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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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Содержание:

TRIPLE THERAPY COMBINED WITH ACCELERATED RECOVERY STRATEGY CAN IMPROVE THE QUALITY OF LIFE OF ELDERLY PATIENTS WITH MECHANICAL VENTILATION

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Abstract.

Objective: The integration of physical therapy (PT), occupational therapy (OT), and speech therapy (ST) into a triple therapy approach has gained recognition in the rehabilitation of patients. The integration of PT-OT-ST triple therapy with accelerated recovery strategies in pulmonary rehabilitation for elderly mechanically ventilated patients is anticipated to overcome the limitations of traditional rehabilitation approaches.

Methods: By applying stringent inclusion and exclusion criteria, a total of 60 elderly patients over 60 years old requiring mechanical ventilation were selected. These patients were then divided into an observation group and a control group using a random number table method, with 30 cases in each group. Quality of life indicators were assessed using the Short Form Health Survey (SF-36) to evaluate changes in the patients' quality of life before the intervention and four weeks post-intervention.

Results: Before the intervention, there was no significant difference in the SF-36 scores between the two groups ($P > 0.05$). After 4 weeks of intervention, the SF-36 scores of the observation group were significantly higher than those of the control group ($P < 0.05$).

Conclusions: This study demonstrates that the combination of PT-OT-ST triple therapy with an accelerated recovery strategy is effective in pulmonary rehabilitation for elderly patients on mechanical ventilation.

Key words. With mechanical ventilation, elderly patients, short form health survey, physical therapy (PT), occupational therapy (OT), speech therapy.

Introduction.

The increase in the elderly population requiring mechanical ventilation is a significant concern in contemporary healthcare. As life expectancy rises, more elderly patients, particularly those aged 65 and older, are being admitted to intensive care units (ICUs) and are often placed on mechanical ventilation due to acute respiratory failure. For instance, a study indicated that the proportion of patients aged 65 years and older admitted to ICUs increased from 47.9% in 2005 to 63.7% in 2014, highlighting a growing trend in this demographic [1]. Moreover, the elderly population, especially those over 80 years, is particularly vulnerable. The in-hospital mortality rate for patients aged 80 years or older has been reported to be significantly higher, with studies showing rates as high as 19.1% for this age group [1]. This demographic often presents with multiple comorbidities, which complicates their treatment and increases the likelihood of requiring prolonged mechanical ventilation (PMV). For example, patients with four or more comorbidities have been shown to have a poorer one-year survival rate after being on PMV [2]. The implications of this trend are profound. The increasing number of elderly patients on mechanical ventilation not only places a strain on healthcare resources but also raises ethical considerations regarding the quality of life and the appropriateness of life-sustaining treatments in this population. Many elderly patients may prioritize quality of life over the extension of life, leading to a reluctance to accept invasive treatments like mechanical ventilation [3]. Furthermore, the healthcare system must adapt to these changes. The rising demand for mechanical ventilation among the elderly necessitates the establishment of specialized care units and the implementation of policies that address the unique needs of this population.

The integration of physical therapy (PT), occupational therapy (OT), and speech therapy (ST) into a triple therapy approach has gained recognition in the rehabilitation of patients, particularly those recovering from strokes. This combined strategy aims to address the multifaceted impairments that often accompany neurological events, such as motor, cognitive, and communicative deficits.

Research indicates that each of these therapies plays a distinct yet complementary role in rehabilitation. PT primarily focuses on improving physical function, mobility, and balance, which are crucial for daily activities. OT, on the other hand, emphasizes enhancing the ability to perform everyday tasks and improving fine motor skills, which can be significantly affected after a stroke. ST is essential for addressing language and communication deficits, which are common sequelae of stroke and can severely impact a patient's quality of life and social interactions. The triple therapy approach of PT, OT, and ST represents a comprehensive strategy for addressing the diverse needs of patients recovering from strokes and other neurological conditions. By leveraging the strengths of each therapy and promoting interdisciplinary collaboration, this approach holds the potential to significantly improve rehabilitation outcomes and enhance the quality of life for patients. Continued research and clinical trials will be essential to further validate the efficacy of this integrated model and refine therapeutic protocols to optimize patient care [4].

Enhanced Recovery After Surgery (ERAS) is a comprehensive, evidence-based approach designed to improve surgical outcomes and expedite recovery for patients undergoing various surgical procedures. ERAS has been shown to significantly reduce pain scores, opioid consumption, and length of hospital stays, while simultaneously improving patient satisfaction and reducing healthcare costs [5,6].

The integration of PT-OT-ST triple therapy with accelerated recovery strategies in pulmonary rehabilitation for elderly mechanically ventilated patients is anticipated to overcome the limitations of traditional rehabilitation approaches. Through early intervention, multidisciplinary collaboration, and the

development of personalized rehabilitation plans, PT-OT-ST triple therapy can be effectively implemented in the pulmonary rehabilitation of elderly patients requiring mechanical ventilation. This approach has the potential to enhance respiratory function, reduce complications, shorten hospital stays, and improve quality of life. Furthermore, it introduces innovative concepts for the rehabilitation treatment of elderly mechanically ventilated patients, holding significant clinical and social value. This study aims to evaluate the effectiveness of the PT-OT-ST triple therapy combined with an accelerated recovery strategy in the pulmonary rehabilitation of elderly patients undergoing mechanical ventilation.

Subjects and Methods.

Subjects:

This study focused on elderly patients who were mechanically ventilated and hospitalized in the Department of Intensive Care Unit at Hangzhou Geriatric Hospital from June 2022 to August 2023. The inclusion criteria were as follows: patients aged ≥65 years; those receiving mechanical ventilation through tracheal intubation or tracheotomy, with an expected duration of mechanical ventilation exceeding 48 hours; and patients in relatively stable condition, characterized by stable vital signs, specifically a heart rate of 60-100 beats per minute, systolic blood pressure of 90-140 mmHg, diastolic blood pressure of 60-90 mmHg, a respiratory rate of 12-30 breaths per minute, and blood oxygen saturation (SpO_2) ≥90%. Furthermore, patients or their family members were required to sign an informed consent form to voluntarily participate in this study. The exclusion criteria included: severe heart, liver, or kidney failure with an expected survival time of less than one month; severe mental illness or cognitive impairment that hindered cooperation with rehabilitation treatment; the presence of unstable fractures or acute myocardial infarction, which restricted activity; severe arrhythmias or uncontrolled hypertension (systolic blood pressure >180 mmHg or diastolic blood pressure >110 mmHg); neurological instability such as increased intracranial pressure and risk of brain herniation; and recent major surgery (within one week) that could affect the evaluation of the recovery process. By applying stringent inclusion and exclusion criteria, a total of 60 elderly patients requiring mechanical ventilation were selected. These patients were then divided into an observation group and a control group using a random number table method, with 30 cases in each group. This approach ensured that both groups were comparable in terms of age, gender, underlying conditions, reasons for mechanical ventilation, and other baseline data, with no significant differences ($P > 0.05$), thereby enhancing the scientific rigor and reliability of the research findings.

Grouping method:

The random number table method is employed for grouping to ensure both randomness and scientific rigor in the allocation process. The procedure is as follows: Each elderly patient on mechanical ventilation who meets the inclusion criteria is assigned a unique identifier, ranging from 1 to the total number of samples 60. Subsequently, numbers are randomly selected using a computer-generated random number table, and patients are allocated to either the observation group or the control group according to predetermined rules. Following the completion of grouping, statistical analyses are performed on the baseline data of both patient groups, which include age, gender, underlying disease composition (such as hypertension, coronary heart disease, diabetes, etc.), reasons for mechanical ventilation (such as exacerbation of chronic obstructive pulmonary disease, severe pneumonia, respiratory failure, etc.), vital signs (heart rate, blood pressure, respiratory rate, etc.) upon admission, inhalation frequency, blood oxygen saturation, and initial lung function indicators (such as vital capacity, forced vital capacity, and forced expiratory volume in 1 second). This analysis aims to verify the balance between the two groups, ensuring that there are no significant differences ($P > 0.05$) and thereby minimizing the potential influence of confounding factors on the research outcomes, thus providing a reliable foundation for comparing the efficacy of subsequent intervention measures.

Intervention measures:

The control group adopts conventional rehabilitation treatment and nursing measures, including conventional anti-infective, expectorant, antiasthmatic and other drug treatments to maintain water and electrolyte balance and nutritional support. Adjust ventilator parameters according to the patient's condition to ensure smooth airway, turn over and pat the back regularly to prevent pressure ulcers, once every 2 hours. After the patient's condition is relatively stable and his vital signs are stable, he can start simple passive activities of the limbs, twice a day, for 15 minutes each time. The movable joints include shoulders, elbows, wrists, hips, knees, ankles, etc. The range of motion is suitable for the patient's tolerance, and no systematic PT, OT, ST rehabilitation training or accelerated rehabilitation strategy intervention is performed.

The observation group implemented PT-OT-ST triple therapy combined with accelerated recovery strategy.

Physical therapy (PT): Start within 24-48 hours of mechanical ventilation of the patient, when the vital signs are stable and there are no contraindications. **1. Bed position management:** Change the patient's position regularly, turn over every 1-2 hours, alternate between side and semi-recumbent positions, and use pressure-reducing mattresses, air mattresses, etc. to prevent pressure ulcers. At the same time, adjust the height of the bedside and raise it by 30°-45° when the condition permits to improve respiratory function and reduce the risk of aspiration. **2. Joint activity training:** passively move the joints of the patient's limbs, from the proximal large joints to the distal small joints, and move the shoulders, elbows, wrists, fingers, hips, knees, ankles, and toes in sequence, with each joint moving for 5-10 minutes times, 3 times a day; after the patient's muscle strength recovers to level 2 or above, gradually guide the patient to perform active joint activities and power-assisted exercises to increase the intensity and range of motion, such as using grippers, elastic bands, etc. for resistance training. According to the patient's tolerance Adjust the resistance according to the degree of stress. **3. Respiratory muscle training:** Instruct the patient to perform pursed-lip breathing, inhale through the nose with the mouth closed for 2 seconds, and slowly exhale for 4-6 seconds with

the lips pursed. When exhaling, the lips should be pursed enough to gently blow the paper 30 cm in front of them. It is advisable to perform 3-4 groups every day, each group 10-15 times; for abdominal breathing training, the patient should be in a supine or semi-recumbent position. Relax your whole body and place your hands on your abdomen. When you inhale, the abdomen rises and when you exhale, the abdomen sinks. The ratio of inhalation and exhalation time is about 1:2. Each training session is 10-15 minutes, 3 times a day; according to the patient's recovery Depending on the situation, breathing trainers can be added in a timely manner for auxiliary training, to adjust breathing resistance and enhance respiratory muscle strength.

Occupational therapy (OT) will intervene after the patient is conscious and his vital signs are stable. 1. Daily life self-care ability training: Based on the patient's actual situation, starting from simple basic activities such as washing, eating and dressing, break down the action steps and gradually guide the patient to complete them independently. For example, first practice using the unaffected hand to assist the affected hand in brushing teeth, and gradually transition to one-handed operation as the ability improves. The training frequency is 2-3 times per day. Eating training focuses on tableware selection and food texture adjustment, aiming to prevent choking and cultivate patients' ability to eat independently. 2. **Functional work activities:** Arrange fine hand movement training, such as building blocks, stringing beads, and tying shoelaces, etc., to exercise the coordination and flexibility of hand muscles. Each training lasts 15-20 minutes and is performed twice a day. Customize personalized homework projects based on the patient's previous occupation and hobbies. For example, for patients who like calligraphy, perform simple calligraphy exercises and use a brush dipped in water to write on paper to exercise upper limb control and concentration. The training frequency is 3-4 times a week. These activities enrich hospital life, promote psychological recovery, and enhance social role identity.

Speech therapy (ST): Assessment and intervention begin within 24 hours after the patient is extubated. 1. Swallowing function training: Training on the strength, coordination and swallowing reflex of patients' swallowing muscles. For oral muscle massage, the therapist uses fingers to massage the patient's lips, buccinator muscles and tongue muscles in a circular motion for 5-10 minutes each time, twice a day; for swallowing reflex stimulation, use ice cotton swabs to gently stimulate the soft palate, tongue base and pharynx. Posterior wall to induce swallowing movements, 3 - 4 times daily times; adjust the swallowing posture, and guide the patient to adopt special postures such as lowering the head to swallow or turning the head to swallow according to the patient's swallowing imaging results to reduce the risk of aspiration; eating training starts with paste food and gradually transitions to semi-liquid and soft food. During the process, the patient's swallowing condition was observed, and the food properties and eating speed were adjusted in time. Each eating session was conducted for 15-20 minutes, 3 times a day. 2. Speech function training: For patients with dysphonia, respiratory and vocal coordination training is provided. After the patient takes a deep breath, slowly make an "ah" sound, and gradually extend the vocalization time, training for 10-15 minutes each time, 3 times a day; for patients with dysarthria, carry out targeted training based on the evaluation results of the motor function of the articulatory organs. Lip and tongue exercises training, such as lip curling, lip curling, tongue thrusting, tongue thrusting, etc., repeat each action 5-10 times, 3-4 times a day Group; carry out vocabulary and sentence expression training, guide patients to carry out communication exercises such as naming, description, question and answer through pictures, physical display, etc., and gradually improve the fluency and accuracy of verbal expression, training 2-3 times a day.

The accelerated recovery strategy runs throughout: 1. Optimize airway management: Strictly follow the principles of aseptic operation for sputum suctioning, and reasonably adjust the frequency of sputum suctioning based on the viscosity and volume of sputum and the patient's breathing conditions. Give high-concentration oxygen before and after suctioning to prevent hypoxemia; regularly humidify the airway, and use a micropump for continuous airway humidification to keep the airway mucosa moist, dilute sputum, and promote sputum discharge; according to the condition of the disease Dynamically adjust ventilator parameters, perform daily arterial blood gas analysis, and timely optimize respiratory support modes and parameters based on the results to avoid over-ventilation or under-ventilation and reduce ventilator-related lung damage, such as adjusting tidal volume, respiratory frequency, oxygen concentration, Positive end expiratory pressure (PEEP), etc. 2. Early mobilization: Develop a detailed early mobilization plan and start it as soon as possible under the premise that the patient's hemodynamics are stable (heart rate and blood pressure fluctuate within ±20% of the basic value), there is no active bleeding, and there is no serious arrhythmia. Gradually transition from passive activities on the bed to active activities, such as making fists, raising legs, turning over, etc. On the 1st to 2nd day after surgery, increase sitting and standing training beside the bed, 10-15 minutes each time, 2-3 times a day; on the 3rd to 4th day after surgery, try standing and walking beside the bed, with an initial walking distance of 3- 5 meters and gradually increase. Provide professional medical staff to assist during walking to ensure safety and prevent accidents such as falls and bed falls; closely monitor the patient's vital signs, blood oxygen saturation and subjective tolerance level during the activity, and promptly terminate and adjust the activity if discomfort occurs plan. 3. Nutritional support: Complete nutritional risk screening within 24 hours after admission. If the Nutritional Risk Screening 2002 (NRS 2002) scale is used, enteral nutrition is preferred for patients with nutritional risks. According to the patient's age, weight, underlying diseases and metabolic status, a personalized nutritional formula is formulated. Choose enteral nutrition preparations rich in high-quality protein (such as whey protein, casein), dietary fiber, vitamins (such as vitamin C, vitamin D, and B vitamins) and minerals. Infuse at a constant rate through a nasogastric tube or nasojejunal tube, with an initial rate of 20 - 30 ml/h, and gradually increase to the target feeding amount according to

tolerance to ensure that the daily caloric intake reaches 25 - 30 kcal/kg. For patients whose enteral nutrition cannot meet their nutritional needs or who have contraindications to enteral nutrition (such as severe gastrointestinal dysfunction, intestinal obstruction, etc.), parenteral nutritional support should be supplemented in a timely manner to maintain nitrogen balance, promote body repair and improve immune function. 4. Pain management: Use multimodal analgesia methods. Provide pain education to patients before surgery and inform them of pain assessment methods and response measures to improve patients' awareness of and ability to cope with pain. After surgery, the patient's pain level was regularly assessed based on the Numerical Pain Rating (NRS) or the Visual Analogue Scale (VAS). For mild pain (NRS or VAS score 1-3 points), use non-drug analgesic methods, such as relaxation therapy (deep breathing, meditation, progressive muscle relaxation), cold compress or hot compress and other physical therapy methods to divert the patient's attention and Relieve pain; for moderate pain (score 4-6), combine with NSAIDs (such as ibuprofen, Acetaminophen) and weak opioids (such as tramadol) should be administered as needed, and attention should be paid to monitoring of adverse drug reactions; for severe pain (7-10 points), the anesthesiology department should be consulted promptly to adjust the analgesic plan , increase the use of strong opioids (such as morphine, fentanyl) to ensure that patients' pain is effectively controlled and improve rehabilitation compliance. 5. Psychological intervention: From the time the patient is admitted, medical staff take the initiative to communicate with the patient and their family members to understand the patient's psychological state, personality characteristics and family support, and establish a good nurse-patient relationship. Regularly conduct mental health education lectures, distribute promotional materials, and popularize disease knowledge, recovery processes, and prognosis to alleviate patients' fear and anxiety caused by unknown diseases. For patients with anxiety, depression and other negative emotions, psychological scales (such as Hamilton Anxiety Scale, Self-Rating Depression Scale) are used for quantitative assessment, and personalized psychological counseling, such as cognitive behavioral therapy, is implemented based on the results to guide patients to correctly understand Disease and recovery process, correcting negative thinking. Encourage family members to accompany the patient to increase the patient's emotional support. If necessary, invite a psychologist for consultation and provide professional psychological treatment to enhance the patient's confidence in recovery and cooperate with the treatment with a positive attitude. 6. Optimize the ward environment: The indoor temperature is maintained between 22 and 24 degrees Celsius, and the humidity is maintained between 50 and 60%. Ventilation is performed regularly every day to keep the indoor air fresh. Facilities within the ward should be arranged thoughtfully to provide a spacious and safe area for patient activities. Call bells, oxygen inhalation devices, and first aid equipment should be readily accessible around each hospital bed to ensure patient convenience at all times. The lighting in the ward should be soft to minimize noise interference, while warm reminders and images of successful rehabilitation cases can be displayed on the walls to foster a comfortable, warm, and positive atmosphere that supports both physical and mental recovery for patients.

Observation indicators:

Quality of life indicators were assessed using the Short Form Health Survey (SF-36) to evaluate changes in the patients' quality of life before the intervention and four weeks post-intervention. SF-36 s a widely utilized instrument designed to assess health-related quality of life (HRQoL) across various populations and conditions [7]. It consists of 36 items that evaluate eight distinct health domains: physical functioning, role limitations due to physical health, role limitations due to emotional problems, vitality, mental health, social functioning, bodily pain, and general health. Each domain is scored on a scale from 0 to 100, where higher scores indicate better health status and fewer reported symptoms.

Data collection and analysis methods.

Data collection was conducted by uniformly trained researchers to ensure the accuracy and consistency of the data. From the time a patient is included in the study, the patient's baseline information, data on various observational indicators, implementation of rehabilitation treatment, and information on the occurrence of complications are recorded in detail. Specially designed data collection forms are utilized, with both paper and electronic versions backed up to ensure redundancy, and real-time entry and verification processes are in place to prevent data omissions or errors. Data analysis was performed using SPSS 22.0 statistical software. Measurement data are expressed as mean ± standard deviation. The paired t-test was employed for comparisons before and after intervention within the same group to evaluate whether changes in indicators at different time points were significant; the independent sample t-test was used for comparisons between groups to determine whether the differences in indicators between the observation group and the control group at the same time point were statistically significant. A P-value of <0.05 was considered statistically significant.

Results.

Comparison of patient general information.

This study included a total of 60 years of mechanical ventilation patients, who were randomly divided into an observation group and a control group, with 30 patients in each group. The baseline data of the two groups of patients were balanced in terms of age, gender, and basic disease composition, with no significant difference ($P>0.05$). Comparability. See Table 1 for specific data.

Quality of life indicators.

Before the intervention, there was no significant difference in the Health Survey Short Form (SF-36) scores between the two groups ($P>0.05$). After 4 weeks of intervention, the SF-36 scores of the observation group were significantly higher than those of the control group ($P<0.05$), indicating that the observation group had a better effect on improving the quality of life of patients. See Table 2 for specific data.

Table 1. *Comparison of general information of patients.*

Group		**Observation group**	**Control group**
Age (Mean±SD, years)		70±4	71±3
Gender (male/female)		16/14	15/15
Basic diseases	Hypertension	13	12
Reasons for mechanical ventilation	coronary heart disease.	30	30

Table 2. *comparison of Quality-of-life indicators between two groups.*

	Control group		**Observation group**	
F-36 Domain	**Baseline**	**Post-treatment**	**Baseline**	**Post-treatment**
General health	53± 22	72±17	52±17	82±12
Physical functioning	72± 19	82±23	71±16	83±12
Physical role	43±32	64±18	41±34	74±13
Vitality	47±20	66 ± 16	48±21	78±15
Mental health	63± 17	77± 12	63±18	86±13
Emotional role	63±39	81±22	62±38	91±21
Social functioning	69 ± 1	75± 20	68±12	88±22
Bodily pain	71±20	78±11	71±21	89±12

Discussion.

The results of this study show that PT-OT-ST triple therapy combined with accelerated recovery strategies is effective in pulmonary rehabilitation in elderly patients with mechanical ventilation. The quality-of-life indicators improved significantly. After 4 weeks of intervention, the observation group's Short Form Health Survey (SF-36) and Activities of Daily Living Scale (ADL) scores were higher than those of the control group. OT helps patients regain their ability to take care of themselves in daily life, from dressing, washing to eating, and gradually regain their confidence in life.ST solves speech and swallowing disorders, promotes patient communication, and improves the quality of social interaction; accelerates psychological intervention and comfortable environment creation in rehabilitation strategies, comprehensively improve the patient's mental state and life experience, and encourage them to better return to the normal life track, demonstrating the excellent role of this joint strategy in promoting the overall recovery of elderly mechanically ventilated patients. In terms of improving quality of life, traditional rehabilitation pays insufficient attention to patients' psychological and social functions. Elderly patients often develop anxiety and depression due to long-term illness, communication barriers, and inability to take care of themselves, which affects their confidence in recovery and quality of life. This joint strategy integrates full-process psychological intervention and optimizes the ward environment. OT and ST jointly support patients to regain their life and social skills, enhance their sense of self-identity and belonging, comprehensively improve the patient's quality of life, and help them better return to their families and society. This demonstrates the outstanding advantages of this strategy in the field of pulmonary rehabilitation for elderly mechanically ventilated patients and provides a better path for clinical rehabilitation practice.

Conclusion.

This study demonstrates that the combination of PT-OT-ST triple therapy with an accelerated recovery strategy is effective in pulmonary rehabilitation for elderly patients on mechanical ventilation. Quality of life indicators have shown significant improvement, with enhancements noted in the Short Form Health Survey (SF-36).

These findings indicate that not only has the patient's physical function recovered well, but there has also been a comprehensive improvement in daily self-care abilities, psychological well-being, and quality of social interactions. Consequently, patients are better able to return to normal life, underscoring the substantial role of this combined strategy in promoting the overall recovery of elderly patients requiring mechanical ventilation and its high clinical applicability.

Research Limitations and Prospects.

Although this study has yielded certain results, it is not without limitations. In terms of sample size, the challenges associated with conducting multi-center studies, along with constraints related to time and resources, have resulted in a relatively limited sample. This limitation may affect the generalizability of the findings to a broader population of elderly mechanically ventilated patients. Future research should aim to collaborate with medical institutions across multiple regions to expand the sample size and enhance the reliability of the conclusions drawn. Additionally, the duration of the study was short, focusing solely on the rehabilitation effectiveness of patients during hospitalization. It did not track the dynamics of rehabilitation post-discharge over an extended period, such as the maintenance of respiratory function and long-term changes in quality of life. Therefore, future studies should be designed to include long-term follow-up assessments to comprehensively evaluate long-term prognoses. While the observation indicators encompass multiple dimensions, some are not sufficiently precise. For instance, the assessment of patients' mental status relies solely on general scales, lacking an in-depth exploration of the underlying mechanisms linking psychological changes to rehabilitation. Similarly, the evaluation of muscle strength primarily employs manual muscle strength examinations, which may not accurately reflect subtle fluctuations in muscle strength.

Follow-up research could benefit from incorporating more sensitive and specialized assessment tools to enhance the depth of the investigation. Looking ahead, there is an urgent need for in-depth mechanistic research. Utilizing technologies such as molecular biology and imaging, we can analyze the intrinsic molecular pathways involved in PT-OT-ST triple therapy combined with accelerated rehabilitation strategies to improve respiratory function and reduce complications. This approach aims to reveal the microscopic targets of rehabilitation treatment and provide a theoretical foundation for precision medicine.

The potential applications of intelligent rehabilitation equipment are substantial. Developing intelligent breathing training instruments and remote rehabilitation monitoring systems can facilitate personalized, home-based rehabilitation training, overcoming the temporal and spatial limitations of traditional rehabilitation methods and enhancing patient compliance. Furthermore, accessibility to sexual health and recovery must be addressed. Additionally, there is a need for in-depth multidisciplinary integration, which should encompass not only collaboration among medical disciplines but also include fields such as sociology and engineering. This approach aims to comprehensively optimize the rehabilitation ecology for elderly patients on mechanical ventilation, creating a holistic integration of prevention, treatment, rehabilitation, and social support. Such a comprehensive model can significantly enhance the overall quality of rehabilitation and the quality of life for patients, ultimately advancing the field of elderly critical care rehabilitation medicine to new heights.

Consent for publication.

Not applicable.

Availability of data and material.

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests.

The authors declare that this research was conducted in the absence of any business or financial relationships that could be construed as potential conflicts of interest.

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