**UPMC SPORTS MEDICINE CONCUSSION PROGRAM GUIDELINES FOR POST-CONCUSSION REHAB**

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| **Stage of Rehabilitation** | **Physical Therapy Program** | **Recommended Exercises** |
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| **Stage 1**  Target Heart Rate : **30-40% of maximum exertion**  \*(Max HR- Rest. HR X .30)+Rest. HR  Recommendations: exercise in quiet area (treatment rooms recommended); no impact activities; balance and vestibular treatment by specialist (prn); limit head movement/ position change; limit concentration activities; 10-15 minutes of light cardio exercise. | -Very light aerobic conditioning  -Sub-max isometric strengthening and gentle isotonic  -ROM/ Stretching  - low level balance activities | Stationary Bike; Seated Elliptical; UBE; Treadmill walking: (10-15 min)  Quad sets; Ham sets; (UE) light hand weights; resistive band rowing; (LE) SLR’s, Resistive bands ankle strengthening  Cervical ROM exercise, Trap/LS stretching, Pec stretching, Hamstring stretching, Quad stretching, Calf stretching  Romberg exercises (feet together, tandem stance, eyes open-closed); single leg balance |
| **Stage 2**  Target Heart Rate : **40-60% of maximum exertion**  **\*** (Max HR- Rest. HR X .40)+Rest. HR  Recommendations: exercise in gym areas recommended; use various exercise equipment; allow some positional changes and head movement; low level concentration activities (counting repetitions); 20-30 minutes of cardio exercise.  (stage 1 exercises included, as appropriate) | -Light to Moderate aerobic conditioning  -Light weight PRE’s  -stretching (active stretching initiated)  -Moderate Balance activities; initiate activities with head position changes | Treadmill; Stationary Bike; Elliptical (upright or seated); UBE; (20-25 min)  Light weight strength exercise (Nautilus style equipment); resistive band exercises (UE/LE); wall squats, lunges, step up/downs  Any stage 1 stretching, active stretching as tolerated (Lunge walks, side to side groin stretching, walking hamstring stretch)  Romberg exercises, VOR exercise (walking with eyes focused with head turns); Swiss ball exercises; single leg balance exercises |
| **Stage 3**  Target Heart Rate: **60-80% of maximum exertion**  **\***(Max HR- Rest. HR X .65)+ Rest HR  Recommendations: any environment ok for exercise (indoor, outdoor); integrate strength, conditioning, and balance/proprioceptive exercise; can incorporate concentration challenges (counting exercises, MRS equipment/ visual games)  (stage 1&2 exercises included, as appropriate) | -Moderately aggressive aerobic exercise  -All forms of strength exercise (80% max)  -active stretching exercise  -Impact activities running, plyometrics (no contact)  -Challenging proprioceptive/ dynamic balance (integrated with strength and conditioning); challenging positional changes. | Treadmill (jogging); Stationary Bike; Elliptical (upright or seated); UBE (25-30min)  Resistive weight training including free weights; MRS/ Functional Squat; Dynamic Strength activities  Active stretching (Lunge walks, side to side groin stretching, walking hamstring stretch)  Initiate agility drills (zig zag runs, side shuffle, ect…), Jumping on tramp/blocks.  Higher level balance activities: ball toss on plyo floor, balance discs, trampoline; squats and lunges on BOSU ball |
| **Stage 4 (Sport Performance Training)**  Target Heart Rate: **80% of maximum exertion**  **\***(Max HR- Rest. HR X .80)+ Rest HR  Recommendations: continue to avoid contact activity, but resume aggressive training in all environments | -Non-contact physical training  -Aggressive strength exercise  -Impact activities/ plyometrics  -Sport Specific Performance Training | Program to be designed by Sport Performance Trainers  Graded Treadmill testing  Interval training  Sport Specific drills/training |
| **Stage 5 (Sport Performance Training)**  Target Heart Rate: **Full exertion**  Recommendations: Initiate contact activities as appropriate to sport activity; full exertion activities for sport activities | -Resume full physical training activities with contact  -Continue Aggressive strength/ conditioning exercise  -Sport specific Activities | Program to be designed by Sport Performance Trainers  Practice and game intensity training  Sport specific activities |

\* Target Heart Rates calculated by Karvonen’s equation : Max HR (220-Age) – Resting HR X Target Percentage + Resting HR