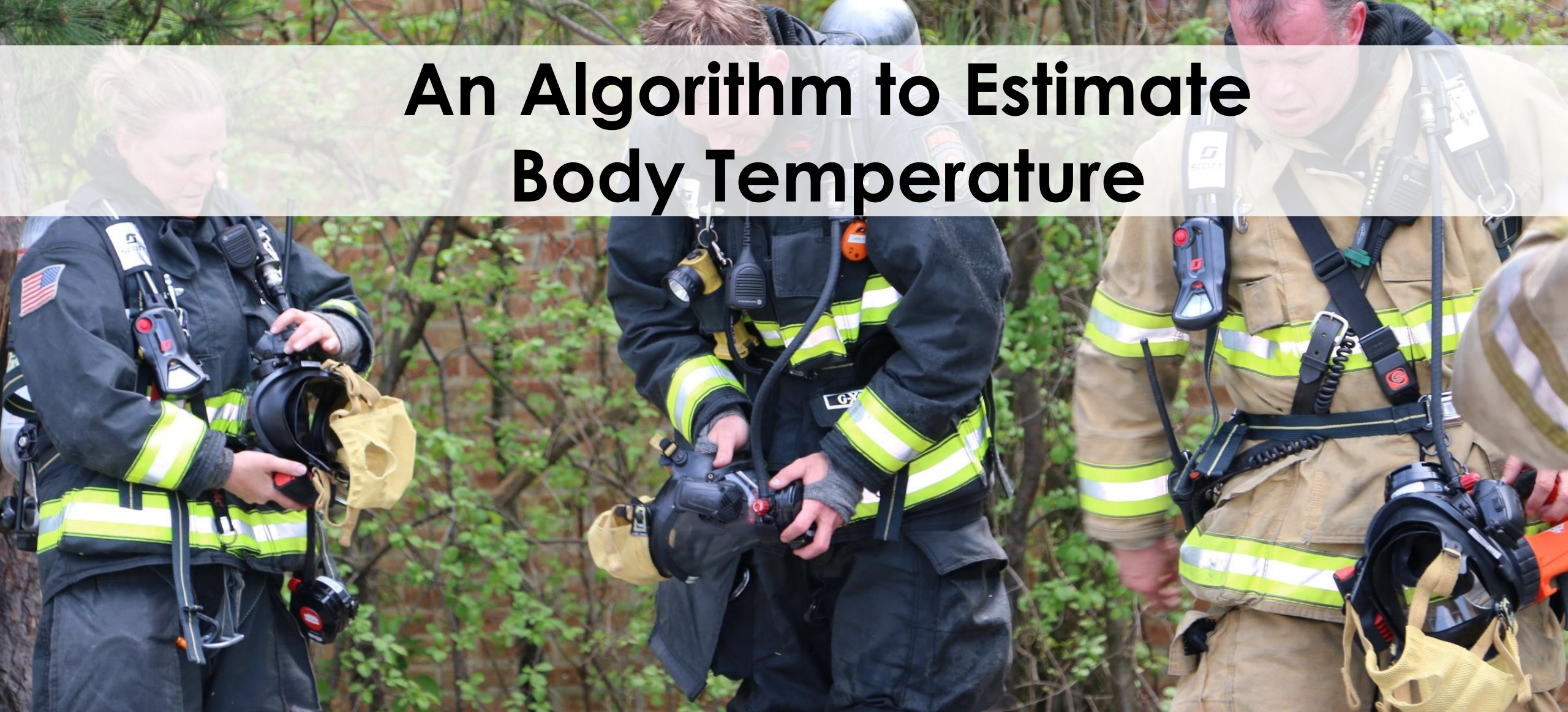


# An Algorithm to Estimate Body Temperature



**FIREFIGHTER PHYSIOLOGICAL MONITORING**  
**TECHNOLOGY**  
SUMMIT  
March 28-30, 2018  
Washington, DC



**RESEARCH FOUNDATION**  
RESEARCH FOR THE NFPA MISSION



# Firefighting Affects all Systems of the Body



- **Cardiovascular** (Increased HR and BP, Decreased SV, Increased Arterial Stiffness)
- **Hematological** (Decreased Plasma Volume, Hemoconcentration, Procoagulatory)
- **Thermoregulatory (Elevated Core Temperature, Dehydration)**
- **Respiratory** (Increased Breathing Rate and Oxygen Consumption)
- **Metabolic** (High Oxygen Cost, Increased Lactate, Fatigue)
- **Immune/Endocrine** (Increased Leukocytes and Hormones)
- **Nervous** (Sympathetic Surge and Increased Adrenaline)
- **Muscular** (Increased Oxygen Use and Heat Production)

# Physiological/Psychological Stress of Firefighting

“Probably the **greatest stress** ever imposed on the human **cardiovascular system** is the **combination of exercise and hyperthermia**. Together these stresses can present life-threatening challenges, especially in highly motivated athletes who drive themselves to extremes in hot environments.”

L.Rowell, 1993. In *Human Cardiovascular Physiology*, Oxford Press.

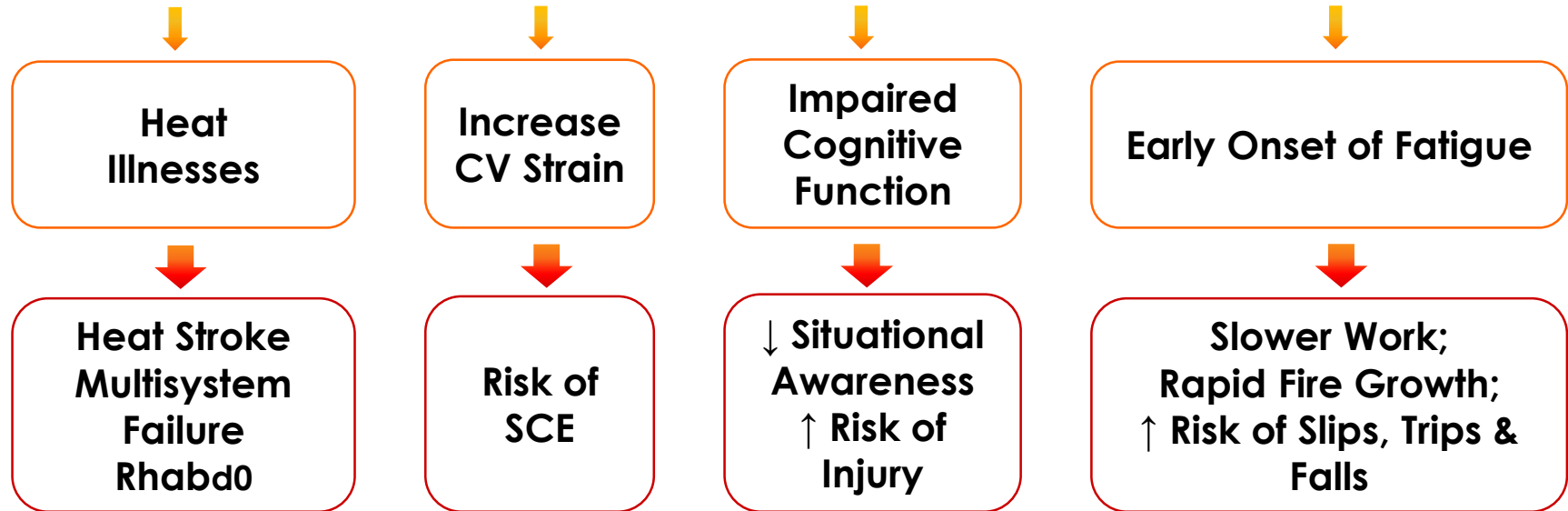
**A Aspects of Firefighting Work**



**B Heat Stress**



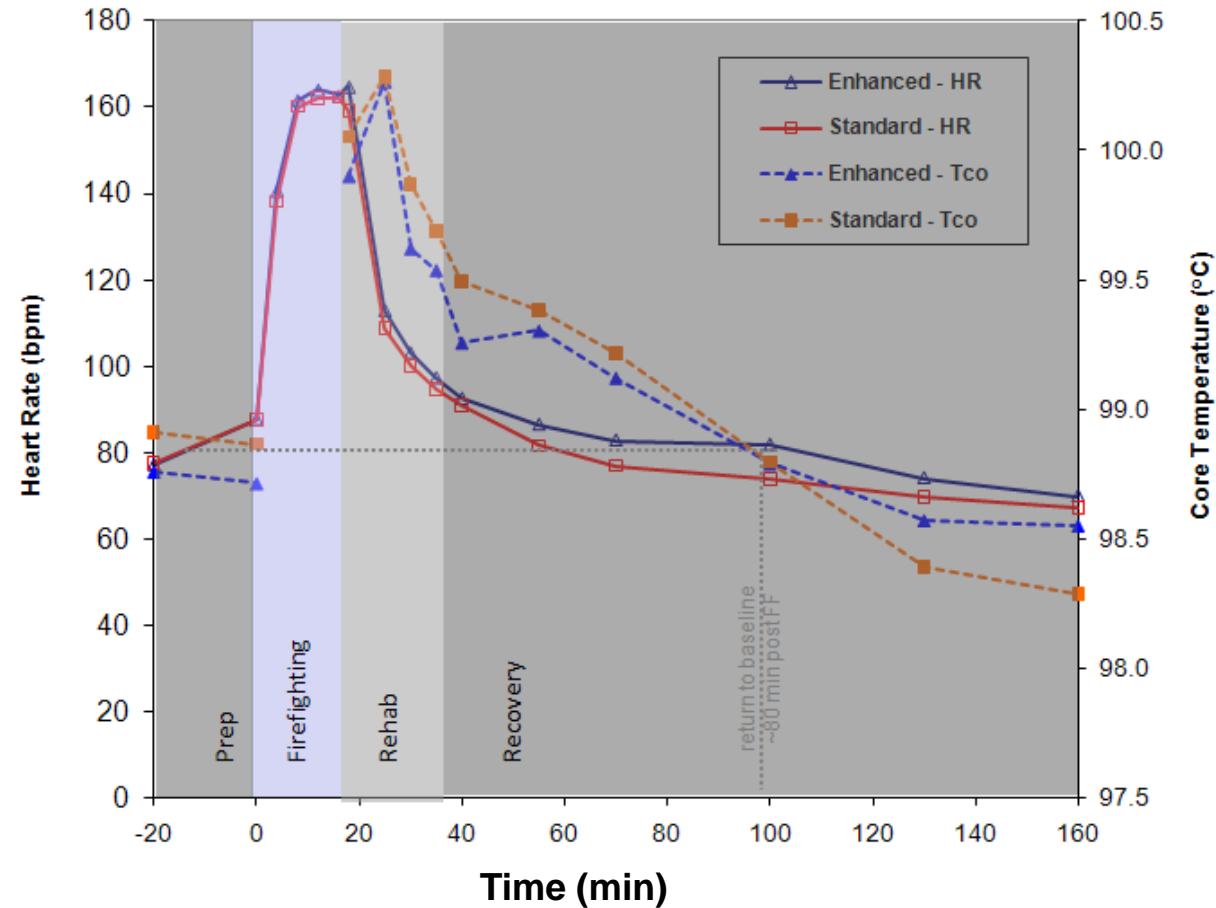
**C Physiological Consequences**



**D Life-Threatening Consequences**



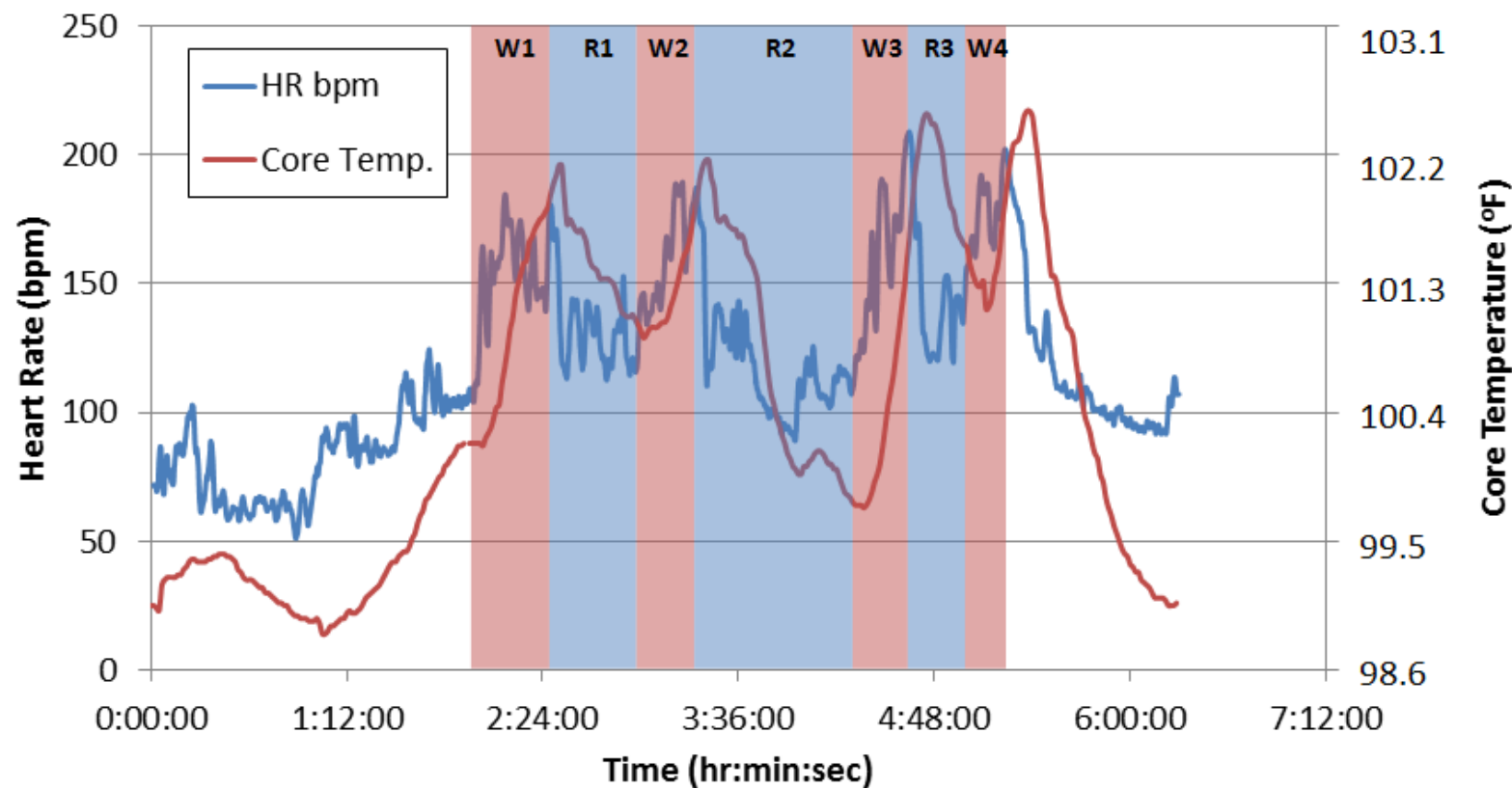
# Heart Rate and Core Temperature Recovery



Horn et al., *Prehospital Emergency Care*, 2011



# Core Temperature & Heart Rate



Horn et al.,  
*Ergonomics*, 2013

# Common Core Temperatures

