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Review article

Post-traumatic growth experiences of emergency and critical care nurses after the COVID-19 pandemic: A qualitative meta-synthesis

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ABSTRACT

Objective: The previous coronavirus disease 2019(COVID-19) epidemic inflicted significant psychological trauma on emergency and critical care nurses due to various factors, potentially leading to job burnout. Despite the rise of positive psychology, little is known about the post-traumatic growth experience of these nurses after the pandemic. The aim of this study was to assess the experience of post-traumatic growth among emergency and critical care nurses, in order to provide managerial insights for developing effective strategies and facilitating the transformation of nurses' negative emotions into positive ones.

Design: A qualitative review.

Data sources: PubMed, EBSCO, Medline, Elsvier, Cochrane Library, CINAHL, Web of Science, Embase, and Ovid and Chinese databases include the following: Chinese National Knowledge Infrastructure (CNKI), Wanfang Database (CECDB), VIP Database and China Biomedical Database (CBM).

Review methods: All articles about emergency and critical care nurses' post-traumatic growth after the COVID-19 pandemic were included after searching and screening 13 databases. The meta-synthesis method was used to integrate and evaluate the included literature in qualitative research. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was used as a basis for reporting the review. The literature was selected and evaluated by two researchers, and then meta-integration was used for analysis.

Results: From a total of 11 articles, 90 main results were presented, eight new categories were integrated, and three themes were formed: stress period, adjustment period and growth period. These three themes include eight sub-themes: negative emotion, psychological gap, self adjusting, social support, improvement of personal ability, increased sense of professional belonging, spiritual awakening and extended thinking, look ahead.

Conclusion: Post-traumatic growth in emergency and critical care nurses is dynamic. Managers should monitor the psychological changes experienced by emergency and critical care nurses following traumatic events, offering targeted support at different stages, providing enhanced professional development opportunities, refining management strategies, guiding nurses in self-

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adjustment and active coping with trauma, and promoting their physical and mental well-being to ensure a positive mindset for effectively addressing future public health crises.

1. Introduction

Traumatic events are occurrences that pose a threat to an individual's life or the integrity of their spiritual realm, resulting in excruciatingly distressing experiences. This encompasses personal experiences, as well as hearing or witnessing events such as death or a serious threat to life, situations that cause or pose a risk of severe bodily harm, incidents of sexual assault, and occurrences leading to recurring involuntary and intrusive painful memories [1]. Severe trauma can even lead to traumatic stress and post-traumatic stress disorder (PTSD), which can affect social life and interpersonal communication. Due to the unique nature of their specialities, emergency and critical care (ECC) nurses often face high-intensity work, critically ill patients, complex relationships, workplace violence, high-pressure environments, and frequently witness death or participate in clinical first aid. They are more likely to experience trauma than other nurses. Moreover, during the process of administering nursing care, due to the influence of empathy, patients establish a profound connection with nurses. This emotional bond can lead to vicarious trauma, which refers to the empathic engagement with the caregiver's own experience of trauma and can result in negative and potentially long-lasting effects on their inner well-being [2]. All of these factors that can lead to trauma were further exacerbated during the previous COVID-19 pandemic, as ECC nurses faced a heavy workload and constant risk of infection due to a severe shortage of medical resources, which significantly increased their exposure to trauma. Therefore, the mental health of ECC nurses needs urgent attention.

The COVID-19 broke out in Wuhan in early December 2019 and rapidly spread around the world. After infection, there will be physical symptoms such as fever, fatigue and loss of taste and a series of negative emotions such as fear, anxiety and depression [3]. As first-line clinical staff, ECC nurses need to wear personal protective equipment (PPE) to work, in the absence of scientific and effective treatment, vaccine, and even in high-risk conditions where the cause is unknown to care for patients with infectious diseases. The constraints of PPE often result in physical exhaustion for healthcare workers. This discomfort is compounded by the emotional burden of worrying about contracting an infection from patients. Additionally, uncooperative patients can increase psychological pressure on nurses. Finally, the pervasive fear of isolation following contact with confirmed cases further exacerbates these challenges, and the nurses diagnosed with COVID-19 are burdened by public stigma, which has a negative impact on their social identity and self-concept, leading to social avoidance behaviors such as emotional depression and anxiety, resulting in self-stigma. To escape the discriminatory environment, they are reluctant to talk about the facts related to their diagnosis [4]. Because the COVID-19 pandemic has exceeded the human response capacity, the outbreak can be classified as a severe traumatic event given the lack of knowledge about the etiology, pathology, treatment, and prevention of the virus [5]. The frequent occurrence of traumatic events can result in a myriad of adverse outcomes, encompassing job burnout, compromised professional identity and compassion fatigue, as well as nurse turnover, thereby impacting the quality of care and patient safety. Currently, the global community is faced with a pervasive shortage and inequitable distribution of nursing professionals, particularly evident in ECC settings [6], while the outbreak of the COVID-19 pandemic has further intensified the turnover rate among ECC nurses [7]. In this context, an increasing number of researchers are showing interest in the adaptability and growth potential exhibited by ECC nurses, aiming to gain insights for reducing the turnover rate of nurses and promoting their mental health from a positive psychology perspective.

Post-traumatic growth (PTG) is a construct that was initially identified and defined by Tedeschi et al. [8]. PTG encompasses the constructive psychological transformation and behavioral changes experienced following exposure to traumatic events or circumstances, including five dimensions: personal strength, new opportunities, interpersonal connections, enhanced life appreciation, and spiritual change [8]. Currently, the majority of studies investigating PTG among ECC nurses employ quantitative research methods. However, a single qualitative study cannot adequately encompass the diverse experiences of this population. To address this gap, the aim of our study was to utilize a meta-synthesis approach to synthesize qualitative studies about PTG among ECC nurses following the COVID-19 pandemic. By fully understanding the psychological changes and real needs experienced by post-traumatic nurses, our findings can help nursing managers identify and enhance the factors that promote post-traumatic growth while minimizing and avoiding impediments to such growth. Ultimately, this will help develop more effective support and management strategies for responding to future public health emergencies. Our research question was: How do ECC nurses understand PTG? How can their PTG be promoted?

2. Methods

2.1. Design

In this study, the meta-synthesis method of qualitative studies was used to integrate and evaluate the included literatures. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was used as a basis for reporting the review [9]. Because qualitative research focuses on exploring how people observe and understand their social world, compared with quantitative research, it can explore the emotions of the participants more deeply [10]. However, some scholars believe that although individual qualitative studies provide rich insights and profound connotations, the lack of connection between studies reduces the universality of qualitative research applications [11]. Inspired by Sandelowski [12], the meta-synthesis of qualitative research is devoted to understanding its philosophical conception and methodology, repeatedly reading the included literature, extracting themes and

connotations, summarizing and analyzing them, forming new categories, and finally integrating new results. With the incorporation of these new findings, a more profound and comprehensive elucidation of this specific phenomenon can be formulated, thereby providing a more compelling conclusion.

2.2. Search strategy

The inclusion and exclusion criteria are shown in the Table 1. We searched a total of 13 databases, respectively: Cochrane, EBSCO, Embase, Medline, Ovid, CNKI, CINAHL, Pubmed, Web of Science, Elsvier, VIP, Chinainfo and Chinese Biomedical Literature database. Search terms: "critical care", "emergency care", "intensive care", "emergency care", "posttraumatic growth", "post-traumatic growth", "post traumatic growth", "PTG", "nurs*", "experience", "COVID-19*", "2019 Novel Coronavirus*", "2019-nCoV*","COVID-19 Virus*", "COVID19", "Coronavirus Disease*", "SARS-CoV-2*", "qualitative". Boolean operators were used for composition during retrieval. The retrieval time was from the establishment of the database to April 2024. The retrieval results were imported into endnoteX9 for further processing. Two Chinese scholars proficient in English screened the retrieved literature according to inclusion and exclusion criteria, and the third researcher made the decision in case of different opinions.

2.3. Screening and data extraction

The EndnoteX9 software was used to eliminate duplicate references, which are defined as articles with similar titles and abstracts. Subsequently, the title and abstract of each article were thoroughly examined to exclude irrelevant literature, while the remaining literature was carefully screened based on inclusion criteria., specific literature screening steps are shown in Fig. 1. The researchers extracted the following data: author and year, source, objective, methodology, and conclusion. Two scholars participated in the process of extracting the data, and if there was a disagreement, a third scholar handled it. The final results are shown in Table 2.

2.4. Quality appraisal

The quality of the included 11 articles was evaluated by the quality evaluation criteria of Qualitative research of the Australian JBI Evidence-based Health Care Center [24]. The evaluation content includes the philosophical basis of the research, the representativeness of the research objects, the methods of data collection and analysis, the ethical norms, etc. Each item was evaluated as "yes", "no", "unclear" or "not applicable", if all items are satisfied, it is grade A; if some are satisfied, it is grade B; and if all are not satisfied, it is grade C. To ensure the quality of research, researchers should exclude C level literature. The evaluation process was independently completed by two investigators who had been trained in the evidence-based nursing curriculum system, and then compared. A third investigator was asked to decide if there was any objection. After evaluation, the quality of the 11 included studies were at grade B or above. The quality evaluation outcomes are show in Table 3.

JBI Australian Centre for Evidence-based Health Care Qualitative research Quality evaluation criteria [24]: ① Is there congruity between the stated philosophical perspective and the research methodology?② Is there congruity between the research methodology and the research question or objectives?③ Is there congruity between the research methodology and the methods used to collect data?④ Is there congruity between the research methodology and the representation and analysis of data?⑤ Is there congruity between the research methodology and the interpretation of results?⑥Is there a statement locating the researcher culturally or theoretically?⑦Is the influence of the researcher on the research, and vice-versa, addressed?⑧Are participants, and their voices, adequately represented?⑨Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?⑩Do the conclusions drawn in the research report flow from the analysis,/or interpretation, of the data?

2.5. Data analysis and synthesis

With an understanding of the philosophical foundations of various qualitative research methodologies, first, the included literature

Table 1
Inclusion and exclusion criteria.

Inclusion criteria
Study Design(S)
Both qualitative research and mixed methodological research including qualitative research were included, and the methodology of the execution research is not limited, including ethnography, phenomenological methods, grounded theory and so on.
Participant(P)
Nurses who have worked in ECC units during the COVID-19 pandemic.
Interest of Phenomena(I)
Nurses experiencing PTG after COVID-19.
Context(Co)
ECC nurses after the COVID-19 pandemic.
Exclusion criteria
The subjects were non-critical care nurses; non-chinese and non-English literature; full-text literature is not available; conference papers; case studies; official reports; check articles; editorials and book reviews.

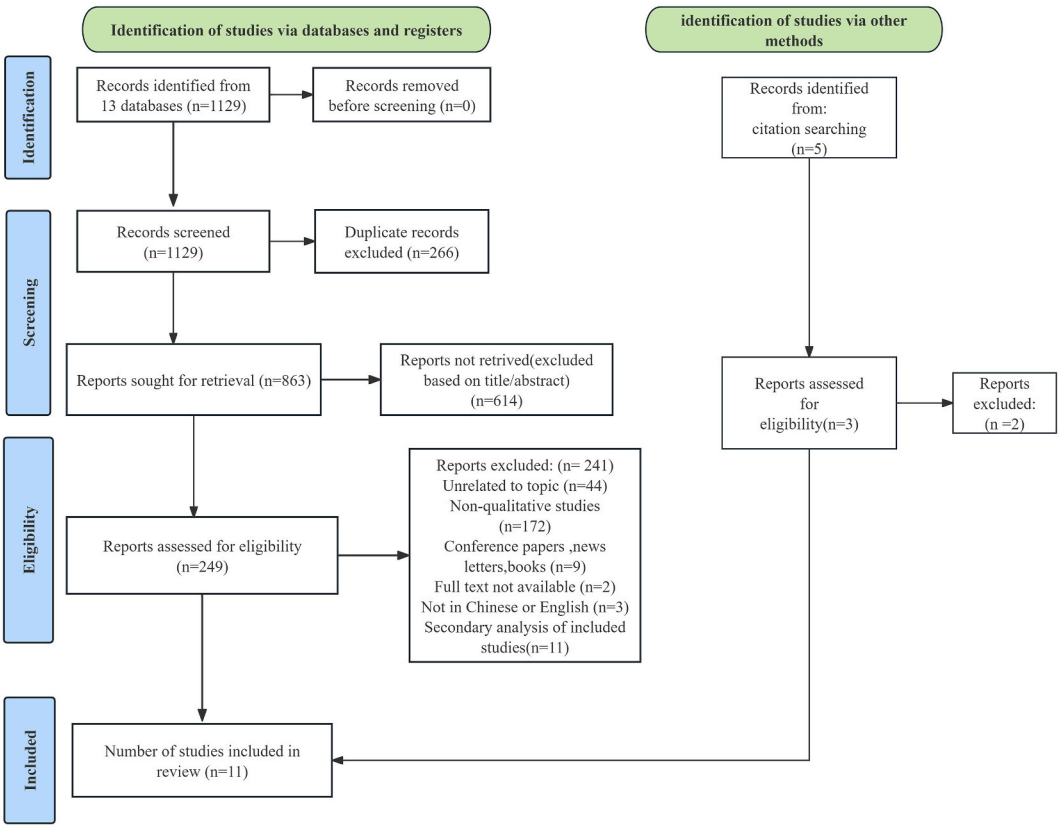

Fig. 1. PRISMA flow diagram.

was read and reviewed repeatedly, the key conclusions were extracted and sorted out. After repeatedly reviewing and fully explaining the significance of each result, similar results are grouped together to form a new category. Then the new category was integrated and a new integration result was formed.

2.6. ConQual-assessment of confidence of evidence

The ConQual system, developed by the JBI Center for Evidence-Based Health Care in 2014, is designed to assess and rate meta-synthesized bodies of evidence derived from qualitative studies [25]. The system assesses the credibility and reliability of integrated evidence, resulting in a ConQual-based quality rating categorized as high, medium, low, or very low. When assessing dependability and credibility, meta-synthesized evidence is presumed to possess high quality and is evaluated based on three aspects of credibility and five aspects of dependability. Dependability focuses on the quality of original studies included in the analysis, while credibility assesses the consistency between integrated results and supporting data. The ConQual system scores for this review are presented in Table 4.

3. Results

From a total of 1134 identified studies, 11 were included in the analysis. The results of the quality evaluation showed that only one article pointed out the influence of the researcher's cultural background and values on the research, two of the papers did not specify whether they had been approved by an ethics committee. Among the 11 articles, there was literature from China (n = 4), South Korea (n = 1), Indonesia (n = 1), Turkey(n = 1), Japan(n = 1) and the United State(n = 3). The methodologies included phenomenological method(n = 6), and qualitative descriptive research (n = 5). Various methods were used to collect data, including face-to-face in-depth interviews (n = 5), telephone interviews (n = 4), an email interview(n = 1) and an online questionnaire (n = 1), and the literature included was from 2020 to 2023, with a total of 258 participants. Through repeated reading, the researchers extracted a total of 90 clear results, which were summarized into 8 categories and finally reduced to three integrated results. The summarized themes and sub-themes are shown in Fig. 2.

Table 2
Characteristics of the included studies (n = 11).

Authors and year	Origin	Aim	Methodology	Results
Jun et al. (2022) [13]	USA.	Explore the experience of nurses during onset of the COVID-19	Qualitative descriptive study, semi-structured in-depth telephone interview. Purposive sampling method.22 respondents	Four themes emerged: (1) Fear (2) collective resilience through shared trauma (3) uncharted territory (4) disposability
Foli et al. (2021) [14]	USA.	To describe the experiences of frontline nurses who are working in critical care areas during the COVID-19 pandemic	Qualitative research, online qualitative data collection. 105 respondents. Nurses were recruited through the American Association of Critical Care Nurses (AACN) research web page as well as alumni lists from large hospitals.	Six themes emerged: (1) Psychological distress in multiple forms (2) Tsunami of death (3) Torn between two masters (4) Betrayal (5) Resiliency/posttraumatic (6) growth through self and others
Kandemir et al. (2022) [15]	Turkey	To explore the occupational and psychological perception of emergency department nurses during COVID-19	Qualitative research, phenomenological approach, face-to-face semi-structured in-depth interview. Purposive sampling method.12 respondents. Age range:24-44	Four themes emerged: (1) Increasing roles and responsibilities as an emergency nurse (2) Difficulties of working in pandemic conditions (3)Emotional responses in the pandemic (4)Strategies for coping with the effects of the pandemic
Mulyadi et al. (2021) [16]	Indonesia	To explore the experience of emergency nurses in Indonesia during COVID-19	Qualitative research, phenomenological approach, semi-structured in-depth telephone interview. Purposive sampling method.10 respondents. The average age was 31 years.	Six themes emerged: (1) Extreme challenges in triage (2) Feeling of responsibility under uncontrolled spread and infection (3) Physical and psychological exhaustion (4) Discovering strategies under difficult circumstance (5) Optimism in togetherness (6) Looking for positive reinforcement
Peng et al. (2021) [17]	China	To explore the positive and negative emotional experiences of nurses working on the clinical front line during the COVID-19 epidemic	Qualitative research, phenomenological approach, face-to-face semi-structured in-depth interview. Purposive sampling method.20 respondents. Age range: 24-43	Four themes emerged: (1) Interpersonal relationship improvement (2) personal belief sublimation (3) Understand the meaning of life (4) new opportunities
Zhang et al. (2021) [18]	China	To explore the experience of frontline nurses four months after the end of COVID-19 rescue mission	Qualitative research, phenomenological approach, face-to-face in-depth interview. Purposive sampling method.15 respondents. Age range: 26-42	Four themes emerged: (1) recurring involuntary memories about the experience (2) feeling guilty and depressed (3) cultivation of occupational ability (4) increased professional pride and happiness
Jiang et al. (2022) [19]	China	To explore the PTG experience of emergency department nurses infected with COVID-19	Qualitative research, phenomenological approach, face-to-face semi-structured in-depth interview. Purposive sampling method. 13 respondents. The average age was 26.	Three themes emerged: (1) the stress period (2) the adjustment period (3) the growth period
Lee, N., & Lee, H. J. (2020) [20]	South Korea	To explore the psychological experience of South Korean nurses after nursing patients during the COVID-19 epidemic	Qualitative research, phenomenological approach. In-depth individual telephone interviews. Purposive sampling method. 18 respondents., all were women. Age range: 20–49.	Nine themes emerged: (1) Pushed onto the battlefield without any preparation (2) Struggling on the frontline (3) Altered daily life (4) Low morale (5) Unexpectedly long war (6) Ambivalence toward patients (7) The power to keep me going (8) Give meaning to my work (9) Take the next step in my growth

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Table 2 (*continued*)

Authors and year	Origin	Aim	Methodology	Results
Gordon et al. (2021) [21]	USA.	To explore the experience of critical care nurses caring for COVID-19 patients during the 2020 pandemic	Qualitative descriptive study, semi-structured in-depth interview. Purposive sampling method.11respondents. Age range: 23–60.	Five themes emerged: (1) Emotions experienced (2) Physical symptoms (3) Care environment challenges (4) Social effects (5) Short term coping strategies
Zhi et al. (2023) [22]	China	To explore the thinking of nurses in Hubei Province of China in the fight against COVID-19	Qualitative descriptive study, semi-structured telephonic interview. Purposive sampling method.9 respondents. Work years range: 4.5–22.	Three themes emerged: (1) Assertive attitude to fight against the pandemic (2)Challenges associated with the anti-pandemic mission (3) Unbearable heaviness and lightness of being a nurse
Umeda et al. (2023) [23]	Japan	To explore the experience of critical care nurses in Japan in the early stage of COVID-19	Qualitative descriptive study. Interview by email. Purposive sampling method. 23 respondents.	Five themes emerged: (1)Fear of risk to my own life and to those of others around me (2)The shock of finding myself amid an infectious disease pandemic (3) Anxiety about unknown challenges (4) Driven by a sense of purpose (5) Growth as nurses

Table 3
Evaluation of methodological quality.

Included studies	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Score
Jun et al. [13]	Y	Y	Y	Y	Y	N	Y	Y	N	Y	8
Foli et al. [14]	Y	Y	Y	Y	Y	N	N	Y	Y	Y	8
Kandemir et al. [15]	Y	Y	Y	Y	Y	N	N	Y	Y	Y	8
Mulyadi et al. [16]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10
Peng et al. [17]	Y	Y	Y	Y	Y	U	Y	Y	N	Y	8
Zhang et al. [18]	Y	Y	Y	Y	Y	U	U	Y	Y	Y	8
Jiang et al. [19]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9
Lee, N., & Lee, H. J. [20].	Y	Y	Y	Y	Y	U	U	Y	Y	Y	8
Gordon et al. [21]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9
Zhi et al. [22]	Y	Y	Y	Y	Y	U	U	Y	Y	Y	8
Umeda et al. [23]	Y	Y	Y	U	Y	U	Y	Y	Y	Y	8

Table 4
ConQual system scores and the specific reason.

Synthesized fingdings	Type of research	Dependability	Credibility	ConQual score	Comments
Stress period	Qualitative	Downgrade one level - Moderate*	remains unchanged**	Moderate	The findings came from 11 papers *Downgraded one level as the majority of studies (10 out of 11) scored 3 on questions related to the appropriateness of the conduct of the study **remains unchanged as all findings unequivocal
Adjustment period	Qualitative	Downgrade one level -Moderate*	remains unchanged**	Moderate	The findings came from 9 papers *Downgraded one level as the majority of studies (6 out of 9) scored 3 on questions related to the appropriateness of the conduct of the study **remains unchanged as all findings unequivocal
Growth period	Qualitative	Downgrade one level -Moderate*	remains unchanged**	Moderate	The findings came from 9 papers *Downgraded one level as the majority of studies (7 out of 9) scored 3 on questions related to the appropriateness of the conduct of the study **remains unchanged as all findings unequivocal

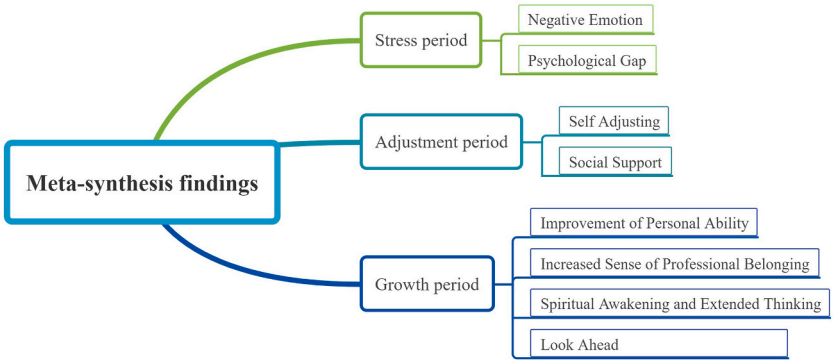

Fig. 2. Themes and subthemes structure.

3.1. Synthesized finding 1: stress period

Stress period refers to the period when nurses face a major impact on their emotions after sudden trauma, and face administrative accountability or criticism from public opinion at any time. During this period, nurses experienced various negative emotions and their original life order was disrupted.

3.1.1. Negative emotion

Nurses during stress period often encounter a multitude of intricate negative emotions, including fear, anxiety, helplessness, and the desire to escape. One nurse said: "*The virus is terrible, I don't want to go back to the fever clinic. If I have to go back, I'll quit* [17]." Another nurse said, "*I've never seen ECMO before, so it's pretty scary and hard to understand!* [23]" In addition, the outbreak disrupted the original order of life and forced nurses to work at a new pace and standard [20], thus catalyzing the generation of negative emotions. A nurse said: "*The constant updating of the guidelines makes me anxious. Even if we follow them, we still doubt whether they are right* [20]."

The public stigma exhibited during the pandemic undoubtedly made matters worse, leading to self-doubt and even self-stigmatization among nurses. "*One day, a neighbor got infected and the ambulance took her to quarantine. Someone took a video of her being picked up and posted it on a wechat group, with the caption: 'Sheep (referring to confirmed COVID-19 patients) finally picked up!' I was very sad and helpless at that moment; I don't know what kind of ridicule I'm going to face* [19]."

Furthermore, as many studies reported, the physical discomfort of protective clothing, a surge in the number of patients admitted without warning, the sudden changes in guidelines and the exhaustion of nurses, who have been caring for every aspect of patients during the pandemic without the help of a companion, have added to their stress [20]. One nurse said: "*You're just all sweaty and it's uncomfortable.* [21]" "*It was all like a dream, and suddenly I was put in this situation to take care of COVID-19 patients* [17]."

3.1.2. Psychological gap

At the start of the pandemic, the public did feel recognition and appreciation for what health care workers were doing, but that initial gratitude quickly faded, giving way to complaints, protests and attacks on social media [26]. Lee et al. [20] found that people tend to avoid nurses when they learn that they work in designated hospitals for COVID-19 patients. Another nurse stated, "*I have noticed a significant amount of discrimination against medical professionals in televised media, which I believe deserves attention. Personally, I am concerned about how these biases may affect my own reputation and therefore refrained from openly discussing this matter* [23]." Diagnosed patients refused to cooperate with nurses and even resorted to violence against them [20]. One nurse said that because communication with patients is particularly difficult, even if she put herself in their shoes, it is difficult to get them to open up [21].

3.2. Synthesized finding 2: adjustment period

The adjustment period is when nurses begin to change their mindset and regulate their emotions. It is also a critical time for managers to provide nurses with sufficient social support and guide them through the traumatic experience.

3.2.1. Self adjusting

Post-trauma nurses in self-regulation often no longer attempt to escape reality, but take the initiative to talk with the people around. Some nurses said they often chat with colleagues or their families, not only to relax but also to get psychological support, "*My family always* supports *me, and my colleagues always encourage each other* [15]." Or shift their focus to the positive and think on the bright side, Kandemir et al. [15] pointed out that there are nurses who regulate themselves through positive psychological suggestions, one nurse said, "*I always reassure myself over and over that the worst days will pass and that we will have a normal life*." Jiang et al. [19] found that nurses can also mobilize positive psychological capital to cope with trauma, one nurse mentioned, "*Dr. Julie Noram, an American psychiatrist, once said, 'Some people tend to be pessimistic in their behavior, but they still achieve remarkable results.' I think I might be a defensive pessimist.*"

3.2.2. Social support

Support from family and friends can help nurses build confidence, one nurse shared, "As the child of two nurses, I frequently seek their guidance and support. Their encouragement to approach my work with seriousness, enthusiasm, and strict adherence to emergency department protocols has been invaluable in motivating me [16]." A simple thank you in everyday life can motivate a nurse to work, some nurses were deeply moved by the letters and food they received from members of the public when supplies were scarce during the pandemic [20]. Support from colleagues is also an influential factor in promoting nurses to achieve PTG,"I have a great team," said one nurse. "The communication within the team is very good. Everyone talks and cheers each other up and works together [15]".

3.3. Synthesized finding 3: growth period

During this period, nurses' professional abilities, empathy skills, and self-regulation capabilities are enhanced while also achieving spiritual growth. Additionally, their future direction becomes clearer and they develop higher expectations for themselves.

3.3.1. Improvement of personal ability

Many nurses mentioned that working on the front lines during the COVID-19 pandemic not only improved their nursing skills, but they also gained a lot of knowledge. A nurse said, "*For me, this is the first time I have participated in this kind of epidemic relief, but I did learn a lot, and I think I have more confidence to face similar work in the future* [18]."

Additionally, frontline nurses working during the pandemic have improved their ability to protect themselves, "*I'm not so scared anymore. After seven months of taking care of a diagnosed patient, I think I'm equipped to take care of someone with an infectious disease, and I'll be able to deal with it even if it happens again* [20]."

After experiencing a traumatic event, some nurses began to learn how to empathize with others and actually felt that incorporating psychological care into practice was true nursing. They began to understand how patients feel and to be there for them during their most difficult times, "*Previously, I lacked the ability to attend to patients' emotional needs. However, as these issues have come into my purview, I have become more attuned to their expressions, tone of voice and frustrations - even those of neighboring patients upon discharge. It occurred to me that playing music for them could be beneficial and witnessing their joyous response has been immensely gratifying* [20]."

Nurses also learn tolerance and improved relationships after experiencing trauma, "*I got closer to my best friend. We encouraged each other and got to know each other better* [19]." Another nurse said: "*I used to be too competitive, but after this epidemic, I understand that I can always ask my colleagues for help, and we are closer* [17]." Meanwhile, the self-regulation ability and psychological quality of nurses also improves [19].

3.3.2. Increased sense of professional belonging

During the pandemic, some nurses found their work sacred and proud, "*The serious pandemic has spread all over the country and even worldwide. The nursing staff in emergency rescue, critical patient treatment, and other aspects of nursing technology demonstrate their high professional value* [22]." Perhaps when most nurses first started fighting the pandemic, they were commissioned by the government or hospital management. However, as they matured, they developed a strong sense of mission and came to believe that only they could shoulder the responsibility of safeguarding people's health [20].

In addition, nurses mentioned that in isolation rooms during the pandemic, nurses could make clinical decisions as well as doctors, replacing some doctors' decisions, "*Usually it's doctors who see patients and give them information about their condition, but during the COVID-19 pandemic, nurses are doing that* [15]." At the same time, nurses are also responsible for the education of patients and their families, which makes them feel a great responsibility [16].

3.3.3. Spiritual awakening and extended thinking

Some participants said they chose to trust God when dealing with the pandemic, "*I rely on the Lord for me personally*. [21]." Many nurses learned to see things from a different perspective. One nurse believed that every senior nurse she met on the clinical front line was a good example for her to learn from, and by learning their strengths, she became more competent [20]. Several nurses reported adopting protective measures, including donning PPE and practicing self-isolation, to safeguard their families while simultaneously alleviating their anxiety [15]. Some nurses also actively changes their outlook, becoming more passionate about life and believing that they can be more capable in the future. A nurse said, "*After witnessing too many lives and deaths, I know that the most important thing is to live, and to live optimistically and happily is my life goal* [18]." At the same time, some nurses changed their life philosophy [19], believing that nothing is more precious than health, and realizing the importance of family, saying that they will spend more time with their families in the future.

3.3.4. Look ahead

Numerous nurses explored novel avenues for professional development, such as actively participating in psychological counseling, palliative care, politics, and other associated domains [17], thereby expanding the realm of possibilities for their future endeavors. There are nurses who go into classes and share their PTG experiences with students and some nurses choose to study for a doctorate, to enter a new path of higher education [20]. As nurses developed, they also discovered what communities and people need to follow and pay attention to during the pandemic, as well as the importance of social media to get the news right to help people work together to get through the tough times. A nurse said: "*Communities should follow and adhere to protocols, including wearing masks, washing hands and physical distancing. It is also important to be careful when using social media. Don't create fake news about the pandemic; Instead, use good*

judgment and support *health workers and patients who are being treated* [16]." The deficiencies of the hospital management system and suggestions for improvement have also been put forward to promote the development of nursing simultaneously [16].

4. Discussion

Our study findings indicate that the experiences of PTG among ECC nurses following COVID-19 can be classified into three distinct stages: stress, adjustment, and growth, which aligns with previous research about PTG [27]. Among them, the accomplishments of ECC nurses during their growth period primarily encompass cognitive and spiritual growth, enhancement of professional identity, and self-competency requirements. These findings align closely with Dr. Richard Tedeschi's PTG model [8]. In addition, Dr. Richard Tedeschi proposed post-traumatic interventions based on the PTG model [28], encompassing the following five elements: meditation, emotional regulation, trauma disclosure, social support, and narrative development (as depicted in Fig. 3). Building upon this model

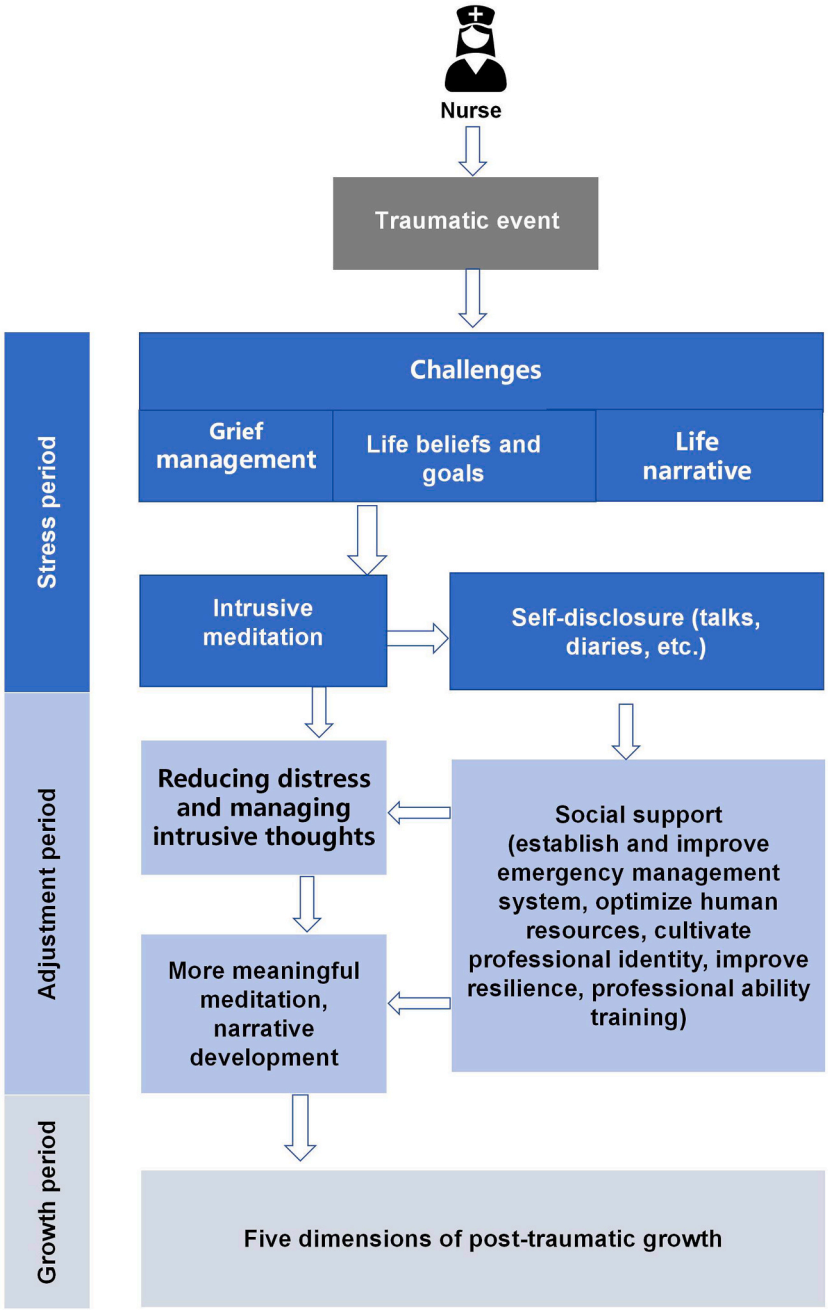

Fig. 3. PTG intervention model.

and its corresponding intervention strategies, we propose management strategies for fostering PTG among ECC nurses at different stages.

4.1. Stress period is an important period to provide psychological support

During the stress period, nurses often experience intrusive rumination, anxiety, depression, and other negative emotions. Invasive rumination refers to maladaptive repetitive thinking patterns where individuals passively dwell on the causes, consequences, and negative feelings associated with adverse events [29]. As a pathological process, invasive rumination is not only closely linked to the onset of mental illnesses like depression, anxiety disorders, and bipolar disorder but also significantly impacts the progression of organic diseases including hypertension, heart disease, and endocrine disorders [30], this interference hampers rehabilitation efforts and detrimentally affects overall quality of life. Therefore, managers should proactively strive to secure psychological treatment resources for nurses in the early stages of trauma, establish connections with psychological counselors, and provide guidance to facilitate self-adjustment among nurses. According to Dr. Richard Tedeschi's post-traumatic intervention model [28], self-disclosure can serve as an initial approach for nurses to effectively articulate their thoughts and emotions, encompassing various forms such as conversations and writing. By comprehensively understanding the perspectives of nurses, personalized psychological support can be provided, facilitating transformative thinking. In this context, motivational interviewing(MI) based on the THRIVE model can be employed. The aim of motivational interviewing is to assist individuals in resolving their conflicting feelings resulted from traumatic experiences, using interview techniques, with the goal of enhancing their internal motivation for change [31]. The THRIVE model, proposed by renowned British psychologist Stephen Joseph as a coping mechanism for PTSD [32], consists of six sequential steps: taking stock, harvesting, re-authoring, identifying change, valuing change and expressing change in action. This study proposes that managers proactively contact psychological counselors to integrate the THRIVE model with motivational interviewing and apply it for psychological intervention among ECC nurses during stress period, as depicted in Fig. 4.

4.2. Adjustment period is an important transition period

Through self-disclosure during the stress period and guided meditation by managers and psychological counselors, nurses in the adjustment period begin to learn to manage intrusive thoughts, shift emotions and mindset, and gradually develop towards positive aspects. This period also represents a critical juncture for managers to provide social support to nurses and guide them in exploring their aspirations. Based on the findings of this study, social support primarily encompasses the following dimensions. The first step is to enhance the establishment of hospital emergency response capacity for public health emergencies. To effectively address a series of future public health emergencies, it is recommended that medical and healthcare systems develop practical emergency plans and regularly update comprehensive plans and guidelines pertaining to the organization and operation of nursing resources [33]. In addition, the study conducted by Lee et al. [20] revealed that amidst the COVID-19 pandemic, nurses experienced heightened levels of anxiety and helplessness due to frequent changes in infection control policies and unexpected work situations. The already burdensome protective clothing, combined with unreasonable shift scheduling, exacerbates nurse fatigue. Ruskin et al. [34] discovered that factors such as heat stress, hearing and vision impairments, and limited mobility exacerbate physical and cognitive fatigue when wearing personal protective equipment (PPE). Simultaneously, improper utilization of protective clothing can also contribute to infection. Therefore, in addition to developing PPE that is both comfortable and safe, it is imperative for managers to provide proper training on the correct use of PPE and conduct regular assessments and drills to ensure nurses are equipped with the necessary skills to protect themselves in high-risk work environments. Furthermore, the rationality of nurses' shift patterns should not be disregarded. Research has demonstrated a direct correlation between medical staff's overtime hours and their emotional well-being, including anxiety and depression [35]. Ensuring adequate rest periods for nurses between shifts, optimizing human resources in ECC departments, establishing a reserve pool of healthcare professionals, implementing flexible scheduling techniques, among other strategies can effectively alleviate the pressure experienced by nurses. In recent years, the management approach known as "management

Fig. 4. Motivational interviewing based on THRIVE model.

by walking around" has garnered attention from managers. Originally, this concept referred to senior managers immersing themselves in the production floor to gain insights into actual production and operational conditions, enabling them to devise tailored solutions for fostering sustainable business development [36]. The implementation of "management by walking around" in ECC departments facilitates the optimization of resource allocation and enhances economic benefits, while also promoting effective communication and cooperation among managers, nurses, and patients. Furthermore, it aids in understanding caregivers' needs and identifying potential safety risks during their work [37]. This approach effectively alleviates the workload of clinical nurses and truly embodies a patient-centered nursing philosophy.

Secondly, it is of paramount importance to enhance the construction of public opinion and guide both the masses and other medical professionals within the team in accurately comprehending the image and role of nurses. Managers can publicize the deeds of excellent nurses, elevating the societal status of nurses, encouraging patients and their families to exhibit greater understanding and support towards nurses, thereby fostering an amicable cultural atmosphere within the department. Furthermore, attention should also be given to addressing COVID-19-related stigma. Qi et al. [4] found that the impact and causes of COVID-19 stigma show three dimensions of biological, psychological and social characteristics, and the coping mechanism should be based on whole-person support model. Governments can disseminate medical knowledge about epidemics through authorized channels and avoid labeling viruses as "people". Official platforms for debunking rumors, both online and offline, can be established to provide psychological counseling interventions for stigmatized groups and offer resources and support to enhance their coping capacity. Additionally, it is also necessary to develop appropriate interventions according to different cultures.

Thirdly, enhancing the resilience of ECC nurses is crucial. Resilience denotes an individual's capacity to adapt and thrive in challenging environments, encompassing the ability to withstand stressors and effectively embrace change [38]. By bolstering nurses' resilience, their adaptability towards traumatic events can be enhanced, enabling them to identify positive aspects amidst adversity, swiftly alter their perspectives, and optimally utilize internal resources when confronted with challenges. Currently, empirical evidence supports the efficacy of cognitive behavioral therapy, mindfulness-based psychological interventions, PERMA-based resilience training, stress emotion management, and resilience training programs (SMART) in enhancing individual resilience [39]. These findings can serve as valuable references for managers. Moreover, considering the nature of ECC departments and the limited availability of medical resources during public health emergencies, exploring team resilience is more crucial than focusing solely on individual resilience. Team resilience refers to the collective ability of a team to recover from adversity or setbacks, which is based on shared beliefs, emotions, and motivations among team members [40]. Previous studies suggested that promoting a positive team atmosphere, enhancing team learning abilities, and facilitating information sharing can improve team resilience [40]. Managers can adopt a network-based support system to implement the narrative support in nursing management, facilitating nurses to openly express their work-related challenges and needs, encouraging senior nurses to share their valuable work experiences and operational skills with junior nurses. This approach not only enhances team cohesion but also fosters mutual learning among team members. Moreover, managers themselves should prioritize the development of resilience and exercise dialectical thinking abilities while influencing team members through the "trickle-down effect" to guide the direction of the team [41].

4.3. Enhance the competency of ECC nurses

Literature shows that individual strength is conducive to the development of the team and even the whole discipline, which is also a necessary part of PTG [8]. Our study found that the improvement of competency had a significant effect on PTG of ECC nurses. Therefore, nursing managers should prioritize nurses' learning needs by offering ample opportunities for education, training, and teaching. Additionally, allocating time for case discussions and bedside communication in nurses' daily work is crucial to foster their cognitive development. The significance of professional skills ongoing training cannot be disregarded, and it is imperative to regularly conduct both theoretical and practical training for ECC nurses in order to ensure their ability to calmly and proficiently handle emergencies. Furthermore, managers should effectively leverage nurses' professional interests to cultivate their practical skills. For instance, nurses proficient in computer operations can be designated to join teams that require such skills, thereby enhancing work efficiency and harnessing their professional expertise.

5. Limitations

A total of 11 articles, encompassing the period from 2020 to 2023, were included in this study, originating from six different countries. In addition, this study excludes non-Chinese and non-English literature, which is limited to a certain extent. Despite our best efforts to retrieve articles, there will undoubtedly be missed selections. In addition, our study was limited to qualitative data and therefore could not provide broader insight into the feelings and experiences of PTG in ECC nurses.

6. Conclusion

This is a meta-synthesis of qualitative studies exploring PTG of nurses in ECC departments after COVID -19. Three themes were extracted: stress period, adjustment period and growth period. PTG is a dynamic process; therefore, it is crucial for managers to be attentive to the psychological changes experienced by nurses following trauma and provide tailored support at different stages. This necessitates enhancing the management framework, offering increased opportunities for professional development, and guiding nurses toward acquiring self-adjustment skills while actively coping with traumatic experiences. In future research, it is imperative to further investigate the PTG experiences of ECC nurses in public health crises, comprehend cross-cultural variations in nurses' responses

to trauma, dynamically attend to the positive changes that occur among emergency critical care nurses following traumatic events, and conduct a comprehensive set of systematic studies to present a more holistic understanding.

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Review and/or approval by an ethics committee was not needed for this study because this is a meta-synthesis of qualitative studies, with all data from previously published studies. Informed consent was not required for this study because this is a meta-synthesis of qualitative research.

Data availability statement

Data availability is not applicable to this article as no new data were created or analyzed in this study.

CRediT authorship contribution statement

Shuyang Liu: Writing – original draft, Methodology. **Huifeng Chen:** Writing – original draft, Methodology. **Dele Xu:** Data curation, Conceptualization. **Yue Liu:** Software, Data curation. **Peng Han:** Methodology, Data curation. **Jinxia Jiang:** Writing – review & editing, Conceptualization. **Yugang Zhuang:** Writing – review & editing, Conceptualization.

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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Abbreviations

ECC	Emergency and critical care
PPE	personal protective equipment
PTG	post-traumatic growth
ICU	Intensive care unit
PRISMA	Preferred Reporting Items for Systematic Reviews

References

[1] B. Tehranineshat, C. Torabizadeh, Posttraumatic growth: an analysis of the concept based on rodgers' concept development, J. Relig. Health 60 (4) (2021) 2728–2744.
[2] E. Dominguez-Gomez, D.N. Rutledge, Prevalence of secondary traumatic stress among emergency nurses, J. Emerg. Nurs. 35 (3) (2009) 199–204, quiz 273-4.
[3] C. Willis, T. Chalder, Concern for Covid-19 cough, fever and impact on mental health. What about risk of Somatic Symptom Disorder? J. Ment. Health 30 (5) (2021) 551–555.
[4] J. Qi, S. Yao, Z. Wang, Study on the impact, generation and response mechanism of stigmatization of COVID-19, Medicine and philosophy 42 (8) (2021) 49–53.
[5] F. Dutheil, L. Mondillon, V. Navel, PTSD as the second tsunami of the SARS-Cov-2 pandemic, Psychol. Med. 51 (10) (2021) 1773–1774.
[6] N. Winters, Seeking status: the process of becoming and remaining an emergency nurse, J. Emerg. Nurs. 42 (5) (2016) 412–419.
[7] A. Pourmand, et al., Rethinking traditional emergency department care models in a post-coronavirus disease-2019 world, J. Emerg. Nurs. 49 (4) (2023) 520–529.e2.
[8] R. Tedeschi, et al., Posttraumatic Growth: Theory, Research, and Applications, 2018.
[9] D. Moher, et al., Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement, Bmj 339 (2009) b2535.
[10] E. Fossey, et al., Understanding and evaluating qualitative research, Aust. N. Z. J. Psychiatr. 36 (6) (2002) 717–732.
[11] E.F. France, et al., A methodological systematic review of meta-ethnography conduct to articulate the complex analytical phases, BMC Med. Res. Methodol. 19 (1) (2019) 35.
[12] M. Sandelowski, J. Barroso, C.I. Voils, Using qualitative metasummary to synthesize qualitative and quantitative descriptive findings, Res. Nurs. Health 30 (1) (2007) 99–111.
[13] J. Jun, M.S. Rosemberg, I. Am a Nurse, Not a martyr: qualitative investigation of nurses' experiences during onset of the coronavirus pandemic, Pol. Polit. Nurs. Pract. 23 (1) (2022) 48–55.
[14] K.J. Foli, et al., Voices from the COVID-19 frontline: nurses' trauma and coping, J. Adv. Nurs. 77 (9) (2021) 3853–3866.

[15] D. Kandemir, A. Yılmaz, B. Sönmez, Professional and psychological perceptions of emergency nurses during the COVID-19 pandemic: a qualitative study, Jpn. J. Nurs. Sci. 19 (3) (2022) e12470.
[16] M. Mulyadi, et al., Nurses' experiences of emergency department triage during the COVID-19 pandemic in Indonesia, J. Nurs. Scholarsh. 54 (1) (2022) 15–23.
[17] X. Peng, et al., Negative and positive psychological experience of frontline nurses in combatting COVID-19: a qualitative study, J. Nurs. Manag. 30 (7) (2022) 2185–2193.
[18] X.T. Zhang, et al., The traumatic experience of clinical nurses during the COVID-19 pandemic: which factors are related to post-traumatic growth? Risk Manag. Healthc. Pol. 14 (2021) 2145–2151.
[19] J. Jiang, et al., Post-traumatic growth experience of first-line emergency nurses infected with COVID-19 during the epidemic period-A qualitative study in Shanghai, China, Front. Public Health 10 (2022) 1015316.
[20] N. Lee, H.J. Lee, South Korean nurses' experiences with patient care at a COVID-19-designated hospital: growth after the frontline battle against an infectious disease pandemic, Int. J. Environ. Res. Publ. Health 17 (23) (2020).
[21] J.M. Gordon, T. Magbee, L.H. Yoder, The experiences of critical care nurses caring for patients with COVID-19 during the 2020 pandemic: a qualitative study, Appl. Nurs. Res. 59 (2021) 151418.
[22] Z. Xiaoxu, et al., Reflections of nurses in the fight against COVID-19 in Hubei: a qualitative study, BMJ Open 13 (10) (2023) e066155.
[23] A. Umeda, et al., Experiences of nurses in charge of COVID-19 critical care patients during the initial stages of the pandemic in Japan, Glob Health Med 5 (3) (2023) 169–177.
[24] JOANNA BRIGGS INSTITUTE, Joanna Briggs Institute Reviewers' Manual, 2021. Available from: https://joannabriggs.org/.
[25] Z. Munn, et al., Establishing confidence in the output of qualitative research synthesis: the ConQual approach, BMC Med. Res. Methodol. 14 (2014) 108.
[26] J.L. Vincent, et al., Ten areas for ICU clinicians to be aware of to help retain nurses in the ICU, Crit. Care 26 (1) (2022) 310.
[27] Q. Liu, et al., Longitudinal qualitative study of post-traumatic growth trajectory in young and middle-aged stroke patients, journal of nursing science 36 (21) (2021) 65–68.
[28] R.G. Tedeschi, The post-traumatic growth approach to psychological trauma, World Psychiatr. 22 (2) (2023) 328–329.
[29] R. Sansone, L. Sansone, Rumination: relationships with physical health, Innovations in clinical neuroscience 9 (2012) 29–34.
[30] E.R. Watkins, H. Roberts, Reflecting on rumination: consequences, causes, mechanisms and treatment of rumination, Behav. Res. Ther. 127 (2020) 103573.
[31] S. Rollnick, W. Miller, What is motivational interviewing? Behav. Cognit. Psychother. 23 (1995) 325–334.
[32] J. Zhang, et al., A study on the intervention of post-traumatic growth of young and middle-aged stroke convalescent patients by motivational interview based on THRIVE model, J. Bengbu Med. Coll. 48 (8) (2023) 1152–1157.
[33] M. Nejadshafiee, et al., Providing telenursing care for victims: a simulated study for introducing of possibility nursing interventions in disasters, BMC Med. Inf. Decis. Making 22 (1) (2022) 54.
[34] K.J. Ruskin, et al., COVID-19, personal protective equipment, and human performance, Anesthesiology 134 (4) (2021) 518–525.
[35] S. Yang, L. Chen, X. Bi, Overtime work, job autonomy, and employees' subjective well-being: evidence from China, Front. Public Health 11 (2023) 1077177.
[36] Y. Liao, Application of walking management mode in nursing management of intensive care medicine department, Electronic journal of practical clinical nursing 3 (33) (2018) 167+172.
[37] C. Kong, F. Yang, Observation on the effect of walking management mode in nursing quality control, Chinese medical innovation 10 (24) (2013) 65–66.
[38] K.M. Connor, J.R. Davidson, Development of a new resilience scale: the connor-davidson resilience scale (CD-RISC), Depress. Anxiety 18 (2) (2003) 76–82.
[39] L. Liao, L. Wang, Research progress of psychological resilience intervention in nurses, Chin. J. Nurs. 58 (8) (2023) 942–949.
[40] Z. Wang, et al., The association between team resilience and team performance in nurses during COVID-19 pandemic: a network analysis, BMC Nurs. 22 (1) (2023) 54.
[41] S. Liu, et al., The resilience of emergency and critical care nurses: a qualitative systematic review and meta-synthesis, Front. Psychol. 14 (2023) 1226703.