Return-to-Work Prevalence in Patients with COVID-19 after Receiving Intensive Care: A Systematic Review and Meta-Analysis

Takeshi Unoki 1, Hideaki Sakuramoto 2, Akira Ouchi 3, Noriko Inagaki 4, Mio Kitayama 5, Yusuke Kawai 6, Tomomi Furumaya 7, Yoko Tsukada 8

1. Department of Acute and Critical Care Nursing, School of Nursing, Sapporo City University, Sapporo, JPN
2. Department of Critical care and Disaster Nursing, Japanese Red Cross Kyushu International College of Nursing, Munakata, JPN
3. Department of Adult Health Nursing, College of Nursing, Ibaraki Christian University, Hitachi, JPN
4. Faculty of Nursing, Setsuman University, Hirakata, JPN
5. Department of Nursing, Kanazawa Medical University Hospital, Uchinada, JPN
6. Department of Nursing, Fujita Health University Hospital, Toyoake, JPN
7. Department of Nursing, Saitama Red Cross Hospital, Saitama, JPN
8. Department of Nursing, Tokyo Medical and Dental University Hospital, Tokyo, JPN

Corresponding author: Takeshi Unoki, t.unoki@scu.ac.jp

Abstract

The return to work of patients receiving intensive care is a serious issue. Previous studies have reported a relatively low return-to-work prevalence in patients receiving intensive care. Some patients with coronavirus disease 2019 (COVID-19) experience severe pneumonia and require intensive care, including mechanical ventilation. However, little is known about the return-to-work prevalence in such patients. Therefore, we conducted a systematic review and meta-analysis of the return-to-work prevalence of patients with COVID-19 who received intensive care. Data were collected from the Medical Literature Analysis and Retrieval System Online (MEDLINE; via PubMed), the Cumulated Index to Nursing and Allied Health Literature (CINAHL), and the International Clinical Trials Registry Platform (ICTRP).

Specifically, we collected studies reporting data on the return-to-work prevalence of patients with COVID-19 after they received intensive care. Data extraction and quality assessment were performed using the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data; pre-developed standard forms were used for data collection, which was conducted until June 14, 2023. Out of 2221 available records, 42 full texts were reviewed, and 20 were included in the qualitative synthesis. The number of return-to-work cases reported at 0-3 months, 4-6 months, and 7-12 months were 3, 11, and 9, respectively. At 0-3 months, the pooled prevalence was 0.49 (three trials; n = 73; 95% CI, 0.15-0.84; I² = 82%). At 4-6 months, the pooled prevalence was 0.57 (11 trials; n = 900; 95% CI, 0.40-0.73; I² = 92%). Finally, at 7-12 months, the pooled prevalence was 0.64 (nine trials; n = 281; 95% CI, 0.50-0.77; I² = 80%). The overall quality of the included studies was low.

Based on the results, approximately one-third of COVID-19 patients did not return to work 12 months after receiving intensive care. Thus, a more detailed and extensive cohort study is required, along with integrated job support.

Introduction And Background

Introduction

Returning to work after a critical illness is a significant concern. Studies have reported that the return-to-work prevalence is relatively low in patients with a critical illness [1,2]. Not returning to work is associated with low income, impaired role function, and lower health-related quality of life [1,3].

Some patients with coronavirus disease 2019 (COVID-19) have severe pneumonia and require intensive care, such as mechanical ventilation and extracorporeal membrane oxygenation (ECMO) [4]. These patients may experience difficulty returning to work due to impaired physical or cognitive function or mental health issues, similar to critically ill patients without COVID-19 [5]. Additionally, Long COVID may be associated with the difficulty of returning to work for those patients [6].

A previous systematic review indicated that patients with COVID-19 had a lower prevalence of returning to work; however, a meta-analysis was not conducted by the study [7]. The return-to-work prevalence in patients with COVID-19 may be lower than in those without COVID-19 [2]. In addition, studies have reported that the return-to-work prevalence usually improves with longer follow-up periods [2]. However, a

How to cite this article
previous systematic review had a follow-up period of only six months, and there remains an incomplete understanding regarding the long-term prevalence of return-to-work thereafter.

Thus, we conducted a systematic review and meta-analysis to clarify the return-to-work prevalence in patients with COVID-19 after receiving intensive care.

**Review**

**Methods**

This systematic review and meta-analysis was conducted following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Statement (Supplemental file 1). The protocol for the systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42022346222).

**Eligibility Criteria**

The eligibility criteria were defined based on the condition, context, and population framework as follows: (1) full-text observational study, (2) context: patients with COVID-19 admitted to the intensive care unit (ICU), (3) condition: return-to-work prevalence after ICU discharge, and (4) population: critically ill patients who are 18 years and older. Eligible studies included randomized controlled trials and observational studies. Review articles, case reports, letters to the editor, and comments without data that did not report return-to-work prevalence were excluded. If insufficient data were available to estimate the return-to-work prevalence, the corresponding authors of those articles were contacted. Studies wherein sufficient data on the return-to-work prevalence were not obtained. Furthermore, we excluded studies wherein the evaluation period for return-to-work prevalence was unknown or too broad.

**Information Sources and Search Strategy**

We searched the Medical Literature Analysis and Retrieval System Online (MEDLINE; via PubMed), the Cumulated Index to Nursing and Allied Health Literature (CINAHL; via EBSCOhost), and the International Clinical Trials Registry Platform (ICTRP) databases from inception to July 26, 2022, and updated on June 14, 2023. The following search terms were used in all the databases: “critical care,” “intensive care unit,” “critical illness,” “coronavirus disease 2019,” “return-to-work,” “unemployment,” “sick leave,” “working,” and “jobless.” These search terms were derived from MeSH or Entry terminology. Manual searches were performed on Google Scholar. No language restrictions were imposed.

**Selection Process**

Of the eight reviewers, two independently reviewed the study titles and abstracts to identify potentially relevant studies. Subsequently, two reviewers independently assessed the studies’ eligibility based on a full-text review. Disagreements between the reviewers were resolved with a consensus discussion. If the disagreement remained unresolved, it was arbitrated by a third reviewer.

**Data Collection Process**

We extracted data on the authors’ names, year of publication, study design, country, sample size, the participants’ age range, and the severity of illness. Outcome data were categorized according to the return-to-work proportion measured after receiving intensive care. The categories were 0-3 months, 4-6 months, 7-12 months, and 13-24 months after ICU or hospital admission and discharge. Data were documented using an Excel spreadsheet. Two reviewers independently extracted the data from individual studies in a dichotomous manner to pool the results. The results were pooled according to the category.

**Outcome**

The main results of this study examined the return-to-work prevalence in COVID-19 patients at various pre-defined time points after ICU discharge. In this study, return-to-work was defined as being employed prior to ICU admission and after ICU discharge. Because we speculated that some studies may not have provided detailed employment status, we assumed that if the patient was employed, it did at least issue if the workplace or work hours changed.

**Assessment of Study Quality**

The JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data was used to assess the methodological quality of the included studies. This checklist contains nine questions. The questions are divided into three areas: participants (questions 1, 2, 4, and 9), outcome measures (6 and 7), and statistics (5, 3, and 8). In all three areas, a study was rated as high quality if it had an appropriate methodology. The risk of bias was independently evaluated by two of the seven reviewers. Disagreements among reviewers
were resolved by consensus discussion; if they could not be resolved, they were arbitrated by a third reviewer.

**Statistical Analysis**

We pooled the prevalence estimates from the included studies using a random-effects meta-analysis model. Meta-analysis was performed based on defined time periods (e.g., 4-6 months, 7-12 months, etc.). Heterogeneity across studies was assessed using the $I^2$ statistic.

Data from the longest follow-up period available for each study was used for the prevalence estimates. A subgroup analysis assessed whether the population of patients receiving ventilatory therapy only affected the estimates at the time of the return-to-work assessment. A sensitivity analysis assessed the robustness of the results. This was done was by removing only the population that received extracorporeal membrane oxygenation (ECMO). Additionally, a post-hoc analysis was conducted to clarify the heterogeneity of the primary analysis.

Certain policies compensate for disability and improve employment opportunities, making it a desirable choice for patients. These policies are implemented with the support of both workers and employers [10]. Many countries are shifting from compensation-driven support to a more integrated approach. We conducted a post-hoc subgroup analysis, defining countries above the median of the integration index for each Organization of Economic Cooperation and Development (OECD) country as having highly integrated support policies and countries below the median as having low integrated support policies [10]. In this analysis, we excluded articles from non-OECD countries [10].

The results are presented as forest plots with 95% confidence intervals (95% CI). The analyses were conducted using the R statistical software version 3.4.4 (R Development Core Team, 2008), package "meta" version.

**Patient and Public Involvement Statement**

No patients were involved in this study. We only used data from previously published papers.

**Results**

**Study Selection**

The PRISMA flow diagram is shown in Figure 1. We identified 2221 articles and abstracts. A total of 42 studies were assessed; 1254 patients across 20 studies were included in the quantitative synthesis and 19 studies were used for the meta-analysis. The number of studies (i.e., number of patients) reporting an instance of return-to-work at 0-3 months, 4-6 months, and 7-12 months were three [11-13], eleven [14-23], and eight [13,21,23-28], respectively. Studies in which outcome assessments were conducted over a wide time range were excluded.
**Figure 1: PRISMA flow diagram**

**Study Characteristics**

All studies were published from 2021 to 2023 (Table 1). Two studies [19,28] were conducted in the United States, 16 in Europe [11,13,14,16-18,20-27,29,30], one in Brazil [12], and one in Australia [15]. Four studies [12,21,22,29] assessed return-to-work in patients receiving ECMO.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Design</th>
<th>Study Period</th>
<th>Population</th>
<th>Males, n (%)</th>
<th>Age, median (IQR)</th>
<th>Severity of Illness</th>
<th>Number in employment prior to ICU</th>
<th>Males</th>
<th>Age</th>
<th>Evaluation timing (months)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carenzo L. et al. [14]</td>
<td>2021</td>
<td>Italy</td>
<td>Prospective observational study</td>
<td>1 March 2020 to 30 June 2020</td>
<td>71 ICU patients</td>
<td>40 (89)</td>
<td>57 (51-62)</td>
<td>APACHE II (6.5-10)</td>
<td>45</td>
<td>38</td>
<td>57</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Demoule A. et al. [24]</td>
<td>2022</td>
<td>France</td>
<td>Prospective observational study</td>
<td>April 2000 to June 2020</td>
<td>94 ICU patients</td>
<td>67 (71)</td>
<td>63 (49-72)</td>
<td>SAPS 2 (23-36)</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>12 months</td>
<td>Twelve patients were part-time</td>
</tr>
<tr>
<td>Gilmartin M. et al. [16]</td>
<td>2022</td>
<td>Ireland</td>
<td>Prospective cohort study</td>
<td>-</td>
<td>22 ICU patients</td>
<td>15 (88)</td>
<td>52.4 +/- 15</td>
<td>-</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Schindl A. et al. [19]</td>
<td>2021</td>
<td>Sweden</td>
<td>Prospective observational study</td>
<td>25 March to 13 August 2020</td>
<td>113 ICU patients</td>
<td>86</td>
<td>-</td>
<td>-</td>
<td>46</td>
<td>&lt;65</td>
<td>-</td>
<td>5 months</td>
<td>Four patients were reduced work rate, three patients were occupation change.</td>
</tr>
<tr>
<td>van Veerendael N. et al. [17]</td>
<td>2021</td>
<td>Netherlands</td>
<td>Prospective cohort study</td>
<td>19 March to 30 September 2020</td>
<td>60 ICU patients</td>
<td>41</td>
<td>62.5 (55.3-68.5)</td>
<td>APACHE IV (45.0-65.3)</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>Vitoria Pérez N. et al. [20]</td>
<td>2022</td>
<td>Spain</td>
<td>Prospective observational study</td>
<td>12 March to 31 December 2020</td>
<td>73 ICU patients</td>
<td>46</td>
<td>61.8 +/- 4.1</td>
<td>APACHE II (7.1)</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>4-5 months</td>
<td></td>
</tr>
<tr>
<td>Ziagrill A. et al. [25]</td>
<td>2022</td>
<td>Italy</td>
<td>Prospective observational study</td>
<td>25 February to 27 April 2020</td>
<td>56 ICU patients</td>
<td>50</td>
<td>55 +/- 9</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>13 months</td>
<td></td>
</tr>
</tbody>
</table>
Evidence Quality

The risk of bias in the included studies is shown in Table 2. All studies had a high risk of bias in the participant and statistics domains. Furthermore, none of the studies were of high quality and none of them had a sufficient sample size or described detailed characteristics. We judged that all the studies in the outcome domain had a low risk of bias.

---

**TABLE 1: Characteristics of the included studies**

IQR, interquartile range; APACHE II, Acute Physiology and Chronic Health Evaluation II; APACHE IV, Acute Physiology and Chronic Health Evaluation IV; ICU, intensive care unit; SAPS, Simplified Acute Physiology Score; SOFA, sequential organ function score.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Country</th>
<th>Design</th>
<th>Start Date</th>
<th>End Date</th>
<th>n</th>
<th>95% CI</th>
<th>APACHE II</th>
<th>SAPS</th>
<th>SOFA</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hodgson C. L., et al.</td>
<td>2021</td>
<td>Australia</td>
<td>Multicenter, prospective cohort study</td>
<td>8 March to 4 October 2020</td>
<td>160 ICU patients</td>
<td>97 (63-101)</td>
<td>62 (55-71)</td>
<td>114</td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Neville TH., et al.</td>
<td>2022</td>
<td>United States</td>
<td>Prospective cohort study</td>
<td>11 March to 31 December 2020</td>
<td>205 ICU patients</td>
<td>118 (86-153)</td>
<td>59.6 (48.3-70.3)</td>
<td>68</td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Guenter et al.</td>
<td>2023</td>
<td>Germany</td>
<td>Retrospective cohort study with prospective follow-up</td>
<td>April 2020 to September 2021</td>
<td>60 ECMO patients</td>
<td>46 (32-70)</td>
<td>60.5 (47.4-74.6)</td>
<td></td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Larusec-R., et al.</td>
<td>2022</td>
<td>Europe</td>
<td>Prospective observational study</td>
<td>1 March 2020 to 13 September 2020</td>
<td>1215 ECMO patients</td>
<td>942 (80.5-1198)</td>
<td>53 (46-60)</td>
<td></td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Gabb, FWSO, et al.</td>
<td>2023</td>
<td>Brazil</td>
<td>Retrospective cohort study</td>
<td>April 2020 to August 2021</td>
<td>85 ECMO patients</td>
<td>72 (44-77)</td>
<td>58 (41-72)</td>
<td></td>
<td></td>
<td></td>
<td>1-3 months</td>
</tr>
<tr>
<td>Wertz, ONH, et al.</td>
<td>2022</td>
<td>Netherlands</td>
<td>Prospective cohort study</td>
<td>2 April 2020 to 30 June 2020</td>
<td>150 ICU patients</td>
<td>52 (35-68)</td>
<td>62 (47-77)</td>
<td>36</td>
<td></td>
<td></td>
<td>12 months</td>
</tr>
<tr>
<td>Chomelbaux J., et al.</td>
<td>2020</td>
<td>France</td>
<td>Prospective observational study</td>
<td>1 March 2019 to 15 June 2020</td>
<td>62 ECMO patients</td>
<td>45 (20-72)</td>
<td>47 (40-55)</td>
<td>SAPS-2, 45 (32-54)</td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td>Larsson M., et al.</td>
<td>2023</td>
<td>Sweden</td>
<td>Prospective cohort study</td>
<td>13 March 2020 to 14 July 2020</td>
<td>48 ICU patients</td>
<td>34 (24-47)</td>
<td>59 (33-69)</td>
<td>SAPS-3, 52 (46-58)</td>
<td></td>
<td></td>
<td>12 months</td>
</tr>
<tr>
<td>Hernad SO., et al.</td>
<td>2023</td>
<td>United States</td>
<td>Prospective observational study</td>
<td>January to September 2020</td>
<td>44 ICU patients</td>
<td>20 (45.5%)</td>
<td>56.5 (47.3-63.2)</td>
<td>APACHE score 14.5 (10.5-20.8)</td>
<td></td>
<td></td>
<td>1 year post discharge</td>
</tr>
<tr>
<td>Hermann J., et al.</td>
<td>2023</td>
<td>Germany</td>
<td>Prospective longitudinal study</td>
<td>March and December 2020</td>
<td>45 ICU patients</td>
<td>29 (44%)</td>
<td>61 (52-68)</td>
<td></td>
<td></td>
<td></td>
<td>12 months</td>
</tr>
<tr>
<td>Wolfgang C., et al.</td>
<td>2023</td>
<td>Sweden</td>
<td>Prospective cohort study</td>
<td>1 March 2020 to 31 May 2020</td>
<td>47 ICU patients</td>
<td>38 (41%)</td>
<td>64 (20-11)</td>
<td>-</td>
<td>24</td>
<td></td>
<td>2 years</td>
</tr>
</tbody>
</table>

5 of 12
TABLE 2: Risk of bias in the included studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carenzo L., et al. [14]</td>
<td>2021</td>
<td>Italy</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>NA</td>
</tr>
<tr>
<td>Hodgson CL., et al. [15]</td>
<td>2021</td>
<td>Australia</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Schandl A., et al. [16]</td>
<td>2021</td>
<td>Sweden</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>NA</td>
</tr>
<tr>
<td>van Veenendaal N., et al. [17]</td>
<td>2021</td>
<td>Netherlands</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Demoule A., et al. [24]</td>
<td>2022</td>
<td>France</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Gilmartin M., et al. [18]</td>
<td>2022</td>
<td>Ireland</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Larsson IM., et al. [23]</td>
<td>2022</td>
<td>Sweden</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Vitoria Pérez, N., et al. [20]</td>
<td>2022</td>
<td>Spain</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Zangrillo, A., et al. [25]</td>
<td>2022</td>
<td>Italia</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Guenther, SPW., et al. [22]</td>
<td>2022</td>
<td>Germany</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Lorusso, R., et al. [29]</td>
<td>2022</td>
<td>Euro</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Galas, FRBG., et al. [12]</td>
<td>2023</td>
<td>Brazil</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Viertz, CMH., et al. [26]</td>
<td>2022</td>
<td>Netherlands</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Chommeloux, J., et al. [21]</td>
<td>2022</td>
<td>France</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Onrust, M., Et al. [27]</td>
<td>2023</td>
<td>Netherlands</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Heraud, SO., et al. [28]</td>
<td>2023</td>
<td>U.S.</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Herrmann, J., et al. [13]</td>
<td>2023</td>
<td>Germany</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Wahlgren, C., et al. [30]</td>
<td>2023</td>
<td>Sweden</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>NA</td>
</tr>
</tbody>
</table>

Results of Syntheses

The number of instances of return-to-work reported at 0–3 months, 4–6 months, and 7–12 months were four, eleven, and seven, respectively. At 0–3 months, the pooled prevalence was 0.49 (three trials; n = 73; 95% CI: 0.25–0.84; I² = 82%) (Figure 2–A). At 4–6 months, the pooled prevalence was 0.57 (11 trials; n = 900; 95% CI:...
At 7-12 months, the pooled prevalence was 0.64 (eight trials; n = 281; 95% CI: 0.50-0.77; $I^2 = 80\%$) (Figure 2-C). Notably, no meta-analysis was performed because only one study [30] had a follow-up after 13 months.

**FIGURE 2: Forest plot of return-to-work prevalence after 0–3 months (A), 4–6 months (B), and 7–12 months (C).**

**Subgroup Analysis and Sensitivity Analysis**

We conducted a post-hoc subgroup analysis to explain the inconsistency in our findings for return-to-work prevalence in countries with highly integrated support policies compared to those with low integrated support policies. The results showed a trend toward lower return-to-work prevalence in countries with lower integrated support policies 7-12 months after receiving intensive care (Figure 3). We performed a sensitivity analysis by removing studies that included patients solely receiving ECMO (Figure 4). The results showed a similar trend to the main results except for the time period of 7-12 months after receiving intensive care, wherein the points estimate increased in the sensitivity analysis.
FIGURE 3: Subgroup analysis of return-to-work rates after 0–3 months (A), 4–6 months (B), and 7–12 months (C) classified according to countries with high and low integrated support.
Discussion

We identified 20 studies that evaluated the return-to-work prevalence in patients with COVID-19. In this study, we found that the return-to-work prevalence in patients with COVID-19 who received intensive care gradually increased one year after discharge. The prevalence of returning to work at 2 months, 4 to 6 months, and 12 months after receiving intensive care was approximately 49%, 57%, and 64%, respectively. One year after discharge, approximately one-third of the patients did not return-to-work. However, the results of the reviewed study were highly heterogeneous and its overall quality was low.

Several symptoms called Long COVID (e.g., fatigue, insomnia, and palpitations) and post-intensive care syndrome may impact the return-to-work prevalence in patients with COVID-19. The prevalence of Long COVID has been reported in 30–50% of cases of COVID-19 [31]. Symptoms common to Long COVID may be physical and psychological [32]. In a meta-analysis, the prevalence of fatigue after at least one month of COVID-19 was 0.32 (95% CI, 0.27–0.37) and cognitive impairment was 0.22 (95% CI, 0.17–0.28) [32]. In a follow-up study of symptoms at 2, 6, 12, and 24 months after hospitalization, fatigue was the most common at 6 months (73%) and decreased to 21% and 36% at 12 and 24 months, respectively [33]. After 6 months, 32% of patients still needed assistance for day-to-day activities. This was associated with an inability to return-to-work. The increased return-to-work prevalence after 12 months in our study may be attributed to improved long-term COVID-19 symptoms, including fatigue [18]. Additionally, a previous study reported that patients who required ventilation were more likely to have neuropsychiatric (67.3% vs 55.4%) and musculoskeletal (38.7% vs 2.97%) problems than non-critical patients adjusted for age, sex, and length of hospital stay [54]. These problems were more likely to prevent a return-to-work in critically ill patients than in non-critically ill patients.
The return-to-work prevalence was higher in patients with COVID-19 admitted to the ICU than in those without COVID-19. A previous systematic review of return-to-work prevalence in non-COVID-19 ICU patients reported 56% (95% CI, 50-62%) [35] and 60% (95% CI, 50-59%) [2] return-to-work prevalence at the 12-month follow-up [36]. The prevalence figures reported in the study are slightly lower compared to our findings. We anticipated that it would be more challenging to return to work during the COVID-19 pandemic than under ordinary circumstances due to discrimination and prejudice against those infected and reduced economic activities due to the lockdown. It is difficult to clearly explain why the return-to-work prevalence in patients with COVID-19 was comparable to or slightly higher than that of patients without COVID-19.

Previous studies suggested that countries with highly integrated support for healthcare policies are associated with higher return-to-work prevalence in ICU survivors without COVID-19 [35]. In this study, six to eight articles with a 12-month follow-up were from countries with highly integrated support. Additionally, changes in workstyle, such as teleworking during the pandemic, may be associated with return-to-work prevalence. Therefore, our findings may be affected by changes in work style.

The results of this study showed a high degree of heterogeneity. This heterogeneity could not be explained by subgroup analysis using the level of integration support. As a result, explanations for this heterogeneity are difficult to provide. One possible explanation is that we used the OECD report [10] published in 2010 to perform subgroup analysis classified based on integrated and less integrated support. However, numerous countries implemented a variety of measures during the COVID-19 pandemic, rendering the OECD classification inaccurate.

Strength and Limitations

This is the first study to use a meta-analysis to clarify the return-to-work prevalence in patients with COVID-19 admitted to the ICU. Our study has several limitations. First, data regarding the patients’ detailed occupational information was unavailable and the relationship between job title and return-to-work was unknown. Second, the certainty of the point estimates was low because of the insufficient sample size. It should be emphasized that reinstatement does not indicate that the employee is completely capable of performing the tasks they could previously. Future research is needed to determine the exact employment status and return-to-work prevalence.

Clinical and Research Implications

Although severely ill patients with COVID-19 return to work more quickly than those without COVID-19, approximately one-third of the patients do no return to work one year after ICU discharge, indicating that these patients need social integration support. Workplace support is critical and can require multifaceted interventions, including health-related support, service coordination (including return-to-work programs and case management), and modification of working conditions (including changes in working hours and duties) [37].

A large cohort study evaluating employment status after ICU discharge is warranted in various countries. A detailed description of job characteristics, such as employment status and type, as well as general characteristics, can help us discern the actual problems of patients with COVID-19 after receiving intensive care.

Conclusions

Approximately one-third of patients with COVID-19 do not return-to-work 12 months after receiving intensive care. These findings align with those of critically ill patients without COVID-19 infection. A more detailed and larger cohort study and integrated job support are needed.

Additional Information

Disclosures

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: Japan Academy of Critical Care Nursing. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

We appreciate Natsuko Yamada for providing screening support and Tomoko Fujino for reviewing the manuscript. We also thank Ms. Hitae Hrima and Ms Mwako Inaki for editing the manuscript. This study was a project of the COVID-19 Committee of the Japan Academy of Critical Care Nursing.

References


