

CFH Trust Heart Fitness Screening Test Guidance

This guide provides information for fire agencies and entities performing the screening measurements.

Resting 12-lead electrocardiogram (ECG) (Kligfield 2007, Mason 2007, Surawicz 2009, Wagner 2009, Hancock 2009, Rautahaju 2009, Maron 2014)

- A 12-lead ECG establishes a baseline for the individual and may reveal waveform changes and/or rhythm changes that may require further screening or medical review. There are many changes that do not result in signs and/or symptoms.
- 12-lead ECG is determined as normal or abnormal by a physician.

Fasting glucose (ACSM 2014, NFPA 2012)

- Fasting glucose is a helpful screening tool for diabetes and impaired fasting glucose, which is a precursor to diabetes. Diabetes is a risk factor for heart disease.
- 100 mg/dL or greater is a risk factor.
- For those with diabetes, it is recommended to acquire an A1c test. (A1c greater than 8% requires medical evaluation per NFPA 1582 9.6.4.1 (7)(b).)

Fasting lipids (ACSM 2014)

- Fasting lipids provide values for total cholesterol, LDL (low density lipoprotein), HDL (high density lipoprotein) and triglycerides. These are risk factors for heart disease.
- This qualifies as a risk factor if:
 - Low density lipoprotein (LDL) \geq 130 mg/dL
OR
 - High density lipoprotein (HDL) $<$ 40 mg/dL
OR
 - Lipid lowering medication

Height and weight for Body Mass Index (BMI) Assessment (ACSM 2014, Cornier 2011)

- Height and weight measurements allow for the calculation of body mass index (BMI), a risk factor for heart disease, providing a very rough estimate of body fat composition.
- BMI is (weight in kg)/(height in m)². Online calculators for this calculation using weigh in pounds and height in inches may be found at:
 - LiveWell Colorado
<http://livewellcolorado.org/healthy-living/360-gut-check/bmi-calculator>
 - National Heart Lung and Blood Institute
http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm
- This is classified as a risk factor if BMI \geq 30.

Waist circumference (ACSM 2014, Cornier 2011)

- Waist circumference indicates the amount of abdominal fat deposition. Excess abdominal fat is a risk factor for heart disease.
- Waist circumference is measured at the level at the top of the iliac crest.
- The following measures qualify as a risk factor:
 - Males $>$ 102 cm (40 in)
 - Females $>$ 88 cm (35 in)

Resting blood pressure (ACSM 2014, Chobanian 2011, NFPA 2012)

- High blood pressure (hypertension) is a silent killer and a risk factor for heart disease. It has few signs or symptoms until the damage caused by high blood pressure is extensive. Early detection is important for appropriate management.
- Blood pressure assessment must be performed with a properly sized cuff and in the seated position after resting for 5 minutes. Firefighters should refrain from using tobacco or ingesting caffeine for at least 30 minutes prior to the measurement.
- The following criteria identify risk:
 - Systolic blood pressure \geq 140 mm Hg
OR
 - Diastolic blood pressure \geq 90 mm Hg
OR
 - On hypertension (blood pressure) medication
- Uncontrolled or poorly controlled hypertension is considered a Category A condition. (NFPA 1582 6.10.2.1 (1))

Review of family health history for cardiovascular conditions (Maron 2014, Ashley 2012, ACSM 2014)

- Family history is the best screening tool for congenital heart defects. (Maron) In addition, family history may reveal genetic predisposition to other risk factors for heart disease such as hypercholesterolemia.
- Congenital heart defects may cause early sudden cardiac death.
- Family history of cardiovascular disease includes:
 - Myocardial infarction, coronary revascularization or sudden cardiac death before 55 years of age in father or other first degree male relative
 - Myocardial infarction, coronary revascularization or sudden cardiac death before 65 years of age in mother or other first degree female relative
- Information on GINA (Genetic Information Non-discrimination Act): "Because the purpose of GINA was to limit discrimination based on genetic information, it does not extend to prohibiting health insurance providers from using patient health or disease history to make health insurance coverage and underwriting decision." (Ashley 2012)

Review of personal health history (ACSM 2014)

- Personal health history will include a questionnaire about common signs and symptoms of heart disease and medical history.
- Individuals that are symptomatic or have known cardiovascular, pulmonary or metabolic disease have increased risk when participating in physical activity. (ACSM)
 - Unstable or new or possible signs and symptoms of heart disease include:
 - Pain, discomfort in the chest, neck, jaw, arms or other areas that may result from ischemia
 - Shortness of breath at rest or with mild exertion
 - Dizziness or syncope
 - Orthopnea or paroxysmal dyspnea
 - Ankle edema
 - Palpitations or tachycardia
 - Known heart murmur
 - Unusual fatigue or shortness of breath with usual exertion
 - Diabetes mellitus and at least one of the following:

- Age > 35 years OR
- Type 2 diabetes mellitus > 10 year duration OR
- Type 1 diabetes mellitus > 15 year duration OR
- Hypercholesterolemia (total cholesterol \geq 240 mg/dL OR
- Hypertension (systolic blood pressure \geq 140 or \geq 90 mm Hg) OR
- Smoking OR
- Family history of coronary artery disease in a first degree relative < 60 years old OR
- Presence of microvascular disease OR
- Peripheral artery disease OR
- Autonomic neuropathy
- End stage renal disease
- Individuals with symptomatic or diagnose pulmonary disease including:
 - Chronic obstructive pulmonary disease (COPD)
 - Asthma
 - Interstitial lung disease
 - Cystic fibrosis

Smoking status (ACSM 2014)

- Current cigarette smoking or having quit within the last six months is a risk factor.
- Exposure to environmental tobacco smoke is a risk factor. This includes living with someone who smokes.

Special consideration for those with Metabolic Syndrome (Alberti 2009, ACSM 2014)

Metabolic Syndrome is a predecessor to diabetes. Its identification may be an important step in reducing risk for cardiovascular disease. Metabolic Syndrome is diagnosed by identifying any three of these five characteristics:

- Blood pressure \geq 130/85 OR on medication
- Glucose \geq 100 mg/dL OR on medication
- HDL < 40 mg/dL for men and < 50 mg/dL for women OR on medication
- Triglycerides \geq 150 mg/dL OR on medication
- Waist circumference \geq 40 inches for men and \geq 35 inches for women

In addition, metabolic syndrome is classified as a Category A medical condition if the individual achieves an aerobic capacity less than 12 METS. It is classified as a Category B condition if the individual achieves an aerobic capacity of 12 METS or greater. (NFPA 1582 6.12, 6.12.1 and 6.12.2)

Definitions

Category A Medical Condition – A medical condition that would preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others. (NFPA 1582 3.3.13.1)

Category B Medical Condition - A medical condition that, based on severity or degree, could preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others. (NFPA 1582 3.3.13.2)

References

Alberti KGMM, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, Fruchart JC, James PT, Loria CM, Smith Jr SC. “Harmonizing the Metabolic Syndrome: A Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity.” *Circulation* 120 (2009): 1640-1645.

American College of Sports Medicine (ACSM). *ACSM’s Guidelines for Exercise Testing and Prescription*. Ninth Edition. Baltimore: Wolters Kluwer / Lippincott Williams and Wilkins, 2014.

Ashley EA, Hershberger RE, Caleshu C, Ellinor PT, Garcia JGN, Herrington DM, Ho, CY, Johnson JA, Kittner SJ, MacRae CA, Mudd-Martin G, Rader DJ, Roden DM, Scholes D, Selke FW, Twobin JA, Van Eyk, Worrall BB. “Genetics and Cardiovascular Disease: A Policy Statement From the American Heart Association.” *Circulation* 126 (2012): 142-157.

Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Jones DW, Materson BJ, Oparil, S, Wright Jr JT, Roccella. “Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure – JNC 7: Complete Report.” *Hypertension* 42 (2003): 1206-1252.

Cornier MA, Depres JP, Davis N, Brossniklaus DA, Klein S, Lemarche B, Lopez-Jimenez F, Rao G, St-Onge MP, Towfighi A, Poirier P. “Assessing Adiposity: A Scientific Statement from the American Heart Association.” *Circulation* 124 (2011): 1996-2019.

Hancock EW, Deal BJ, Mirvis DM, Okin P, Kligfield P, Gettes LS. “AHA/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part V: Electrocardiogram Changes Associated With Cardiac Chamber Hypertrophy; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 119 (2009): e251-e261.

Kinfield P, Gettes LS, Bailey JJ, Childers R, Deal BJ, Hancock W, van Herpen G, Kors JA, Macfarlane P, Mirvis DM, Pahlam O, Rautaharju P, Wagner GS. “Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part I: The Electrocardiogram and Its Technology; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 115 (2007): 1306-1324.

Maron BJ, Friedman RA, Kligfield P, Levine BD, Viskin S, Chaitman BR, Okin PM, Saul JP, Salberg L, Van Hare GF, Soliman EZ, Chen J, Matherne GP, Bolling SF, Mitten MJ, Caplan A, Balady GJ, Thompson PD; on behalf of the American Heart Association Council on Clinical Cardiology, Advocacy Coordinating Committee, Council on Cardiovascular Disease in the Young, Council on Cardiovascular Surgery and Anesthesia, Council on Epidemiology and Prevention, Council on Functional Genomics and Translational Biology, Council on Quality of Care and Outcomes Research, and American College of Cardiology. “[Assessment of the 12-lead ECG as a screening test for detection of cardiovascular disease in healthy general populations of young people \(12–25 years of age\)](#): a scientific statement from the American Heart Association and the American College of Cardiology.” *Circulation* 130 (2014):130-1334.

Mason JW, Hancock W, Gettes LS. “Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part II: Electrocardiography Diagnostic Statement List; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 115 (2007): 1325-1332.

National Fire Protection Agency (NFPA). *NFPA 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments*. 2013 Edition. Quincy, Massachusetts: NFPA, 2012.

Rautaharju PM, Surawicz B, Gettes LS. “ACC/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part IV: The ST Segment, T and U Waves, and the QT Interval; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 119 (2009): e241-e250.

Surawicz B, Childers R, Deal BJ, Gettes LS. “AHA/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part III: Intraventricular Conduction Disturbances; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 119 (2009): e235-e240.

Wagner GS, Macfarlane P, Wellens H, Josephson M, Gorgels A, Mirvis DM, Pahlam O, Surawicz B, Kligfield P, Childers R, Gettes LS. “AHA/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram – Part VI: Acute Ischemia/Infarction; A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society.” *Circulation* 119 (2009): e262-e270.