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REVIEW

Readiness for Hospital Discharge Among Patients with T-Tubes: A Review of Influencing Factors and Interventions

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Objective: This review aimed to summarizes existing research on readiness for hospital discharge among patients discharged with T-tubes, with a focus on assessment tools, influencing factors, and intervention strategies, to establish a theoretical foundation for improving discharge preparation in this population.

Methods: A structured literature review was conducted to identify and synthesize studies examining determinants of discharge readiness in patients with drainage tubes, particularly T-tubes.

Results: Multiple factors were found to influence readiness for hospital discharge among patients with T-tubes, including age, living conditions, educational background, and the clarity and comprehensiveness of discharge instructions. In addition, external elements such as the availability of social support significantly impacted discharge readiness.

Conclusion: Discharge preparation for patients with T-tubes remains suboptimal in current clinical practice. Future research should prioritize the identification of key influencing factors and the development of individualized discharge plans or decision-support protocols to promote smooth transitions from hospital to home, reduce unplanned readmissions, and improve both patient-reported outcomes and health-related quality of life.

Keywords: influencing factors, patients with tubes, readiness for hospital discharge, t-tube

Introduction

The T-tube, a commonly used postoperative biliary drainage device in general surgery, facilitates bile drainage, supports the biliary tract, reduces bile leakage, prevents biliary stenosis, and assists in the expulsion of residual calculi.[1] Although recent advancements in medical technology and improvements in surgical methods have led to a decline in the routine use of T-tubes, their application remains essential in certain complex cases, where retention for a duration of 4 to 8 weeks or longer may be required.[2]

Within the framework of *Enhanced Recovery After Surgery* (ERAS), early discharge of patients with indwelling T-tubes has become more prevalent. However, post-discharge management challenges persist and merit close attention. The longer the T-tube remains in place, the higher the risk of post-discharge related complications.[3] Furthermore, patients discharged with T-tubes and their caregivers often face significant challenges in transitioning from structured hospital care to home or community-based self-management, which requires substantial adaptation.

There remains a significant knowledge gap among patients discharged with T-tubes, particularly in the areas of nursing knowledge and skills. Patients often lack a systematic understanding of infection prevention measures, which can lead to improper handling and subsequent catheter-related complications. Additionally, patients may fail to recognize complications such as cholangitis or catheter displacement, thereby delaying timely medical intervention.[4] These issues highlight the necessity for adequate pre-discharge preparation and the importance of effective health education prior to discharge.

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In this context, the concept of readiness for hospital discharge among patients with T-tubes has garnered increasing interest. Evidence from studies conducted in oncology, cardiology, and cerebrovascular care settings has demonstrated that a higher level of discharge readiness is associated with improved adherence to post-discharge instructions, enhanced health-related quality of life, and reduced rates of unplanned readmissions and emergency department visits.[5,6] Despite these findings, research specifically addressing discharge readiness in the context of T-tube placement remains limited.

This review synthesizes existing literature to inform future research and provide a theoretical basis for developing discharge preparation strategies, guiding discharge decision-making, and enhancing continuity of care for patients with T-tubes and other abdominal drainage devices following hospital discharge.

Concept of Readiness for Hospital Discharge

The concept of readiness for hospital discharge was initially introduced by Fenwick as a framework for evaluating the comprehensive preparation of patients for discharge, encompassing physiological, psychological, and social dimensions prior to discharge from the hospital. This assessment, typically conducted by healthcare professionals, evaluates the capacity of patients and their caregivers to manage health conditions and rehabilitation needs in home and community settings. It functions as a critical indicator for predicting risk during the post-discharge transition period.[7]

Readiness for hospital discharge comprises five primary dimensions: (1) stability of the medical condition and treatment status; (2) functional independence in performing activities of daily living; (3) level of psychosocial adaptation among patients and their caregivers; (4) ability to understand and communicate health-related information; and (5) adequacy of the planned post-discharge living arrangements.

Readiness for discharge emphasizes that patients need to possess health knowledge related to their disease to ensure self-management after discharge. This requires a transformation from knowledge to behavior, an individualized need for health education, and psychological adaptation. Adequate knowledge can alleviate patients' anxiety about being discharged with a T-tube and enhance their confidence in recovery. Additionally, social support and the accessibility of medical resources also affect discharge readiness, as a lack of social support and relevant resources can exacerbate health risks after discharge.

The clinical relevance of discharge readiness lies in its association with favorable outcomes, including improved transitions from hospital to home, enhanced patient satisfaction with medical services, better health-related quality of life, reduced incidence of unplanned readmission, and improved adherence to long-term treatment and rehabilitation protocols.[8]

Assessment of Readiness for Hospital Discharge

The assessment of readiness for hospital discharge serves as a critical measure for evaluating whether patients have achieved a sufficient level of recovery to be safely discharged. A systematic assessment facilitates continuity of care between hospital, community, and home environments, thereby promoting a safe and effective care transition.[9] Evaluating discharge readiness helps ensure that patients are adequately prepared to leave the inpatient setting and initiate rehabilitation, while also enabling the development of individualized discharge plans that offer appropriate guidance and support.

A variety of assessment tools have been developed both in China and internationally to evaluate discharge readiness. These tools have been designed for use across diverse clinical conditions and target populations. Among the most widely used are: 1) The Readiness for Hospital Discharge Scale (RHDS), applicable to assessing overall discharge readiness among hospitalized patients; 2) The Quality of Discharge Teaching Scale (QDTS), which evaluates the quality and effectiveness of discharge education provided by healthcare professionals; and 3) The Social Support Rate Scale (SSRS), which assesses the level of social support available and its potential influence on discharge readiness.

Readiness for Hospital Discharge Scale (RHDS)

The RHDS, developed by Weiss et al in 2006 based on the theoretical foundation established by Meleis et al,[10,11] comprises 4 dimensions and a total of 23 items. The scale has demonstrated strong applicability across a range of clinical studies. A Chinese version of the RHDS was translated and culturally adapted by Lin et al in Taiwan.[12] This version includes 3 dimensions—personal status, adaptation capability, and expected social support—with a total of 12 items.

The RHDS employs a scoring system ranging from 0 to 10 for each item. The total score is calculated as the sum of all item scores, with a maximum possible score of 120 points. Certain items are reverse-scored. According to the mean item score, readiness for hospital discharge can be classified into four levels: insufficient (< 7 points), moderate (7–8 points), good (8–9 points), and very high (> 9 points).

The revised scale demonstrates strong internal consistency, with a Cronbach's α coefficient of 0.89, and has shown favorable applicability in populations such as patients with cancer and those receiving maternal or child healthcare services. The introduction of the RHDS marks a paradigm shift from clinical standards and healthcare professional-led discharge preparation toward patient autonomous decision-making. It has since become a widely adopted instrument for evaluating readiness for hospital discharge.[13]

Quality of Discharge Teaching Scale (QDTS)

The QDTS, originally developed by Weiss et al, consists of 24 items across 3 dimensions.[14] It was designed to comprehensively assess the alignment between patients' anticipated needs for pre-discharge knowledge, the actual acquired medical guidance content, and the effectiveness of skill acquisition and feedback during the discharge education process.

Wang et al translated and culturally adapted the QDTS for use in China, ensuring that the instrument preserved the conceptual integrity of the original version while aligning with the healthcare system and cultural context of the local population.[15] The Chinese version consists of the three original dimensions: congruence between educational needs and provided content, completeness of information acquisition, and the effectiveness of instruction and skills application. It also retained the 24-item structure.

The scale uses a 0 to 10 scoring format for each item, yielding a total score of up to 180 points. Higher total scores indicate higher quality discharge teaching. Psychometric evaluation of the Chinese version demonstrated strong reliability and validity, with a content validity index of 0.98 and a Cronbach's α coefficient of 0.92. These metrics support its utility as a standardized and evidence-based instrument for evaluating the quality of discharge education in clinical settings.[16]

Social Support Rate Scale (SSRS)

The SSRS, developed by Xiao, was designed as a psychological assessment instrument to quantitatively evaluate the level of social support available to individuals within their social environment. This scale facilitates a comprehensive understanding of an individual's perceived and actual social support, offering valuable insight for evaluating adaptation to social contexts and supporting both physical and psychological well-being.[17]

The SSRS comprises 3 dimensions encompassing a total of 10 items: objective support (3 items), subjective support (4 items), and utilization of support (3 items). The total score is derived by summing all item scores, yielding a score ranging from 12 to 66 points. Higher total and dimensional scores indicate more adequate social support. Total scores are interpreted as follows: less than or equal to 22 points indicates low-level support, between 23 to 44 points corresponds to medium-level support, and greater than 44 points represents high-level support. The SSRS has been extensively utilized in Chinese populations, demonstrating robust psychometric properties, including satisfactory reliability and validity. The comparison of assessment scales was shown in the Table 1.

Potential Influencing Factors of Readiness for Hospital Discharge

Readiness for hospital discharge is influenced by a range of interrelated factors spanning individual, social, and healthcare system domains. These influencing factors operate at multiple levels, including patient-related characteristics, the surrounding social support environment, and healthcare professional practices. Understanding these determinants is essential for developing targeted discharge planning strategies and ensuring the continuity of nursing care post-discharge.

Evidence from Chinese and international studies has demonstrated a positive association between the quality of discharge teaching and readiness for hospital discharge among patients discharged with T-tubes. The quality of discharge guidance has been identified as an independent influencing factor of readiness for hospital discharge in this population.[18,19] In addition, sociodemographic factors such as age, living arrangements, and economic status, have been shown to significantly impact both the quality of life and discharge preparedness among patients requiring post-discharge tube care.[20,21]

Table 1 Comparison of Assessment Scales

Assessment Scales	Apply Crowd	Core Dimensions	Reliability and Validity	Advantage	Limitation
RHDS (Readiness for Hospital Discharge Scale)	Universality	1. Physiological condition (including the adaptability of the drainage tube) 2. Self-care ability (pipeline maintenance) 3. Knowledge acquisition (complication recognition), psychological preparation	Cronbach's α 0.89~0.92; Good validity	Multidimensional assessment, widely applied in clinical practice	Routine discharge readiness assessment
QDTS (Quality of Discharge Teaching Scale)	Post-operative surgical patients	1. Quality of discharge guidance education content 2. Effectiveness of guidance methods	Cronbach's α:0.95	Focus on the health education section, with nurses taking the lead in the assessment.	Ignoring the individual differences of patients
CTM (care transitions measure)	Chronic diseases/ Elderly patients	1. Doctor-patient communication 2. Self-management preparation 3. Medication management 4. Follow-up plan	The test-retest reliability: 0.79; Good predictive validity	Emphasize the management of the transitional period and predict the risk of readmission	Some items require special supplementation.
SSRS (Social Support Rate Scale)	Universality	1. Objective support (such as economic, material, and instrumental support) 2. Supervisor support (emotional, companionship, etc.) 3. Support utilization degree	Cronbach's α:0.8–0.92; Good validity	The scale is concise and universal, with clear and understandable items, and is applicable to people from different cultural backgrounds.	Lack of dynamics, insufficient specificity for patients with T-tubes

Patient Factors

Age

Readiness for hospital discharge has been shown to be significantly influenced by age, with older adults generally exhibiting lower readiness levels.[22] This phenomenon may stem from multiple factors. Older adults frequently present with multiple chronic conditions and functional decline, often accompanied by reduced self-care ability and greater reliance on caregiver support following discharge. Additionally, age-related cognitive decline can impair the ability to comprehend and implement health-related information.

Baksi et al further validated this association, reporting that advanced age was linked to lower levels of discharge preparedness and a heightened risk of unplanned readmission.[23] The underlying causes of this relationship may include increased disease burden, greater physical limitations, motor impairment, and impaired self-care capability among older adults.

Healthcare professionals need to recognize the constraints that age places on patients' disease cognition ability, especially among older adults. They should employ concise, comprehensible communication methods, reinforce key health management concepts through repetition, and ensure that older adults acquire the necessary knowledge and skills to support post-discharge recovery. Such individualized educational interventions may improve readiness for hospital discharge and reduce associated transitional care risks in this population.

Residence Location and Living Arrangements

Residence location has been identified as an independent factor influencing readiness for hospital discharge. Patients residing in rural areas or at considerable distances from hospitals demonstrated reduced levels of readiness for hospital discharge, consistent with the findings reported by Wang et al[24,25] This association may be attributed to limited access to healthcare services and medications, delayed responses to emerging health concerns, and heightened anxiety related to insufficient medical support in remote settings.

Additionally, living arrangements have been found to affect discharge preparedness. Research by Marie et al indicated that patients living alone exhibited reduced readiness for hospital discharge and experienced higher rates of emergency department readmission.[26] Similarly, Li et al reported that patients discharged after total hip replacement who lived alone showed inadequate readiness for hospital discharge, likely due to physical limitations and insufficient emotional or instrumental support.[27]

For patients discharged with indwelling devices such as T-tubes, living alone has been associated with reduced self-care capacity, lower psychological confidence, and limited access to social support systems. It is recommended to strengthen discharge guidance education for patients residing alone or in remote areas to mitigate these risks. In addition, post-discharge follow-up and continuous nursing care for T-tube management should be prioritized to ensure safe transitions from hospital to home.

Education Level

The cross-sectional survey by Qian et al demonstrated that education level and living arrangements were the most significant sociodemographic factors affecting patients discharged with tubes.[28] Patients with higher levels of education were able to complete readiness for hospital discharge questionnaires independently and demonstrated higher compliance and self-discipline following discharge guidance. In contrast, those with lower education levels often required assistance from healthcare professionals to complete questionnaires and generally provided moderate feedback regarding the effectiveness of discharge instructions, indicating variability in health information comprehension. Findings from a related intervention study further supported that the education level of patients discharged with T-tubes was directly associated with disease cognition, discharge preparedness, and capacity for home-based self-care.[29]

Patients with higher education levels demonstrated better acceptance during discharge guidance, improved readiness for hospital discharge levels, and stronger home self-care ability. The observed differences may be attributable to the role of educational attainment in shaping cognitive abilities, learning ability, and communication skills. Patients with higher education backgrounds demonstrated a greater ability to interpret medical information, engage in self-regulation, and effectively prepare for hospital discharge.

Other Factors: BMI

A study focusing on hepatobiliary disorders demonstrated that patients with body mass index (BMI) ≥ 30 kg/m² exhibited significantly lower postoperative readiness for hospital discharge compared to those with a normal BMI.[28] This difference was attributed to challenges such as increased difficulty in postoperative pain management, limited physical mobility, and higher risk of wound-related complications, including fat liquefaction. It is recommended to design individualized discharge plans for patients with obesity, including enhanced pain control, early rehabilitation training, and home care education to support safe transition and recovery.

Healthcare Professional Factors

Quality of Discharge Guidance

Evidence from existing studies indicate that the quality of discharge guidance served as a critical determinant of patient readiness for hospital discharge. Weiss et al reported that high-quality discharge guidance significantly enhanced discharge preparation status, a conclusion supported by multiple Chinese and international studies demonstrating a significant association between discharge guidance quality and readiness levels.[30–33] The provision of comprehensive and effective discharge education poses a substantial challenge for healthcare professionals.

For patients discharged with T-tubes, discharge education requires not only the acquisition of knowledge related to disease management and drainage bag replacement techniques but also the mastery of home-based tube maintenance skills. Therefore, discharge education is recommended to be incorporated throughout the entire hospitalization process, rather than being confined to the day of discharge.[34] In addition, both the content and the delivery method of the educational intervention needs to be tailored to ensure quality and relevance.

Findings from an intervention study conducted by Wang et al on patients discharged with T-tubes demonstrated that the discharge education competencies of nursing staff, along with the degree of coordination among the nursing team, represented key factors influencing readiness for hospital discharge.[35] Additionally, careful planning regarding the timing, setting, and environmental conditions of discharge education was essential to optimize patient comprehension and information retention.

Research also indicated discrepancies between the discharge instructions provided and the actual needs encountered during post-discharge recovery. Possible contributing factors included: (1) insufficient targeting of health education

toward patients and families, leading to suboptimal outcomes; and (2) reduced effectiveness of education delivered by less experienced nursing personnel due to limited professional knowledge and practical experience.

Discharge Planning

Scientific and standardized discharge planning plays a key role in improving the rehabilitation of patients. Findings reported by Patel et al demonstrated that the early establishment and strict implementation of discharge protocols contributed to enhanced levels of discharge preparedness.[36] Accurate estimation of discharge timing enables healthcare professionals to initiate systematic discharge preparation in advance, which not only optimizes the hospitalization cycle but also significantly improves treatment safety and patient medical experience.

Numerous studies recommend that discharge planning commence upon admission, contingent upon comprehensive nursing assessments, with dynamic adjustment during hospitalization. This dynamic and individualized approach, when combined with routine pre-discharge assessments and targeted health education, has been shown to effectively reduce hospitalization duration, minimize the risk of readmission, and lower the incidence of post-discharge complications.

Therefore, clinical practice should focus on improving discharge assessment systems, strengthening discharge guidance measures, and establishing systematic post-discharge follow-up mechanisms.

Social Support

Social support and interpersonal encouragement represent essential components of home-based management for patients discharged with drainage tubes, reflecting the social concept of continuous nursing care. Evidence indicates that higher social support scores are positively associated with elevated levels of readiness for hospital discharge.[37] Higher social support scores indicate enhanced social resources and interpersonal communication, both of which facilitate the transition from hospital to home care for patients discharged with T-tubes.

Studies have further demonstrated that living arrangements and levels of social support function interactively, jointly influencing discharge preparedness.[18] Patients living alone frequently exhibit limited social support, along with significant deficiencies in knowledge and skills related to post-discharge home self-care, drainage tube care, and drainage bag replacement. These deficits contribute to reduced readiness for hospital discharge and are compounded by the absence of immediate assistance in the home environment.

Additional factors such as the presence of family caregivers and the level of health literacy among patients also influences discharge readiness. Concerns regarding the adequacy of post-discharge medical support and follow-up care were commonly reported as primary barriers to discharge preparedness.[21] To improve outcomes, adequate social support should be ensured for patients discharged with T-tubes as they transition from hospital to home.

Other Factors

Multiple clinical and individual factors influence the readiness for hospital discharge among patients discharged with T-tubes. These include duration of illness, whether the drainage tube was placed for the first time, history of similar surgeries, familiarity with T-tube functionality, and knowledge of drainage tube care. According to findings by Xue, among patients with cholelithiasis discharged with T-tubes, both the number of prior hospitalizations and the length of hospital stay demonstrated a positive correlation with discharge readiness.[38] Increased hospitalization exposure is associated with greater familiarity with disease-related knowledge, and enhanced awareness regarding drainage tube management.

A history of cholangitis, as a disease-related factor, can have a significant impact on the health outcomes of patients discharged with a T-tube. This is because the underlying pathology increases the risk of recurrence and can affect the recovery of biliary function. Research has shown[39] that patients with a history of cholangitis have a significantly higher rate of disease recurrence during the period of T-tube placement compared to those without such a history. Recurrent infections may further lead to liver function impairment.

Moreover, patients with a history of cholangitis are at increased risk of T-tube-related complications, such as catheter blockage and displacement. Chronic inflammation can lead to increased fragility of the biliary tract walls, which can affect the healing of tissues around the T-tube and increase the risk of mechanical complications related to the catheter.

This, in turn, can affect the discharge readiness of patients discharged with a T-tube and their ability to self-manage the catheter after discharge.

In a separate study, Huang et al reported that patients with cholelithiasis complicated by diabetes exhibited elevated anxiety and uncertainty about discharge when discharged with T-tubes. This group also demonstrated reduced self-care ability and lower health-related quality of life.[40] The presence of comorbid conditions appears to exacerbate the challenges associated with managing T-tubes, thereby increasing the complexity of post-discharge disease self-management. Patients frequently face difficulties in navigating the multifaceted demands imposed by multiple health conditions and show inadequate preparation for the transition from hospital to home care.

Future research should focus on patients with comorbidities discharged with T-tubes to identify specific barriers and inform the development of targeted interventions aimed at improving discharge preparation and post-discharge care outcomes.

Formulating Discharge Decisions for Patients Discharged with T-Tubes

Emphasizing Team-Based Care and a Multidisciplinary Collaborative Model

The implementation of a multidisciplinary care model serves as a critical component in supporting patients discharged with T-tubes by providing access to professional knowledge, clinical experience, and comprehensive rehabilitation strategies. Evidence indicates that the establishment of a drainage tube discharge management team—comprising physicians, primary care nurses, nutrition nurses specialist and other healthcare professionals—contributes significantly to optimizing discharge readiness.[41] Clear delineation of team member responsibilities, and coordinated collaboration at key clinical time points such as admission, preoperative, postoperative, pre-discharge, and post-discharge phases enable the delivery of structured assessments and evidence-based guidance.

Joint formulation of individualized discharge plans and health education protocols by multidisciplinary teams contributes to reducing uncertainty and anxiety related to disease status and post-discharge care. This integrated approach facilitates both the acquisition of disease-specific knowledge and practical self-care skills among patients discharged with drainage tubes. Additionally, timely identification and management of potential complications need to be prioritized throughout the discharge planning process. This collaborative strategy enhances discharge readiness and supports a safer transition from hospital to home care for patients with T-tubes.

Implementation of Diversified Discharge Planning and Continuous Nursing Care Supported by Mobile Health Technology

Advancements in medical technology and the integration of mobile health platforms have facilitated the development of more accessible, comprehensive, and individualized discharge education, thereby promoting improved recovery among patients discharged with T-tubes. In a study by Wang et al, nurse-led discharge planning was implemented for patients with T-tubes, with intervention strategies including the establishment of specialist teams and the use of information technology to facilitate diversified follow-up tracking.[35] The findings indicated that the use of tailored discharge management strategies supported smoother transitions from inpatient to home care while enhancing both self-care capacity and caregiver competency.

Other studies have introduced discharge planning assessment systems encompassing demographic characteristics, physical and psychological status, and discharge care needs. These tools allow for a comprehensive evaluation of discharge readiness, particularly among older adults, thereby supporting the development of individualized discharge plans.[42] Improved readiness for hospital discharge is associated with the use of evidence-based, personalized discharge strategies supported by mobile health systems and multidisciplinary coordination.

Limitations

Heterogeneity of the Study Population

The heterogeneity of the study population is a significant concern. The included studies encompass a wide range of disease types (eg, post-biliary surgery, pancreatic drainage), varying durations of T-tube placement, and different risks of

complications. These differences may introduce bias into the analysis of influencing factors. Future research should further stratify and explore the unique needs of different subgroups, such as elderly patients and those with complex surgical histories.

Lack of Standardization in Assessment Tools

The assessment tools used in the studies are not fully standardized. The discharge readiness assessment tools summarized in this study (eg, RHDS, QDTS) are not entirely unified across existing research. Moreover, some tools lack specific items related to T-tube care (eg, observation of drainage fluid, emergency situation management), which may affect the comparability of study conclusions. It is recommended that future research develop or optimize a standardized assessment system specifically for patients with T-tubes.

Limited Evidence on Long-Term Effects of Intervention Strategies

The evidence on the long-term effects of intervention strategies is limited. Most of the intervention studies reviewed here (eg, health education, remote follow-up) have short observation periods and lack assessments of long-term patient outcomes (eg, readmission rates at 6 months, quality of life). There is a need for more prospective cohort studies to validate the sustained effects of these interventions. This will facilitate broader reviews and the refinement of research content.

Conclusion

Although substantial progress has been achieved in research on readiness for hospital discharge in medical fields such as cancer and hip replacement, investigations specific to patients discharged with T-tubes remain limited.[43–46] Within the framework of ERAS, these patients encounter significant challenges during the transition from inpatient to home care, necessitating further examination of factors influencing discharge readiness. Notably, the development of an RHDS tailored to patients discharged with drainage tubes warrants further attention.

Future research may benefit from targeting this patient population as recipients of tailored interventions. Potential strategies include leveraging mobile internet platforms, mobile applications, and communication tools such as WeChat to deliver individualized behavioral and cognitive health education. The development of personalized health guidance in collaboration with an integrated doctor-nurse-patient care model, may further enhance outcomes. Concurrently, establishing community-based support networks and peer assistance programs, such as virtual or in-person forums for sharing experiences, may strengthen emotional support and mutual engagement among patients discharged with T-tubes.

Data Sharing Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Ethics Approval and Consent to Participate

This study did not involve human or animal subjects, and thus, no ethical approval was required. The authors confirm that this study was conducted in accordance with the principles of academic integrity and research ethics.

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Disclosure

The authors declare that they have no competing interests in this work.

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