First Responder Fitness & Injury Risk Assessment/Mitigation (FIRA)

PURPOSE

Program Description:

ERHC will partner with the Fire Department to introduce preliminary Fitness and Injury Risk Assessment/Mitigation (FIRA) programming for its fire service members, aligned with standards outlined in NFPA 1583.

The FIRA program will support and encourage members to pursue their fitness goals by increasing individual member awareness of their baseline level of physical conditioning.

The FIRA program will support injury prevention efforts by a) identifying members at elevated risk for musculoskeletal injury; b) isolating the type of injuries members are most likely to incur; and c) providing members with targeted corrective exercises to mitigate their specific, individual risks.

Rationale:

Studies have shown that firefighter fitness and conditioning correlates with occupational performance, and that firefighting "taxes virtually all aspects of physical fitness." Researchers have therefore recommended that, "Traditional firefighter exercise programs … should be replaced with physical conditioning programs that address all components of fitness."[i] Further, a study of obesity and incident injury among 347 career firefighters[ii] demonstrated that baseline weight status is a significant predictor of musculoskeletal injury. Firefighters with an unhealthy waist circumference (>40 inches) were almost 3 times as likely to sustain a musculoskeletal injury.

ERHC's FIRA program will offer overall fitness testing adapted from the Wellness Fitness Initiative protocol recommended by the IAFF/IAFC.

Firefighters experience an on-the-job injury rate 4 times that of all other occupations.[iii] Of the 68,085 line-of-duty injuries reported among firefighters in 2015 (including fireground and non-fireground), more than half were musculoskeletal (e.g. strains, sprains, fractures). Further, more than half of all active duty injuries were attributed to falls, jumps, slips, and overexertion/strain, suggesting a high correlation between physical conditioning and injury risk.[iv] The evolving science of injury prevention has identified key factors – such as movement patterns, mobility, and core stability – which may predict an individual's likelihood of experiencing a significant injury. While firefighters have little control over the hazards they encounter at the fireground, they *can* modify their individual level of fitness and conditioning. Therefore, injury risk assessment and mitigation presents a common-sense approach to injury prevention among active-duty firefighters.

ERHC's FIRA program will offer injury risk screening founded on the well-recognized Functional Movement Screen (FMS).™

Evidence Base:

Wellness Fitness Initiative - Fitness Test: WFI assessment includes 8 exercises/measurements designed to determine a baseline level of physical and cardiovascular fitness among firefighters. WFI assessments include body composition, aerobic capacity/VO_2max, muscular strength, muscular endurance, and flexibility.

The WFI protocol is well-studied. Low cardiovascular fitness, as assessed through the WFI aerobic capacity test, has been associated with higher injury rates among firefighters. Firefighters from Tucson, AZ, who presented with low levels of aerobic fitness (VO_2max <42 ml/kg/min*)* were 2.2 times more likely to be injured than those with a greater than 48 ml/min/kg. Researchers concluded that for every 1 ml O2/kg/min increase in aerobic fitness, a 14% decrease in injury rate exists.[v] As noted, multiple aspects of fitness correlate with injury risk. Researchers examined how each of the WFI fitness components combined to predict injury rates among 799 fire members over a 4-year period.[vi] Those in the least-fit group were 1.82 times more likely to sustain any kind of injury, and 2.9 times more likely to sustain a sprain or strain, when adjusted for age and gender. Researchers identified flexibility, total grip strength, percent body fat, and resting heart rate as the most reliable measures of fitness.

Functional Movement Screen™: FMS is a series of 7 tests to evaluate the quality and strength of an individual's fundamental movement patterns, with respect to mobility, stability, and symmetry. During these simple tests, the participant is placed in various positions designed to expose weaknesses and imbalances associated with injury. Movements are observed and scored by an FMS-certified screener (3-movement with no compensation; 2-movement with compensation; 1-movement pattern cannot be performed; 0-movement causes pain).

FMS has been widely evaluated, and has been shown to be a reliable predictor of musculoskeletal injury in numerous studies.[vii]

Benefits/Outcomes:

Short-Term:

Individual firefighters participating in the FIRA program are expected to benefit from:

✓ Increased awareness of their individual level of conditioning and fitness.

✓ Specific fitness scores, to use as a baseline to establish realistic, measurable individual fitness goals.

✓ Decreased personal injury risk, through physical therapy intervention.

Improved self-awareness of individual fitness levels and injury risks may increase motivation to pursue fitness goals and adopt risk-reduction measures.

Departments participating in the FIRA program are expected to benefit from:

✓ Increased awareness of aggregate levels of conditioning and fitness among their members.

✓ Individual results (baseline and re-evaluation) on which to establish member fitness incentive programs.

✓ Decreased injury risk among members, corresponding with eventual reductions in Workman's Compensation claims and personnel replacement costs.

By better understanding injury risk among their members, fire agencies can develop more beneficial and cost-effective department-wide injury prevention programs, and invest limited resources where they are likely to yield the greatest impact.

Long-Term:

Fitness and injury risk assessment will provide a foundation to implement pro-active prevention and wellness programs, toward improved firefighter performance, safety, well-being, and longevity.

PROPOSED SCOPE

LEVEL 1: FITNESS & INJURY RISK SCREENING

Target Participants:

✓ Recommended for all active-duty Fire Department members.

Screening Protocol:

FIRA Screening Protocol will be used to predict a) each participant's likelihood of incurring a musculoskeletal injury (on or off duty), and b) to isolate their specific areas of vulnerability. Further, FIRA screening protocol will increase participants' awareness of their individual fitness level, relative to their overall injury predisposition and ability to fulfill core job duties.

- **Injury Risk Assessment** will map each participant's patterns of movement.
- **Basic Fitness Testing** will assess each participant's overall conditioning, correlating with both job performance and injury risk.

FIRA Screening Protocol will be based on:

✓ **Injury Risk Assessment** / Functional Movement Screen™ regimen[1]

7 exercises to assess:

- Movement Patterns/Asymmetry
- Mobility
- Core Stability

✓ **Basic Fitness Assessment** / IAFF-IAFC Wellness Fitness Initiative guidelines

8 exercises/measurements to assess:

- Aerobic Capacity
- Body Composition
- Muscular Strength
- Muscular Endurance
- Flexibility

Please refer to APPENDIX A for additional details.

Screening Duration:

- Approximately 45-60 minutes per participant / 13 motor assessments; 1 body composition measurement
- Approximately 45 minutes per participant / 1 Exercise Stress Test assessment[2]

Test Administrators:

- FMS Injury Risk Assessment will be led by a certified FMS test administrator.
- WFI screening will be led by qualified ERHC Clinical Support Team members.
- Exercise Stress Testing will be led by qualified ERHC Clinical Support Team members.

[1] FMS has been selected as the introductory injury risk screening tool. The FIRA program may adapt or develop additional testing procedures in alignment with NFPA 1583 standards.

[2] This assessment may occur in tandem with an Annual Wellness Exam, conducted with other FIRA procedures, or conducted independently.

Scoring & Results Reporting:

- FIRA assessment results will be reported to participants to increase their awareness of their specific injury risks and fitness level.
    - FMS results will be delivered as a score.
        - Each of 7 testing procedures may be scored from 0 to 3;
        - The maximum FMS score is 21 (all movement with no compensation);
        - Participants scoring ≥15 will be considered 'low risk' for injury;
        - Participants scoring ≤14 will be considered 'high risk' for injury
    - WFI results will be quantified, but not "scored," and will serve to increase patient awareness of their individual conditioning.

- Participants *only* will receive a confidential printed report, inclusive of all specific WFI and FMS testing results/measurements, immediately following the testing series.
    - ERHC will maintain a HIPAA-protected copy of participant results, in the FIRA database.

- The sponsoring Department will receive an aggregate report showing:
    - Mean Department-wide scores (with standard deviation):
        - By specific WFI tests/measurements;
        - By total FMS score (0 – 21).
    - Participant completion of FIRA testing.
    - Number of participants "passing" FMS assessment (FMS score of ≥15).
    - Number of participants referred for FIRA mitigation (FMS score of ≤14).

  ✓ For FMS scores ≥15, the participant will receive brief injury prevention counseling by ERHC physical therapy team immediately following testing. The therapist will outline corrective exercises to optimize injury reduction and to remain in a low injury-risk category.

  ✓ For FMS scores ≤14, the participant will be referred to ERHC Physical Therapy (PT) for FIRA mitigation (injury prevention evaluation and counseling).
    - FIRA test administrators will provide the roster of participants assessed as 'high-risk' to an ERHC scheduler.
    - The ERHC scheduler will call the participant to initiate the appointment sequence.
    - All 3 FIRA mitigation appointments will be pre-scheduled on the Clinic/PT calendar.

Timeframe/Frequency:

Baseline Injury Risk Assessment:

✓ Baseline Screening completed on all Department members.

✓ Baseline Screening scheduled as follows:

- Current members scheduled as a cohort, i.e. screened within one-month timeframe;
- Recruits screened (per department schedule).

Annual (Repeat) Injury Risk Assessment:

✓ Repeat Screening completed on all Department members.

✓ Repeat Screening scheduled on an annual basis as follows:
- +/- 12 months following Baseline Screening;
- New hires gradually incorporated into screening schedule with balance of Department.

✓ Repeat Screening to utilize full FIRA testing regimen.

LEVEL 2: INJURY RISK MITIGATION

Target Participants:

✓ Recommended for all participants with an FMS result of ≤ 14.

Mitigation Protocol:

Mitigation will include a) more comprehensive physical therapy evaluation and b) injury prevention counseling (recommendations for corrective exercises to reverse specific vulnerabilities by improving movement patterns, mobility, and strength).

FIRA mitigation will occur in a series of 3 appointments:

- Introductory Physical Therapy evaluation and corrective exercise session (60 minutes);
- Follow-up corrective exercise session at 8-week mark (30 minutes);
- FMS-only re-assessment at 6-month mark (30 minutes).

Mitigation Administrators:

- FIRA mitigation will be delivered by a board-certified Physical Therapist.
- FMS Re-Evaluation will be led by a certified FMS test administrator

Scoring & Results Reporting:

- FMS re-evaluation scores will be reported to participants.
- Participants *only* will receive a confidential printed report, inclusive of all 7 FMS testing results/measurements, immediately following the 6-month re-evaluation.
    - ERHC will maintain a HIPAA-protected copy of participant results, in the FIRA database.

- The sponsoring Department will receive an aggregate report showing:
    - Number of patients referred to, and number of patients completing, FIRA mitigation.
    - Comparison of baseline and re-evaluation scores (with standard deviation):
        - By total FMS score (0 – 21).
    - Number of participants "passing" FMS re-evaluation (score of ≥15).

ERHC CAPACITY/CREDENTIALS

As the foremost provider of medical and wellness services to Treasure Valley first responders, ERHC is uniquely qualified to design and launch a First Responder Fitness & Injury Risk Assessment/Mitigation program.

✓ ERHC staff physicians are board-certified in family medicine *and* sports medicine.

✓ ERHC clinical staff includes an on-site, board-certified Physical Therapist and FMS-certified Physical Therapy Assistant.

✓ The ERHC Clinic facility features a Physical Therapy/Rehabilitation Studio and dedicated Exercise Stress Test room.

The FIRA program will be designed and overseen by Robert Hilvers, MD (University of Washington School of Medicine; Family Medicine Residency of Idaho; Idaho Sports Medicine Institute). Dr. Hilvers is the ERHC founder, medical director, and lead provider. He brings more than 15 years of clinical practice in preventative medicine, sports medicine/exercise physiology, and cardiac health. He has led the region in developing highly specialized preventative medicine standards, customized to the elevated risks experienced by firefighters and other first responders. Further, Dr. Hilvers has completed extensive due diligence in evaluating fitness and injury risk screening modalities, relative to NFPA 1583.

APPENDIX A

Proposed FIRA Testing Regimen

Injury Risk Assessment Components: Scored (0-21) as Mitigation Referral Criteria			
Function	Risk Zone	Exercise	Source
Movement Pattern	Hips, Knees, Ankles (bilateral, symmetrical, functional)	Deep Squat	FMS
	Hips, Knees, Ankles (bilateral, stability)	Hurdle Step	
	Torso, Shoulders, Hips, Ankles (mobility, stability) Quadriceps (flexibility) Knees (stability)	In-Line Lunge	
Mobility	Shoulders (range of motion, internal and external rotation and adduction)	Shoulder Mobility Test	
	Hamstrings, Calf Muscles (flexibility)	Active Straight Leg Raise	
Core Stability	Trunk Stability (longitudinal plane)	Trunk Stability Push-Up	
	Trunk Stability (multi-plane)	Rotary Stability Test	

Fitness Assessment Components: Not Scored; Patient Reference Only			
Function	Region	Test(s)	Source
Aerobic Capacity (VO_2 Max)	Heart and Lung Endurance	Exercise Stress Testing[3]	WFI
Body Composition	Healthy Body Mass	Waist Circumference	
Muscular Strength – Upper Body	Hand Grip Arm Strength	Dynamometer Grip Test Isometric Arm Muscle Contraction	
Muscular Strength – Lower Body	Leg Strength	Vertical Power Jump (pressure mat)	
Muscular Endurance	Upper Body/Core	Push-Up/ Prone Static Plank Test	
Flexibility	Trunk	Sit and Reach Test	

[3] This assessment may occur in tandem with an Annual Wellness Exam, conducted with other FIRA procedures, or conducted independently.

APPENDIX B

PROPOSED FEE STRUCTURE

Fitness and Injury Risk Assessment Screening Firefighter Performance and Longevity Protocol 1. Functional Movement Screen™ 2. Wellness Fitness Initiative 3. Low-Risk Injury Prevention Counseling	**$150 per participant**
Injury Risk Mitigation 1. Physical Therapy Evaluation/High-Risk Injury Prevention Counseling Session (Corrective Exercise Regimen) 2. Follow-Up Injury Prevention Counseling Session 3. FMS Re-Evaluation	**$300 per participant**

[iii] J Strength Cond Res. 2004 May;18(2):348-52. Physical fitness and job performance of firefighters. Rhea MR1, Alvar BA, Gray R.

[ii] Jahnke SA, Poston WS, Haddock CK, and Jitnarin N. Obesity and incident injury among career firefighters in the central United States. *Obesity (Silver Spring)* 21: 1505-1508, 2013.

[iii] Found at www.bls.gov/iif/oshwc/cfoi/osar0017.htm; accessed April 2016.

[iv] Found at www.nfpa.org/research/reports-and-statistics/the-fire-service/fatalities-and-injuries/firefighter-injuries-in-the-united-states; accessed February 2017.

[v] Poplin GS, Roe DJ, Peate W, Harris RB, and Burgess JL. The association of aerobic fitness with injuries in the fire service. *Am J Epidemiol* 179: 149-155, 2014.

[vi] Poplin GS, Roe DJ, Burgess JL, Peate WF, and Harris RB. Fire fit: assessing comprehensive fitness and injury risk in the fire service. *Int Arch Occup Environ Health* 89: 251-259, 2016.

[vii] Confirmed in a review of 10 independent studies, including: Minick KI, Kiesel KB, Burton L, Taylor A, Plisky P, and Butler RJ. Interrater reliability of the functional movement screen. *J Strength Cond Res* 24: 479-486, 2010.