**Aerobic Exercise for Individuals with Stroke and TBI in Inpatient Rehabilitation**

*Inservice for WakeMed Inpatient Rehabilitation Staff
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Aerobic Exercise: “Planned, structured, repetitive physical activity performed for extended periods of time at sufficient intensity to improve or maintain physical fitness.”

**Individuals with stroke**: ~50% reduction in aerobic capacity compared to healthy peers, ~75% with CAD, 60% survivors in stroke rehab with metabolic syndrome

**Individuals with TBI**: ~25-30% reduction in aerobic capacity compared to healthy sedentary peers, 3x greater risk of mortality from cardiovascular disease

**Benefits of aerobic exercise for these populations**: improved functional capacity/exercise tolerance, improved walking endurance and ADL, improved cardiovascular health and reduced risk factors for cardiovascular/cerebrovascular events, may augment neuroplasticity (evidence from animal studies)

**General Physical Activity Guidelines:***To improve aerobic fitness, exercise must:*

* Involve large muscle groups
* Be rhythmical in nature
* Last at least 20 minutes (minimum 10 minute intervals)
* Achieve intensity of at least 40% heart rate reserve (for the very unfit)

**Formulas for Calculating Exercise Target HR:**

Age-predicted maximal HR (max HR) = ~220 – age

% intensity x max HR = target HR

Heart Rate Reserve (HRR) =
max HR – resting HR

Karvonen formula (% HRR) = [(max HR – resting HR)

x % intensity] + resting HR = target HR

Pts on Beta Blocker:

target HR – (resting HR – resting HR on Beta blocker) OR use RPE for target intensity

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| --- |
| Guidelines for Individuals with Stroke |
| Screen first with structured exercise test with ECG monitoring! |
| Frequency | 3+ days/week |
| Duration | 20-60 minutes per session (>10 minute bouts) |
| Intensity | Moderate to vigorous:40-70% VO2peak/Heart Rate Reserve50-80% MaxHRRPE 11-14 (6-20 scale) |
| Monitoring (for safety and proper intensity) | HR (frequent-continuous), BP (periodic), RPE |

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| Guidelines for Individuals with TBI |
| Frequency | 3-4 days/week |
| Duration | 20-40 minutes per session  |
| Intensity | 60-90% of age-predicted Maximal HR |

**ACSM Risk Stratification System**
*(for classifying risk of cardiovascular event with exercise)*

Low Risk:

Men<45, women <55 yo asymptomatic and no more than 1 of the following risk factors:

* family history of cardiac disease, cigarette smoking, HTN, dyslipidemia, impaired fasting glucose, obesity, sedentary lifestyle

Moderate Risk: Maximal stress test recommended

Men>45, women>55 yo with two or more above-listed risk factors

High Risk: Submaximal stress test recommended

Individuals with 1+ of the following:

* ischemic pain, SOB, dizziness/syncope, orthopnea/dyspnea, ankle edema, palpitation/tachycardias, intermittent claudication, heart murmur, fatigue with usual activities, cardiovascular/pulmonary/metabolic disease

**For patients with moderate to high risk and no available exercise ECG:**

* May use a submaximal exercise test—monitor HR, BP and cardiac symptoms
* Prescribe lower-intensity exercise and compensate with increased frequency, duration or both

**Conservative Exercise Testing Recommendation for Stroke:**

Submaximal test with a predetermined endpoint:

* 70% age-predicted MaxHR (60% if DMII with comorbidites or on Beta-blocker medication)
* 120 bpm
* “Strong” RPE reported (5+/10 modified Borg)

*OR*

* Peak MET level of 5

Absolute indications for termination of test:

* SBP > 250 mmHg
* DBP > 115 mmHG

Exercise prescription from exercise testing:

* Upper limit of target HR range = 10 bpm below HR associated with above BP measures

**Proposed Models for Incorporating Aerobic Exercise Training Per Above Diagnosis-specific Guidelines into Inpatient Rehabilitation**

General Structure:

**Frequency**: minimum of 3x/wk

**Typical session**:

* Warmup: 2-10 minutes
* Aerobic exercise: up to 20-30 minutes continuous exercise at target HR (per recommendations by diagnosis above and pt tolerance), <2 minute seated rest breaks allowed as needed initially after at least 2 minutes at target HR (breaks and exercise below target zone not counted towards total exercise time)
* Cool down: 2-5 minutes

**Monitoring**: HR (frequent/continuous)—oximeter or chest strap monitor, RPE (every 5 minutes recommended), BP (before/after)

**Documentation/Lo**g: peak work rate achieved, RPE, amount of time spent in target HR zone, total exercise time, length of intervals/rest breaks

**Feedback**: Encouragement to reach/maintain target HR zone

Group Fitness Model: Implemented *in addition to* conventional therapies, individualized aerobic exercise prescription devised by primary treating therapist, supervised by PT/PTA and trained assistants, highly recommended program is scheduled outside peak therapy times to minimize scheduling conflicts.

* Pros:
* Challenges:

Individual Training Model: Incorporated into conventional therapies, PT and OT coordinate to ensure minimum of 20 total minutes in >10 minute periods achieved over each training day (3 days/week), treadmill walking with/without body weight support recommended as exercise mode to achieve concurrent gait and fitness goals (see Floel et al 2013)

* Pros:
* Challenges:

**Factors Limiting Implementation/Success of Aerobic Exercise in Inpatient Rehabilitation**:

Operational Factors:

* Lack of supervising staff
* Lack of time
* Lack of appropriate exercise equipment
* Lack of knowledge
* Lack of access to exercise testing
* Scheduling conflicts
* Billing--?

Therapist Factors:

* Perception neurorehab is not the appropriate setting for aerobic exercise
* Lack of knowledge about exercise prescription
* Overly conservative exercise prescriptions
* Pt safety concerns: unwarranted?

Patient Factors:

* Severe cardiac/medical comorbidities: uncontrolled HTN/DMII, CHF, arrhythmias, aortic stenosis, orthostatic hypotension, unstable angina
* Musculoskeletal comorbidities: arthritis, etc
* Insufficient motor control to perform exercise independently
* Inability to achieve target HR intensity or meet duration goals
* Speeds required for cardiovascular benefit of walking exercise are difficult for subacute recovery phase
* Behavioral deficits: unable to comply with intervention
* Cognitive/communication deficits: unable to comprehend/follow simple verbal instructions, unable to report concerns
* Fatigue
* Unwilling
* Lack of long-term adherence\*\*

**\*\*Important Note:** Benefits of structured supervised exercise interventions are transient without tailored counseling

Long-term exercise behavioral change interventions should:

* Employ theoretically based behavioral modification techniques
* Educate about benefits of aerobic exercise: function and cardiovascular health/prevention
* Address specific pt-identified barriers to exercise
* Include transition planning: share training parameters achieved in rehab with community-based exercise program post-discharge
* Teach self-regulatory techniques: goal-setting, planning, monitoring

Barriers to Exercise Post-Discharge Reported by Stroke Survivors:

* Environmental (access, transport, cost)
* Health problems
* Stroke-related impairments
* Embarrassment
* Fear of repeated strokes
* Lack of knowledge of how/where to exercise
* Lack of knowledge of benefits of exercise
* Unmotivated

**Behavioral Change Theory/Methods—Recommended Resources**

Motivational Interviewing:
Matulich, Bill. (2013, May 30). *Introduction to Motivational Interviewing* (Video File). Retrieved from: <https://www.youtube.com/watch?v=s3MCJZ7OGRk>
APTA Behavior Change Podcast Series. Available at: <http://www.apta.org/PatientCare/BehaviorChange/PodcastSeries/> (Access to this podcast requires an APTA membership account.)

Social Cognitive Theory:
McAlister AL, Perry CL, Parcel GS. How individuals, environments, and health behaviors interact: Social cognitive theory. In: Glanz K, Rimer BK & Viswanath K, eds. *Health behavior and health education: Theory, research, and practice*. 4th ed. San Francisco, CA: Jossey-Bass; 2008:169-188.

Health Belief Model:
Champion VL, Skinner CS. The health belief model. In: Glanz K, Rimer BK & Viswanath K, eds. *Health behavior and health education: Theory, research, and practice*. 4th ed. San Francisco, CA: Jossey-Bass; 2008:45-66.

Transtheoretical Model:
Prochaska JO, Redding CA, Evers KE. (2008). The Transtheoretical Model and Stages of Change. In Glanz, Rimer, Viswanath (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (pp. 97-121). Indianapolis: Jossey-Bass.

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