Post-intensive care syndrome: a concept analysis


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Post-intensive care syndrome: A concept analysis

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ABSTRACT

Objective: Post-intensive care syndrome is a term used to describe new or worsening multidimensional impairments in physical, psychological, cognitive and social status arising from critical illness and persisting beyond hospital discharge. It is associated with high morbidity among patients discharged from intensive care units. However, due to its complexities, which encompass physical, psychological, cognitive and social impairments, the exact nature of this condition has not been fully conceptualized. The aim of this analysis therefore was to define the concept of post-intensive care syndrome. This conceptual clarity provides a general definition that is essential for practitioners and researchers to gain a comprehensive understanding of the syndrome and provide for accurate measurement of its incidence and prevalence.

Design: The Walker and Avant approach to concept analysis guided this investigation.

Data source: An electronic search of the literature using PubMed, CINHAL, PsycArticles, Academic search complete, Science Direct, MEDLINE and Health Source databases informed the analysis. The search included both quantitative and qualitative studies related to post-intensive care syndrome published in English between 2010 and 2020.

Results: Of the 3948 articles identified, 24 ultimately met the inclusion criteria. Analysis identified the defining attributes of post-intensive care syndrome as: (1) new or worsening multidimensional impairments; (2) physical dysfunction; (3) psychological disorder; (4) cognitive impairment; (5) failed social reconstruction; and (6) persistent impaired multidimensional symptoms extending beyond intensive care and hospital discharge. Antecedents were divided into two categories: pre-existing and those related to the intensive care admission. Consequences were identified as both positive (for example the establishment of coping processes) and adverse (for example decreased quality of life and caregiver burden).

Conclusion: Post-intensive care syndrome affects more than half of patients discharged from intensive care units. This operational definition and conceptual understanding of this syndrome will help improve understanding and inform the design of preventative strategies to improve long-term consequences of the syndrome. Future research and standardized instrument development will serve to better understand the scope and characteristics of this syndrome and inform the development of possible preventative interventions.

What is already known about the topic?

- Post-intensive care syndrome has adverse multidimensional effects on patients discharged from ICU.
- Although the syndrome is widely discussed in the literature, it is poorly defined and conceptualized.
- Over half of ICU survivors experience this syndrome.

What this paper adds

- This paper provides a detailed conceptual definition of post-intensive care syndrome.
- This paper provides information about post-intensive care syndrome for practitioners and researchers that will serve to underpin a comprehensive understanding of the syndrome and paves the way for a more accurate measurement of its incidence and prevalence.
- This paper provides a clear conceptual basis upon which future research on this topic can be developed.

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1. Introduction

The intensive care unit (ICU) is a specialist hospital facility that provides treatment and monitoring for people who are seriously ill and in need of both life supporting interventions and intensive monitoring by nurses (Kelly et al., 2014). Owing to medical, scientific and technological advances, survival rates of ICU patients have increased dramatically in recent years (Fuke et al., 2018; Howard et al., 2019; Inoue et al., 2019). This capacity to enhance survival has led to the expansion of ICU services globally, to provide critical support such as that required after lifesaving and intensive surgical procedures; following serious injuries, burns, poisoning and overdoses; and to support worsening cardiovascular and renal disorders; respiratory disorders and other diseases. At the same time factors such as an aging population have exacerbated this demand on the global provision of ICU care, as the average age of hospital inpatients has risen. Indeed, as people are generally living longer there is greater potential for the need for ICU. This is due to increased complexity of the disease trajectory/post-operative recovery in the older person who likely has reduced physiological function that can be seriously compromised by illness, treatment or surgery. Additionally, the increasing use of active interventions for older people such as oncological treatment of cancer (Kagan, 2016) means a positive impact on their functionality and quality of life (Kagan, 2015), but also renders older people more vulnerable to the need for ICU treatment. Consequently, more than half of all ICU patients are now aged 65 years or over, with the fastest-growing age group being those in the 85-year and over age category (Kheir et al., 2018; Inoue et al., 2019). Older people are presenting with an increasingly novel multi-comorbidity, given their longevity and possible survival from other illnesses and disorders (Kagan, 2015). Older ICU patients are therefore much more likely to experience poorer cognitive and functional outcomes than younger patients (Soliman et al., 2015; Inoue et al., 2019; Riegel et al., 2019). ICU survival therefore offers additional quality of life for people but also presents challenges, especially to the increasingly older cohort of patients.

Indeed, successful ICU discharge is a positive development for patients who in the past might not have otherwise survived their condition or treatment. However, the period following ICU also heralds the commencement of the recovery trajectory. In addition to recovery from the main presenting condition, it is increasingly understood that recovery from ICU may include coping with a variety of newly acquired or worsening impairments in one or more domains of physical, psychological, cognitive or social functioning (Chung et al., 2017; Bakhru et al., 2018). These impairments are often long lasting, not necessarily directly related to the presenting condition, and collectively have become problematic for survivors. It is alarming that more than half of ICU adult patients experience such impairments (Jackson et al., 2014; Marra et al., 2018; Heydon et al., 2019). As such the term post-intensive care syndrome (PICS) is now used increasingly to describe the interaction of a range of physical and psychological and other impairments that arise after ICU discharge and affect individuals and their families. Thus, in response to the increasing number of ICU survivors and the high prevalence of obvious multiple impairments observed and reported by staff (Needham et al., 2012; Elliott et al., 2014) some further conceptualizing of PICS has occurred. However, there is little consensus emerging and only marginal in-depth conceptual understanding of the syndrome. Importantly original descriptions of PICS (Needham et al., 2012; Elliott et al., 2014) while providing outline definitions, provide little detailed guidance for understanding or assessing the risk factors for the development of this syndrome. Furthermore, there is very limited guidance for the identification and management of PICS. Given the ever-expanding numbers of ICU patients, increasing age burden and enduring personal and healthcare burden of PICS, a clear understanding of the concept is needed to help nurses and other healthcare professionals to understand the multiple impairments that coexist within this syndrome and to assist and inform the development of an assessment tool to aid diagnosis.

This study aims to undertake a concept analysis of PICS using the framework of Walker and Avant (2011). It is suggested that the identification of defining attributes, model and contrary cases; antecedents; consequences and empirical referents will strengthen the comprehension of the concept and support the development of theoretical definition and measurement.

2. Methods

2.1. Concept analysis

In accordance with Walker and Avant (2011), concept analysis is the detailed study of a word or a phrase and its meaning and usage as the building block for theory development. The process of concept analysis enables one to clearly distinguish one concept from others that may be similar but slightly different. Conducting a concept analysis is a valuable process that can be used to clarify a concept, develop a theoretical definition and inform tools for further research. Therefore, a concept analysis of PICS can help healthcare professionals clarify contributory elements of this syndrome, provide direction of detection and prevention and thus provide a theoretical foundation for future research and practice.

The approach of Walker and Avant (2011) is widely employed for concept analysis within nursing, and comprises eight key stages: 1) selecting the concept (PICS); 2) determining the purpose of analysis (analyzing PICS to establish the theoretical definition and develop research tool); 3) identifying all uses of the concept; 4) defining attributes; 5) identifying a model case; 6) identifying borderline, related and contrary cases; 7) identifying antecedents and consequences; and 8) identifying the empirical referents of the defining empirical attributes.

2.2. Data sources

A systematic search using the terms (“post-ICU syndrome” OR “post intensive care syndrome” OR “PICS”) in the following electronic databases: CINAHL Complete; PsycArticles; Academic search complete; Science Direct, PubMed; MEDLINE and Health Source. The search was confined to articles published in English only between the years 2010 and 2020 and available in full text. This selection provided an up-to-date understanding of the topic and attempted to develop and build upon those definitions identified before this period (Needham et al., 2012; Elliott et al., 2014). A manual search of the reference lists of relevant papers was also undertaken (Fig. 1).

PICOS/PEO criteria were used as a guide to identify papers suitable for the analysis (Bettany-Saltikov, 2010). The population of interest were ICU patients, thus papers identified were confined to those who had been hospitalized in an ICU. The exposure was the identification of PICS in ICU, hospital, community or home care. The study design included was either qualitative or quantitative research. In terms of outcomes articles were included if they examined two or more elements of PICS. As such we excluded papers that only examined one isolated element of PICS only (for example cognitive impairment as a stand-alone component of PICS) as this did not comply with understandings of PICS as a multiplicity of effects and would lead to insufficient understanding of PICS as a syndrome (Proffitt and Menzies, 2019).
3. Results

The initial search yielded 3948 articles. After removal of duplicates and restriction to those that considered PICS only, 241 remained for further scrutiny (Fig. 1). Following an initial screening, 49 of these papers were included as they satisfied the basic inclusion criteria of being research studies that examined two or more symptoms of PICS (Fig. 1). In addition, five studies were manually searched by examining the reference lists of all papers retrieved to identify relevant papers on the topic. Following a more detailed analysis of the papers retrieved, in terms of their full compliance with the inclusion criteria, 24 studies were selected for inclusion in the final concept analysis (Fig. 1). Of these 24 studies, nine were conducted in the United States, two in Korea, two in Australia and two in New Zealand. The remaining studies emerged from European countries. Apart from two mixed method studies and three qualitative research studies, the others (n = 19) were cohort studies either prospective or retrospective.

3.1. Uses of the concept

The approach of Walker and Avant (2011) involves determining the defining attributes of a concept that are used to describe the concept. This requires evaluating as many conceptual examples as possible and documenting repeated features (Walker and Avant, 2011). The original PICS definition referred to “new or worsening impairments in physical, cognitive, or mental health status arising after critical illness and persisting beyond acute care hospitalization” (Needham et al., 2012, p. 505; Elliott et al., 2014, p. 2521). Another user-friendly lay definition of PICS for public understanding was described as “new or worse health problems after critical illness that remain after you leave the hospital. These problems can be with your body, thoughts, feelings or mind and may affect you or your family.” Apart from these two definitions, no further conceptual or operational understandings were identified (Table 1).

3.2. Defining attributes

Analysis of the research studies permitted the identification of the most common features associated with PICS (Table 2). Following the identification of these features, it was possible to identify key defining attributes (Table 2). Table 2 reflects a complete and concise list of these attributes. Consequently, the defining attributes are outlined as follows:

(1) New or worsening multidimensional impairments;
(2) Physical dysfunction;
(3) Psychological disorder;
(4) Cognitive impairment;
(5) Failed social reconstruction;
(6) Impaired multidimensional symptoms persisting beyond ICU and hospital discharge.

3.2.1. New or worsening multidimensional impairments

The first defining attribute of PICS is new or worsening multidimensional impairments. As such PICS is an ICU related problem that is new or represents a worsening of preexisting issues (Jackson et al., 2014; Chung et al., 2017; Wang et al., 2017; Marra et al., 2018; Sevin et al., 2018; Venni et al., 2018; Heydon et al., 2019; Riegel et al., 2019). These new or worsening symptoms although ICU related, persist long beyond dis-
charge. Marra et al. (2018) for example found that 39% of ICU survivors were still experiencing a least one PICS related impairment 3 months after discharge, with 35% of them continuing to have this issue at 12 months. However, about one-fifth of patients experienced two PICS related issues and 6% had three problems at 3 months, respectively. Indeed, qualitative studies illuminate this fact with participants describing that they needed to “embrace the new vulnerable self” after ICU discharge (Kang and Jeong, 2018, p.28).

In fact ICU survivors experiencing PICS symptoms accepted their vulnerable status as the new normalcy after their hospitalization (Walker et al., 2015; Hanifa,Glæemose and Laursen, 2018; Kang and Jeong, 2018).

3.2.2. Physical dysfunction

The second defining attribute of the concept is physical dysfunction, manifesting as acquired muscle weakness; impaired lung spirometry volumes and diffusion capacity; being exhausted; loss of appetite and weight; pain and deteriorated independence. Appleton et al. (2015) described acquired muscle weakness as the most frequently occurring characteristic of physical impairment in the context of PICS, with a possible incidence of 40%. Most studies consistently examined physical impairment using activities of daily living (ADL) and measuring a walk of 6-minute duration, and demonstrated a significant decline of physical function across all cohorts (Jackson et al., 2014; Farley et al., 2016; Torres et al., 2017; Daniels et al., 2018; Marra et al., 2018; Sevin et al., 2018; Heydon et al., 2019; Riegel et al., 2019; Wang et al., 2019b). Additionally, qualitative exploration supported this by demonstrating that patients experienced a strong feeling of being exhausted and in pain (Walker et al., 2015; Kang and Jeong, 2018). Sevin et al. (2018) also reported weight loss. They compared the pre-hospitalization weight with post discharge data indicating most patients had a median of 2.4 kg of weight loss.

3.2.3. Psychological disorders

The third key attribute is psychological disorders. Anxiety, depression and posttraumatic stress disorder (PTSD) were the most frequently described psychological disorders patients with PICS experienced. Respondents rarely were diagnosed with anxiety, depression or PTSD solely, but normally presented a combination of these. The prevalence of anxiety, depression and PTSD ranged from 13% (Marra et al., 2018) to 60% (Chung et al., 2017). Indeed, Farley et al. (2016) mentioned that some participants dropped out from the study because they thought it was too traumatic to recall their ICU experiences. In addition, several participants expressed that they felt overwhelmed by their ICU experience, and had a fear of death (Walker et al., 2015; Hanifa et al., 2018; Kang and Jeong, 2018).

3.2.4. Cognitive impairment

A fourth emerging attribute related to PICS is cognitive impairment, exhibiting as impaired memory, poor executive function, weakened language, inattention and worsening dementia. The studies identified a high incidence of cognitive impairments among those discharged from ICU. Many patients reported difficulties recalling their ICU experience and finding it difficult to express their feelings and concentrate on daily tasks (Walker et al., 2015; Daniels et al., 2018; Hanifa et al., 2018; Kang and Jeong, 2018; Wang et al., 2019b). Wang et al. (2017) found that nearly 90% of participants, mostly in the older age group, experienced cognitive impairment. Other studies found a high incidence of cognitive impairment, accounting for around half of the study population (Chung et al., 2017; Sevin et al., 2018).

3.2.5. Failed social reconstruction

Failed social reconstruction is the fifth attribute identified. Failed social reconstruction refers to problems with interpersonal relationships, altered personal identity and outlook and also and other social issues, such as becoming unemployed. Firstly, reduced interpersonal relationships and social isolation are commonly experienced by these patients (Walker et al., 2015; Hanifa et al., 2018; Kang and Jeong, 2018). Following hospital discharge, and given the lingering physical and psychosocial effects, most patients relied on family support, with many claiming that they did not want to venture outside and they lacked confidence to meet new people (Walker et al., 2015; Hanifa et al., 2018; Kang and Jeong, 2018). Studies demonstrated that some participants reported a changed identity and felt timid and passive when meeting people whereas they had been outgoing before their ICU experience (Hanifa et al., 2018; Kang and Jeong, 2018). Additionally, it was strikingly reported that less than 15% of those who experienced an ICU admission returned to work after their discharge from hospital (Daniels et al., 2018; Sevin et al., 2018). Moreover, some participants became completely dependent on their family, causing new and worsening social and economic issues (Kang and Jeong, 2018; Heydon et al., 2019).

3.2.6. Impaired multidimensional symptoms persisting after ICU and hospital discharge

The 6th and final defining attribute reveals that PICS problems persist after ICU and hospital discharge (Chung et al., 2017; Wang et al., 2017; Kang and Jeong, 2018; Marra et al., 2018; Sevin et al., 2018; Venni et al., 2018; Heydon et al., 2019; Riegel et al., 2019). This attribute confirms the long-term duration and effects of PICS. Studies that commenced from early ICU discharge (Chung et al., 2017; Wang et al., 2017; Sevin et al., 2018) and longitudinal studies (some up to nine years) (Kang and

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### Table 1

<table>
<thead>
<tr>
<th>Research topic</th>
<th>Concept analysis of Post Intensive Care Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Strategy</td>
<td><strong>Keywords/concepts</strong> Post Intensive Care Syndrome 2010 – 2020 English language Full text <strong>Synonyms/alternative terminology</strong> “post-ICU syndrome” OR “post intensive care syndrome” OR “PICS”</td>
</tr>
<tr>
<td>Limits and Type of material required</td>
<td>Databases and Resources to be searched relevant CINAHL Complete MEDLINE PsychArticles PubMed Health Source Academic Search Complete Science Direct</td>
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Table 2
Defining attributes.  

<table>
<thead>
<tr>
<th>Defining attributes</th>
<th>Sources</th>
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<tbody>
<tr>
<td>New or worsening multidimensional impairments</td>
<td>Reference articles: (Jackson et al., 2014; Walker et al., 2015; Chung et al., 2017; Petrinec, 2017; Wang et al., 2017; Gayat et al., 2018; Hanifa, Glæmose and Laursen, 2018; Kang and Jeong, 2018; Marra et al., 2018; Sevin et al., 2018; Heydon et al., 2019)</td>
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<tr>
<td>• Embracing the new vulnerable self</td>
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<td>• New normality</td>
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<td>• Adjusting the present health status</td>
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<tr>
<td>• Symptom-free or preexisting less serve problems at baseline</td>
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<tr>
<td>Physical dysfunction</td>
<td>Reference articles: (Jackson et al., 2014; Soliman et al., 2015; Walker et al., 2015; Farley, Eastwood and Bellomo, 2016; Torres et al., 2017; Daniels et al., 2018; Kang and Jeong, 2018; Marra et al., 2018; Sevin et al., 2018; Heydon et al., 2019; Riegel et al., 2019; Wang et al., 2019b)</td>
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<tr>
<td>• Being exhausted</td>
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<tr>
<td>• Acquired weakness: physically week or loss of physical function</td>
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<td>• Pain</td>
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<td>• Loss of appetite</td>
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<tr>
<td>• Deteriorated independence</td>
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<tr>
<td>• Loss of weight</td>
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<td>• Impaired lung spirometry, volumes, and diffusion capacity</td>
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<tr>
<td>Psychological disorders</td>
<td>Reference articles: (Jackson et al., 2014; Soliman et al., 2015; Walker et al., 2015; Farley, Eastwood and Bellomo, 2016; Chung et al., 2017; Torres et al., 2017; Wang et al., 2017; Daniels et al., 2018; Hanifa, Glæmose and Laursen, 2018; Kang and Jeong, 2018; Marra et al., 2018; Sevin et al., 2018; Heydon et al., 2019; Wang et al., 2019b)</td>
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<tr>
<td>• Depression</td>
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<td>• Anxiety</td>
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<td>• Post-traumatic stress disorders</td>
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<td>• Fear and feeling unsafe</td>
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<tr>
<td>• Being overwhelmed</td>
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<tr>
<td>• Boredom</td>
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<td>• Irritability</td>
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<td>• Insomnia</td>
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<tr>
<td>• Nightmare</td>
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<td>Cognitive impairments</td>
<td>Reference articles: (Soliman et al., 2015; Chung et al., 2017; Wang et al., 2017; Hanifa, Glæmose and Laursen, 2018; Kang and Jeong, 2018; Marra et al., 2018; Sevin et al., 2018; Heydon et al., 2019; Wang et al., 2019b)</td>
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<tr>
<td>• Decreased memory</td>
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<td>• Difficulty in concentration</td>
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<td>• sensory disturbance</td>
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<td>• executive function</td>
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<td>• worsening dementia</td>
<td></td>
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<tr>
<td>• weakened language</td>
<td></td>
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<tr>
<td>Failed social construction</td>
<td>Reference articles: (Walker et al., 2015; Daniels et al., 2018; Kang and Jeong, 2018; Sevin et al., 2018; Heydon et al., 2019)</td>
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<tr>
<td>• Unstable family relationship</td>
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<td>• Diminution of interpersonal relationship</td>
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<td>• Social isolation</td>
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<td>• Employment difficulties</td>
<td></td>
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<tr>
<td>• Financial problems</td>
<td></td>
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<tr>
<td>• Changed personal identity and outlook</td>
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<tr>
<td>Impaired multidimensional symptoms persisting after intensive care and hospital discharge</td>
<td>Kang and Jeong (2018) and Hanifa, Glæmose and Laursen (2018) and Torres et al. (2017) (Jackson et al., 2014; Marra et al., 2018) (Heydon et al., 2019) (Farley, Eastwood and Bellomo, 2016) (Chung et al., 2017; Wang et al., 2017; Sevin et al., 2018) (Petrinec, 2017) (Soliman et al., 2015) (Gayat et al., 2018)</td>
</tr>
<tr>
<td>• Participants post-discharge varied from 1 month to 9 years</td>
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<tr>
<td>• 3 months post ICU admission</td>
<td></td>
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<tr>
<td>• More than 3 months and less than 5 years</td>
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<td>• At 3 and 12 months after hospital discharge</td>
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<tr>
<td>• At 1 and 3 months after ICU discharge</td>
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<td>• Between 14–25 months</td>
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<tr>
<td>• At ICU discharge</td>
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<td>• ICU admission, 30 days and 60 days</td>
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<tr>
<td>• 1-year discharge</td>
<td></td>
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<tr>
<td>• At least discharge from ICU 1 year</td>
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</table>

Jeong, 2018) all demonstrated the persistence of PICS symptoms over time.

3.3. Model case and contrary case

3.3.1. Model case

A model case is prescribed by Walker and Avant (2011) as a paradigmatic example indicating the precise use of the concept. As a result, all the defining attributes should be present in the model case. The model case is outlined as follows.

Mary, a 67-year-old, was admitted to ICU with a diagnosis of pneumonia. She had respiratory failure and needed respiratory support for two weeks. On admission, a urinary catheter was inserted, and mechanical ventilation and antibiotic treatment was commenced supported by the use of sedation and muscle relaxants. She continued to be treated with mechanical ventilation and antibiotic support in the second week, however her condition had improved, so the administration of sedation and muscle relaxants ceased. After the sedation ceased, she gradually regained consciousness and recovered. Spontaneous breathing trials and daily screening of respiratory function were provided to aid the wean-
ing of mechanical ventilation. Mechanical ventilation was gradually suspended, and the endotracheal intubation tube was removed. Following extubation Mary was provided oxygen through a mask, and later using nasal cannula as her condition improved. At the end of the third week she was discharged from ICU and transferred to a hospital ward. While on the ward, nurses observed that Mary found it difficult to use cutlery and she needed to be helped with meals. She also had problems mobilizing to the toilet alone and needed assistance (new and worsening physical impairment). In addition, if she couldn’t see her family for a period of time, she became anxious and her mind would go blank. She also found it difficult to sleep at night and usually awoke several times (new and worsening psychological disorders). Remembering the date was difficult for her, despite receiving several prompts and reminders (new and worsening cognitive impairments). After an overall hospital stay of 33 days, Mary was discharged. Three months following discharge (persisting later than critical care and beyond ICU discharge), she still found it difficult to walk alone, and needed help from family members. She was experiencing difficulties falling asleep and often woke up in the night. She complained of fatigue, mild cough and other new symptoms. She often felt helpless and anxious (physical impairment and psychological disorders). She became forgetful and had difficulty concentrating; she frequently lost her train of thought (cognitive impairments). In the past Mary had regularly met friends, however since her hospital stay, she seldom came out to see her friends. She has had a hard time reconnecting with her friends. One challenge with talking to her friends was her concern and preoccupation with her condition and she was reluctant to continue to recollect her negative feelings about her condition and ICU treatment with them as this made her feel more anxious (failed social reconstructions).

3.3.2. Contrary case

John, a 62-year-old, with a history of chronic diabetes suddenly lost consciousness during treatment of an acute infection. After endotracheal intubation in the emergency room, he was admitted to ICU and was supported by mechanical ventilation treatment and sedation. Low-dose sedatives were used to prevent his breathing from interfering with the treatment of the mechanical ventilation. The nurse in charge provided adequate explanations during the treatment, and John was able to write out the things that he wanted to communicate to his family, and the nurse helped him to communicate these. On admission, he was diagnosed with acute renal failure caused by sepsis due to high blood sugar, high urinary glucose levels and high creatine levels. After full explanation to John and his family members, he commenced continuous renal replacement therapy for 7 days. After this treatment, the test results improved, so hemodialysis was stopped. The process of weaning the ventilator was also carried out. At each stage of the treatment progress, John and his family’s questions and concerns were addressed. When John was sent to the hospital ward a week later, the ICU nurse fully explained John’s treatment during the handover process, which was fully understood by the nurse. After being admitted to the ward, John actively participated in rehabilitation exercises. Three months after discharge, John came to hospital for the review alone, and he was actively controlling his blood glucose levels and was positive about his recovery progress. He was making a full recovery and no new impairments were noted (lack of new and worsened impairments in physical, psychological, cognitive and social, and not persisting beyond discharge).

3.4. Antecedents

Antecedents are those events that must occur prior to the occurrence of the concept (Walker and Avant, 2011). Therefore, in this concept analysis, antecedents are precursive elements of PICS. After reviewing the selected literature, due to the complexity of PICS, the emerging antecedents are divided into groups according to either pre-existing or ICU-related antecedents. Pre-existing antecedents mainly encompass factors that exist prior to the ICU admission, and are unrelated to it. These include patients’ demographic characteristics, socioeconomic status and lifestyle. These pre-existing antecedents include female gender; older age; lower education levels; alcohol abuse; unemployment and individual personality factors (Needham et al., 2012; Elliott et al., 2014; Hoffman, 2015; Marra et al., 2018). Women for example are noted to be more likely to develop psychological symptoms, a common feature of PICS, after ICU admission (Davydow et al., 2008). Older people are also reported as having a higher incidence of PICS compared with younger adults (Marra et al., 2018). Having a higher education level appears to be a protective factor (Marra et al., 2018). Besides these, pre-existing cognitive impairments; depression; anxiety; other psychological factors; frailty; intellectual ability and immobility also contribute to developing or worsening PICS problems (Jackson et al., 2014; Farley et al., 2016; Gunderson et al., 2016; Chung et al., 2017; Torres et al., 2017; Marra et al., 2018; Petrinec and Martin, 2018).

ICU-related antecedents are key contributors to the occurrence of PICS arising from ICU specific treatments and also the critical illness. Studies have documented that severe illnesses such as sepsis, acute respiratory distress syndrome (ARDS); multi-organ failure; systemic inflammatory response syndrome; hypoxia; glucose dysregulation: hyperglycemia; hypoglycemia; catabolic state and treatments such as neuromuscular blocking agents and glucocorticoids are specifically linked to the development of PICS (Needham et al., 2012). Studies of patients with sepsis or ARDS demonstrate that over half of them experienced one or more PICS symptoms at 3 and 12 months (Marra et al., 2018; Riegel et al., 2019). Additionally, ICU lifesaving treatments also have been reported as high predictors for PICS. Those treatments include mechanical ventilation; bed rest; physical restraints and sedation (Farley et al., 2016; Torres et al., 2017). The development of agitation in ICU is also a precursor to developing PICS. Indeed patients who experience delirium are at a particular risk of long-term consequences related to cognitive impairments (Chung et al., 2017).

3.5. Consequences

Consequences are the results of the concept, which appear subsequent to and as a result of the concept (Walker and Avant, 2011). Hence, the consequences of PICS refer to the outcomes. The positive consequence of PICS is that the coping process helps the patients establish a post-normal condition. ICU patients embrace their post normality after struggling with the recovery of PICS, and some even act as an advocate to support others who are newly discharged from ICU (Walker et al., 2015; Kang and Jeong, 2018). On the other hand, the adverse outcomes include decreased quality of life and increased burden on caregivers. Many studies examining health-related quality of life demonstrated that PICS has a negative impact (Soliman et al., 2015; Daniels et al., 2018; Da Costa et al., 2019; Kerckhoffs et al., 2019). Moreover, a decrease in quality of life not only occurs among survivors but is also mirrored among their caregivers, with 50% of caregivers experiencing overburden in relation to their care of PICS survivors (van den Born-van Zanten et al., 2016).

3.6. Empirical referents

A validated tool to identify the holistic domains of PICS remains undeveloped. At the discovering stage, tools used to evaluate PICS were not adequately comprehensive, such as those used to address physical dysfunction (Medical Research Council Scale for Muscle
Strength and Activities of Daily Living (ADL)) (Jackson et al., 2014; Torres et al., 2017; Wang et al., 2017); those used to monitor the incidence of psychological disorders (Hospital Anxiety and Depression Scale (HASD) and Posttraumatic Stress Symptoms-14 (PTSS-14) (Jackson et al., 2014; Farley-Eastwood and Bellomo, 2016; van den Born-van Zanten et al., 2016; Chung et al., 2017; Torres et al., 2017; Marra et al., 2018; Petrinec and Martin, 2018). Yet, to measure PICS, physical, psychological, cognitive and social dimensions that involve interrelated problems need to be taken into consideration. However these tools only reflect single or dual domains of PICS. The ADL, HASD and PTSS-14 were validated to examine the physical and psychological outcomes (only).

The Healthy Aging Brain Care Monitor Questionnaire is more comprehensive and measures PICS symptoms within three domains including cognition, psychological symptoms, and physical functioning (Wang et al., 2019a, 2019b). This questionnaire examines patients’ perceived frequency of PICS symptoms during the 2 preceding weeks. It has 27 items including six items related to cognition assessing memory, orientation, and judgment; 11 items related to physical problems about ADLs and 10 items measuring psychological status evaluating symptoms of depression, psychosis, and anxiety. Each item is rated with four points on the basis of frequency. A score of zero for example means that symptoms did not happen at all, while a score of 3 means that problems occur almost daily over the preceding 2 weeks. The Post-Intensive Care Syndrome Questionnaire (PICSQ) is another comprehensive tool that consists of 18 items with six questions each for cognition, function and psychological status. Each of the subscales has six questions, respondents reflect their views on the frequency of symptoms using a four-point likert scale (0 means never, 1 means sometimes, 2 means often and 3 represents always (Jeong and Kang, 2019).

These two aforementioned PICS instruments both include exploration within three domains (cognition, psychological symptoms, and physical functioning), and they have some overlap on the items assessed within each. With regard to cognition, both evaluated the memory, executive function and concentration. Regarding psychological issues, both examined anxiety and depression and issues about sleeping. Yet, on the physical subscale, only Wang et al. (2019a) rated participants’ perceived quality of life in this area. However, none of the instruments incorporate measurement of social impairments. Existing research tools do not entirely reflect the characteristics of ICU survivors, which masks the holistic presentation and symptoms of PICS.

3.7. Definition of the concept

Post Intensive Care Syndrome is defined as new or worsening co-occurrence of physical dysfunctions, psychological disorders, cognitive impairments or failed social reconstruction with these impairments persisting beyond ICU and hospital discharge.

4. Discussion

The ultimate purpose of ICU care is to provide a better quality of life. However, the long-term consequences of ICU survival have recently come into the spotlight for healthcare providers (Howard et al., 2019; Inoue et al., 2019). At the same time the general public have also become increasingly aware of some of the possibilities, limitations and consequences of ICU care. COVID 19 has dramatically increased the numbers of ICU survivors, and both healthcare and ICU are unprecedentedly regular subjects of public discourse. The resultant increase in ICU survivors and greater awareness of ICU care might provide increased opportunities for dialog about ICU experiences, perhaps providing a platform for patients and family to open up and share more about their ongoing challenges. This might pave the way for a greater exploration of ICU survival experiences and perhaps develop opportunities for PICS research. PICS is a complex concept experienced by ICU survivors involving persistent new onset or worsening multidimensional impairments that can negatively affect peoples’ quality of life. Therefore, the holistic consequences identified within this concept analysis offer a holistic view of ICU survivors’ perspectives on life beyond discharge and draw attention to the potential long-term effects on quality of life of ICU care.

This concept analysis offers a greater understanding of PICS by identifying attributes, antecedents and consequences according to the approach of Walker and Avant (2011). This syndrome comprises six defining attributes: new or worsening multidimensional impairments; physical dysfunction; psychological disorder; cognitive impairment; failed social reconstruction and impaired symptoms persisting beyond the ICU discharge. With regard to the six defining attributes, new or worsening multidimensional impairments and impaired symptoms persisting after ICU and hospital discharge are two concrete attributes that can be found in the literature frequently and explicitly. The other four defining attributes: physical dysfunction, psychological disorders, cognitive impairments and failed social reconstruction characterize the core properties of PICS. The four core attributes intersect and influence each other (as shown in Fig. 2).

The antecedents in this concept analysis highlighted that ICU survivors are vulnerable to a range of interactional risk factors that can lead to the development of PICS. The identification of antecedents such as age, gender and ICU related treatments identified within the literature can help clinicians to develop an awareness of PICS risk factors and thus aid treatment and prevention. However further research is needed to systematically evaluate these antecedents/risk factors and ascertain the extent and relational influence of these.

After examining the consequences from the studies, this concept analysis found that patients often experience long-term adverse complications, causing a diminishment of the quality of life and an overburdening of their caregivers. However, some patients establish a new normalcy and a positive coping strategy although they may experience some PICS symptoms, thus there is potential that providing support to these patients could yield positive outcomes.

Many studies evaluated the long-term effect of physical and psychological health status and cognition on patients (Estrup et al., 2018; Zorowitz, 2016). There is no doubt that individuals’ impairments contribute to the development of PICS, and patients are more likely to be affected within two or more domains, which concurrently interact with one and affect one another (see Fig. 2). Patients usually exhibit challenges in at least two domains however, even a single impairment has the potential to subsequently influence other domains (Proffitt and Menzies, 2019). Physical deficits for example can influence psychological health or create social problems. Therefore, it is important to begin to consider patients who develop physical dysfunction; psychological disorder or cognitive impairment within ICU, or during their hospital stay, as being not only at risk of developing PICS but at risk of one problem exacerbating or initiating another. While these relationships have not received much attention in the literature, it is possible for example that physical dysfunction in the presence of cognitive impairment would likely lead to psychological problems and failed social reconstruction. Prevention and early treatment initiatives of individual antecedents are therefore important, such as timely and effective screening for delirium (Selim et al., 2018) and early delirium intervention and management (Bidwell 2017). Good communication between nurses, patients and families can also be successful in preventing or exacerbating psychological distress (Jo et al., 2019), and thus possibly reducing the PICS burden. Other family centered initiatives such as family ICU ward rounds (Kalliopi et al.,
2020) might prove useful in terms of providing both family and patient support, but may also qualitative insight into predisposing risk factors and early signs of new or worsening physical, social, cognitive or psychological symptomology.

This concept analysis emphasizes the issue of failed social reconstruction for the first time and the potential effect of PICS on the social life of patients. These social consequences were not included when the PICS definition was firstly proposed. However, being social is a core function of quality of life and well-being. Noteworthy is that those who are socially vulnerable are also more likely to experience psychological impairments and contribute to overburdening caregivers (Kang and Jeong, 2018). Thus, there are far reaching consequences to these social issues. Recognizing and supporting failed social reconstruction can help ICU survivors reestablish social networks, interactions and outlook following discharge and serve to reduce possible impact on other PICS symptoms and family burden. The social effects of PICS are possibly less likely to be evident within the hospital setting and are something that the family will later report, or which may be observed as negatively impacting upon a person’s physical activity or psychological health. However, it is important for the nurse to be mindful of the presence of these symptoms, their potential interaction and their contribution to a PICS diagnosis. Certainly, impaired symptoms persisting beyond hospital discharge are distressing for patients and family and require action and support in the clinical setting. These symptoms can negatively affect quality of life and recovery, and thus attention should be paid to the identification, detection, treatment and prevention of PICS.

PICS prevention requires a cooperative effort to be successful. If not, family members may bear the main burden of managing their family member's long-term challenges (Needham et al., 2012; Elliott et al., 2014; Herrup et al., 2017; Esses et al., 2019). It is important to provide continuing care to ICU survivors who experience PICS, therefore timely assessments and recognition by healthcare professionals are important (Walker et al., 2015) and urgently needed. In keeping with the findings from this concept analysis, isolated single and paired impairments studies cannot adequately embody the requirements for assessment or treatment of PICS. It is necessary therefore to develop a holistic screening guideline that takes into account holistic multidimensional effects of this syndrome. Additionally, ICU nurse sensitive outcomes (Daniels et al., 2020) need to be explored and developed to support a structure for the identification of the incidence and prevalence of PICS or its antecedents. It is anticipated that this concept analysis might contribute to screening tool development, and nurse sensitive outcome analysis for the future.

5. Limitations

There are some limitations with this concept analysis. Firstly, the articles were restricted to English only, which limits the scope of the investigation. Secondly, the paucity of research examining a combination of all four elements of PICS might contribute to an overestimation of the effect of these PICS sub elements on patients.

6. Conclusion

This concept analysis provides a comprehensive insight into PICS, which emerges as a more holistic and all-embracing syndrome than previously thought, with the co-occurrence of physical, psychological, cognitive and social impairments that remain long after the critical illness (and discharge from ICU). Given the increasing use of ICU, its current high profile globally, the long-term consequences of PICS and the possible multiple impairments, the present analysis provides a theoretical foundation to influence future understanding and research in this field. This paper provides information for nurses and other healthcare professionals that serves as the basis for aiding the identification of PICS in ICU at an early stage and the foundation for developing rigorous assessment tools and designing appropriate needs-led interventions.

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.

References


