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URINARY RETENTION IN STROKE PATIENTS: BLADDER RETRAINING PROTOCOL

RETENÇÃO URINÁRIA NA PESSOA COM AVC: PROTOCOLO DE REEDUCAÇÃO VESICAL

RETENCIÓN URINARIA EN PERSONAS CON ACCIDENTE CEREBROVASCULAR: PROTOCOLO DE REEDUCACIÓN VESICAL

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Abstract

Objective: To present and evaluate the implementation of a bladder retraining protocol in stroke patients admitted to a Stroke Unit. **Methodology:** Quantitative, descriptive study using a multiple-case design conducted between September 2021 and January 2022. Twelve patients with urinary retention were included and submitted to a protocol comprising a clinical decision algorithm, prompted voiding training, and pelvic floor exercises. **Results:** A 12.4% catheterization rate was observed. Only three patients were catheterized in the unit, with no subsequent urinary tract infections. Four patients completed the full protocol, showing improvements in urinary elimination and neurological function. The infection rate was linked to pre-admission catheterizations. **Discussion:** The application of the protocol appears to be effective in reducing unnecessary catheterisations and associated infections. Active participation was limited by cognitive and functional deficits, which are common in the acute phase of stroke. **Conclusion:** Systematic application of the protocol contributed to relevant clinical gains in urinary function and functional recovery, demonstrating feasibility and effectiveness in a hospital setting.

Keywords: Clinical Protocols; Rehabilitation Nursing; Stroke; Urinary Retention.

Resumo

Objetivo: Apresentar e avaliar a implementação de um protocolo de reeducação vesical em pessoas com AVC internadas numa Unidade de AVC. **Metodologia:** Estudo quantitativo, descritivo, com desenho de casos múltiplos, realizado entre setembro de 2021 e janeiro de 2022. Foram incluídos 12 doentes com retenção urinária e submetidos a um protocolo composto por algoritmo clínico, treino de micção estimulada e exercícios do pavimento pélvico. **Resultados:** Verificou-se uma taxa de cateterização de 12,4%. Apenas três doentes foram cateterizados na própria unidade, sem casos subsequentes de infeção do trato urinário. Quatro doentes completaram o protocolo integralmente, com melhorias observadas na eliminação urinária e na função neurológica. A taxa de infeções foi atribuída a cateterizações prévias à admissão. **Discussão:** A aplicação do protocolo indicia ser eficaz na redução de cateterizações desnecessárias e infeções associadas. A participação ativa foi condicionada por défices cognitivos e funcionais, comuns na fase aguda do AVC. **Conclusão:** A aplicação sistemática do protocolo contribuiu para ganhos clínicos relevantes na função urinária e recuperação funcional, demonstrando viabilidade e eficácia em contexto hospitalar.

Palavras-chave: Acidente Vascular Cerebral; Enfermagem em Reabilitação; Protocolos Clínicos; Retenção Urinária.

Resumen

Objetivo: Presentar y evaluar la implementación de un protocolo de reeducación vesical en pacientes con ACV ingresados en una Unidad de ACV. **Metodología:** Estudio cuantitativo, descriptivo, con diseño de casos múltiples, realizado entre septiembre de 2021 y enero de 2022. Se incluyeron doce pacientes con retención urinaria sometidos a un protocolo compuesto por algoritmo clínico, entrenamiento de micción estimulada y ejercicios del suelo pélvico. **Resultados:** Se observó una tasa de cateterización del 12,4%. Solo tres pacientes fueron cateterizados en la propia Unidad, sin casos subsiguientes de infección del tracto urinario. Cuatro pacientes completaron el protocolo en su totalidad, con mejoras en la eliminación urinaria y función neurológica. Las infecciones fueron atribuibles a cateterizaciones previas al ingreso. **Discusión:** La aplicación del protocolo parece ser eficaz para reducir las cateterizaciones innecesarias y las infecciones asociadas. La participación activa se vio condicionada por déficits cognitivos y funcionales, comunes en la fase aguda del ACV. **Conclusión:** La aplicación sistemática del protocolo contribuyó a ganancias clínicas relevantes en la función urinaria y recuperación funcional, demostrando viabilidad y eficacia en un entorno hospitalario.

Descriptores: Accidente Cerebrovascular; Enfermería en Rehabilitación; Protocolos Clínicos; Retención Urinaria.

Introduction

Acute urinary retention (AUR) is a common complication in individuals with stroke, affecting between 29% and 56% of patients in the acute phase[1,2]. This condition is characterized by the sudden inability to completely empty the bladder, resulting in pain, abdominal distension, discomfort, and an increased risk of urinary tract infections (UTIs)[3]. Its occurrence compromises functional autonomy and may worsen patient prognosis, prolonging hospital stay and exposing individuals to invasive procedures, such as urinary catheterization, often implemented without clearly defined clinical criteria[4].

The literature indicates that urinary catheterization, although effective for bladder decompression in emergency situations, is associated with a significant risk of UTIs, particularly when maintained for periods longer than 72 hours[5,6]. It is estimated that 12% to 16% of hospitalized adults undergo catheterization, with a progressive increase in infection risk associated with the duration of device use[5]. In stroke patients, the presence of cognitive deficits, impaired mobility, and communication difficulties contributes to the underreporting of urinary symptoms, thereby hindering an accurate assessment of bladder elimination[7].

In this context, the rehabilitation nurse specialist plays a pivotal role in the assessment, monitoring, and intervention directed at urinary function, particularly in stroke patients, in whom neurological impairments affect autonomy and the ability to achieve effective bladder elimination.

Accordingly, a structured bladder retraining protocol was developed in a Stroke Unit of a public hospital in southern Portugal, as a proposal for an autonomous rehabilitation nursing intervention. This protocol aims to standardize the clinical approach to urinary retention, promote spontaneous voiding, and minimize the unnecessary use of urinary catheters.

Methodology

This study adopted a quantitative, descriptive, and non-experimental design, focused on the implementation of a clinical intervention protocol. The choice of a multiple-case design allowed the observation of the applicability of the interventions across different clinical profiles, while respecting the real-world context of hospital practice. The study aimed to develop and implement a bladder retraining protocol for patients admitted to a Stroke Unit in a public hospital in southern Portugal.

The protocol sought to standardize the approach to urinary elimination, minimize unnecessary urinary catheterization, reduce the incidence of catheter-associated urinary tract infections, and promote the functional autonomy of stroke patients.

Participants were patients admitted to the Stroke Unit of a hospital in southern Portugal, and the study was conducted between September 2021 and January 2022.

Eligible participants included patients with a current clinical diagnosis of stroke who were catheterized at admission, regardless of the indication (urinary output monitoring, diagnosis of urinary retention, or other unspecified causes), and who experienced at least one documented episode of urinary retention during hospitalization. Exclusion criteria included a prior history of chronic catheterization and a previous diagnosis of urinary incontinence.

The implementation of the protocol was organized into three sequential phases—diagnostic, intervention, and evaluation—and adapted to the clinical reality of the Stroke Unit.

In the diagnostic phase, clinical and functional data were collected through direct observation and the application of standardized instruments. The first patient assessment occurred within the first 48 hours after admission to the Stroke Unit, while patients were still catheterized, or within the first 24 hours following an episode of urinary retention. The Barthel Index (activities of daily living autonomy), the Glasgow Coma Scale, the Modified Rankin Scale,

and the National Institutes of Health Stroke Scale (NIHSS) were used to characterize neurological and functional status at baseline. Additionally, a questionnaire specifically developed for this protocol was administered to collect data related to urinary catheterization and urinary retention, including time spent on bed rest, duration of catheter use, and occurrence of UTIs.

Throughout the implementation of the protocol, daily assessments were conducted to ensure safety and the adequacy of therapeutic progression. These included monitoring hemodynamic stability, assessing muscle strength using the Medical Research Council (MRC) Scale, and evaluating static and dynamic balance using the Berg Balance Scale, complemented by verification of medical clearance for mobilization. These assessments enabled the individualization of interventions and the safe adjustment of progression, thereby enhancing functional recovery.

The intervention phase consisted of the individualized application of the three components of the protocol (Figure 1):

- the clinical decision-making algorithm to assess the need for catheterization (Step 1);
- prompted voiding, with scheduled voiding times and verbal cues (Step 2);
- and pelvic floor muscle training, through Kegel exercises adapted to each patient's clinical condition (Step 3).

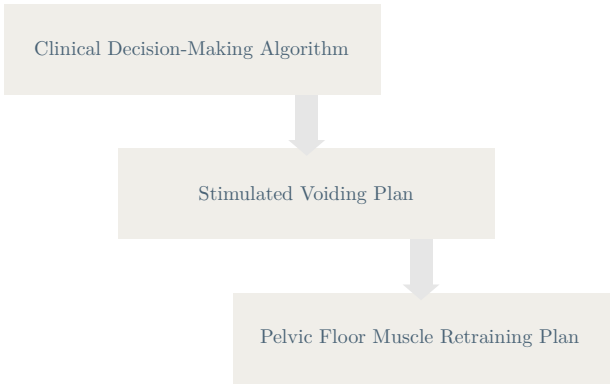

Figure 1: Bladder Retraining Protocol in Acute Urinary Retention.

The protocol was operationalized through a structured clinical algorithm designed to support the decision-making process of the rehabilitation nurse in the context of stroke care. The algorithm (Figure 2) comprises two phases: an initial phase, which guides the steps to be followed upon the diagnosis of urinary retention, and a TWOC (Trial Without Catheter) phase, aimed at catheter removal and the restoration of spontaneous voiding.

In the initial phase, the approach focused on the clinical confirmation of the diagnosis, identification of probable causes, and implementation of interventions that promote physiological bladder emptying, with intermittent catheterization being preferred whenever necessary. The TWOC phase established criteria and procedures for attempting voiding following catheter removal, with systematic monitoring of the patient's response and prevention of unnecessary recatheterizations, thereby ensuring a standardized and safe approach.

Prompted voiding corresponded to a behavioural training strategy in which patients were encouraged to attempt urination at predefined intervals, regardless of the subjective perception of bladder fullness, with positive reinforcement provided following successful attempts. Within the protocol, this intervention was applied to patients capable of understanding and following simple instructions, typically scheduled every 2–3 hours, promoting the restoration of normal voiding patterns, reducing reliance on invasive devices, and enhancing patient autonomy.

The pelvic floor muscle retraining programme, initiated after urinary catheter removal, began with prior bladder emptying and conscious identification of the perineal musculature. The prescription included contractions sustained for 5 seconds followed by relaxation for an equal duration, progressing to cycles of 10-second contractions and 10-second rest periods. The programme was implemented daily, with a maximum duration of 45 minutes per session, and structured according to functional progression (supine, seated, and subsequently standing positions), in accordance with neurological and motor recovery.

Whenever clinically feasible, exercises using a Swiss ball were incorporated to enhance muscle activation. Following the first supervised session, patients were encouraged to perform autonomous training throughout the day, consisting of 2 to 3 daily sets of short (2–3 seconds) and sustained contractions. All interventions were documented using a daily clinical checklist to monitor adherence and immediate response.

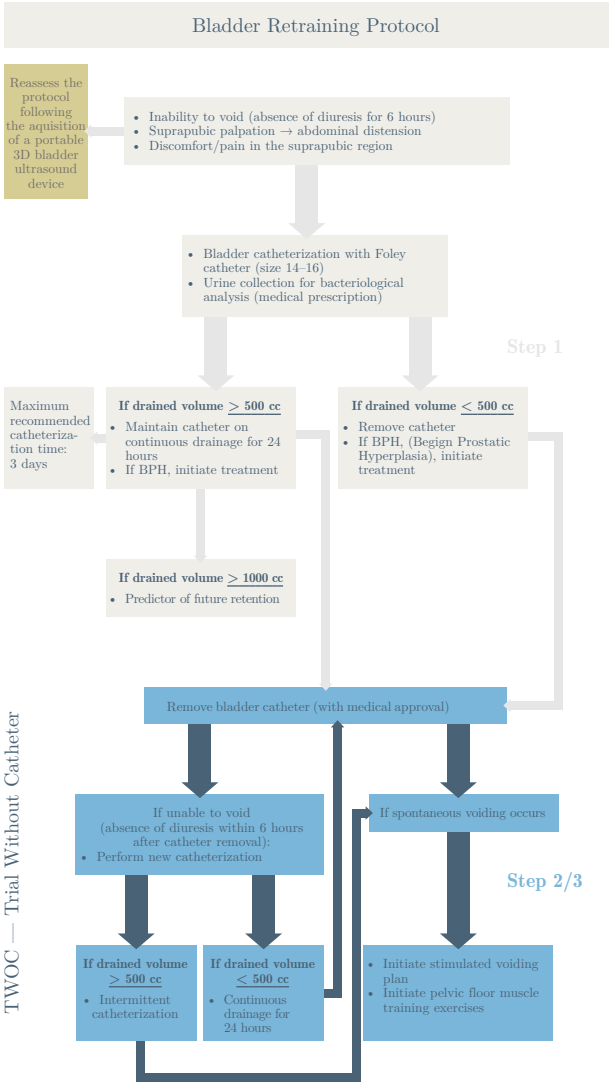

Figure 2: Clinical Decision-Making Algorithm (Initial Phase and TWOC Phase).

The final evaluation phase aimed to compare patient progression following the intervention. For this purpose, the instruments used in the initial assessment were reapplied, allowing for the analysis of changes in urinary elimination, the occurrence of urinary tract infections (UTIs), and overall functional autonomy up to the time of discharge.

The entire process was carried out in collaboration with the unit's multidisciplinary team, under the supervision of specialist rehabilitation nurses.

The implementation of the protocol was guided by the principles of human dignity, autonomy, and justice, ensuring respect for each patient's individuality and equity in the provision of care. The intervention was conducted in accordance with the ethical and deontological values of nursing, promoting a person-centred approach to care. Informed consent was obtained from patients and/or their legal representatives after clarification of the study's objectives and procedures, and the right to refuse or withdraw participation without compromising continuity of care was ensured. Anonymity and confidentiality of the collected data were guaranteed, in accordance with ethical principles applicable to clinical research. The project was approved by the Ethics Committee of the hospital centre where it was conducted, in compliance with institutional guidelines for clinical practice and continuous quality improvement initiatives.

Results

The study was conducted between September 13, 2021, and January 14, 2022, involving 12 patients diagnosed with stroke and admitted to a Stroke Unit in southern Portugal. During the study period, 97 patients were admitted. A urinary catheterization rate of 12.4% was observed, corresponding to 12 patients who met the inclusion criteria for the implementation of the bladder retraining protocol and were therefore included in the study.

The sample showed an equal sex distribution (50% male and 50% female), with a mean age of 75.75 years. Male participants were younger (mean age of 71 years) compared to female participants (mean age of 81 years).

Regarding medical history, multiple comorbidities were identified. Arterial hypertension was the most prevalent condition, present in 91.7% of patients (n = 11), followed by dyslipidaemia (83.3%) and atrial fibrillation (50%). Type II Diabetes *Mellitus* and hypertensive heart disease were present in 41.7% of participants, while 25% had ischaemic heart disease, benign prostatic hyperplasia, or alcohol consumption habits. This high burden of comorbidities highlights the clinical complexity of this population.

In terms of clinical characterization, 9 participants (75%) experienced ischaemic stroke and 3 (25%) haemorrhagic stroke. In all haemorrhagic stroke cases (n = 3; 100%), the haematoma was located in the supratentorial region, i.e., above the *tentorium cerebelli*, in brain areas with significant functional implications.

Regarding vascular territories affected in ischaemic stroke cases, 33.3% of patients (n = 3) presented lesions in the territory of the left middle cerebral artery (MCA). Lesions involving the right MCA and the vertebrobasilar circulation occurred in 22.2% of cases (n = 2 each). Additionally, lesions involving multiple vascular territories were identified, namely right MCA + vertebrobasilar and right MCA + right anterior cerebral artery (ACA), each accounting for one case (11.1%).

Neurological assessment revealed frequent and clinically significant deficits. Central facial paresis was identified in 91.7% of patients, followed by hemiparesis (83.3%), hypoesthesia (66.7%), hemianopia and dysphagia (58.3%), and aphasia and dysarthria (41.7%). These deficits reflect a substantial impact on communication, mobility, and functional autonomy, directly influencing active participation in the protocol.

Length of hospital stay ranged from 3 to 33 days, with a mean of 9.42 days, and 66.7% of patients were hospitalized for between 3 and 8 days.

Regarding urinary catheterization, acute urinary retention was the primary clinical indication (75%), followed by unknown aetiology (16.7%) and the need for urinary output monitoring (8.3%), particularly in patients with cardiac pathology and renal dysfunction. Concerning the setting of catheterization, most patients were already catheterized at admission following transfer from other hospital services. Only 3 patients (25%) were catheterized within the Stroke Unit itself, according to the clinical decision-making algorithm defined in the protocol. Whenever possible, intermittent catheterization was preferred over indwelling catheterization to reduce complications. None of these three patients developed catheter-associated urinary tract infections, highlighting the effectiveness of the nursing care provided.

In terms of catheterization duration, 41.7% of patients remained catheterized for 1 to 7 days, 25% for 8 to 14 days, and 8.3% for more than 15 days. Two patients (16.7%) were catheterized for less than 24 hours, and one patient (8.3%) underwent only a single intermittent catheterization. Following catheter removal using the TWOC approach, 3 patients (25%) required recatheterization due to ineffective spontaneous voiding, and 2 patients (16.7%) were transferred with an indwelling catheter due to persistent urinary retention and repeated TWOC failure.

Among the 12 patients, 4 cases of urinary tract infection were recorded (33.3%), all occurring after catheterization. The predominant pathogens identified were *Enterococcus faecalis* and *Escherichia coli*.

For a clearer systematization of results related to urinary catheterization and urinary tract infections, the main indicators are presented in Table 1.

Table 1: Clinical Indicators Related to Bladder Catheterization and Urinary Tract Infection.

Variable	Result
Catheterization rate in the Stroke Unit	12/97 admissions (12.4%)
Catheterizations performed in the Stroke Unit	3 (25%)
UTI after catheterization in the Stroke Unit	0 (0%)
Total UTI in the sample	4 (33.3%)

Regarding the level of dependency, the Barthel Index presented a mean score of 20 points at admission (minimum = 0; maximum = 65) and 27 points at discharge (minimum = 0; maximum = 85), with 66.7% of patients classified as totally dependent (< 20 points) at admission and 58.3% at discharge. The proportion of "slightly dependent" patients (≥ 60 points) increased from 16.6% to 33.3%.

On the Modified Rankin Scale, the mean score at discharge was 4 points, with 33.3% of patients presenting moderate to severe disability (grade 4) and 33.3% severe disability (grade 5), totalling 66.6% with high dependency.

The NIHSS showed a mean score of 14 points at admission (minimum = 1; maximum = 25) and 11 at discharge (minimum = 1; maximum = 24), with a reduction in the proportion of patients with severe neurological deficit (> 17 points) from 33.3% to 16.7%, suggesting moderate neurological improvement.

The overall functional evolution of participants is summarized in Table 2.

Table 2: Functional Evolution of Participants.

Scale	Admission	Discharge
Barthel Index (mean)	20	27
NIHSS (mean)	14	11
Total dependence (Barthel < 20)	66.7% (n = 8)	58.3% (n = 7)
Severe neurological deficit (NIHSS > 17)	33.3% (n = 4)	16.7% (n = 2)

Regarding protocol implementation, only four patients (cases 5, 6, 8, and 12) were able to complete all three prescribed phases, demonstrating the capacity to actively participate in bladder retraining strategies. Three patients (cases 1, 3, and 4) completed only Steps 1 and 2 due to cognitive limitations or difficulties in executing complex commands. Finally, five patients (cases 2, 7, 9, 10, and 11), due to reduced levels of consciousness (Glasgow Coma Scale score < 12), global aphasia, and/or sphincter incontinence, were only managed at the level of Step 1 — The Clinical Decision Algorithm — focused on the assessment and management of urinary elimination (Table 3).

Table 3: Protocol Implementation (Degree of Completeness).

Protocol Phase	n	%
Step 1	5	41.7
Steps 1 and 2	3	25.0
Steps 1, 2 and 3	4	33.3

Discussion

The analysis of the results obtained in this study allowed for reflection on the impact of implementing a bladder retraining protocol in stroke patients admitted to a specialized unit. The sociodemographic characterization of the sample revealed an equal sex distribution and an advanced mean age, which is consistent with the literature identifying age as one of the main risk factors for stroke[8]. Greater female longevity, associated with hormonal changes, may contribute to the increased vulnerability observed at older ages[8].

From a clinical perspective, patients' medical histories revealed a high burden of comorbidities, consistent with recent global data on the main risk factors for stroke, particularly arterial hypertension, dyslipidaemia, and atrial fibrillation—widely recognized as modifiable and predominant factors in the development of cerebrovascular events[8]. The identification of these factors reinforces the role of nursing in health education and disease prevention, in line with contemporary nursing theoretical frameworks[9].

Ischaemic stroke was the most prevalent type, as described in the literature[9], with a higher incidence in the territory of the middle cerebral artery. In haemorrhagic stroke cases, the supratentorial location of haematomas was also consistent with recent clinical descriptions[10].

The presence of significant neurological deficits, such as central facial paresis, hemiparesis, and dysphagia, was prominent in this population and strongly influenced functional status and autonomy, reinforcing the need for targeted rehabilitation nursing interventions[11].

Urinary retention, identified as the main indication for catheterization, is frequently associated with multiple factors, including immobility, neurological impairment, and post-stroke lower urinary tract dysfunction[1,2]. Prescribed bed rest and restrictions on mobilization during the acute phase of stroke further increase this risk, highlighting the importance of early anticipation and intervention[12].

The reduction in urinary catheterization rates observed in this study (12.4%) is particularly noteworthy when compared with institutional data from a retrospective study conducted in 2020, which included all catheterized patients admitted to the unit. This trend is consistent with recent evidence demonstrating that structured protocols and systematic bladder management strategies reduce the use of invasive devices and associated complications[13]. The systematic intervention by the nursing team, combined with reinforced voiding training and promotion of physiological elimination, proved essential in achieving this outcome, contributing not only to complication prevention but also to the preservation of dignity and comfort in vulnerable patients.

Only three patients were catheterized within the unit, always based on clinical criteria for urinary retention and in accordance with the decision-making algorithm. This practice was associated with the absence of urinary tract infections in these cases, supporting the relevance of the implemented approach. The promotion of intermittent catheterization whenever feasible, alongside close clinical monitoring, was crucial in preventing complications.

Despite the reduction in UTI rates, the incidence remained relatively high (33.3%), being exclusively associated with catheterizations performed prior to admission. This finding reinforces the importance of limiting catheter duration and adopting evidence-based preventive measures[14,15,16]. The use of devices such as bladder ultrasound, which allows accurate and non-invasive assessment of urinary volume, may further optimize clinical decision-making and reduce unnecessary interventions[17].

Another relevant aspect concerns the rate of catheterization at discharge, which was lower than that observed in previous years (16.7% vs. 28.8% in 2020). This reduction reflects the team's efforts to promote recovery of urinary function and minimize the impact of catheterization on autonomy, sexuality, and quality of life[18].

Regarding functional outcomes, although most patients presented high dependency and significant neurological deficits at admission, improvements were observed in functional assessment scales (Barthel, Rankin, and NIHSS), even within a short hospitalization period. These indicators, although modest, are clinically relevant and predictive of recovery[11].

However, protocol implementation encountered practical limitations. Only four patients were able to complete all three phases, while the remaining participants were limited by cognitive deficits, altered levels of consciousness, or lack of indication for mobilization. Pelvic floor muscle training requires concentration, comprehension, and motor execution, which limits its applicability in the acute phase. Nevertheless, patients who completed the protocol did not experience further episodes of urinary retention, suggesting the potential effectiveness of this intervention in restoring urinary function.

Finally, it is important to highlight the need to adapt the protocol to different clinical contexts, particularly post-acute care units, where patients are more stable and better able to actively participate in their rehabilitation process.

Conclusion

The results obtained indicate that the implementation of a bladder retraining protocol in a Stroke Unit setting has the potential to reduce urinary catheterization rates when compared with data from a previous retrospective study conducted in the same unit. Most catheterizations were performed outside the unit, and among those catheterized internally, decisions were consistently guided by the clinical algorithm, with a preference for intermittent catheterization whenever possible.

The sample analysis revealed an elderly population with a high burden of comorbidities and significant neurological deficits, factors that limited active participation in the protocol, particularly in pelvic floor muscle training. Nevertheless, among patients who completed all three phases, effective recovery of urinary elimination function was observed.

The systematic application of the protocol suggests a reduction in unnecessary catheterizations, fewer recatheterizations, and prevention of catheter-associated urinary tract infections. Additionally, im-

provements were observed in urinary function as well as neurological and functional recovery. These findings suggest that the structured use of the protocol resulted in clinically relevant gains in urinary elimination, UTI prevention, and functional rehabilitation, proving to be both feasible and effective in a hospital setting.

This study presents several limitations. The small sample size (n = 12) limits the generalizability of the findings. Being conducted in a single hospital unit during the acute phase of the disease, with a limited length of stay, also hindered full protocol implementation across all participants. Furthermore, deficits in consciousness, language, and mobility affected adherence to the proposed interventions. The absence of long-term follow-up prevents assessment of medium- and long-term outcomes, highlighting the need to replicate the protocol in other stages of the rehabilitation process and in different care settings.

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IB: Study coordination, study design, data collection, storage and analysis, review and discussion of results.
MM: Study design, data analysis, review and discussion of results.
GR: Study design, data analysis, review and discussion of results.
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