Predicting Nonrecovery of Muscle Strength in Critically Ill Patients With Intensive Care Unit–Acquired Weakness

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Background Individual differences exist in the recovery of muscle strength in critically ill patients with intensive care unit (ICU)–acquired weakness, but the characteristics of patients who do not recover muscle strength are unclear.
Objective To elucidate the factors associated with the nonrecovery of muscle strength in patients with ICU-acquired weakness.
Methods This prospective cohort study involved critically ill patients with ICU–acquired weakness. The patients' outcomes were categorized as recovery (Medical Research Council Sum Score [MRC-SS] ≥48 until hospital discharge or the time of stroke, death, or ICU readmission) or nonrecovery (MRC-SS <48). Separate logistic regression analyses adjusted for age and sex were performed for each candidate factor to identify factors associated with nonrecovery of muscle strength.
Results A total of 111 patients were included in the analysis. Thirty patients were classified as having nonrecovery. Analysis using a logistic regression model showed that septic shock, duration of deep sedation, corticosteroid use, total amount of corticosteroids used, duration of mechanical ventilation, duration of renal replacement therapy, day of first out-of-bed mobilization, initial evaluation of MRC-SS, and length of ICU stay were age- and sex-adjusted predictors of nonrecovery of muscle strength.
Conclusions Patients with ICU–acquired weakness with the predictors identified in this study may not recover muscle strength. Future multicenter interventional studies should assess not only the timing of rehabilitation but also its intensity and the muscle groups specifically targeted. (*American Journal of Critical Care.* 2026;35:276-285)

CE 1.0 Hour

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EBR Evidence-Based Review on pp 286-287

This article is followed by an *AJCC* Patient Care Page on page 288.

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Advances in intensive care have improved the prognosis of critically ill patients; thus, attention to long-term sequelae has increased.[1] Up to 5 years after discharge from the intensive care unit (ICU), survivors exhibit significantly impaired physical abilities and reduced quality of life.[2] Intensive care unit–acquired weakness is defined as muscle weakness that develops after the onset of critical illness and is primarily associated with the loss of muscle mass and function, although its exact pathophysiology is not fully understood.[3,4]

Intensive care unit–acquired weakness is a common complication of critical illness, with a reported median prevalence of 43%, depending on the diagnostic method used and the severity of the critical illness.[5] Furthermore, ICU-acquired weakness is a serious problem that is worsening, affecting short-term and long-term outcomes.[4]

Most patients with ICU-acquired weakness recover within months, reaching a plateau at approximately 1 year.[6,7] However, functional recovery varies from patient to patient.[5] The clinical factors involved in the recovery of physical function in patients with ICU-acquired weakness have not been identified.[8]

Early rehabilitation reduces the risk of developing ICU-acquired weakness.[9] However, effective treatments, including early rehabilitation, to promote functional recovery in patients with complications of ICU-acquired weakness have not yet been established. In addition, the clinical characteristics of patients who do not recover from physical dysfunction remain unclarified. Therefore, it is crucial to investigate the characteristics of patients who do not recover their physical function and identify those in whom more aggressive interventions are needed. Thus, this study was conducted to clarify the factors associated with the nonrecovery of muscle strength in patients with ICU-acquired weakness.

The clinical factors involved in the recovery of physical function in patients with ICU-acquired weakness have not been identified.

Materials and Methods

Study Design

This single-center, prospective, observational cohort study was conducted at a tertiary care university hospital between May 2020 and December 2022. The inclusion criteria were age greater than 18 years, ICU stay longer than 72 hours, development of ICU-acquired weakness, and ability to provide informed consent. Patients with preexisting neuromusculoskeletal disorders and a Barthel Index of less than 70 before admission, whose surgery involved special postoperative management, and who died before the muscle strength assessment were excluded. The human ethics review committee of the institution approved this study (approval number 20042030), which was registered with the University Hospital Medical Information Network Clinical Trials Registry (https://www.umin.c.jp/ctr/index-j.htm; trial UMIN000039955).

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Study Setting

This study was performed in the ICU of the university hospital. All patients underwent physical therapy, which was continued until discharge.

ICU-Acquired Weakness Assessment

Intensive care unit–acquired weakness was diagnosed using the current diagnostic criteria.[3] Manual muscle strength was assessed by having trained ICU physical therapists use the Medical Research Council Sum Score (MRC-SS)[10,11] immediately after the patients awakened (ie, had a Richmond Agitation-Sedation Scale[12] score between −1 and +1; 5 standardized commands ["Open (close) your eyes," "Look at me," "Open your mouth and put out your tongue," "Nod your head," and " Raise your eyebrows when I have counted up to 5")[13]: score of 5 out of 5). The MRC-SS was measured bilaterally in the following muscle groups: wrist dorsiflexors, elbow flexors, shoulder abductors, hip flexors, knee extensors, and ankle dorsiflexors. The muscle group scores were summed and divided by the number of muscle groups to obtain the average MRC-SS (from 0 [paralysis] to 5 [normal strength]). When calculating the composite MRC-SS, if data were missing for 1 muscle group (eg, owing to a radial arterial catheter limiting the testing of 1 wrist), the MRC-SS for the contralateral muscle group was substituted, given that ICU-acquired weakness affects the left and right sides similarly.[13] If muscle strength data were missing bilaterally for 1 muscle group, they were imputed using the average score from the other muscle groups to calculate the composite MRC-SS.[7] The MRC-SS was evaluated on the first day of awakening, every week after the initial assessment, at ICU discharge, and either when an event (ie, stroke, death, or ICU readmission) occurred or when the patient was discharged from the hospital.

Intensive care unit–acquired weakness was defined as a symmetrical weakness that developed after ICU admission with an MRC-SS score of less than 48.[3] Eight physical therapists participated in this study. Before the study, the physical therapists underwent training in administering the MRC-SS to ensure interrater reliability. The MRC-SS was administered by 2 independent physical therapists for each patient. Both physical therapists were aware of each other's results. These physical therapists were familiar with the technique, and there was a maximum time gap of 24 hours between the 2 measurements.[14] For analysis purposes, the highest total MRC-SS obtained on either day was defined as each patient's strength.[15]

Outcome

The primary outcome of this study was nonrecovery. The patients with an MRC-SS less than 48 and residual dysfunction until hospital discharge or the time of stroke, death, or ICU readmission were defined as having nonrecovery. The patients with an MRC-SS of 48 or greater within the same periods were defined as having recovery.

Baseline and Clinical Characteristics

Data on age, sex, body mass index, baseline comorbidity (Functional Comorbidity Index),[16] and Clinical Frailty Scale score[17] were collected. Furthermore, data on the following ICU-related factors were recorded: Sequential Organ Failure Assessment[18] score at the time of ICU admission and on the day of ICU discharge, diagnosis category, days of deep sedation (Richmond Agitation-Sedation Scale score of −3 to −5), use of corticosteroids and neuromuscular blockers, the total amount of corticosteroids used (prednisolone equivalent, mg/day), mean daily blood glucose level in the ICU, use of renal replacement therapy and extracorporeal membrane oxygenation, duration of mechanical ventilation and renal replacement therapy, ICU and hospital length of stay, and discharge destination from the hospital.

Physical Therapy

Physical therapy as early rehabilitation during the ICU stay was performed for all patients by trained ICU physical therapists according to a previously reported protocol.[19] After ICU discharge, all patients underwent a supervised individualized physical therapy program for more than 20 minutes per day, 5 to 6 days per week, until discharge. The program included upper- and lower-limb exercises graded from passive to active. Once the patients could complete these exercises, resistance training was initiated. The sessions included sitting, standing, transfer training, and balance and ambulation exercises. The progression of the program depended on patient tolerance.

The following data regarding the physical therapy program in the ICU were collected: time to first out-of-bed mobilization from ICU admission, highest ICU Mobility Scale[20] scores during the ICU stay, number of daily physical therapy sessions (1 session for 20 minutes of physical therapy according to the regulations pertaining to insurance-based medical treatment) per person, number of days of physical therapy, and frequency of physical therapy (the number of sessions divided by the working days of the physical therapist) during the ICU stay. We defined "first out-of-bed mobilization" as sitting on the edge of the bed.

Statistical Analysis

As this study was exploratory and did not evaluate causality regarding specific exposures or interventions and outcomes, the sample size was not calculated based on hypothesis testing, typical of a randomized controlled trial. Considering the number of patients previously admitted to our ICU and our study's feasibility, a sample size of at least 30 nonrecovery patients would be required, with age and sex as adjustment variables and 10 patients per variable. Considering that 36% of patients with ICU-acquired weakness did not recover muscle strength in an earlier study,[7] an overall sample size of approximately 100 patients was needed.

Data are expressed as median and IQR and number and percentage. The binary outcomes classified with recovery and nonrecovery were compared with their clinical data using the Mann-Whitney test for continuous variables and the χ^2 test for categorical variables.

To explore predictors of nonrecovery, we estimated age- and sex-adjusted odds ratios for each predictor and 95% CIs using logistic regression models. We hypothesized that baseline and ICU-related factors (frailty, septic shock, corticosteroid and neuromuscular blocker use) would be associated with increased risk of muscle strength nonrecovery. Individual logistic regression models, adjusted for age and sex, were used to explore these associations. Because of the small number of nonrecovery patients, we did not adjust for the addition of other variables. This study was exploratory, and no adjustments were made for multiplicity. Therefore, we interpreted the results using point and interval estimates. Analyses were performed using IBM SPSS Statistics, version 25.0 (IBM Corp).

Results

Patient Characteristics

The study flow diagram is presented in Figure 1. Among the excluded patients, 157 did not meet ICU-acquired weakness criteria on awakening. Among the 67 patients for whom completion of the MRC-SS was not possible, reasons included language barriers, cognitive dysfunction (delirium or psychiatric conditions), prolonged unconsciousness (after cardiac arrest or ketoacidosis), or clinical instability (end-of-life care). Twenty-eight assessments were missed because of logistical issues such as lack of physical therapy referral, weekend ICU admission, or staff member oversight. Some assessments exceeded the 24-hour window or were not independently performed by 2 assessors. A total of 116 patients were diagnosed with ICU-acquired weakness, of whom 5 could not

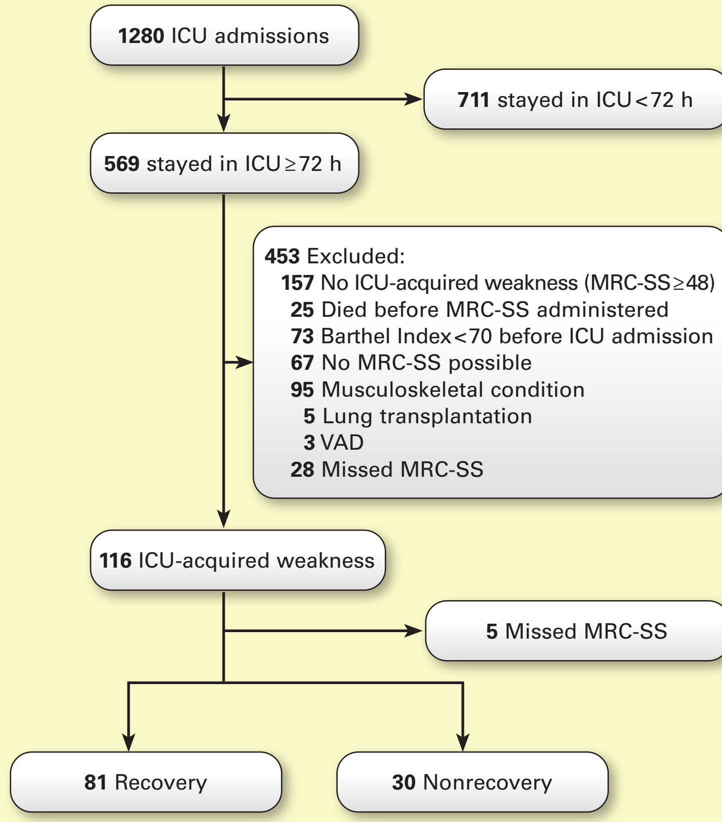

Figure 1 Flowchart of the study population.

Abbreviations: ICU, intensive care unit; VAD, ventricular assist device; MRC-SS, Medical Research Council Sum Score.

continue with muscle assessment. In total, 111 patients were included in the analysis. Of these, 30 patients (27.0%) did not have recovery of muscle strength. The Table shows a comparison of the clinical characteristics between the patients assigned to recovery (n = 81) and nonrecovery (n = 30) .

Trajectories of Muscle Strength

Figure 2 shows the muscle strength trajectories evaluated using the MRC-SS for all patients. In the recovery patients, muscle strength improved (MRC-SS ≥48) in a median of 2 (IQR, 1-3) weeks. However, some of the nonrecovery patients had persistent severe muscle weakness 20 or 27 weeks after the first evaluation). The MRC-SS was measured on the first day of awakening, ICU discharge, and hospital discharge; in the recovery vs nonrecovery patients, the median (IQR) values were 36 (29-42) vs 22 (12-28), 40 (33-46) vs 25 (14-33), and 59 (56-60) vs 38 (32-44), respectively (P < .001 for all).

Twenty-seven percent of patients with ICU-acquired weakness did not have recovery of muscle strength.

Table
Demographic and hospital data according to ICU-acquired weakness

Characteristic	No. (%) of patients or median (IQR) Recovery (n=81)	Nonrecovery (n=30)	*P*
Patients' characteristics			
Age, y	74 (66-79)	73 (66-83)	.74
Male sex	51 (63)	18 (60)	.78
Body mass index[a]	23.1 (20.7-25.2)	22.7 (20.4-25.6)	.84
Functional Comorbidity Index	2 (1-3)	2 (1-2)	.76
Score on Clinical Frailty Scale	3 (3-4)	3 (3-4)	.04
Critical illness/ICU characteristics			
ICU admission type			.08
Planned ICU admission after elective surgery	12 (15)	1 (3)	
Unplanned ICU admission	69 (85)	29 (97)	
SOFA score			
At ICU admission	9 (7-11)	9 (7-12)	.77
At ICU discharge	4 (3-6)	5 (3-7)	.32
Diagnosis categories			
Septic shock	27 (33)	19 (63)	.004
Cardiogenic shock	19 (23)	3 (10)	.11
After cardiovascular surgery	24 (30)	4 (13)	.08
Acute respiratory failure	7 (9)	1 (3)	.31
Other	4 (5)	3 (10)	.28
Days of deep sedation	4 (2-6)	9 (5-12)	<.001
Corticosteroid use	55 (68)	27 (90)	.02
Total amount of corticosteroids, mg	200 (0-288)	407 (239-838)	<.001
Neuromuscular blocker use	33 (41)	17 (57)	.13
Mean daily blood glucose level, mg/dL	149 (139-154)	151 (144-154)	.21
Days with mechanical ventilation	5 (3-8)	11 (7-24)	<.001
ECMO	8 (10)	4 (13)	.41
Renal replacement therapy	65 (80)	28 (93)	.08
Days of renal replacement therapy	5 (2-9)	13 (6-22)	<.001
Physical therapy (during ICU stay)			
No. of sessions	5 (3-8)	11 (5-18)	<.001
Frequency, sessions/day	0.8 (0.7-0.9)	0.8 (0.6-0.9)	.96
Day of first out-of-bed mobilization	6 (5-9)	12 (7-20)	<.001
Maximal score on ICU mobility scale	3 (3-4)	3 (3-4)	.98
Muscle strength MRC-SS			
Time to initial evaluation of MRC-SS, d	7 (4-9)	11 (7-16)	.001
Score at initial evaluation of MRC-SS	36 (29-42)	22 (12-28)	<.001
Score at ICU discharge	40 (33-46)	25 (14-33)	<.001
Score at hospital discharge	59 (56-60)	38 (32-44)	<.001
Days in ICU	9 (6-13)	18 (11-26)	<.001
Post-ICU admission characteristics			
Days in hospital	42 (29-63)	50 (37-91)	.03
Discharge destination from hospital			
Other hospital	58 (72)	22 (73)	.86
Home	22 (27)	0 (0)	.001
Death	1 (1)	8 (27)	<.001

Abbreviations: ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; MRC-SS, Medical Research Council Sum Score; SOFA, Sequential Organ Failure Assessment.

[a] Calculated as weight in kilograms divided by height in meters squared.

Factors Associated With Nonrecovery of Muscle Strength

Recovery of muscle strength (MRC-SS ≥48) was treated as the event of interest (ie, the end point at which recovery was achieved), and the median (IQR) observation periods were 2 (1-3) and 4 (3-7) weeks in the recovery and nonrecovery patients, respectively.

In this study, each predictor was modeled separately with adjustment for age and sex. No multiplicity adjustment was applied owing to the exploratory nature of the study; therefore, we emphasize point estimates and 95% CIs rather than dichotomous significance. Septic shock, duration of deep sedation, corticosteroid use, total amount of corticosteroids

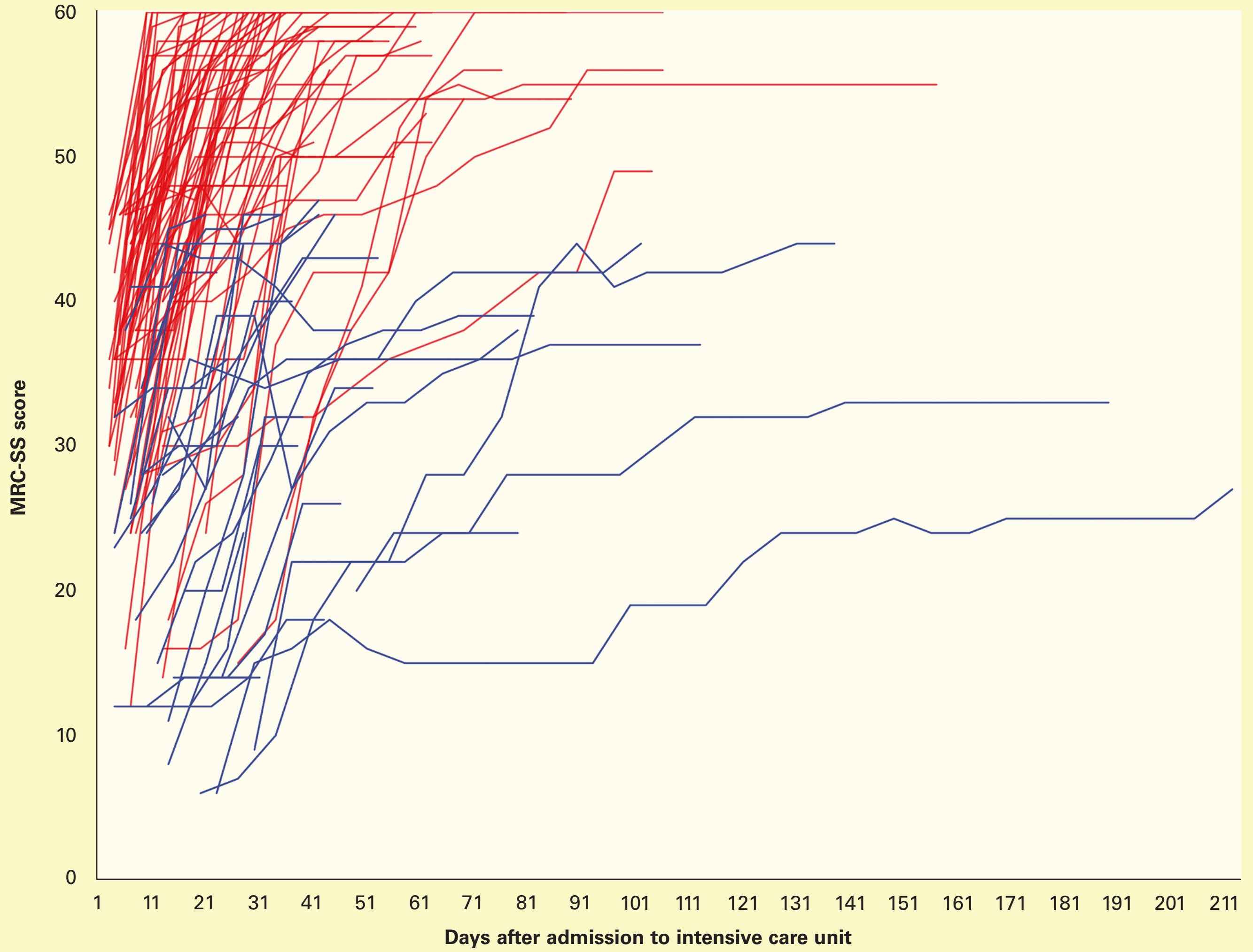

Figure 2 Muscle strength trajectories evaluated using the Medical Research Council Sum Score (MRC-SS). Red and blue lines show the muscle strength trajectories evaluated using the MRC-SS for all patients. Red lines denote a recovery, whereas blue lines denote nonrecovery. Muscle strength of recovery in cases of intensive care unit–acquired weakness varied from patient to patient.

used, duration of mechanical ventilation, duration of renal replacement therapy, day of first out-of-bed mobilization, initial evaluation of MRC-SS, and length of stay in the ICU were found to be predictors of nonrecovery of muscle strength (Figure 3).

Discussion

Key Findings

This study showed that 27.0% of patients with ICU-acquired weakness did not recover muscle strength, and that septic shock, duration of deep sedation, corticosteroid use, the total amount of corticosteroids used, duration of mechanical ventilation and renal replacement therapy, day of first out-of-bed mobilization, first-time assessment of MRC-SS, and length of stay in the ICU were age- and sex-adjusted predictors of nonrecovery of muscle strength.

Comparison With Previous Studies

Although our study showed that 27.0% of patients with ICU-acquired weakness did not recover muscle strength, the rate of ICU-acquired weakness at hospital discharge in previous studies was 36%[7] or 38%.[21] Our lower rate may be due to the fact that our study involved all admitted ICU patients, including those with cardiogenic shock and those who had undergone cardiovascular surgery, whereas the previous studies limited their follow-up to patients with acute respiratory distress syndrome. Thus, the differences may be attributable to differences in the target diseases. Moreover, the median age of the patients in our study was more than 20 years older than that in previous studies.[7,21] The presence of excluded patients, based on the criteria established in previous studies (Barthel Index <70, neuromusculoskeletal disorders), may have influenced this difference.[22,23]

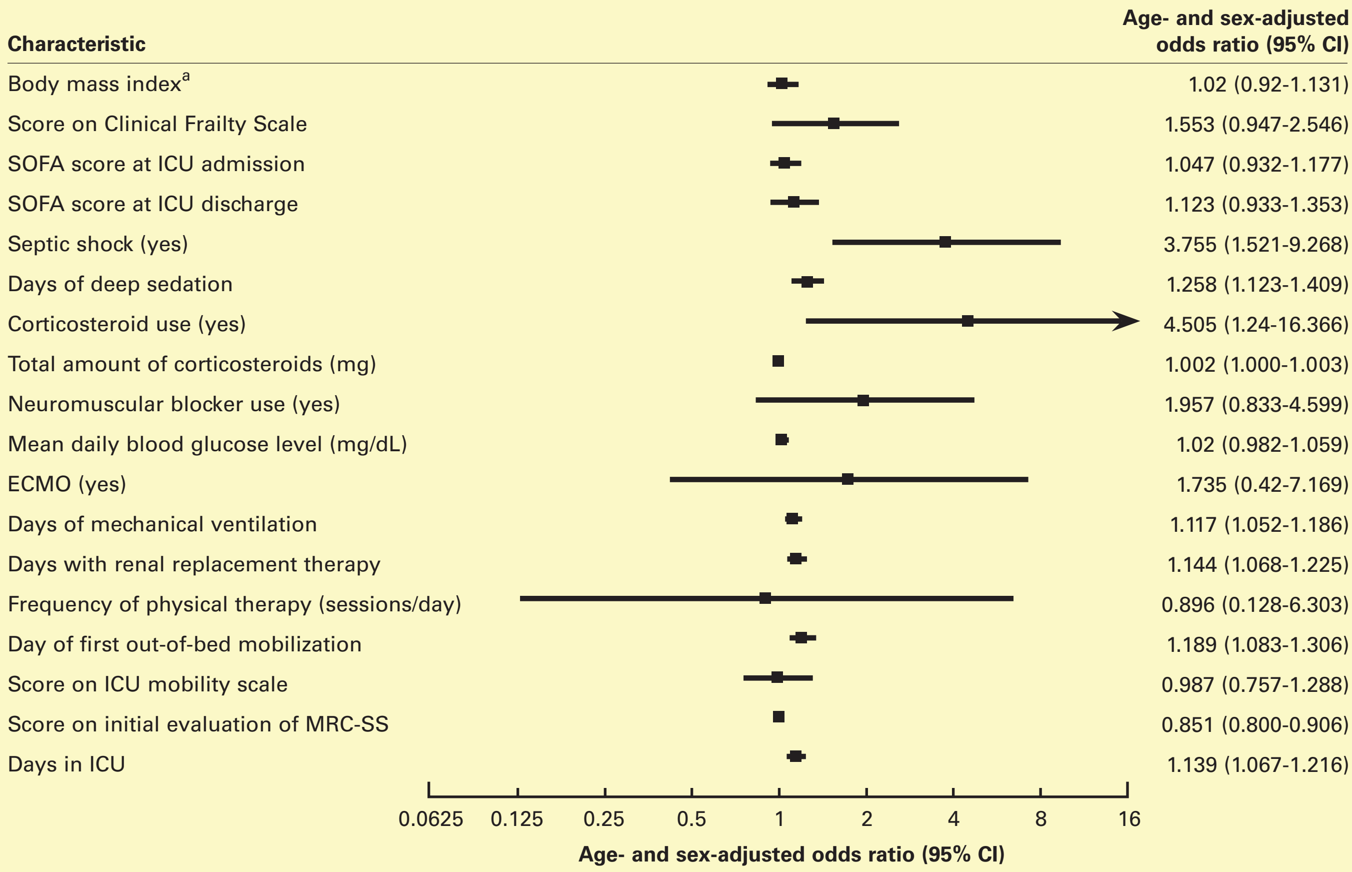

Figure 3 Associations with nonrecovery from separate age- and sex-adjusted logistic models (not a single multivariable model). The factors associated with nonrecovery of muscle strength were analyzed using a logistic regression model. Because the number of events was small in this study, each predictor was adjusted only for age and sex. As a result, septic shock, duration of deep sedation, corticosteroid use, total amount of corticosteroids, duration of mechanical ventilation, duration of renal replacement therapy, day of first out-of-bed mobilization, initial evaluation of MRC-SS, and days in the ICU were found to be predictors of nonrecovery of muscle strength.

Abbreviations: ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; MRC-SS, Medical Research Council Sum Score; SOFA, Sequential Organ Failure Assessment.

[a] Calculated as weight in kilograms divided by height in meters squared.

The logistic regression analysis revealed 9 variables that were associated with nonrecovery of muscle strength: septic shock, duration of deep sedation, corticosteroid use, total amount of corticosteroids used, prolonged use of mechanical ventilation, prolonged use of renal replacement therapy, delayed first out-of-bed mobilization, low score at the initial evaluation of MRC-SS, and ICU length of stay.

Septic shock, as well as corticosteroid use, had a high odds ratio as a factor associated with nonrecovery of muscle strength. Septic shock is a reported risk factor for muscle wasting and development of ICU-acquired weakness.[24,25] An earlier study[25] showed that sepsis was associated with high rates of critical illness neuromyopathy and delayed recovery of muscle strength,which aligns with our results. In another study,[26] sepsis during critical illness was significantly associated with muscle weakness in nearly all muscle groups after hospital discharge.The systemic inflammation associated with sepsis may lead to long-term impairment of muscle function.[27] Corticosteroid therapy is commonly used in critically ill patients, particularly those with refractory septic shock or acute respiratory distress syndrome.[28] Corticosteroid use, along with sepsis, is a risk factor for ICU-acquired weakness,[24] as it alters gene expression, inhibits protein synthesis, and promotes muscle wasting.[29,30] Higher cumulative corticosteroid doses have been associated with the incidence of ICU-acquired weakness[31] and muscle weakness in patients with interstitial lung disease and asthma.[32,33] Our findings suggest that both corticosteroid use and septic shock may significantly impair muscle protein synthesis, hindering strength recovery. Because ICU-acquired weakness is largely preventable, future trials should explore strategies such as minimizing unnecessary corticosteroid use and prioritizing light or no sedation to facilitate early mobilization as soon as physiologically feasible, in alignment with spontaneous awakening and breathing trials and the ABCDEF bundle, and focusing on leg muscle activation to mitigate these risks.

Prolonged mechanical ventilation and renal replacement therapy and longer ICU stay were associated with nonrecovery of muscle strength. These factors may indicate prolonged critical illness, the so-called chronic critical illness, defined as a subacute disease state requiring high-intensity care for a protracted period.[34] The findings suggest the persistence of inflammation, which has been reported to correlate with muscle weakness.[35] During general instability, organ function should be improved through sedation and bed rest. The association between sedation and weakness most likely involves both indirect (sedation-induced immobility, bed rest) and potential direct mechanisms. For instance, propofol has been implicated in mitochondrial dysfunction,[36] which has been suggested to be associated with ICU-acquired weakness.[37] In addition, prolonged deep sedation may reduce muscle excitability and disrupt neuromuscular connections, thereby compounding disuse-related atrophy.[38]

Furthermore, the interaction between critical illness and bed rest may result in greater muscle loss than bed rest alone.[39,40] In our study, the median time to first out-of-bed mobilization was 6 days, with most activities limited to bed-level passive or low-intensity exercises. This practice most likely restricted activation of large lower-extremity muscle groups, which are central to the MRC-SS assessment. The low intensity and delayed rehabilitation may have influenced recovery, warranting further investigation. Siao et al[41] found that inability to perform a sit-to-stand movement at ICU discharge and up to 3 months later was associated with increased 12-month mortality in medical ICU survivors (adjusted hazard ratio, 4.2; 95% CI, 1.61-10.99). These findings support the notion that early rehabilitation strategies should go beyond bed-level activities and target large lower-extremity muscle groups. Incorporating sit-to-stand assessments as both outcome measures and functional milestones may enhance recovery tracking and facilitate timely intervention. Therefore, chronic critical illness (prolonged duration of mechanical ventilation and renal replacement therapy, long stay in the ICU), longer duration of deep sedation, and delayed first out-of-bed mobilization accelerate muscle weakness and delay recovery of strength.

A lower score at the first MRC-SS assessment was associated with nonrecovery of muscle strength. The daily reduction in skeletal muscle mass over the first week of critical illness showed a moderate correlation with MRC-SS.[42] On average, critically ill patients lose approximately 2% of their skeletal muscle mass per day during the first week of ICU admission,[43] suggesting that muscle atrophy may have progressed during the first MRC-SS assessment in the nonrecovery patients. Critically ill patients with severe muscle loss are more likely to be transferred to another hospital.[44] Patients with ICU-acquired weakness who have severe muscle weakness at the first MRC-SS assessment may have difficulty recovering their muscle strength.

These factors may act through distinct yet overlapping pathways that contribute to muscle atrophy and impaired recovery. Septic shock and high-dose corticosteroids can inhibit protein synthesis and accelerate muscle degradation. Prolonged deep sedation delays mobilization and promotes muscle disuse, while delayed out-of-bed mobilization reduces engagement of large lower-extremity muscles essential for functional recovery. These factors most likely interact to exacerbate muscle weakness and hinder restoration of strength during and after an ICU stay. Conceptually grouping them as inflammatory/infectious (sepsis), pharmacological (steroids, sedation), and rehabilitation-related factors (mobilization timing) may help guide targeted interventions.

> Patients with ICU-acquired weakness who exhibit the predictors identified in this study may be at risk of not recovering muscle strength.

Strengths and Limitations

To our knowledge, this is the first study to investigate the trajectories of muscle strength and the predictors of this process in patients with ICU-acquired weakness. One strength of this study is that it is comprehensive and addresses risk factors for development of ICU-acquired weakness as well as factors that may be associated with muscle recovery.

This study had limitations. First, this was a single-center study with a relatively small sample size. The diagnosis categories were mostly septic shock, cardiogenic shock, and after cardiovascular surgery. Therefore, our results may not be generalizable to other populations. Additionally, the small sample size and use of multiple models may limit the robustness of our findings. Future studies should apply a single model with predefined covariates to yield more reliable results. Second, the exclusion criteria were established on the basis of previous studies[22,23]; however, some patients who would be expected to have difficulty recovering muscle strength could have been excluded. Third, the study did not include electrophysiological assessments to differentiate among the underlying disorders such as critical illness myopathy, critical illness polyneuropathy, and critical illness neuromyopathy in ICU-acquired weakness. As previous studies have shown better critical illness myopathy outcomes compared with critical illness polyneuropathy and critical illness neuromyopathy,[25,45] the inclusion of electrophysiological assessments might have identified the cause of nonrecovery of muscle strength. Fourth, although 2 physical therapists assessed each patient, they were not blinded to each other's results. This decision was made to ensure consistency and safety in the intensive care setting, but the lack of blinding may have introduced potential bias. Finally, the analysis of predictors was limited to variables during ICU admission; therefore, we could not examine factors from ICU discharge to hospital discharge. It remains unclear whether exercise-based rehabilitation in general care units is beneficial because the number of studies has been small.[4] Therefore, interventions to attenuate the debilitating consequences of ICU-acquired weakness are important.

Clinical Implications and Future Research

Patients with ICU-acquired weakness who exhibit the predictors identified in this study may be at risk of not recovering muscle strength. These findings suggest that it is important to monitor the course of muscle recovery and further evaluate these predictors. Multicenter interventional studies are needed to assess not only the timing but also the intensity and targeted muscle groups of rehabilitation. Protocols that emphasize early, high-repetition, and lower limb–focused activities may help prevent irreversible muscle loss.

Conclusions

In this study, septic shock, duration of deep sedation, corticosteroid use and the total amount used, duration of mechanical ventilation and renal replacement therapy, day of first out-of-bed mobilization, initial evaluation of MRC-SS, and length of stay in the ICU were age- and sex-adjusted predictors of nonrecovery of muscle strength. Future multicenter interventional studies should assess not only the timing but also the intensity and the muscle groups specifically targeted during rehabilitation.

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FINANCIAL DISCLOSURES

None reported.

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CE 1.0 Hour Category A

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This article has been designated for CE contact hour(s). Increasing knowledge on the following objectives is the desired outcome of this activity:

1. Identify clinical factors associated with nonrecovery of muscle strength in patients with intensive care unit (ICU)–acquired weakness.
2. Describe predictors of persistent muscle weakness in patients with ICU-acquired weakness.
3. Analyze how sedation, corticosteroid exposure, and delayed mobilization may affect muscle strength recovery in ICU-acquired weakness.

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