the work climate is open and friendly, and anyone may ask questions without fearing negative consequences. An environment that allows CCNs to participate in decisions related to patient care and possibilities to influence their work schedule were identified as being important as well. Communication between colleagues and managers had to be clear and transparent, and information about ongoing processes was considered to be able to promote staff's participation in the ICU. An appropriate mix of skills in which different competencies were used appropriately, staff who know each other, and a physical environment with appropriate light, ventilation, sound levels and sufficient ICU beds were also pinpointed as being important for a healthy, sustainable work environment:

> Colleagues who uplift and support each other, and the opportunity to create a schedule that can be balanced with family life. Above all, a work environment where it feels enjoyable to go to work.

Care processes. Only two answers related to care processes. One answer concerned CCNs' work with patients' values and beliefs, about which CCNs described the importance of listening to patients, whereas the second answer concerned relatives' participation in decision-making:

> Physicians dare to make decisions about limited treatment where those of us closest to the patient believe that continued intensive care would cause unnecessary suffering.

Table 3. Descriptions of self-rated exhaustion disorder among critical care nurses (CCNs).

Questions	Women CCNs, n (%)	Men CCNs, n (%)	*p*-value
1. Do you currently feel, and have felt for more than two weeks, physically and/or mentally exhausted?			.720
• No	63 (58.9)	16 (55.2)	
• Yes	44 (41.1)	13 (44.8)	
2. Do you consider the exhaustion to be caused by long-term stress exposure (i.e., that you have been exposed to great strain or experienced pressure for 6 months or more)?			.540
• No	59 (63.4)	13 (56.5)	
• Yes	34 (36.6)	10 (43.5)	
3. During the past 2 weeks, have you experienced:			
a. Concentration or memory problems?			.156
• Yes	41 (38.3)	7 (24.1)	
• No	66 (61.7)	22 (75.9)	
b. Markedly reduced capacity to tolerate demands or to work under time pressure?			.176
• Yes	23 (21.5)	3 (10.3)	
• No	84 (78.5)	26 (89.7)	
c. Emotional instability or irritability?			.385
• Yes	54 (50.2)	12 (41.4)	
• No	53 (49.5)	17 (58.6)	
d. Sleeping problems?			.471
• Yes	41 (38.3)	9 (31.0)	
• No	66 (61.7)	20 (69.0)	
e. Physical weakness or being more easily fatigued?			.067
• Yes	33 (30.8)	4 (13.8)	
• No	74 (69.2)	25 (86.2)	
f. Physical symptoms such as muscular pain, chest pain, palpations, gastrointestinal problems, vertigo, or increased sensitivity to sounds?			.156
• Yes	41 (38.3)	7 (24.1)	
• No	66 (61.7)	22 (75.9)	
4. Have the complaints above (i.e., Questions 1–3) markedly decreased your well-being and/or your functional capacity (e.g., workability, family life, leisure activities or other important functions)?			.546
• Yes, to a great extent or somewhat	53 (51.0)	12 (44.4)	
• No not at all	51 (49.0)	15 (55.6)	

Chi-squared test, with significance set at $p < .05$.

Most free-text answers concerned the domain of the care environment and the two subdomains of effective staff relationships and supportive organizational systems (Table 1). By using the numbers of free-text answers in the domain effective staff relationships and health, a statistically significant ($p = .020$) relationship emerged between women CCNs' current health and the domain. Women CCNs with better current health described effective staff relationships as being important for a healthy, sustainable work environment to a greater extent than women CCNs with lower current health. No significant differences emerged in regard to supportive organizational systems or between men CCNs' current health, effective staff relationships and supportive organizational systems.

Discussion

The present study aimed to capture perceptions of health in relation to sex among CCNs working in ICUs and to deductively investigate how they describe a healthy, sustainable work environment in intensive care. We used an existing theory, namely the McCormack and McCance's[16] Person-Centred Practice Framework, as a lens, and such a deductive approach might afford a better understanding and interpretation of data.[36]

It appears that, although both women CCNs' and men CCNs' health has recovered to some degree subsequent to the COVID-19 pandemic began, it has not completely recovered compared with their perceived health before 2020. Because ICUs are already a highly stressful work environment,[2,37] stress-related health issues may increase if the work environment, characterized by high or increasing demands, is not balanced with sufficient resources.[38] Before the COVID-19 pandemic, there was a global shortage of nurses,[39] and the pandemic only exacerbated that shortage due to an increased rate of sick leaves, unprecedented burnout and a wave of early retirements.[40]

d'Ettorre et al.[7] have highlighted that being a woman predicted post-traumatic stress symptoms among healthcare professionals dealing with the COVID-19 pandemic. We found no statistically significant sex-based differences in CCNs' health as reported in their descriptions of different symptoms of exhaustion. According to d'Ettorre et al.[7] as well as Liyanage et al.,[41] the need to formulate new healthcare policies focused on preventive and management strategies (e.g., implementing institutional debriefing after traumatic events) might have beneficial effects on reducing psychological symptoms and/or psychiatric disorders among healthcare professionals. The need for some kind of debriefing or reflection also appeared in our study when CCNs freely wrote that a prerequisite for a healthy, sustainable work environment is the possibility for reflection, ethical discussions, and feedback from colleagues and nurse managers.

According to Nordenfeldt,[8] health is a fundamental concept in welfare theory and is defined as a persońs ability, under normal circumstances, to achieve their vital goals. Those vital goals represent the conditions that have to be met for minimal welfare, such that welfare is synonymous with happiness. Vital goals in ICUs include supporting patients' vital organ systems and sustaining their lives during life-threatening organ system insufficiency.[42] In our study, CCNs described vital goals as including quality, a sense of sufficiency, enjoying work and having meaningful tasks. Reaching such goals is a prerequisite for job satisfaction and important for the intention to stay.[1,14] In our study, one-fifth of CCNs had changed jobs since 2020, and approximately 15% of women and men CCNs intended to leave their current positions.

Most of the free-text answers from women and men CCNs concerned supportive organizational systems and shift scheduling. Supportive organizational systems that facilitate recovery between shifts and flexible scheduling are essential, according to Jensen et al.,[43] for mitigating the adverse effects (e.g., stress, sleep deprivation, cardiovascular problems, gastrointestinal symptoms and mental health issues) of shift work, particularly in ICUs. In October 2023, the European Working Time Directive (2003/88/EC)[44] stipulated 11 h of daily rest was put into force in Sweden within a collective agreement for employees in municipalities and regions and, in turn, affected CCNs' working hours and shift scheduling in ICUs.

The effects of shift work, extending beyond the workplace, impact the personal lives of CCNs, and, despite different negative health issues, many CCNs find fulfilment in shift work.[43] That understanding aligns with what other studies have shown[45,46] and with nurses' priorities for sleep and recovery. According to Hulsegge et al.,[45] shift workers are at higher risk of developing burnout if they feel that the shift scheduling overly affects their personal lives, and per Lindahl Norberg et al.,[46] some nurses prioritize spending time with family instead of sleeping after their nightshifts. Although the European Working Time Directive (2003/88/EC)[44] guarantees employees at least 11 h of rest, the CCNs in our study described being frustrated by the directive, given fewer opportunities for recovery between shifts and its negative impact on their personal lives. In our study, we collected data in October 2023 when CCNs had only begun scheduling shifts according to the rule of 11 h of daily rest. For that reason, further investigation and follow-up of the European Working Time Directive and its consequences for CCNs and the ICU organization are needed.

Pursio et al.[47] have highlighted the significance of nurses' professional autonomy and emphasized its connection to job satisfaction. They have suggested that, by addressing factors that enhance professional autonomy and focusing on its promotion, enhancing nurses' job satisfaction become feasible. However, those solutions extend beyond the unit level due to requiring investment at the organizational and political levels,[47] advocating the introduction of improvements in the nursing work environment and fostering an organizational culture in which nurses can fully leverage their professional autonomy.[47–49] Enhancing professional autonomy involves preserving independence in decision-making and leveraging one's competencies within the nursing work environment, which aligns with aspects of the Magnet model.[47–49] In addition, control, professional relationships and leadership are also all identified as elements that positively shape workplace culture for nurses both during the development phase and upon achieving Magnet status.[48] That understanding aligns with what our CCNs described as a healthy, sustainable work environment and the need for psychological safety, shared decision-making, a transparent organization and effective staff relationships.

More than 50% of both women and men CCNs described effective staff relationships and well-functioning teams, including CCNs, physicians and enrolled nurses, as being pivotal for a healthy, sustainable work environment. According to Cucolo et al.,[50] the professional relationship between physicians and CCNs in ICUs is important for all employees' job satisfaction, lack of moral distress, ability to avoid burnout and decreased intention to leave the profession. Professional interactions such as teamwork, workgroup cohesion, collaboration, and support from co-workers and peers are predictors of nurses' intention to keep working as nurses[1] and, when highly effective collaborations occur, all stakeholders can benefit.[50] It remains unclear, however, why women CCNs with higher perceived health were more inclined to describe a healthy, sustainable work environment than men CCNs. In any case, the difference needs to be highlighted because achieving a healthy, sustainable work environment requires everyone's commitment to that goal.

CCNs described wanting supportive leadership that is communicative and transparent. Leadership in ICUs is pivotal for the work environment and leaders' authentic listening, communication and participation capabilities exert a positive impact on CCNs' satisfaction and compassion at work.[51] Studies from a nursing perspective have also identified strong connections between leadership style, particularly relational styles, and positive staff outcomes such as clinician engagement, job satisfaction and intention to keep working in an ICU.[51] Those findings align with our results and CCNs' descriptions of their need for information about ongoing processes that increase staff–clinician engagement.

Only a few free-text answers related to care processes and the importance of listening to patients' wishes and involving relatives in decision-making. During the COVID-19 pandemic, CCNs described that not knowing the patient as a person was an obstacle to working in accordance with person-centred care during the pandemic.[26] However, it appears that the CCNs in our study did not consider patients and relatives as being part of the work environment. That understanding again highlights the need for person-centred care,[16] especially following the suggestion of Andersson et al.[4] with respect to the possibility of providing person-centred practice and influencing nursing care for patients and consequently improving the sustainability of CCNs and providing benefits for patients, relatives and CCNs.

Methodological considerations

Our study's findings have several limitations. For one, the response rate was rather low and might indicate selection bias. That limitation recommends a dropout analysis; however, such an analysis was impossible in our study as a result of incomplete data. In particular, the group of men CCNs was rather small compared with the group of women CCNs but represents the proportion of men to women CCNs in Sweden. Even so, it increases the risk of a type II error, meaning that a statistically difference between the groups could exist but that the men CCNs are too few to show it statistically.[52] Other studies, including that of Bruyneel et al.,[37] have revealed that women CCNs form 74.5% of the CCN workforce but have not compared the group because of the unequal numbers of men versus women CCNs. In another limitation, participants were asked to rate their health retrospectively, and there is always a risk that retrospective evaluations are influenced by one's present feeling of health. However, by rating health in the past and comparing it with the present, we learned more about trends in health-related experiences and observed a sex-based difference among CCNs. Lastly, the questionnaire was a self-report instrument and, as such, could be supplemented with measures of staffing levels and quality of care in future studies. The possibility to generalize the results of this study is limited, but it is possible the transform parts of it to similar context and circumstances.

Conclusions

In conclusion, a healthy, sustainable work environment in ICUs includes supportive leadership, workforce stability, adequate staffing, reasonable workloads, and opportunities for skills and knowledge development. Effective staff relationships and supportive organizational systems are crucial. Both women and men CCNs highlight the importance of well-functioning teams and supportive leadership for a healthy work environment. Women CCNs with better current health emphasize the importance of effective staff relationships more than those with lower health. No significant sex-based differences were found in current health, health during the pandemic or health before 2020. Both women and men CCNs reported better current health compared to during the pandemic but worse than before 2020. For further improvement in health, well-functioning teams and supportive organizations can nurture healthy and sustainable work environments for CCNs. Further research is needed to explore why men CCNs reported more frequently exhaustion in contrast to women CCNs who instead reported different exhaustion related symptoms. Moreover, prerequisites for a healthy and sustainable work environment were found to include support for novice nurses and having manageable responsibilities and ethical discussions prioritized by the organization. Opportunities for reflection, learning and feedback were also highlighted as necessary for a healthy and sustainable work environment. The participants in our study additionally stressed the need for supportive work environments that prioritize continuous professional training and provide organizational support. Lastly, the importance of good interpersonal relationships emerged as being essential for promoting CCNs' health and can also provide good prerequisites for person-centred care.

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Author contributions

Design: MA, ÅE,AF, AN; Data collection: AN, MA, AF, ÅE; Data analysis: MA, ÅE, AN, AF; Preparing the manuscript: MA, ÅE, AF, AN.

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