Factors Related to Health-related Quality of Life Among Critical Illness Survivors, Sichuan Province, the People's Republic of China: A Cross-sectional Study*

ปัจจัยที่มีความสัมพันธ์กับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพของผู้ที่รอดชีวิตจากการเจ็บป่วยวิกฤตในเสฉวน สาธารณรัฐประชาชนจีน: การศึกษาแบบตัดขวาง*

Yao	Li**	เหยา	หลี่**
Chiraporn	Tachaudomdach***	จิราภรณ์	เตชะอุดมเดช***
Chomphoonut	Srirat****	ชมพูนุท	ศรีรัตน์****

Abstract

Health-Related Quality of Life (HRQOL) affected by critical illness and ICU treatment, of those who have moved out of an intensive care unit. The sequela of critical illness contributes to Activity of Daily Living (ADL) problems, anxiety, and depression. This descriptive correlational study explored the relationship of HRQOL with ADL, anxiety, and depression among critically ill survivors in Chengdu Fifth People's Hospital, Sichuan Province, the People's Republic of China. The participants included 85 critical illness survivors. Research instruments included the demographic data of participants, and Chinese versions of the Short Form 36-item Health Status survey (SF-36), the Katz ADL scale, and the Hospital Anxiety Depression (HAD) Scale. The Cronbach's alpha coefficient for the SF-36 was 0.98, 0.97, 0.99, 0.91, 0.96, 0.88, 0.87, and 0.91 for the physical function, role physical, role emotion, social function, bodily pain, vitality, mental health, and general health dimensions, respectively. For the Chinese version of the Hospital Anxiety Depression (HAD) Scale, the Cronbach's alpha coefficients for anxiety and depression were 0.84 and 0.83, respectively. The one-week test-retest reliability for the Katz ADL was 1.00. Descriptive statistics, Spearman's rank correlation, and Mann-Whitney U tests were used in this study.

The study results showed that bodily pain received the highest HRQOL score in all dimensions among critical illness survivors (M = 91.54, SD = 16.80). The lowest average rating was for the general health dimension (M = 70.86, SD = 16.06). Role emotion, mental health, social function, physical role, physical function, and vitality were at the moderate average rating and were gradually declining, at 87.50, 86.22, 85.70, 80.10, 78.02, and 77.74, respectively. Most participants had ADL independence (n = 67, 78.80%). In addition, most participants showed no anxiety (n = 76, 89.50%) or depression (n = 75, 88.20%). Anxiety had a slight relationship with HRQOL in physical function and physical role (r = -.214, -.213, $p < 0.05$), a moderate relationship with general health (r = -. 454, $p < 0.01$), and a strong relationship with role emotion, social function, vitality, and mental health (r = -.514 to -.724, $p < 0.01$). In addition, depression had a moderate to strong negative relationship with HRQOL in seven dimensions except for the bodily pain dimension (r = -.478 to -.685, $P < 0.01$).

The results of this study provide evidence supporting strategies to enhance HRQOL among survivors of critical illness in Chengdu, Sichuan province. These strategies focus on improving activities of daily living as well as reducing anxiety and depression among this population.

Keywords: Activities of daily living; Anxiety; Depression; Health-related quality of life; Critical illness survivors

* Master's thesis, Master of Nursing Science Program (International Program), Faculty of Nursing, Chiang Mai University

*** Corresponding author, Graduate student of Nursing Science Program (International Program), Faculty of Nursing, Chiang Mai University; e-mail: yao_li@cmu.ac.th

*** Associate Professor, Faculty of Nursing, Chiang Mai University

**** Assistant Professor, Faculty of Nursing, Chiang Mai University

Received 18 December 2023; Revised 6 August 2024; Accepted 9 August 2024

บทคัดย่อ

คุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ ที่ได้รับผลกระทบจากการเจ็บป่วยวิกฤตและการรักษาในหอผู้ป่วยหนักของผู้ที่รอดชีวิต ผลที่ตามมาของการเจ็บป่วยวิกฤตก่อให้เกิดปัญหาการปฏิบัติกิจวัตรประจำวัน มีความวิตกกังวล และมีภาวะซึมเศร้า การศึกษาเชิงพรรณนาหาความสัมพันธ์ครั้งนี้ เป็นการศึกษาความสัมพันธ์ของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพกับการปฏิบัติกิจวัตรประจำวัน ความวิตกกังวล และภาวะซึมเศร้าของผู้ที่รอดชีวิตจากการเจ็บป่วยวิกฤต ในโรงพยาบาลเฉิงตูแห่งที่ 5 มณฑลเสฉวน สาธารณรัฐประชาชนจีน กลุ่มตัวอย่าง จำนวน 85 คน เครื่องมือในการดำเนินการวิจัยประกอบด้วย แบบรวบรวมข้อมูลกลุ่มตัวอย่าง แบบประเมินคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพฉบับภาษาจีน แบบประเมินการปฏิบัติกิจวัตรประจำวันฉบับภาษาจีน และแบบประเมินความวิตกกังวลและภาวะซึมเศร้าฉบับภาษาจีน ค่า Cronbach's alpha coefficient ของแบบประเมินคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ ด้านการทำหน้าที่ของร่างกาย บทบาทด้านกายภาพ บทบาทด้านอารมณ์ ด้านกิจกรรมทางสังคม ด้านความเจ็บปวด ด้านมีพละกำลัง ด้านสุขภาพจิต ด้านการรับรู้ภาวะสุขภาพโดยทั่วไป เท่ากับ 0.98, 0.97, 0.99, 0.91, .096, 0.88, 0.87 และ 0.91 ตามลำดับ และค่า Cronbach's alpha coefficient ของแบบประเมินความวิตกกังวลและภาวะซึมเศร้า เท่ากับ 0.84, และ 0.83 แบบประเมินการปฏิบัติกิจวัตรประจำวันได้ผ่านการประเมินความเที่ยงด้วยวิธีทดสอบซ้ำ ในหนึ่งสัปดาห์ ได้ค่าเท่ากับ 1.00. วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา สถิติ Spearman's rank correlation และ Mann-Whitney U tests

ผลการศึกษาพบว่า ด้านความเจ็บปวดมีคะแนนสูงสุดในทุกมิติของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพในผู้ที่รอดชีวิตจากการเจ็บป่วยวิกฤต (M = 91.54, SD = 16.80) คะแนนเฉลี่ยต่ำสุดคือด้านการรับรู้ภาวะสุขภาพโดยทั่วไป (M = 70.86, SD = 16.06) บทบาทด้านอารมณ์ ด้านสุขภาพจิต ด้านกิจกรรมทางสังคม บทบาทด้านกายภาพ ด้านการทำหน้าที่ของร่างกาย และด้านมีพละกำลัง มีคะแนนเฉลี่ยในระดับปานกลาง และมีคะแนนเฉลี่ยลดลงตามลำดับดังนี้ 87.50, 86.22, 85.70, 80.10, 78.02 และ 77.74 กลุ่มตัวอย่างส่วนใหญ่สามารถปฏิบัติกิจวัตรประจำวันได้อย่างเต็มที่ (n = 67, ร้อยละ 78.80) นอกจากนี้ กลุ่มตัวอย่างส่วนใหญ่ไม่มีความวิตกกังวล (n = 76, ร้อยละ 89.50) หรือภาวะซึมเศร้า (n = 75, ร้อยละ 88.20) ความวิตกกังวลมีความสัมพันธ์ระดับต่ำกับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ (r = -.214, -.213, $p < 0.05$) มีความสัมพันธ์ปานกลางกับการรับรู้ภาวะสุขภาพโดยทั่วไป (r = -.454, $p < 0.01$) และมีความสัมพันธ์ในระดับสูง กับบทบาทด้านอารมณ์ ด้านกิจกรรมทางสังคม ด้านมีพละกำลัง และด้านสุขภาพจิต (r = -.514 ถึง -.724, $p < 0.01$) นอกจากนี้ ภาวะซึมเศร้ามีความสัมพันธ์ทางลบในระดับปานกลางถึงมากกับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพทั้งเจ็ดด้าน ยกเว้นมิติด้านความเจ็บปวด (r = -.478 ถึง -.685, $P < 0.01$)

ผลการศึกษาครั้งนี้ ได้ข้อมูลที่สนับสนุนกลยุทธ์ในการยกระดับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพในผู้ที่รอดชีวิตจากการเจ็บป่วยวิกฤต ในเฉิงตู มณฑลเสฉวน กลยุทธ์ดังกล่าวมุ่งเน้นให้ผู้รอดชีวิตมีความสามารถในการปฏิบัติกิจวัตรประจำวัน ช่วยลดความวิตกกังวล และภาวะซึมเศร้าในประชากรกลุ่มนี้

คำสำคัญ: การปฏิบัติกิจวัตรประจำวัน ความวิตกกังวล ภาวะซึมเศร้า คุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ ผู้ที่รอดชีวิตจากการเจ็บป่วยวิกฤต

* วิทยานิพนธ์หลักสูตรพยาบาลศาสตรมหาบัณฑิต (หลักสูตรนานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่
** ผู้เขียนหลัก นักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต (หลักสูตรนานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่ e-mail: yao_li@cmu.ac.th
*** รองศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่
**** ผู้ช่วยศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่

วันที่รับบทความ 18 ธันวาคม 2566 วันที่แก้ไขบทความ 6 สิงหาคม 2567 วันที่ตอบรับบทความ 9 สิงหาคม 2567

Background and significance

According to Society of Critical Care Medicine (SCCM) statistics, over five million adult patients are admitted to an intensive care unit (ICU) annually in America while over four million patients are able to be discharged (SCCM, 2020). In fact, during COVID-19, the need for critical care increased by approximately four times in Canada compared with pre-pandemic figures (Gibney et al., 2022). According to a Health Commission report, nearly 2.11 million patients required ICU treatment from 2019 to 2020, and over 1.8 million patients were discharged from an ICU in China (National Health Commission, 2020). According to cohort studies from more than 500 hospitals, there was a significant increase in critical illness survivors from 431,360 to 530,371 during the period from 2016 to 2018 (He et al., 2020). With advanced intensive care, more critically ill patients can be discharged from the ICU alive.

Critical illness survivors are critically ill patients who survive their condition and move out of the ICU. Generally, these patients are admitted under acute life-threatening conditions, such as sepsis, acute organ failure, acute respiration disease, or trauma (Johnson & Gustin, 2013). The sequela of critical illness might result in physical problems and limit their physical activities, even after being discharged for six months (Wieske et al., 2015). Additionally, physical limitations left by critical illness increase mental burdens, such as anxiety and depression after ICU discharge (Teixeira et al., 2021). It has also been observed that cognitive function can be impaired when critical illness survivors are discharged (Müller et al., 2020). Sedation during critical ill patients' ICU stays, which increases delirium, has resulted in cognitive problems three months after discharge from the ICU (Fiani et al., 2022). All these problems might contribute to poor health-related quality of life (HRQOL) (Hofhuis et al., 2021).

Activities of daily living (ADL) refer to essential primary tasks done in one's everyday life to maintain independence (Katz, 1963). Critical illness survivors with ADL dependency might experience deterioration in their mental state, such as depression (Vest et al., 2011), increasing family members' financial burden (Griffiths et al., 2013). Reduced muscle force has led to critical illness survivors not performing daily tasks independently, limiting their self-care (Li et al., 2021). Moreover, 20-40% of critical illness survivors were shown to have ADL problems within three discharges from the ICU (Busico et al., 2016). In China, one study in Guangzhou revealed that 12.3% of critical illness survivors had ADL problems (Li et al., 2021).

Anxiety and depression are defined as mental disorders. Anxiety includes excessive fear and worry about various domains which are challenging to control. Depression refers to feeling sad, empty, or irritable, and can be accompanied by somatic and cognitive changes that affect one's functioning (American Psychiatric Association, 2013). Critical illness results in physical problems (Teixeira et al., 2021), limiting an individual's independence and contributing to their anxiety (Teixeira et al., 2021). The sequela of critical illness extends to physical recovery, and poor post-recovery physical status can result in depression among critical illness survivors (Teixeira et al., 2021).

Extended ICU stays might result in unpleasant feelings, such as feeling worthless, powerless, and guilty about being critical illness survivors, which might trigger negative symptoms of depression (Liao et al., 2020). Between 30-46% of critical illness survivors suffer anxiety and depression after moving to an ICU for three months (Rabiee et al., 2016). However, anxiety and depression among this population in China have not yet been explored. Previous studies have found that critical illness survivors who had ADL independence achieved better HRQOL in eight dimensions (Medhi et al., 2019). Moreover, ADL dependency might decrease critical illness survivors' physical function and HRQOL (Vest et al., 2011). The sequela of critical illness contributes to ADL dependency, causing critical illness survivors to need assistance, limiting their ability to perform physical activities and resulting in decreased HRQOL (Vest et al., 2011).

HROOL refers to patients' judgement of their functioning and emotional well-being as affected by the experience of disease and treatment (Ware & Sherbourne, 1992). It has eight dimensions, including physical functioning, role limitation because of physical problems (role physical), bodily pain, general health perceptions, mental health, role limitation because of mental health problems (role emotional), vitality, and social functioning (Ware & Sherbourne, 1992). For critical illness survivors, a poor HRQOL was linked with work status (Hodgson et al., 2018). The sequela of critical illness caused problems in terms of walking and memory which limited the ability to work, leading to an inability to take responsibility for their prior work (Hodgson et al., 2018).

Low HRQOL post-discharge affects both critical illness survivors and their family members. Poor HRQOL means they have deteriorated physical and mental perspectives, cannot care for themselves, and require assistance (Herridge et al., 2016). In contrast, critical illness survivors with better HRQOL seemed less affected by the sequela of critical illness. In other words, they suffer less illness burden when they have better HRQOL. Compared with survivors with poor HRQOL, one study has shown that those with better HRQOL did not have other walking problems, anxiety, depression, or PTSD (Nakamura et al., 2021).

Several factors might affect HRQOL, such as age, mechanical ventilation, or extended ICU stays. Older individuals suffer from reduced physical activities and need more time to recover from critical illness (Rai et al., 2020). Undergoing more than five days of mechanical ventilation was shown to be a risk factor affecting HRQOL in survivors with sepsis (Su et al., 2018). Long-term mechanisms may lead to immobility, resulting in more physical impairments, such as muscle weakness, affecting their ability to perform activities and do work (Su et al., 2019; Vogel et al., 2018). Long-term ICU stays may result in more physical problems than just limits on physical activities, contributing to poor HRQOL (Zeggwagh et al., 2020).

Furthermore, a study by McKinley et al. produced a range of findings on critical illness survivors, including the finding that anxiety had a significant negative relationship with HRQOL ($r = -.47$, $r = -0.70$, $p < 0.01$), anxiety increased while HRQOL decreased, and critical illness left physical problems and increased anxiety among survivors after ICU discharge, increasing their

mental distress (McKinley et al., 2016; Stevenson et al., 2013). Depression was negatively related to HRQOL among critical illness survivors and was consistent between studies (r = -.22 to -.64, r = -.70, p < 0.01) (McKinley et al., 2016). Critical illness survivors' depression increased, and their HRQOL decreased (McKinley et al., 2016). Critical illness leaves physical problems that contribute to depression, which can affect illness survivors' essential physical activities (Jackson et al., 2014). Additionally, depression might amplify physical symptoms (Jackson et al., 2014) due to which individuals would be less motivated to join physical therapy, thus contributing to decreased physical activity (Bienvenu et al., 2012).

Understanding HRQOL is essential, as subsequent interventions should be initiated as early as possible to promote HRQOL, improve ADL, and reduce mental problems.

In China, no studies have explored anxiety and depression and the relationship between ADL, anxiety, and depression among critical illness survivors. In addition, Li and colleagues found that the mental health dimension had the lowest rating, which differed from other studies. Furthermore, the follow-up duration in Li and colleagues' study was 19.4 months (Li et al., 2021) which was too long for investigating HRQOL. Hofhuis and colleagues found that HRQOL among critical illness survivors was lowest after they were discharged from an ICU (Hofhuis et al., 2021). With the time change, HRQOL had improved three months after they had moved out of the ICU (Hofhuis et al., 2021; Vogel et al., 2018).

Therefore, this study investigated HRQOL among critical illness survivors who had moved out of the ICU for over one month but less than three months. Additionally, we retained all types of essential survivors of illness discharged from the ICU. Our research objective was to explore HRQOL, ADL, anxiety, and depression among critical illness survivors. We were also interested in examining the relationships among ADL, anxiety, depression, and HRQOL among this population.

Research objectives

To explore the health-related quality of life, activities of daily living, anxiety, and depression among critical illness survivors in Chengdu, the People's Republic of China.

Conceptual framework

The conceptual framework of this study was based on Ware and Sherbourne's concept of HRQOL (Ware & Sherbourne, 1992) which differs from the WHO's definition of quality of life as an individual's perception of their position that is related to their goals, expectations, standards, and concerns (World Health Organization, 2012). This study explained HRQOL as critical illness survivors' judgement of function and emotional well-being, across eight dimensions: 1) physical functioning, 2) role limitations because of physical health problems, 3) bodily pain, 4) social functioning, 5) general mental health, 6) role limitations because of emotional problems, 7) vitality, and 8) general health perceptions.

Factors related to HRQOL included ADL, which referred to essential activities of daily living performed by critical illness survivors to maintain independence. The long-term effects of critical

illness often result in physical impairments that contribute to dependence on performing daily activities among survivors. A positive relationship has been observed between the ability to perform activities of daily living (ADL) and health-related quality of life (HRQOL). Critical illness survivors who had ADL independence had better HRQOL compared with an ADL dependency group (Medhi et al., 2019).

Anxiety and depression are mental statuses with the perception of emotional state by critical illness survivors. There is a negative relationship between anxiety and depression with HRQOL. Anxiety and depression are common among critical illness survivors and are associated with a decline in health-related quality of life (HRQOL). The intensive care unit (ICU) experience, along with poor physical functioning following critical illness, can increase the risk of developing anxiety and depression (McKinley et al., 2016). These psychological symptoms, in turn, negatively impact HRQOL. Conversely, survivors who maintain a higher level of independence in activities of daily living (ADL) tend to report better HRQOL. Therefore, improving both physical functioning and psychological well-being is essential to enhancing the overall quality of life in this population.

Methodology

Population and sample

This study included adult critical illness survivors who had undergone ICU treatment, moved out of the ICU for one to three months, and received follow-up service following discharge from Chengdu Fifth People's Hospital, the People's Republic of China. Convenience sampling was used in this study based on the following inclusion criteria: (1) age over 18 years old, (2) ICU stay over 48 hours, (3) discharged from ICU for over one month and less than three months, (4) having the ability to communicate in the Chinese language, and (5) willing to participate.

The researcher determined the final sample size using the power table by power analysis (Cohen, 1988). A level of significance (α) of 0.05, power of the test (1-β) of 0.80, and effect size (ES) were estimated from the r value**.** According to previous related research results from Pongtae et al. (2021), an effect size of 0.3 was adopted. The final sample size was 85.

Research instruments

1.The Short Form 36-item Health Status survey (SF-36)

The SF-36 consists of 36 items in one questionnaire and was developed by Ware and Sherbourne (Ware & Sherbourne, 1992). The Chinese version was adapted by Liu et al. (2013), and includes eight dimensions: physical functioning dimension, role-physical dimension (RP), bodily pain dimension (BP), social functioning dimension (SF), mental health dimension (MH), role emotion dimension (RE), vitality dimension (VT), and general health perceptions (GH). Participants were asked to answer a three-to-five-point Likert scale. Each score is standardized on a scale of 0 to 100, with a higher score in each dimension indicating better health status. The Cronbach's alpha coefficients were 0.98, 0.97, 0.99, 0.91, 0.96, 0.88, 0.87, and 0.91 for the physical function, role physical, role emotion, social function, bodily pain, vitality, mental health, and general health

dimensions, respectively.

2. The Hospital Anxiety Depression (HAD) Scale

The HAD scale was developed by Zigmond and Snaith (1983) and translated into Chinese by Leung et al. (1993). It consists of 14 items, with seven items assessing anxiety and seven assessing depression. Participants respond using a 4-point Likert scale ranging from 0 to 3, where 0 = "not at all," 1 = "a little," 2 = "some of the time," and 3 = "most of the time." Each subscale (anxiety and depression) yields a total score ranging from 0 to 21 (Leung et al., 1993). A score below 7 indicates a non-case, scores between 8 and 10 suggest a borderline case, and scores of 11 or higher indicate clinically significant anxiety or depression. The internal consistency of the scale is acceptable, with Cronbach's alpha coefficients of 0.84 for the anxiety subscale and 0.83 for the depression subscale.

3. The Katz Index of Independence in Activities of Daily Living (Katz ADL scale)

The Katz's ADL index, developed by Katz et al. (1963), has one dimension with six items. The Chinese versions were adapted by Yi and Vaupel (2002). For each item, three ordinal scales are provided corresponding to "without assistance". If a person required partial or full assistance, the activity was scored as 1, indicating dependence. If no assistance was needed, the activity was scored as 0, indicating independence in that function.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of Chiang Mai University and Chengdu Fifth People's Hospital (Approval No: 067/2022). Furthermore, the participants were informed of the purpose and method of this study beforehand, and that individual responses would be kept anonymous**.** Participants had the right to withdraw from the study at any time. A code number replaced participants' identities in the data analysis and statements of results. For the publication of results, it followed the publication policy to keep the confidentiality of the samples. The archival study data was stored in an envelope to be maintained for at least five years before being destroyed. Those who agreed to participate in this study had to sign an informed consent form, and those who could not write their names were asked to put their fingerprints onto the form.

Data collection

After IRB approval, the researchers selected prospective participants from a clinical system of outpatients. Individuals who met the inclusion criteria were invited to participate in the study. Next, researchers met participants and explained the objectives and methods of this study. Participants were ensured of the privacy and confidentiality of the information provided, which was only used for this study. In addition, participants were informed that their participation was voluntary, and they could withdraw at any time, which would not affect their later service in the outpatient ward. An information sheet was given to the participants, and a consent form was presented to obtain permission after participants understood all the information. After receiving the participants' signatures on the consent form, the researcher read each question directly

without further explanation and recorded the answers. The researcher was not given any suggestions for possible solutions. The entire questionnaire took about 30 minutes to one hour. Data collection was conducted until it satisfied sample size requirements.

Data analysis

Data was analyzed using SPSS Statistics, Version 23.0 (IBM SPSS Statistics, Version 23.0. Armonk, NY: IBM Corp.). The score for HRQOL in eight dimensions was not normally distributed. The relationship between anxiety, depression, and HRQOL was tested using the Spearman rank-order correlation test. ADL and HRQOL were analyzed using the Mann-Whitney U test.

Results

This study recruited 85 critical illness survivors. Most participants were male (n = 54, 63.50%) and had comorbidities (n = 47, 55.30%). Nearly half had received primary to junior school education (n = 39, 45.90%) while one-fourth had not received any education (n = 19, 22.60%). Nearly half of participants were aged 18-64 (n = 39, 45.90%), and nearly one-fourth were aged over 75 (n = 20, 23.50%). Over half of participants had 2-7 days of ICU stays (n = 48, 56.50%) while more than one-third had stayed for 8-14 days (n = 30, 35.30%). Approximately 35.30% of participants had cardiovascular disease as their attending diagnosis, and 18.80% had been diagnosed with sepsis and respiratory disease, respectively. A few critical illness survivors (4.70%) had been diagnosed with kidney disease (n = 4, 4.70%)

Bodily pain received the highest HRQOL score in all dimensions among critical illness survivors (mean = 91.54, SD = 16.80). The lowest average rating was for the general health dimension (mean = 70.86, SD = 16.06). The mean score for role emotion was 87.50 (SD = 16.70), mental health was 86.22 (SD = 12.34), social function was 85.70 (SD = 18.01), physical role was 80.10 (SD = 24.96), physical function was 78.02 (SD = 29.14), and vitality was 77.72 (SD = 13.52).

Most participants were independent in six ADL functions (n = 67, 78.80%). Nearly one-fourth of critically ill survivors had ADL function dependency (n = 18, 21.20%). Most participants show no anxiety (n = 76, 89.50%) or depression (n = 75, 88.20%) while those participants showing borderline anxiety and depression were 8.20% and 10.60%, respectively. Only a few participants had high anxiety (2.40%) or depression (1.20%).

A Mann-Whitney test revealed that HRQOL was significant lower in the ADL dependence group compared with the ADL independence group. The lower HRQOL was in the physical function (Mean ± SD = 37.20 ± 28.86, Mean ± SD: 88.99 ± 17.01), role physical (Mean ± SD: 53.59 ± 22.32, 87.22 ± 20.53), role emotion (Mean ± SD: 76.51 ± 24.42, 90.46 ± 12.62), social function (Mean ± SD: 70.37 ± 23.35, 89.83 ± 13.83), vitality (Mean ± SD: 66.01 ± 13.36, 80.90 ± 11.7), and general health perception dimensions (Mean ± SD: 57.22 ± 15.55, 74.53 ± 14.19) (Table 1).

Anxiety had a weak negative relationship with HRQOL in the physical health (r_s = -. 214, $p < 0.05$) and role physical dimensions (r = -.213, $p < 0.05$), a moderate negative relationship with general health perception (r_s = -.454, $p < 0.01$), and a strong relationship with the role emotion, social function,

vitality, and mental health dimensions (r_s = -.514 to -.724, p < 0.01). Depression had a moderate to strong negative relationship with HRQOL in seven dimensions excluding the bodily pain dimension (r_s = -.476 to -.685, P < 0.01) (Table 1).

Table 1 ADL, anxiety, depression, and HRQOL among critical illness survivors

HRQOL	ADL group	Mean ± SD	Sig. (2 tailed)	Z	Anxiety	Depression
Physical function	1	88.99 ± 17.01	.00	(-5.95)	-.214*	-.476**
	2	37.20 ± 28.86				
Role physical	1	87.22 ± 20.53	.00	(-.5.24)	-.213*	-.478**
	2	53.59 ± 22.32				
Role emotion	1	90.46 ± 12.62	.02	(-2.32)	-.619**	-.489**
	2	76.51 ± 24.42				-
Social function	1	89.83 ± 13.83	.00	(-3.56)	-.533**	-.656**
	2	70.37 ± 23.35				
Bodily pain	1	91.66 ± 16.71	.86	(-.18)	-.147	-.049
	2	91.05 ± 17.58				
Vitality	1	80.90 ± 11.79	.00	(-3.63)	-.514**	-.685**
	2	66.01 ± 13.36				
Mental health	1	87.31 ± 12.35	.07	-(1.83)	-.724**	-.665**
	2	82.15 ± 11.74				
General health	1	74.53 ± 14.19	.00	(-4.09)	-.454**	-.567**
	2	57.22± 15.55				

Note.

1 ADL independency group

2 ADL dependency group

Sig. (2-tailed): Mann-Whitney U test.

** Spearman correlation test, p < .01

* Spearman correlation test, p < .05

Discussion

In this study, critical illness survivors reported a high average score in the bodily pain dimension of HRQOL (Mean = 91.54, SD = 16.80), indicating that most survivors experienced little to no pain, which contributed to their higher perceived quality of life. It has been reported that surgical trauma

might cause pain to persist after ICU discharge (Vogel et al., 2018). In this study, most critical illness survivors were admitted with diagnoses such as cardiovascular disease, sepsis, or respiratory disease and did not undergo surgery. As a result, they were less likely to experience pain, which may explain why the bodily pain dimension of HRQOL received the highest score.

Additionally, the results were consistent with a previous study by Hofhuis et al. (2021) which found that critical illnesses survivors reported high scores in the bodily pain dimension and were stable after discharge from the ICU for ten years (Hofhuis et al., 2021). Role emotional, mental health, and social functioning domains also received high scores, which suggests that most critical illness survivors experienced better mental health one to three months after hospital discharge. Vogel et al. (2018) found that over 15 days in the ICU affects HRQOL in the mental health dimension. In this study, the average length of ICU stay was 7.89 days which explained why they had a better mental health condition. Physical role, physical function, and vitality scores were relatively lower, indicating that critical illness survivors experienced ongoing physical health challenges and treatment-related effects. These issues limited their ability to fully resume daily activities after returning home. Additionally, advancing age contributed to a decline in physical function, further restricting their physical capabilities (Rai et al., 2020).

In this study, 25% of the critical illness survivors were over 75, explaining their poor physical condition. The lowest score across all HRQOL subscales was for general health perception, indicating that critical illness survivors showed a poor health perception after discharge from ICU for one to three months. Critical illness survivors with comorbidities might have more physical impairments and worse general health perceptions (Zeggwagh et al., 2020). In this study, 54% of critical illness survivors had comorbidities, indicating they might have more chronic conditions, resulting in poor health perceptions.

A previous study found that 22.0%-60.0% of critical illness survivors had different degrees of ADL dependence (Busico et al., 2016; Jackson et al., 2014). This study demonstrated results that were consistent with prior studies. As age increases, body tissue and organs had difficulty functioning and physiological resistance declines, reducing physical function which limits ADL independence (Li et al., 2021). However, this study found that 21.20% of critical illness survivors had ADL dependency, slightly higher than Li and colleagues (12.30%). This study targeted critical illness survivors discharged from the ICU for one to three months. Li and colleagues' analysis showed a follow-up duration of 19.40 months, a long amount of time for follow-up, which resulted in less ADL dependency. Thus, ADL dependence among critical illness survivors in this study was higher than that among participants in Li and colleagues' study.

One systematic review found that over one-third of critical illness survivors had borderline anxiety (Nikayin et al., 2016) at a significantly higher rate than in this study (10.6%). Nikayin et al. (2016) found that women might have a higher prevalence of anxiety. In this study, nearly 60% of the participants were male, which might explain the lower rates of anxiety than found in Nikayin et al. (2016). Meanwhile, almost one-third of critical illness survivors suffered from depression

after they were discharged from the ICU for three months (Hatch et al., 2018). Battle and colleagues stated sepsis was a post-depression risk factor among critical illness survivors. The inflammation brought on by critical illnesses leads to blood barrier breakdown and alters the impact of sedation drugs that contribute to a direct strike to the brain, resulting in depression (Battle et al., 2015).

In this study, 18.8% of critical illness survivors' diagnoses were for sepsis, which was significantly lower than Battle and colleagues' study, in which 37% of critical illness survivors were admitted to the ICU for sepsis. This might be one reason for the lower rates of depression in this study. Additionally, longer ICU stays might result in depression among critical illness survivors due to unpleasant ICU experiences (Liao et al., 2020). In this study, only 7% of critical illness survivors had over 15 ICU days of stay which explained why less depression occurred after their discharge from ICU of one to three months.

Regarding the results of the present study, the ADL independence group had better HRQOL than the ADL dependence group which was consistent with Medhi et al. (2019) who found that elderly participants with ADL independence achieved better HRQOL in eight dimensions (Medhi et al., 2019). After critical illness, patients suffer physical impairment that limits their daily activities, impairing their physical function and ability to work; because of physical limitations, they cannot work (Vest et al., 2011). Physical problems might affect critical illness survivors' social ability, while poor physical conditions might lead to emotional issues, such as PTSD, which also affects their working ability (Teixeira et al., 2021).

In this study, anxiety had a weak to strong negative relationship with HRQOL. The current study confirmed increased anxiety among critical illness survivors, while HRQOL decreased (Stevenson et al., 2013). Anxiety might increase mental distress (Stevenson et al., 2013), and it might be caused by poor physical status (Stevenson et al., 2013). High levels of anxiety may lead to reduced social engagement and poorer perceptions of health, which in turn lower overall health-related quality of life (HRQOL) (Pongtae et al., 2021). In this study, 21.2% of critical illness survivors had ADL dependency, and the poor physical condition overlapped with anxiety, explaining why anxiety increased and HRQOL decreased, especially for physical function and physical role. For critical illness survivors with increased anxiety, HRQOL decreased.

This study found depression had a moderate to strong relationship with HRQOL (r =- 478 to -.685, $p < 0.01$) which was consistent with McKinley and colleagues' results (r = -.29, r = -.70, $p < 0.01$). Depression might increase mental distress directly; thus with increasing depression, HRQOL also decreased (McKinley et al., 2016). In this study, 11.8% of critical illness survivors had more than borderline depression. Critical illness survivors with depression might develop worse mental conditions, leading to decreased HRQOL. Depression might manifest in somatic symptoms, such as pain (Jackson et al., 2014). Critical illness survivors' physical impairments led to depression, which affected their physical activities, resulting in reduced HRQOL (Vest et al., 2011). Thus, when critical illness survivors experience increased depression, their HRQOL would decrease.

Conclusion

This study confirmed that there were differences in HRQOL between the ADL-dependent and ADL-independent groups of critical illness survivors. Meanwhile, anxiety and depression levels increased while HRQOL levels decreased.

Application of research findings

In nursing practice, anxiety and depression are closely related to HRQOL. Therefore, nursing care should focus on reducing the impact of anxiety and depression, and on promoting a mentally healthy quality of life among critical illness survivors in Chengdu, Sichuan province. Meanwhile, promoting rehibition of ADL can improve HRQOL. Regarding nursing research, this study provided information on HRQOL and ADL, anxiety, and depression among critical illness survivors, laying the foundation for future critical illness survivors post-discharge.

Suggestions for further research

The study design was cross-sectional; therefore, causal relationship was not detected. Predictive research design should be taken into consideration in order to confirm the relationships between ADL anxiety, depression, and HRQOL, which will provide evidence to promote HRQOL.

References

American Psychiatric Association. (2013). *Anxiety disorders*. *In diagnostic and statistical manual of mental disorders* (5th ed., pp.189-233). https://shorturl.asia/s0ZAw

Battle, C., James, K., & Temblett, P. (2015). Depression following critical illness: Analysis of incidence and risk factors. *Journal of the Intensive Care Society, 16*(2), 105–108. https://doi.org/10.1177/1751143714559904

Bienvenu, O. J., Colantuoni, E., Mendez-Tellez, P. A., Dinglas, V. D., Shanholtz, C., Husain, N., Dennison, C. R., Herridge, M. S., Pronovost, P. J., & Needham, D. M. (2012). Depressive symptoms and impaired physical function after acute lung injury: A 2-year longitudinal study. *American Journal of Respiratory and Critical Care Medicine, 185*(5), 517–524. https://doi.org/10.1164/rccm.201103-0503OC

Busico, M., Intile, D., Sívori, M., Irastorza, N., Alvarez, A. L., Quintana, J., Vazquez, L., Plotnikow, G., Villarejo, F., & Desmery, P. (2016). Risk factors for worsened quality of life in patients on mechanical ventilation. A prospective multicenter study. *Medicina Intensiva, 40*(7), 422–430. https://doi.org/10.1016/j.medin. 2016.01.002

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Fiani, B., Figueras, R. A., Samones, P., Lee, C., Castillo, A., Sangalang, B., & Garcia Perez, F. (2022). Long-term Intensive Care Unit (ICU) stays can lead to Long-Term Cognitive Impairment (LTCI): Neurosurgery nursing strategies to minimize risk. *Cureus, 14*(9), e28967. https://doi.org/10.7759/cureus.28967

Gibney, R. T. N., Blackman, C., Gauthier, M., Fan, E., Fowler, R., Johnston, C., Katulka, R. J., Marcushamer, S., Menon, K., Miller, T., Paunovic, B., & Tanguay, T. (2022). COVID-19 pandemic: The impact on Canada's intensive care units. *Facets, 7*, 1411–1472. https://doi.org/10.1139/facets-2022-0023

Griffiths, J., Hatch, R. A., Bishop, J., Morgan, K., Jenkinson, C., Cuthbertson, B. H., & Brett, S. J. (2013). An exploration of social and economic outcome and associated health-related quality of life after critical illness in general intensive care unit survivors: A 12-month follow-up study. *Critical Care, 17*(3), R100. https://doi.org/10.1186/cc12745

Hatch, R., Young, D., Barber, V., Griffiths, J., Harrison, D. A., & Watkinson, P. (2018). Anxiety, depression and post traumatic stress disorder after critical illness: A UK-wide prospective cohort study. *Critical Care (London, England), 22*(1), 310. https://doi.org/10.1186/s13054-018-2223-6

He, H., Ma, X., Su, L., Wang, L., Guo, Y., Shan, G., He, H. J., Zhou, X., Liu, D., Long, Y., Zhao, Y., & Zhang, S. (2020). Effects of a national quality improvement program on ICUs in China: A controlled pre-post cohort study in 586 hospitals. *Critical Care, 24*(1), 73. https://doi.org/10.1186/s13054-020-2790-1

Herridge, M. S., Moss, M., Hough, C. L., Hopkins, R. O., Rice, T. W., Bienvenu, O. J., & Azoulay, E. (2016). Recovery and outcomes after the acute respiratory distress syndrome (ARDS) in patients and their family caregivers. *Intensive Care Medicine, 42*(5), 725–738. https://doi.org/10.1007/s00134-016-4321-8

Hodgson, C. L., Haines, K. J., Bailey, M., Barrett, J., Bellomo, R., Bucknall, T., Gabbe, B. J., Higgins, A. M., Iwashyna, T. J., Hunt-Smith, J., Murray, L. J., Myles, P. S., Ponsford, J., Pilcher, D., Udy, A. A., Walker, C., Young, M., Jamie Cooper, D. J., & ICU-Recovery Investigators. (2018). Predictors of return to work in survivors of critical illness. *Journal of Critical Care, 48*, 21–25. https://doi.org/10.1016/j.jcrc.2018.08.005

Hofhuis, J. G. M., Schrijvers, A. J. P., Schermer, T., & Spronk, P. E. (2021). Health-related quality of life in ICU survivors-10 years later. *Scientific Reports, 11*(1), 15189. https://doi.org/10.1038/s41598-021-94637-z

Jackson, J. C., Pandharipande, P. P., Girard, T. D., Brummel, N. E., Thompson, J. L., Hughes, C. G., Pun, B. T., Vasilevskis, E. E., Morandi, A., Shintani, A. K., Hopkins, R. O., Bernard, G. R., Dittus, R. S., & Ely, E. W. (2014). Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: A longitudinal cohort study. *The Lancet, Respiratory Medicine, 2*(5), 369–379. https://doi.org/10.1016/S2213-2600(14)70051-7

Johnson, R. F. Jr., & Gustin, J. (2013). Acute lung injury and acute respiratory distress syndrome requiring tracheal intubation and mechanical ventilation in the intensive care unit: Impact on managing uncertainty for patient-centered communication. *The American Journal of Hospice & Palliative Care, 30*(6), 569–575. https://doi.org/10.1177/1049909112460566

Katz, S., Ford A. B., Moskowitz R. W., Jackson B. A., & Jaffe M. W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biological and psychosocial function. *JAMA, 185*(12), 914-919. https://doi.org/10.1001/jama. 1963.03060120024016

Leung, C. M., Ho, S., Kan, C. S., Hung, C. H., & Chen, C. N. (1993). Evaluation of the Chinese version of the Hospital Anxiety and Depression Scale. A cross-cultural perspective. *International Journal of Psychosomatics: Official Publication of the International Psychosomatics Institute, 40*(1–4), 29–34.

Liu, J., Qu, B., Hu, B., Jiang, N., & Wang, D. (2013). The quality of life of men who have sex with men in China: Reliability and validity testing of the SF-36 questionnaire. *PLOS ONE*, *8*(12), e83362. https://doi.org/10.1371/journal.pone.0083362

Li, L., Wang, H. M., & Shen, Y. (2003). Chinese SF-36 Health Survey: Translation, cultural adaptation, validation, and normalisation. *Journal of Epidemiology and Community Health, 57*(4), 259–263. https://doi.org/10.1136/jech.57.4.259

Liu, N., Zeng, L., Li, Z., & Wang, J. (2013). Health-related quality of life and long-term care needs among elderly individuals living alone: A cross-sectional study in rural areas of Shaanxi Province, China. *BMC Public Health, 13*, 313. https://doi.org/10.1186/1471-2458-13-313

Li, R., Zhou, Y., Liu, X., Huang, J., Chen, L., Zhang, H., & Li, Y. (2021). Functional disability and post-traumatic stress disorder in survivors of mechanical ventilation: A cross-sectional study in Guangzhou, China. *Journal of Thoracic Disease, 13*(3), 1564–1575. https://doi.org/10.21037/jtd-20-2622

Liao, K. M., Ho, C. H., Lai, C. C., Chao, C. M., Chiu, C. C., Chiang, S. R., Wang, J. J., Chen, C. M., & Cheng, K. C. (2020). The association between depression and length of stay in the intensive care unit. *Medicine, 99*(23), e20514. https://doi.org/10.1097/MD.0000000000020514

McKinley, S., Fien, M., Elliott, R., & Elliott, D. (2016). Health-related quality of life and associated factors in intensive care unit survivors 6 months after discharge. *American Journal of Critical Care, 25*(1), 52–58. https://doi.org/10.4037/ajcc2016995

Medhi, G. K., Sarma, J., Pala, S., Bhattacharya, H., Bora, P. J., & Visi, V. (2019). Association between health related quality of life (HRQOL) and activity of daily living (ADL) among elderly in an urban setting of Assam, India. *Journal of Family Medicine and Primary Care, 8*(5), 1760–1764. https://doi.org/10.4103/jfmpc.jfmpc_270_19

Müller, A., Von Hofen-Hohloch, J., Mende, M., Saur, D., Fricke, C., Bercker, S., Petros, S., & Classen, J. (2020). Long-term cognitive impairment after ICU treatment: A prospective longitudinal cohort study (Cog-I-CU). *Scientific Reports, 10*(1), 15518. https://doi.org/10.1038/s41598-020-72109-0

Nakamura, K., Kawasaki, A., Suzuki, N., Hosoi, S., Fujita, T., Hachisu, S., Nakano, H., Naraba, H., Mochizuki, M., & Takahashi, Y. (2021). Grip strength correlates with mental health and quality of life after critical care: A retrospective study in a post-Intensive care syndrome clinic. *Journal of Clinical Medicine, 10*(14), 3044. https://doi.org/10.3390/jcm10143044

National Health Commission. (2020). *Medical services and medical quality safety in China in 2019*. http://www.gov.cn/zhengce/index.htm

Nikayin, S., Rabiee, A., Hashem, M. D., Huang, M., Bienvenu, O. J., Turnbull, A. E., & Needham, D. M. (2016). Anxiety symptoms in survivors of critical illness: A systematic review and meta-analysis. *General Hospital Psychiatry, 43*, 23–29. https://doi.org/10.1016/j.genhosppsych.2016.08.005

Pongtae, K., Tachaudomdach, C., & Somrarnyart, M. (2021). Factors related to health-related quality of life among critically ill survivors. *Nursing Journal, 48*(1), 281-294. https://he02.tci-thaijo.org/index.php/cmunursing/article/view/250261 (in Thai)

Rabiee, A., Nikayin, S., Hashem, M. D., Huang, M., Dinglas, V. D., Bienvenu, O. J., Turnbull, A. E., & Needham, D. M. (2016). Depressive symptoms after critical illness: A systematic review and meta-analysis. *Critical Care Medicine, 44*(9), 1744–1753. https://doi.org/10.1097/CCM.0000000000001811

Rai, R., Singh, R., Azim, A., Agarwal, A., Mishra, P., & K Singh, K. S. (2020). Impact of critical Illness on quality of life after intensive care unit discharge. *Indian Journal of Critical Care Medicine, 24*(5), 299–306. https://doi.org/10.5005/jp-journals-10071-23433

Society of Critical Care Medicine (SCCM). (2020). *Critical care statistics*. https://sccm.org/Communications/Critical-Care-Statistics

Stevenson, J. E., Colantuoni, E., Bienvenu, O. J., Sricharoenchai, T., Wozniak, A., Shanholtz, C., Mendez-Tellez, P. A., & Needham, D. M. (2013). General anxiety symptoms after acute lung injury: Predictors and correlates. *Journal of Psychosomatic Research, 75*(3), 287–293. https://doi.org/10.1016/j.jpsychores.2013.06.002

Su, M., Hua, X., Wang, J., Yao, N., Zhao, D., Liu, W., Zou, Y., Anderson, R., & Sun, X. (2019). Health-related quality of life among cancer survivors in rural China. *Quality of Life Research*, *28*, 695–702. https://doi.org/10.1007/s11136-018-2038-6

Su, Y.-X., Xu, L., Gao, X.-J., Wang, Z.-Y., Lu, X., & Yin, C.-F. (2018). Long-term quality of life after sepsis and predictors of quality of life in survivors with sepsis. *Chinese Journal of Traumatology, 21*(4), 216–223. https://doi.org/10.1016/j.cjtee.2018. 05.001

Teixeira, C., Rosa, R. G., Sganzerla, D., Sanchez, E. C., Robinson, C. C., Dietrich, C., Kochhann, R., de Souza, D., Rech, G. S., da R Dos Santos, R., Schneider, D., Boldo, R., Sharshar, T., Bozza, F. A., Falavigna, M., & Friedman, G. (2021). The burden of mental illness among survivors of critical care-risk factors and impact on quality of life: A multicenter prospective cohort study. *Chest, 160*(1), 157–164. https://doi.org/10.1016/j.chest.2021.02.034

Vest, M. T., Murphy, T. E., Araujo, K. L. B., & Pisani, M. A. (2011). Disability in activities of daily living, depression, and quality of life among older medical ICU survivors: A prospective cohort study. *Health and Quality of Life Outcomes, 9*, 9. https://doi.org/10.1186/1477-7525-9-9

Vogel, G., Forinder, U., Sandgren, A., Svensen, C., & Joelsson-Alm, E. (2018). Health-related quality of life after general surgical intensive care. *Acta Anaesthe- siologica Scandinavica, 62*(8), 1112–1119. https://doi.org/10.1111/aas.13139

Ware, J. E. Jr., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care, 30*(6), 473–483.

Wieske, L., Dettling-Ihnenfeldt, D. S., Verhamme, C., Nollet, F., van Schaik, I. N., Schultz, M. J., Horn, J., & van der Schaaf, M. (2015). Impact of ICU-acquired weakness on post-ICU physical functioning: A follow-up study. *Critical Care, 19*(1), 196. https://doi.org/10.1186/s13054-015-0937-2

World Health Organization. (2012). *WHOQOL: Measuring quality of life*. https://www.who.int/tools/whoqol/whoqol-bref

Yi, Z., & Vaupel, J. W. (2002). Functional capacity and self–evaluation of health and life of oldest old in China. *Journal of Social Issues, 58*(4), 733-748.

Yi, Z., Vaupel, J. W., & Zhenyu, X. (2001). *The Healthy Longevity Survey and the Active Life Expectancy of the Oldest Old in China*. https://www.persee.fr/doc/pop_0032-4663_2001_hos_13_1_7232

Zeggwagh, A. A., Dendane, T., Abidi, K., Kettani, M. N., Iraqi, A., & Zeggwagh, Z. (2020). Health-related quality of life evaluated by MOS SF-36 in the elderly patients 1 month before ICU admission and 3 months after ICU discharge. *Indian Journal of Critical Care Medicine, 24*(7), 531–538. https://doi.org/10.5005/jp-journals-10071-23489

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67*(6), 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x