changes and 45% of the right-lane changes occurred during highway driving; the remainder occurred on non-highway roads (i.e., main surface and local roads). Analysis of variance results showed that road type, lane change direction and time of day all have significant impact ($p<0.05$ in each case) on drivers' maximum acceleration rate during lane changes. A significant lower maximum acceleration rate was observed when drivers were driving on highways when compared to driving on non-highways. This difference was more obvious during day time driving. Drivers had a higher value of maximum acceleration rate when making right lane changes than making left lane changes. The results of this study suggest that lane change maneuver is a multifactorial process, with implications for motor vehicle crash contributors. The study team is currently reviewing the findings, and will make recommendations for safer truck driving.

E4.3
Title: **Partnering with industry to build safe EMS work environments**
Author: Jim Green

This presentation will summarize the results from the NIOSH developed collaborative research program to improve ambulance crash safety. NIOSH worked hand-in-hand with the ambulance industry to create a family of component specific test standards or test methods aimed at improving the safety of workers and occupants while riding in the patient compartment of an ambulance. The component specific test standards cover; (1) ambulance crash response in frontal impact; (2) ambulance crash response in side impact; (3) ambulance crash response in rear impact; (4) seating and occupant restraints; (5) gurney and patient restraint; (6) equipment mounting, (7) patient compartment structural integrity, (8) gurney-to-floor structural integrity, (9) cabinet and drawer content retention, and (10) seated occupant excursion at impact.

Each test standard or test method is based on quantitative, science based research. Each meets or exceeds existing international standards. All have been validated using full scale test articles redesign and provided by the ambulance industry and its suppliers as a part of the collaborative research process. Each of these component specific test standards or methods has or will be published by the Society of Automotive Engineers (SAE). To date, the first six (6) have been published, while the remaining four (4) are in the SAE review process.

NIOSH is now utilizing these research results and published SAE documents to directly influence changes to four bumper-to-bumper standards now used, or intended for use, in the design of an ambulance. The targeted standard setting bodies and documents are: the General Services Administration's Federal Specification for the Star-of-Life Ambulance; the Ambulance Manufacturer's Division of the National Truck Equipment Association's Ambulance Standards, the National Fire Protection Association's 1917 Automotive Ambulance Standard and the Commission on Accreditation of Ambulance Services Ground Vehicle Standard for Ambulances (GVS 2015). The research team has secured the agreement and cooperation of each of these entities to work toward this common goal and has, as of 2014, provided input to, or directly published standards language with, each.

E4.4
Title: **Tracking the transfer of recommended technologies in high risk tasks of sheet metal workers**
Authors: Ann Marie Dale, Kim Miller, Ching-Ting Hwang, Bethany Gardner, Laura Welch, Bradley Evanoff

Objectives: Sheet metal workers are at high risk for developing musculoskeletal disorders, with one of the highest rates of overexertion injuries among all construction trades. The National Institute for Occupational Safety and Health held a stakeholder meeting to gather information about perceived risk of work tasks, availability of ergonomic controls, and perceived barriers to controlling hazards in sheet metal activities. Stakeholders created prioritized lists of problematic work tasks and recommended interventions for each task and published results in 2005. The objective of this study was to determine whether previously recommended voluntary control measures for high risk activities were being utilized during a sample of commercial heating, ventilating, and air conditioning installation projects.

Methods: Stakeholder groups identified six sheet metal work activities and associated tasks and assigned a risk level (high, moderate, low) and body region potentially affected, and suggested solutions to address the risk in each task. This framework was used to evaluate a series of case studies. Sixteen commercial sheet metal worksite assessments collected between 2007 and 2009 were reviewed. The reviewer determined whether the work methods used to perform each activity incorporated stakeholder-suggested solutions or novel solutions not previously described. The review included video analysis using the Multimedia-Video Task Analysis (MVTA) software, which assists with automating time studies of observable activities, to evaluate postures and time spent carrying loads.

Results: Videos were available for four primary sheet metal activities with high/moderate risk tasks including pack (move material), support system (install hangers), prep (assemble duct), and install ductwork/ equipment. Some stakeholder-suggested solutions were observed in each activity; workers commonly employed mechanical handling equipment to pack heavy objects.

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