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PERSPECTIVE

Addressing cardiometabolic risk in adults with spinal cord injury: acting now despite knowledge gaps

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Abstract

This perspective advocates for the adoption of recently published clinical practice guidelines on identifying and managing cardiometabolic risk after spinal cord injury (SCI). It makes the case for acting now, with the knowledge that we currently have, while continuing to address knowledge gaps with high-quality research studies in this area. Cardiovascular disease is a leading cause of death in people with SCI. Cardiometabolic disease (CMD) and risks are more likely to be overlooked after SCI. Unique SCI-related considerations impact both assessment and management of cardiometabolic risk. Risk factors and components of CMD including obesity, impaired glucose tolerance/insulin resistance, dyslipidemia, and hypertension should be evaluated and managed to optimize the cardiometabolic health of this population. While it would be optimal to base all care on high-quality evidence-based research, its absence should not be an excuse for inaction. Applying what is currently known and filling the research gaps with empirical recommendations based on clinical rationale and expert consensus is both appropriate and necessary till more definitive SCI-specific evidence becomes available.

Introduction

Clinical practice guidelines on "Identification and Management of Cardiometabolic Risk after Spinal Cord Injury" have recently been published [1]. This article responds to some related why, what, and how questions and makes the case for using these guidelines to address cardiometabolic risk in current spinal cord injury (SCI) practice.

Why do we need these guidelines?

Cardiovascular disease is a leading cause of death in people with SCI. Current research collectively indicates an increased prevalence of several cardiometabolic risk factors in individuals with SCI (Table 1) [2–9]. The reported prevalence of cardiometabolic disease (CMD) components in the SCI population does vary considerably [2, 3, 10–16], and legitimate concerns can be raised about relatively small numbers of subjects, inadequate controls for confounding variables, diverse study populations and differences in measured outcomes that contribute to these discrepancies [12]. Regardless, attention to cardio-metabolic risk is increasingly important in the care of these individuals since cardiovascular disease is recognized as a major cause of mortality and morbidity in people with SCI especially with aging and the increase in life-span of this population [2, 6, 9, 14, 17–21].

Cardiometabolic disease and risks are more likely to be overlooked after SCI. CMD is often asymptomatic and insidious in onset. Health care providers may overlook such less conspicuous aspects of health in the context of multiple SCI-related issues that require attention. Moreover, atypical presentations of cardiac events can contribute to delayed or missed diagnosis of cardiac disease in those with SCI above the T5 level who often do not get chest pain with coronary events or angina because the cardiac sympathetic afferent input is interrupted [22–24]. Shortness of breath from cardiac causes may be erroneously attributed to respiratory or deconditioning effects of SCI. In contrast to the relatively low prevalence of typical clinical symptoms of myocardial ischemia, reports suggest a much higher prevalence of ischemia detected on thallium stress tests or myocardial perfusion scans in people with SCI [25, 26]. Generalists often lack SCI-specific knowledge, so people with SCI not uncommonly look to their SCI specialists as also their de

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Table 1 Potentially increased cardiovascular risk factors after SCI

Decreased physical activity
Low HDL cholesterol
Impaired glucose tolerance, insulin resistance
Increased proportion of body fat due to loss of FFM
Potential effects of SCI on emerging risk factors

HDL high-density lipoprotein, *FFM* fat-free mass

facto primary care physicians. However, SCI providers without an internal medicine or primary care background may not keep up with cardiometabolic literature, so SCI-specific guidelines could be helpful in drawing needed awareness and attention to this issue.

Unique SCI-related considerations impact assessment and management of cardiometabolic risk. Effects of SCI on body composition and physiology have an impact on both assessment and management of cardiometabolic risk, so some aspects of guidelines developed for the general population may not apply to individuals with SCI. For example, traditional cut-offs for defining overweight and obesity by body mass index (BMI) may underestimate adiposity due to loss of fat-free mass (FFM) from sarcopenia and osteopenia following SCI, and the presence of abdominal muscle paralysis makes waist circumference a less valid measure of abdominal adiposity [12, 27]. Orthostatic hypotension and autonomic dysreflexia after SCI can impact the interpretation of blood pressure (BP) measurement for diagnosing hypertension [1, 4]. SCI affects options for exercise prescription [28–31]. Reduced caloric expenditure and basal energy requirements impact recommended caloric intake [32]. Unique SCI-related factors can impact pharmacotherapy options for hypertension and for other risk factors and CMD components [4].

What are the recommended guidelines to address CMD in adults with SCI?

Recommendations from the published guidelines on identifying and managing cardiometabolic risk after SCI are summarized below [1]. These guidelines are based on available evidence and will likely evolve with further SCI-specific research in CMD. For some recommendations that have been developed to address CMD in the general population [33, 34], current research and/or strong clinical rationale supports modification when applied to individuals with SCI, while for others there is no current basis for a change.

Assessment

Adults with SCI should be evaluated for risk factors and components of CMD including adiposity/obesity, impaired glucose tolerance/insulin resistance, dyslipidemia, and hypertension. Assessments should be initiated on discharge from initial rehabilitation and repeated periodically thereafter. When BMI is used to determine obesity in adults with SCI, a lower cutoff of BMI ≥ 22 kilograms per square meter (kg/m^2) is suggested versus the standard 30 kg/m^2 used in able-bodied adults to account for loss of FFM after SCI. Techniques to measure and quantify various body components, including body fat, muscle mass, bone mineral content, and total body water provide the most accurate assessment for obesity but are presently not widely available in the clinical setting. Adults with SCI should be screened for prediabetes and diabetes based on criteria specified by American Diabetes Association [34] for fasting plasma glucose, the 2-hour plasma glucose (2-h PG) value after a 75-g oral glucose tolerance test, or A1C. Repeating the screening every three years or less is suggested if negative. Adults with SCI should be tested for dyslipidemia with a lipid panel; empirically, the guidelines recommend a frequency of at least every three years when tests are normal, and more frequently in the presence of multiple risk factors. Repeat elevated BP readings are needed to diagnose hypertension. Unique challenges in interpreting BP readings and diagnosing hypertension in individuals with SCI should be accounted for, such as the influence of posture and autonomic dysfunction.

Management

Patients and care providers should work together on optimizing lifestyle management including attention to nutrition, physical activity, and smoking cessation. A healthy diet minimizes processed meats, trans fats and sweetened beverages and emphasizes intake of vegetables, fruits, whole grains, and lean vegetable or animal protein. Participation in physical exercise should be optimized to the extent feasible within the abilities of the individuals, with a goal of 150 min or more of moderate-intensity activity a week. Aerobic activity should be spread throughout the week and performed in episodes of at least 10 min. Those who are unable to comply with these guidelines should avoid being inactive and should try to engage in routine physical activities based on their ability, in consultation with their clinical team. Lifestyle interventions should be intensified in individuals with prediabetes or diabetes. In adults with Type 2 diabetes mellitus, metformin is typically the recommended first-line drug therapy [34]. Additional medications may be needed if glycemic control is not achieved despite metformin and lifestyle modifications. An endocrinologist referral should be considered and caution exercised with the use of multiple glucose-lowering medications that may increase the risk of hypoglycemia. Lack of calibration for SCI should be kept in mind when applying

integrated cardiovascular risk equations for the management of blood cholesterol. When pharmacotherapy is indicated, statin monotherapy using at least a moderate intensity statin is typically the initial choice. Currently, there is inadequate research to back different BP goals when managing hypertension in people with SCI than what is recommended for the general population [33]. Nonpharmacological interventions, including restricting sodium intake, limiting alcohol to 1–2 drinks a day, increasing physical activity, and appropriate weight control may, by themselves, be adequate to achieve BP goal in some people with hypertension, and are important components of management for those who require antihypertensive medications for BP control. SCI-related factors should be considered when choosing antihypertensive medications, such as the need to adjust the frequency of intermittent catheterization for bladder management if a thiazide diuretic is prescribed to lower blood pressure.

How should we apply guidelines in the face of significant knowledge gaps?

Acknowledge limitations and gaps in knowledge

Recognizing knowledge gaps is critical both to guide interpretation and implementation of current guidelines and to identify areas for future research needed to enhance the validity and optimal applicability of recommended guidelines for the SCI population. Large, multicenter, prospective trials are needed to assess the cardiometabolic risk and the effectiveness and safety of interventions in people with SCI, with the results discriminated by level and completeness of injury.

Apply current evidence

While it would be optimal to base all care on high-quality evidence-based research, its absence should not be an excuse for inaction. Applying what is currently known and filling the research gaps with empirical recommendations based on clinical rationale and expert consensus is both appropriate and necessary till more definitive SCI-specific evidence becomes available. Though clinical practice guidelines are needed to improve population health, decisions at the individual patient level are best made by considering these guidelines in the context of the specific clinical, personal and environmental factors, using a patient-centered approach that emphasizes shared decision-making.

Account for SCI-related factors

Supine hypertension may be missed if blood pressure is only taken in the sitting position in people with tetraplegia instead of measuring both seated and supine blood pressure. Adiposity may be underestimated if BMI cut-offs for able-bodied adults are used as markers for obesity. Depending on the level of injury, energy expenditure is lower in people with SCI after the post-acute phase than in able-bodied individuals, so a lower calorie consumption should be factored in nutritional counseling and planning [27, 35].

Evolve with future research

Current guidelines are likely to evolve with accumulation of further SCI-specific research in cardiometabolic disease. The need for additional investigation in several areas is recognized to enhance the validity and optimal applicability of recommended guidelines for the SCI population. However, for now, the current guidelines serve as a valuable resource for identification and management of cardiometabolic risk after SCI and for positively impacting the health of this patient population.

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Compliance with ethical standards

Conflict of interest The author declares that he has no conflict of interest.

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