Study Protocol Systematic Review

Medicine®

OPEN

Intensive care unit acquired weakness

A protocol for an overview of systematic reviews and meta-analysis

Zheng Li, MD[a], Yitong Cai, MD[b], Qian Zhang, MD[b], Peng Zhang, BD[c], Ruixiang Sun, BD[c], Haijiao Jiang, BD[c], JingJing Wan, MD[a], Fang Wu, MD[a], Xiaoye Wang, MD[c], Xiubin Tao, MD[a,c,*]

Abstract

Background: Intensive care unit-acquired weakness (ICU-AW) is an acquired neuromuscular lesion and a common occurrence in patients who are critically ill. There are already systematic reviews on ICU-AW. Therefore, we provide a protocol for an overview of systematic reviews to improve the effectiveness of the construction of an evidence-based practice for prevention of ICU-AW.

Methods: We will search the PubMed, CINAHL, EMBASE, and the Cochrane Library for the relevant systematic review or meta-analyses about ICU-AW. Study selection, data extraction, and the quality assessment of the included studies will be performed independently by 2 reviewers. And the methodological quality, report quality and evidence quality will be evaluated by Assessment of Multiple Systematic Reviews-2 tool, Preferred Reporting Items for Systematic Reviews and Meta Analyses Statement checklist and Grading of Recommendations Assessment, Development and Evaluation system, respectively.

Results: This overview of systematic reviews and meta-analysis will collect the evidence published about the ICU-AW.

Conclusion: We hope that our research will contribute to clinicians and public decision making about the ICU-AW.

Registration number: INPLASY202070067

Abbreviations: AMSTAR-2 = assessment of multiple systematic reviews-2, ICU-AW = intensive care unit-acquired weakness, PRISMA = preferred reporting items for systematic reviews and meta-analyses statement.

Keywords: assessment of multiple systematic reviews-2, grading of recommendations assessment, development, and evaluation, intensive care unit-acquired weakness, overview, preferred reporting items for systematic reviews and meta-analyses statement

1. Introduction

Intensive care unit-acquired weakness (ICU-AW) is an acquired neuromuscular lesion and a common occurrence in critically ill patients.[1] The incidence is 25% to 85%,[2] and it is still as high as 36% after discharge.[3] Neuromuscular weakness in the ICU is most often due to critical illness myopathy (CIM), critical illness polyneuropathy (CIP), or critical illness neuromyopathy (CINM) a combination of the two.[4] ICU-AW can prolong the patient's mechanical ventilation time and ICU hospital stay, increase the mortality rate and affect the patient's survival rate and quality of life after discharge.[5]

The most common form of ICU-acquired myopathy is CIM,[6] CIM often begins within several days of intensive care unit (ICU) admission.[7] The most common clinical manifestations of CIM are flaccid quadriparesis that may affect proximal more than distal muscles and failure to wean from mechanical ventilation.[8,9] CIP usually occurs in patients who are in the ICU for 1 or especially 2 weeks or more.[10,11] Cardinal clinical manifestations include limb muscle weakness and atrophy, reduced or missing deep tendon reflexes and loss of peripheral sensation to light touch and pinprick.[12] CIM is usually reversible over weeks to months, but leads to prolonged intensive care unit (ICU) stays and increased length of hospital stay overall.[13,14] Patients with CIM tend to have better outcomes than those with CIP. In survivors of CIP with mild or moderate nerve injury, recovery of muscle strength generally occurs over weeks to months.[15,16] CINM has clinical features that overlap the individual but closely corresponding features of CIM and CIP, with symmetric weakness of all 4 limbs, typically affecting proximal more than distal muscles; reduced or absent deep tendon reflexes; and peripheral sensory loss.[17]

ZL and YC have contributed equally to this work and are co-first authors.

Funded by "Climbing Peak" cultivation Project of Yijishan Hospital Science and Technology Innovation Team (PF2019014) and by the Natural Science Foundation of Universities of Anhui Province (KJ2014ZD32).

All analyses were based on previous published studies thus no ethical approval and patient consent are required.

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

The authors have no conflicts of interest to disclose.

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

[a] Graduate College, Wannan Medical College, Wuhu, [b] School of Nursing, Lanzhou University, Lanzhou, [c] The First Affiliated Hospital of Wannan Medical College, Wuhu, China.

[*] Correspondence: Xiubin Tao, No. 2 Zheshan West Road, Wuhu, Anhui province, 241001, China (e-mail: yjstaoxiubin@126.com).

How to cite this article: Li Z, Cai Y, Zhang Q, Zhang P, Sun R, Jiang H, Wan J, Wu F, Wang X, Tao X. Intensive care unit acquired weakness: A protocol for an overview of systematic reviews and meta-analysis. Medicine 2020;99:34 (e21926).

Received: 24 July 2020 / Accepted: 28 July 2020

http://dx.doi.org/10.1097/MD.0000000000021926

Neuromuscular weakness due to critical illness myopathy (CIM) or critical illness polyneuropathy (CIP) is a common occurrence in patients who are critically ill, developing in ≥25 percent of patients who are mechanically ventilated in the intensive care unit (ICU) for at least 7 days.[18,19] Risk factors include sepsis,[20] multiorgan failure, paralytic agents and the systemic inflammatory response syndrome (SIRS).[21,22]

An overview of reviews is a comprehensive research method that comprehensively collects relevant systematic reviews of treatment, etiology, diagnosis and prognosis of the same disease or the same health problem.[23] The systematic review integrates the results of multiple high-quality clinical studies, and its credibility is higher. Overviews conduct systematic review evidence from a higher level, the information contained is larger and more comprehensive, and the clinical practicality is stronger. It is particularly useful for informing health service policy and delivery.[24,25]

There are already systematic reviews on ICU-AW, including the risk factors and intervention methods of ICU-AW. When there are many relevant systematic reviews, the use of systematic review and re-evaluation to summarize evidence can improve the effectiveness of the construction of an evidence-based practice for prevention of ICU-AW. This study summarizes the systematic review/meta-analysis related to ICU-AW and conducts an overview of reviews.

2. Methods and analysis

2.1. Registration

This systematic review protocol followed the guidelines of Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA-P).[26] This overview has been registered on the International Platform of Registered Systematic Review and Meta-analysis Protocols (INPLASY). The registration number is INPLASY202070067 and the DOI is 10.37766/inplasy2020.7.0067.

2.2. Eligibility criteria

We will include studies that met the following criteria: (1) published systematic review or meta-analysis; (2) ICU patients with no restriction on age and gender; (3) The intervention measures are early activity, physical rehabilitation, drug therapy, etc.; (4) ICU-AW related risk factors, assessment and diagnosis, interventions and prevention will be included. We did not limit the language or year of publication. We will exclude protocols, editorials, meeting abstracts, and other reviews.

2.3. Search methods for identifying the studies

2.3.1. Electronic sources. PubMed, CINAHL, EMBASE, and the Cochrane Library will be searched from the inception to August 2020. The search strategies were developed by ZL and guided by XBT, who is an experienced evidence-based medicine researcher. The search terms were "intensive care unit – acquired weakness", ""ICUAW", ""ICU-AW", "critical illness myopathy", "critical illness polyneuropathy", "critical illness neuromuscular abnormality" and "Meta-Analysis", "systematic review", "evidence synthesis", "systematic literature review". Relevant overview of systematic reviews and meta-analysis will also be searched to identify potential studies.

2.3.2. Study records. EndNote X9 will be used to manage the initial search records. Two reviewers (ZL and QZ) will independently review the titles and abstracts based on the inclusion criteria. We will download the texts of the potential records to review them for inclusion further. Disagreements will be resolved by discussion or through consultation with a third reviewer (XBT). Study selection will be summarized in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

2.3.3. Data extraction and management. Two reviewers (ZL and YTC) will extract date independently by each reviewer using a standardized data collection form. We will collect the following date including: the name of the first author, publication year, study location, the main topic, type of included studies, number of included studies, number of participants, ICUAW incidence, quality assessment tools, the main outcomes and etc.

2.4. Quality evaluation

2.4.1. Assessment of methodological quality of included reviews. Two reviewers (ZL and YTC) will independently assess the quality for each study by using the Assessment of Multiple Systematic Reviews-2 (AMSTAR-2) tool.[27] The AMSTAR-2 tool is a modified version of AMSTAR that fits more closely the systematic reviews that include both RCTs and NRCTs. Two reviewers (LZ and PZ) will rate the quality of each meta-analysis as high, moderate, low and critically low based on the overall score of the AMSTAR-2. Conflicts between reviewers will be resolved through discussion and involving experts.

2.4.2. Report quality of included reviews. We will also use PRISMA checklist[28] to assess the report quality of the included reviews. The PRISMA statement for reporting quality consists of a 27-item checklist and a 4-phase flow diagram. When the literature score is 21 to 27, the report is considered relatively complete; when the score is 15 to 21, the report is considered to have some defects; when the score is less than 15, it is considered that there are relatively serious information defects.

2.4.3. Quality of evidence of included reviews. We will rate the evidence as "high", "moderate", "low", or "very low" in a conclusive table using the Grading of Recommendations Assessment, Development and Evaluation system.[29]

2.5. Statistical analysis

2.5.1. Data synthesis. A descriptive synthesis of assessed systematic reviews is planned. The effect sizes from the meta-analyses will be presented as mean differences (WMD), standardized mean differences (SMD), odds ratios (OR), relative risks (RR) or risk differences (RD), depending on the data reported by the authors. In addition, whenever possible, the results will be reported with 95% confidence intervals (95% CI). Excluded papers will be listed, with reasons for exclusion stated.

2.5.2. Assessment of heterogeneity. We can reflect the feasibility of meta-analysis by evaluating the heterogeneity of the included studies.[30] According to the guideline of Cochrane Handbook, heterogeneity between RCTs can be quantified using I-square (I^2) values, if $I^2 >$ is 50%, significant heterogeneity is considered, then a subgroup analysis is needed to determine the source of heterogeneity. If there is missing data in the included study, we will contact the author by email or phone to get the

missing data. We will use Egger test to evaluate publication bias and small-study effect, and a P value $< .1$ in the test confirms the bias and small-study effect.[31]

3. Discussion

ICU-AW has high prevalence and always accompany with poor clinical outcomes. This overview of systematic reviews and meta-analysis will collect the evidence published about the ICU-AW. We hope that our research will contribute to clinicians and public decision making.

Author contributions

XBT conceived the idea of research. ZL, YTC, and QZ developed the first draft of the manuscript. PZ, RXS, HJJ, JJW, FW, and XYW revised several versions of the manuscript.

References

[1] Fan E, Cheek F, Chlan L, et al. An official American Thoracic Society Clinical Practice guideline: the diagnosis of intensive care unit-acquired weakness in adults. Am J Respir Crit Care Med 2014;190:1437–46.
[2] Pati S, Goodfellow JA, Iyadurai S, et al. Approach to critical illness polyneuropathy and myopathy. Postgrad Med J 2008;84:354–60.
[3] Fan E, Dowdy DW, Colantuoni E, et al. Physical complications in acute lung injury survivors: a two-year longitudinal prospective study. Crit Care Med 2014;42:849–59.
[4] Stevens RD, Marshall SA, Cornblath DR, et al. A framework for diagnosing and classifying. intensive care unit-acquired weakness. Crit Care Med 2009;37(10 Suppl):S299–308.
[5] Zorowitz RD. ICU-acquired weakness: a rehabilitation perspective of diagnosis, treatment, and functional management. Chest 2016;150: 966–71.
[6] Latronico N, Bolton CF. Critical illness polyneuropathy and myopathy: a major cause of muscle. weakness and paralysis. Lancet Neurol 2011;10:931–41.
[7] Lacomis D, Giuliani MJ, Van Cott A, et al. Acute myopathy of intensive care: clinical, electromyographic, and pathological aspects. Ann Neurol 1996;40:645–54.
[8] Garnacho-Montero J, Amaya-Villar R, García-Garmendía JL, et al. Effect of critical illness polyneuropathy on the withdrawal from mechanical ventilation and the length of stay in septic patients. Crit Care Med 2005;33:349–54.
[9] Panegyres PK, Squier M, Mills KR, et al. Acute myopathy associated with large parenteral dose. of corticosteroid in myasthenia gravis. J Neurol Neurosurg Psychiatry 1993;56:702–4.
[10] Lacomis D, Zochodne DW, Bird SJ. Critical illness myopathy. Muscle Nerve 2000;23:1785–8.
[11] Bolton C. The polyneuropathy of critical illness. Intensive Care Med 1994;9:132.
[12] Latronico N, Shehu I, Seghelini E. Neuromuscular sequelae of critical illness. Curr Opin Crit Care 2005;11:381–90.
[13] Marrero HG, Stålberg EV. Optimizing testing methods and collection of reference data for differentiating critical illness polyneuropathy from critical illness MYOPATHIES. Muscle Nerve 2016;53:555–63.
[14] Guarneri B, Bertolini G, Latronico N. Long-term outcome in patients with critical illness myopathy or neuropathy: the Italian multicentre CRIMYNE study. J Neurol Neurosurg Psychiatry 2008;79:838–41.
[15] Fletcher SN, Kennedy DD, Ghosh IR, et al. Persistent neuromuscular and neurophysiologic abnormalities in long-term survivors of prolonged critical illness. Crit Care Med 2003;31:1012–6.
[16] Koch S, Wollersheim T, Bierbrauer J, et al. Long-term recovery In critical illness myopathy is complete, contrary to polyneuropathy. Muscle Nerve 2014;50:431–6.
[17] Op de Coul AA, Verheul GA, Leyten AC, et al. Critical illness polyneuromyopathy after artificial respiration. Clin Neurol Neurosurg 1991;93:27–33.
[18] De Jonghe B, Sharshar T, Lefaucheur JP, et al. Paresis acquired in the intensive care unit: a prospective multicenter study. JAMA 2002; 288:2859–67.
[19] Campellone JV, Lacomis D, Kramer DJ, et al. Acute myopathy after liver transplantation. Neurology 1998;50:46–53.
[20] Price DR, Mikkelsen ME, Umscheid CA, et al. Neuromuscular blocking agents and neuromuscular dysfunction acquired in critical illness: a systematic review and meta-analysis. Crit Care Med 2016; 44:2070–8.
[21] Bednarík J, Vondracek P, Dusek L, et al. Risk factors for critical illness polyneuromyopathy. J Neurol 2005;252:343–51.
[22] Druschky A, Herkert M, Radespiel-Tröger M, et al. Critical illness polyneuropathy: clinical findings and cell culture assay of neurotoxicity assessed by a prospective study. Intensive Care Med 2001;27:686–93.
[23] Higgins JPT, Green S. (eds). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011) The Cochrane Collaboration, 2011. Available from www.handbook.cochrane.org.
[24] Higgins JP, Lane PW, Anagnostelis B, et al. A tool to assess the quality of a meta-analysis. Res Synth Methods 2013;4:351–66.
[25] Smith V, Devane D, Begley CM, et al. Methodology in conducting a systematic review of systematic reviews of healthcare interventions. BMC Med Res Methodol 2011;11:15.
[26] Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev 2015;4:1.
[27] Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ 2017;358:j4008.
[28] Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J Clin Epidemiol 2009;62:1006–12.
[29] Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ 2008;336:924–6.
[30] Hoaglin DC. Assessment of heterogeneity in meta-analyses. JAMA 2014;312:2286–7.
[31] Macaskill P, Walter SD, Irwig L. A comparison of methods to detect publication bias in meta-analysis. Stat Med 2001;20:641–54.