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Review

"NEW" Prehabilitation: A 3-Way Approach to Improve Postoperative Survival and Health-Related Quality of Life in Cardiac Surgery Patients

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ABSTRACT

With advances in health care practices and delivery, the overall life expectancy of the Western population has increased. For those practitioners involved in the care of the patient with advanced cardiac disease, there has been a resultant higher prevalence of increasingly frail and older patients undergoing complex cardiac procedures. The higher rates of comorbid-associated higher vulnerability, with associated deconditioning, predisposes older, frail patients to poorer postoperative outcomes and a complicated recovery process after cardiac surgery. In addition, such patients experience inferior quality of life as a result of reduced ability to independently perform activities of daily living. During the preoperative waiting period, the cardiac symptoms and anxiety induces inactivity that in turn compounds the physical and mental deconditioning. To improve functional capacity and enhance postoperative recovery, prehabilitation, a component of the enhanced

RÉSUMÉ

Grâce aux avancées en matière de pratiques et de prestations de soins de santé, l'espérance de vie générale de la population occidentale a augmenté. Pour les praticiens qui prodiguent des soins aux patients atteints de cardiopathies à un stade avancé, une conséquence de cette augmentation a été l'accroissement de la prévalence des patients de plus en plus faibles et âgés subissant des interventions cardiaques complexes. Les taux plus élevés de vulnérabilité associée à la comorbidité et le déconditionnement qui en découle prédisposent les patients fragiles et plus âgés à une issue moins favorable de la chirurgie cardiaque et à un processus de convalescence plus compliqué après une telle intervention. De plus, ces patients ont une qualité de vie inférieure en raison de leur capacité réduite à s'adonner de façon autonome aux activités de leur vie quotidienne. Pendant la période d'attente préopératoire, les symptômes cardiaques et l'anxiété

In patients with a severe symptomatic cardiac disease, open chest surgical procedures remain the current standard first-line treatment strategy for symptoms as well as mortality benefits. With the global aging population, concurrent with improvement in surgical techniques and perioperative care, a greater number of older adult patients undergo cardiac surgery. Older adult patients undergoing cardiac surgery pose many unique challenges. Compared with a younger cohort of patients, the higher burden of comorbid diseases exacerbates the decline in physiological reserves in older, vulnerable patients.[1] Further, because of the concurrent cardiac disease process, there is deconditioning occurring that is out of proportion to the age of the patient.[2,3] The deconditioning places the patients at a higher risk of postoperative mortality and complicates the recovery phase with higher morbidity.[4] Therefore, cardiac surgery, in many cases, is still associated with high morbidity, mortality, and a prolonged postoperative inpatient stay.[5-8] After surgery, the patient's functional capacity might not return to baseline for a prolonged period of time.[9] These patients have difficulties performing activities of daily living after discharge with a high number of patients being discharged to a long-term care facility.[9-11] The preoperative risk assessment primarily evaluates the existing comorbidities and medical history of patients with a goal to reduce the patient's surgical and anaesthetic perioperative morbidity and mortality. However, at present there is typically a lack of a comprehensive preprocedure baseline functional status evaluation by the perioperative team. The lack of detailed baseline

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recovery after surgery model, might be of particular importance. In some studies, the preoperative improvement of the baseline physical, nutritional, and mental status has been reported to improve postoperative outcomes and enhance recovery after cardiac surgery. To address these domains, a 3-way approach to prehabilitation that is targeted toward improving nutritional status (N), exercise capacity (E) and worry reduction (W) (nutrition, exercise, and worry; "NEW" approach) might facilitate the perioperative management by ameliorating the postoperative outcomes and alleviating the surgical stress-related health deconditioning. In this review, the NEW approach and its potential benefits on postoperative outcomes as well as an implementation model (Promoting Action on Research Implementation in Health Services [PARiHS] framework) to aid institutional level implementation is described.

poussent à l'inactivité, ce qui ajoute encore au déconditionnement physique et mental. Pour améliorer la capacité fonctionnelle et favoriser la récupération postopératoire, la préadaptation, qui est un volet du modèle d'amélioration de la récupération post-chirurgie, pourrait jouer un rôle majeur. Dans certaines études, il a été rapporté que l'amélioration préopératoire de la forme physique, de la nutrition et de l'état mental a une incidence positive sur les résultats postopératoires et accroît la récupération après une chirurgie cardiaque. Pour approfondir ces questions, nous avons examiné si une approche de la préadaptation sur 3 niveaux s'attaquant à l'amélioration du statut nutritionnel et de la forme physique et à la réduction de l'inquiétude (ou approche « NEW » en anglais pour « *Nutrition, Exercise and Worry* ») pouvait faciliter la prise en charge périopératoire en améliorant les résultats postopératoires et en atténuant le déconditionnement physique lié à l'anxiété de l'intervention chirurgicale. Dans cette étude, nous décrivons l'approche NEW et ses effets bénéfiques possibles sur les résultats postopératoires, ainsi qu'un modèle de mise en œuvre (cadre *Promoting Action on Research Implementation in Health Services* [PARiHS]) visant à faciliter sa mise en application au niveau des établissements.

information limits the ability of the health care team to predict an individual's anticipated overall postoperative recovery course or effectively screen which patients might benefit from further perioperative optimization.[3] Ultimately this suboptimal identification of at-risk patients hampers effective clinical decision-making.[12] These considerations necessitate an improved model of care with a goal to maintain preoperative organ function and reduce the profound stress response after cardiac surgery. With the emergence of patient optimization protocols also known as enhanced recovery after surgery (ERAS), there is increasing clarity that the preoperative or baseline health status is an important determinant predicting postoperative outcomes.

The intention of this review is to increase awareness of the potential methods to optimize older, vulnerable patients to enhance recovery after cardiac surgery. For this review, we will examine "who" in terms of the type of patient for whom this is relevant with the use of a clinical vignette. Next, we will focus on "why" this is an increasingly important topic for the cardiovascular community to consider. Thereafter, we will describe "how" to optimize the care of the vulnerable older adult to facilitate enhanced recovery after cardiac surgery with a focus on the benefits of preoperative rehabilitation (or "prehab"; Fig. 1). Last, we touch on "what" new research initiatives are on the horizon.

The "Who"—A Clinical Vignette

Clinical vignette part 1

A 75-year-old woman, with known severe 3-vessel coronary artery disease (CAD), has been referred for consideration of coronary artery bypass grafting (CABG). The patient describes a 6-month history of fatigue, progressive worsening of shortness of breath, and swelling of the feet (current New York Heart Association classification II-III). Further, over the past 3 months, she has had progressive angina symptoms which now occur with minimal activity (Canadian Cardiovascular Society classification III). In addition to CAD, the patient has a history of hypertension for 14 years and a 10-year history of type II diabetes mellitus and is receiving oral hypoglycemic agents. Last year, the patient experienced a stroke with minimal residual left-sided weakness. Laboratory analysis indicates moderate renal insufficiency (creatinine clearance 55 mL/min) and anemia (hemoglobin, 10 g/dL). A transthoracic echocardiogram estimated a left ventricular ejection fraction at 40% with no other significant valvular pathology.

If one were to calculate the patient's **Euro**pean **S**ystem for **C**ardiac **O**perative **R**isk **E**valuation II (EuroSCORE II) risk with this information, the predicted risk of operative mortality would range from 1.94% to 2.45% depending on whether the patient was classified as having "poor mobility" (defined as severe impairment of mobility secondary to musculoskeletal or neurological dysfunction)[13] or not. This tool, however, does not provide detailed information on longer-term morbidity or health-related quality of life (HRQoL). The Society of Thoracic Surgery (STS) Risk Score[14] would predict a slightly higher risk of mortality and provides an additional prediction of prolonged hospital length of stay (LOS) and morbidity. However, it does not provide for any assessment of baseline functional capacity. To illustrate this point further, we continue with our clinical vignette.

Clinical vignette part 2

The patient underwent an "uncomplicated" 3-vessel CABG and was admitted to the postoperative cardiovascular intensive care unit (CVICU). On postoperative day 2, the patient developed delirium that persisted for 5 days and contributed to a prolonged stay in the CVICU. The postoperative rehabilitation efforts were limited by low baseline physical capacity (patient used a walker at home preoperatively) that was compounded by prolonged bed rest in the CVICU and postoperative ward due to resolving delirium. The associated physical deconditioning resulted in limited ability to carry out physical activity including activities of daily living. The patient, who lived on her own in the preoperative setting, was subsequently discharged to a long-term care facility.