A Study of the Effect of Online Reviews on Cruise Travel Purchase Intentions

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Abstract. A large number of clinical studies have shown that mechanical ventilation is an important means to improve the airway ventilation and oxygenation status of patients. In this paper, the meta-analysis method was used to analyze the effect of inspiratory muscle training on respiratory muscle function in ICU mechanically ventilated patients. By computer searching PubMed, Embase, The Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), Wan-Fang Data, VIP Chinese Periodical Database (VIP), China Biomedical Literature Database (CBM), From the library to April 2021, the relevant literature on inspiratory muscle training on inspiratory muscle function in ICU mechanically ventilated patients was analyzed. Stata14.0 software was used for Meta-analysis, and the results showed that inspiratory muscle training was helpful to improve patients' MIP (MD = −1.17, 95%CI−8.7, −0.47, P < 0.05); reduce patients' mechanical ventilation time [MD = −0.74, 95%CI (−1.42, −0.06), P < 0.05]; reduce the length of hospital stay [MD = −1.87, 95%CI (−3.22, −0.11), P < 0.05]. The study shows that IMT can improve MIT and reduce the length of hospital stay and mechanical ventilation.

Keywords: Inspiratory Muscle Training · Mechanical Ventilation · Evidence Based Nursing

1 Introduction

According to the research, mechanical ventilation is an important means of respiratory support for severe patients, and mechanical ventilation [8] is an important means to improve patients' airway ventilation (U B 2013). At present, about 73% of patients in ICU in China are receiving mechanical ventilation treatment. Relevant studies have shown that during mechanical ventilation, the patient's breathing is mainly provided by the ventilator, and the diaphragm is in a completely inoperative state, so its contraction movement is less [2], which eventually leads to diaphragm atrophy. A survey shows that the incidence of diaphragm atrophy is twice that of other muscle atrophy. Once diaphragm atrophy, patients can have ventilator dependence, difficult extubation, long mechanical

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ventilation time and other conditions, increasing the risk of associated pneumonia (VAP) and death.

Inspiratory muscle training (IMT) is mainly to improve the strength and endurance of respiratory muscle by training diaphragm and auxiliary inspiratory muscle. At present, IMT has been determined to improve chronic obstructive pulmonary disease, chronic heart failure and athletes' inspiratory muscle strength, so as to improve their sports performance [6]. At present, the rehabilitation work in intensive care unit mainly focuses on peripheral muscle dysfunction, while the research on training respiratory muscle is relatively less in China. The purpose of this study is to explore the effect of inspiratory muscle training on respiratory muscle of ICU patients with mechanical ventilation, so as to provide basis for the rehabilitation of respiratory muscle function of ICU patients with mechanical ventilation.

2 Materials and Methods

2.1 Objectives and Registration

Our scheme has been registered on the international registration system research and meta-analysis protocol platform (implant). The registration number is implasy202170034.

2.2 Ethics and Communication Plan

Our article is a secondary study and does not involve patient recruitment, data collection and ethical considerations. We will publish the results of the meta-analysis in the form of journal papers or conference papers.

2.3 Fact Sheet

Participant type: ICU patients with mechanical ventilation.

Intervention and control type: IMT was used in the experimental group. The control group received routine nursing or sham IMT. The time and frequency of intervention are unlimited.

Result type: main outcome measurement: maximum inspiratory pressure (MIP) after respiratory muscle training. Secondary outcome measures: duration of mechanical ventilation; Length of stay in ICU.

Study type: the included studies will be randomized controlled trials in this systematic study, regardless of publication status and language. Animal trials, systematic studies, case reports and studies with incorrect design or incomplete data will be excluded.

2.4 Data Sources and Retrieval Strategy

This paper was obtained mainly from databases such as China Knowledge Network (CNKI), Wanfang Data, China Science Journal Database (VIP), PubMed, CBM, Embase, Web of science and Cochrane Library, and no publication date or language was considered for this study. These databases were searched mainly by combining subject terms with random words. In the case of PubMed, for example, the search terms are appropriately adapted to the grammatical rules of the different databases in special cases. The specific scheme of their searches is shown in Table 1.

Table 1. The retrieval strategy

Number	Term
#1	"Respiration, Artificial" [MeSH] OR "Artificial Respirations" [Title/Abstract] OR "Respirations, Artificial" [Title/Abstract]
	OR "Ventilation, Mechanical" [Title/Abstract] OR "Mechanical Ventilations" [Title/Abstract] OR "Artificial Respiration"
	[Title/Abstract] OR "Mechanical Ventilation" [Title/Abstract]
#2	"Respiratory muscle training" [MeSH] OR "inspiratory muscle training" [Title/Abstract] OR "respiratory muscles"
	[Title/Abstract] OR "breathing exercises" [Title/Abstract]
#3	#1 AND #2 AND #3
#4	Randomized controlled trial [Title/Abstract] OR Controlled clinical trial [Title/Abstract]OR "RCT" [Title/Abstract]
#5	#3 AND #4

2.5 Study Selection and Data Extraction

Endnotex9 was used in this paper to manage the retrieved studies (Jixin Zhou and Ying Li). As shown in Fig. 1, this paper selection is divided into two steps and completed by two researchers. Preliminary screening: Duplicate and disqualified studies were excluded by reading titles and abstracts. Rescreening: Read through the full text and select studies based on inclusion and exclusion criteria. According to the Cochrane Handbook of Systematic Review of Interventions, two researchers extracted authors (Ying Li and Yajun Fu), publication time, number of participants, age, ethnicity, interventions in the control group, interventions in the experimental group, treatment process and outcome indicators, filled in the data extraction form, and compared the patient's baseline level.

2.6 Risk of Bias Assessment

Two researchers (Yajun Fu and Jixin Zhou) independently assessed the quality of the included RCTs using the Cochrane risk of bias assessment tool. According to the provisions of the Cochrane Manual V.5.1.0 Manual for Risk of Bias Assessment, the quality of the included literature was evaluated, and the high (A), medium (B), and low (C) grades of the literature were determined according to the scores [3]. Major assessments included: random sequence generation, blinding, allocation concealment (to study subjects, investigators, and outcome assessors), completeness of outcome data, selective reporting of study results, and other sources of bias.

2.7 Statistical Analysis

Statistical software stata 14.0 was used for meta-analysis. The outcome measure was the time effect probability of enumeration data, and its 95% confidence interval (CI) was the

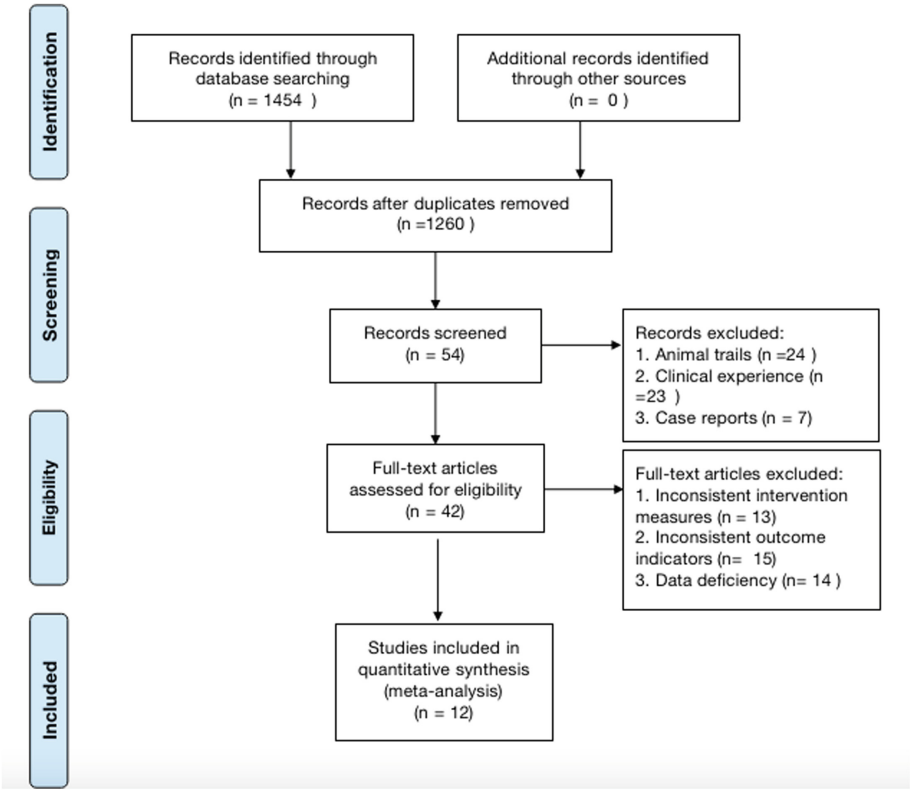

Fig. 1. Literature Selection Process

effect size; the mean difference (MD) and its 95% confidence interval (CI) were used to represent the effect of measurement data. If there was no statistical heterogeneity between studies ($P > 0.05$, $I2 < 50\%$), a fixed-effects model was used for analysis; otherwise, a random-effects model was used for analysis. If there was statistical heterogeneity between studies, sources of heterogeneity were analysed and factors that might have arisen were analysed.

2.8 Quality of Evidence

In assessing the quality of evidence, the Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach will be used. Considerations for assessing the quality of evidence included study limitations, consistency of effect, imprecision, inaccuracy, and publication bias. The quality of evidence will be graded on 4 levels (high, moderate, low and very low).

3 Analysis of Results

3.1 Literature Search Results

After carefully reading the title, abstract and full text, 12 articles [1] with a total of 750 patients were included.

Study Characteristics and Quality Assessment
General characteristics of the included studies are presented in Table 1. Six study was published in the Brazil, one studies originated from China, one originated from Australia, one study was from Columbia, one study was from India and two study was from Egypt. The quality of 5 articles was grade A, and that of 7 articles was grade B. The characteristics of included studies and the literature quality evaluation are shown in Table 2.

Table 2. The characteristics of included studies and the literature quality evaluation

Author	Year	Region	sample size	Interventions	Control group	Frequency	score	Outcome
Samári	2008	Brazil	41	IMT	Routine care	NA	A	MIP, Duration of mechanical ventilation
Bissett	2016	Australia	70	IMT	Routine care	Once a day	A	Length of stay in ICU
Robled	2013	Brazil	92	IMT	Routine care	Once a day	A	MIP, Duration of mechanical ventilation
Carus	2005	Brazil	25	IMT	Routine care	2 times/day	B	Duration of mechanical ventilation
Min Li	2018	china	74	IMT	Routine care	2 times/day	B	Duration of mechanical ventilation
Balbin	2017	Brazil	65	IMT	Routine care	2 times/day	A	MIP, Length of stay in ICU
Rodrig	2017	Brazil	19	IMT	Atomization inhalation	2 times/day	B	MIP

(*continued*)

Table 2. (*continued*)

Author	Year	Region	sample size	Interventions	Control group	Frequency	score	Outcome
Juliana	2014	Brazil	128	IMT	Atomization inhalation	2 times/day	B	MIP, Duration of mechanical ventilation
Sandov	2019	Australia	126	IMT	Routine care	2 times/day	A	MIP
Mohammed	2014	Egypt	40	IMT	Routine care	2 times/day	B	MIP
Akansh	2014	India	30	IMT	Routine care	2 times/day	B	MIP
AMANY	2014	Egypt	40	IMT	Routine care	NA	B	MIP, Duration of mechanical ventilation, Length of stay in ICU

3.2 Meta Analysis Results

Results from nine of these publications showed maximal inspiratory pressure for a total of 581 patients. The final results were heterogeneous ($I2 = 93.5\% > 50\%$) and the Q-test $P < 0.1$, so a random-effects model was selected for analysis. The results showed that the MIP of the experimental group was higher than that of the control group (MD $= -1.17$, 95%CI $-8.7 \sim -0.47$, $P < 0.05$). Group analysis was performed according to the initial threshold load pressure, and it was finally found that different pressures of IMT had different effects on MIP.

Results from 6 of these publications showed duration of mechanical ventilation, for a total of 400 patients. The results were heterogeneous ($I2 = 89.7\% > 50\%$) and the Q-test $P < 0.1$, so the random effects model was finally selected for analysis. The results showed that the mechanical ventilation time between the experimental group and the control group was significantly different [MD $= -0.74$, 95%CI $(-1.42, -0.06)$, $P < 0.05$].

A total of 3 of the literature outcomes reported length of hospital stay for a total of 175 patients. There is heterogeneity in the results ($I2 = 91.5\% > 50\%$) and the $P < 0.1$ of the Q test, so the random effect model was selected for analysis. The final results showed that the mechanical ventilation time between the experimental group and the control group was significantly different [MD $= -1.87$, 95%CI $(-3.22, -0.11)$, $P < 0.05$].

4 Discussion

4.1 Bias Analysis

Funnel plot showed the possibility of publication bias (egger's test, $P < 0.05$), which may be related to the inconsistent inclusion criteria of patients in RCT. In this study, patients with mechanical ventilation were included, the disease status of patients was not considered, and the age span of patients in this study was large, which may have a certain impact on publication bias.

4.2 Limitations

The European Respiratory Society (ERs) and the European Society of intensive care medicine (ESICM) proposed in the physical therapy recommendations for adult critically ill patients that respiratory muscle training should be considered for patients with respiratory muscle weakness and weaning failure. In this study, the results show that IMT can improve the MIP of patients, reduce the length of hospital stay and mechanical ventilation time, but there are some limitations in this study: ① in this study, when many outcome indicators are combined, the heterogeneity test shows that the heterogeneity is large, so the homogeneity of the included literature needs to be improved. ② In this study, the included literatures are from abroad, and considering the large age span, considering the existence of regional and age differences. ③ At present, there is no unified standard for the time, frequency, intensity and implementers of IMT training, and there are some differences among the studies. ④ In this study, we only discussed the short-term effect of patients, but not the long-term quality of life of patients. We hope to increase the sample size in the future research, carry out multi center high-quality clinical research, and further explore the IMT training, so as to provide reference for future clinical research.

5 Conclusions

In this study, we found that IMT can improve the MIP of patients. The results of this study are the same as those of Yao Li and Wu Yuchen. Some studies have pointed out that compared with other indicators, MIP is more direct and accurate in reflecting respiratory muscle contractility. Currently, MIP is used as a sensitive indicator to evaluate respiratory muscle contractility abnormality, respiratory muscle fatigue and respiratory muscle lesions. Inspiratory muscles, like other parts of muscle strength training, can also achieve the best effect through training [5]. IMT is mainly through exerting resistance in the process of inspiration, strengthening the training of inspiratory muscles, increasing exercise endurance, delaying muscle fatigue and speeding up the process of rehabilitation. In this study, through subgroup analysis, it was found that initial pressure $\geq 50\%$ or $< 50\%$ had significant effect on improving MIP. However, at present, the training parameters of ideal inspiratory muscle training have not been established. There are different studies on the setting of initial inspiratory pressure in patients with mechanical ventilation [4]. It is suggested that clinical studies should be continued in the future to explore the initial parameters of inspiratory muscle training in patients with mechanical ventilation.

In this study, it was found that IMT can shorten the duration of mechanical ventilation and length of stay in ICU. The results of this study are the same as those of vorona. It has been reported that the off-line time of patients admitted to ICU for mechanical ventilation accounts for 70% of the total mechanical ventilation time. Once the off-line failure occurs, the mechanical ventilation time of patients can be prolonged and the hospitalization time can be increased. At present, the weakness or weakness of diaphragm and auxiliary inspiratory muscle is one of the reasons for weaning failure. IMT exerts the inspiratory muscles, promotes the adaptive structural changes of the inspiratory muscles, reduces the occurrence of diaphragmatic and abdominal respiratory muscle weakness, so as to reduce the mechanical ventilation time and hospitalization time of patients with mechanical ventilation.

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