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Six-Minute Walk Test as a Functional Discharge Marker in Post-Cardiothoracic Surgery Patients and Implications for Nurse Practitioner-Led Transitional Care

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Abstract: ***Cardiothoracic surgery is associated with significant physiological stress and transient functional impairment, necessitating careful evaluation of discharge readiness. While traditional discharge criteria emphasize hemodynamic stability and wound healing, functional capacity and physical endurance are often under- assessed. The six-minute walk test (6MWT) is a simple, low-cost, and validated measure of functional exercise capacity that reflects integrated cardiopulmonary and musculoskeletal function. This review synthesizes current evidence on the role of the six-minute walk test as a functional discharge marker in post- cardiothoracic surgery patients and examines implications for nursing and nurse practitioner-led transitional care. Functional readiness after cardiothoracic surgery is a multidimensional construct encompassing physical endurance, mobility, symptom tolerance, confidence, and ability to perform activities of daily living. Evidence suggests that 6MWT performance is associated with post-operative physical activity levels, rehabilitation participation, reduced complications, and lower readmission rates. Despite its established utility, routine use of the six-minute walk test at discharge remains limited, particularly in low- and middle-income countries. Nurses and nurse practitioners play a pivotal role in integrating functional assessment into discharge planning, coordinating rehabilitation services, and ensuring safe transitions from hospital to home. Incorporating the six-minute walk test into routine discharge evaluation may significantly enhance patient safety, recovery outcomes, and continuity of care following cardiothoracic surgery.***

Keywords: Six-minute walk test, cardiothoracic surgery, functional recovery, discharge readiness, transitional care, nursing

1. Introduction

Cardiothoracic surgery remains a cornerstone in the management of advanced cardiac and thoracic diseases, significantly improving survival and quality of life. Advances in surgical techniques, anesthesia, and intensive care have led to reduced postoperative mortality and shorter hospital stays. However, early discharge often occurs before complete functional recovery, placing patients at risk for complications, reduced independence, and hospital readmissions.

Functional capacity following cardiothoracic surgery is frequently compromised due to sternotomy-related pain, reduced cardiopulmonary reserve, muscle deconditioning, and prolonged immobilization. Despite this, discharge decisions are largely guided by physiological stability rather than objective functional assessment. Functional discharge readiness has therefore emerged as a critical determinant of safe transition from hospital to home.

The six-minute walk test (6MWT) has gained prominence as a practical tool for assessing functional exercise capacity in cardiovascular and pulmonary populations. It reflects the patient's ability to perform daily physical activities and provides insight into recovery status. Nurses and nurse practitioners (NPs) play a central role in discharge planning, functional assessment, and transitional care coordination, positioning the six-minute walk test as a nursing-sensitive outcome measure. This review examines the role of the six-minute walk test as a functional discharge marker in post-cardiothoracic surgery patients and explores its implications for nursing and NP-led transitional care.

Recent evidence emphasizes that post-cardiothoracic surgery recovery is not linear and varies widely across individuals, even among patients undergoing similar surgical procedures. Functional decline may persist despite optimal surgical outcomes due to factors such as prolonged bed rest, inflammatory responses, nutritional deficits, and psychological stress. Consequently, reliance solely on physiological parameters may result in premature discharge of patients who are functionally vulnerable. Incorporating objective functional assessment into discharge planning is therefore essential to ensure patient safety and optimize recovery trajectories.

Concept of Functional Discharge Readiness

Functional discharge readiness refers to the patient's ability to safely resume essential physical activities and self-care following hospital discharge. It encompasses physical endurance, mobility, symptom tolerance, balance, confidence, and access to support systems. Functional readiness is distinct from physiological stability; a patient may be medically stable yet functionally unprepared for discharge.

In cardiothoracic surgery patients, functional readiness is particularly important due to the complexity of recovery and risk of post-discharge deterioration. Reduced exercise tolerance, fatigue, dyspnea, and pain can significantly limit activity performance. Functional readiness is dynamic and evolves throughout hospitalization and recovery, underscoring the need for objective assessment prior to discharge.

Functional discharge readiness extends beyond ambulation ability and includes endurance for sustained activity, ability to tolerate exertional symptoms, balance, coordination, and confidence in performing daily activities. In cardiothoracic surgery patients, readiness is influenced by pain control, sternal precautions, respiratory mechanics, and cardiovascular reserve. Functional readiness is also shaped by psychosocial factors such as fear of exertion, anxiety related to symptom recurrence, and perceived self-efficacy.

From a transitional care perspective, functional readiness is dynamic and may fluctuate during the immediate post-discharge period. Patients who appear functionally stable at discharge may experience rapid deterioration if endurance is inadequate or if post-discharge support is insufficient. Therefore, assessment of functional readiness should be viewed as an ongoing process rather than a single-point evaluation.

Six-Minute Walk Test as a Measure of Functional Capacity

The six-minute walk test is a submaximal exercise test that measures the distance a patient can walk on a flat surface in six minutes. It evaluates the integrated response of cardiovascular, respiratory, and musculoskeletal systems and closely reflects activities of daily living.

Unlike maximal exercise testing, the 6MWT is simple, inexpensive, and well tolerated by post-operative patients. It requires minimal equipment and can be administered safely under nursing supervision. In cardiothoracic surgery patients, 6MWT performance has been shown to correlate with physical activity levels, functional independence, and rehabilitation outcomes.

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Measurement and Clinical Utility of the Six-Minute Walk Test

Standardized protocols for the six-minute walk test have been established by professional societies, enhancing its reliability and validity. The test is commonly used in cardiac rehabilitation, heart failure management, and pulmonary disease assessment.

Evidence indicates that poor 6MWT performance is associated with delayed recovery, increased symptom burden, and higher risk of readmission. Conversely, improved performance reflects adequate functional recovery and readiness for discharge. Despite its advantages, variability exists in timing and consistency of assessment, and routine implementation at discharge remains limited in many clinical settings.

The six-minute walk test offers a pragmatic balance between clinical feasibility and functional relevance. Unlike maximal exercise tests, which require specialized equipment and trained personnel, the 6MWT can be conducted in ward corridors with minimal resources. This makes it particularly valuable in high-volume surgical centers and resource-limited settings.

Physiologically, the 6MWT reflects the combined effects of cardiac output, pulmonary ventilation, peripheral muscle strength, and neuromuscular coordination. In post-cardiothoracic surgery patients, test performance is influenced by residual myocardial dysfunction, pulmonary atelectasis, pain- related splinting, and deconditioning. As such, the 6MWT provides a holistic snapshot of recovery rather than isolated organ system assessment.

Safety and Feasibility of Six-Minute Walk Test at Discharge

Concerns regarding patient safety often limit the use of functional testing in the immediate post-operative period. However, studies demonstrate that the six- minute walk test is safe when conducted in clinically stable patients under appropriate supervision. Adverse events during the test are rare and typically mild, including transient dyspnea or fatigue, which resolve with rest.

Pre-test screening, continuous observation, and clear termination criteria are essential to ensure safety. Nurses and nurse practitioners are well positioned to conduct these assessments, given their continuous patient monitoring and familiarity with post-operative limitations. The feasibility and safety profile of the 6MWT support its routine use as part of discharge readiness assessment.

2. Factors Influencing Functional Performance at Discharge

Patient-Related Factors

Age, pre-operative functional status, comorbidities, type of surgery, and post- operative complications significantly influence functional recovery. Patients with reduced pre-operative exercise tolerance or prolonged ICU stays often demonstrate poorer 6MWT performance at discharge.

Hospitalization and Care Factors

Early mobilization, physiotherapy involvement, pain management, and length of hospital stay impact functional outcomes. Patients actively engaged in mobilization and rehabilitation during hospitalization demonstrate better endurance and confidence at discharge.

Rehabilitation and Education Factors

Structured rehabilitation and patient education regarding activity progression, symptom recognition, and energy

conservation enhance functional recovery. Education delivered early and reinforced throughout hospitalization is more effective than discharge-day teaching alone.

Pain and Symptom Burden

Post-sternotomy pain and thoracic discomfort significantly affect mobility and endurance. Inadequate pain control leads to shallow breathing, reduced mobility, and fear of movement, all of which negatively impact functional performance. Effective multimodal pain management is therefore a prerequisite for accurate functional assessment.

Nutritional and Metabolic Factors

Malnutrition and altered metabolic demands following cardiothoracic surgery contribute to muscle weakness and fatigue. Patients with inadequate nutritional intake may demonstrate reduced endurance during the six-minute walk test. Early nutritional optimization is thus integral to functional recovery.

Impact of Functional Readiness on Patient Outcomes

Higher functional readiness at discharge is associated with improved physical activity participation, better adherence to rehabilitation programs, reduced complications, and lower hospital readmission rates. Patients who demonstrate adequate functional endurance are better equipped to manage daily activities and recognize early signs of deterioration.

Implications for Nursing and Nurse Practitioner Practice

Nurses and nurse practitioners play a pivotal role in assessing functional readiness, administering the six-minute walk test, and integrating findings into discharge planning. NP-led transitional care models emphasize continuity, patient education, and coordination of post-discharge services.

Routine incorporation of the six-minute walk test into discharge assessment allows early identification of patients requiring extended rehabilitation or community-based support. Nurse practitioner–led interventions can improve functional outcomes, enhance patient confidence, and ensure safer transitions from hospital to home.

Nurses and nurse practitioners are uniquely positioned to champion functional assessment as a standard of care. Incorporating the six-minute walk test into routine discharge protocols empowers nurses to contribute objective data to clinical decision-making. Nurse practitioner–led discharge clinics can use 6MWT results to stratify risk, tailor follow-up plans, and provide targeted education on activity progression and symptom monitoring.

Furthermore, nurse-led research and quality improvement initiatives focusing on functional discharge markers can drive evidence-based practice and policy development within cardiothoracic units.

Implications for Cardiac Rehabilitation and Continuity of Care

The six-minute walk test serves as a valuable bridge between acute care and cardiac rehabilitation. Performance at discharge can guide individualized rehabilitation prescriptions, identify patients requiring supervised rehabilitation, and inform progression of physical activity intensity. Poor functional performance may warrant delayed discharge, enhanced home-based rehabilitation, or closer follow-up.

Integrating 6MWT findings into discharge summaries improves communication between acute care teams and rehabilitation providers, enhancing continuity of care. This alignment is particularly important in nurse practitioner–led transitional care models, where coordination across care settings is central to improved outcomes.

Gaps in Existing Literature

Despite growing evidence supporting the six-minute walk test, gaps remain in standardized discharge protocols, particularly in low- and middle-income countries. Most studies are cross-sectional, highlighting the need for longitudinal and interventional research evaluating nurse-led and NP-led functional assessment strategies.

Current literature lacks consensus on optimal timing and cut-off values for six- minute walk test performance at discharge. Variability in protocols and patient populations limits comparability across studies. There is also limited research evaluating the predictive value of discharge 6MWT performance on long-term outcomes such as quality of life and functional independence.

Future research should prioritize longitudinal designs, interventional studies, and evaluation of nurse practitioner–led functional assessment models, particularly in low- and middle-income countries.

3. Conclusion

Functional discharge readiness is a critical yet under-assessed component of post- cardiothoracic surgery care. The six-minute walk test offers a simple, reliable, and clinically meaningful method to evaluate functional capacity at discharge. Integrating the six-minute walk test into routine nursing and nurse practitioner– led discharge planning can enhance patient safety, optimize recovery, and improve transitional care outcomes. Strengthening functional assessment practices is essential for ensuring safe and effective transitions following cardiothoracic surgery.

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