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Work-related nonfatal injuries in Alaska's aviation industry, 2000–2013

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ABSTRACT

Aviation is a critical component of life in Alaska, connecting communities off the road system across the state. Crash-related fatalities in the state are well understood and many intervention efforts have been aimed at reducing aircraft crashes and resulting fatalities; however, nonfatal injuries among workers who perform aviation-related duties have not been studied in Alaska. This study aimed to characterize hospitalized nonfatal injuries among these workers using data from the Alaska Trauma Registry. During 2000–2013, 28 crash-related and 89 non-crash injuries were identified, spanning various occupational groups. Falls were a major cause of injuries, accounting for over half of non-crash injuries. Based on the study findings, aviation stakeholders should review existing policies and procedures regarding aircraft restraint systems, fall protection, and other injury prevention strategies. To supplement these findings, further study describing injuries that did not result in hospitalization is recommended.

1. Introduction

Aviation is a critical part of Alaskan life and a major contributor to Alaska's economy, generating approximately 47,000 on-site and off-site jobs, or about 10% of Alaskan employment (Northern Economics, 2009). Alaska's remote geography necessitates the use of air transportation to deliver people, food, cargo, and mail across the state. There are an estimated 3693 pilots certificated to fly commercially in the state (Federal Aviation Administration, 2015), flying roughly 835,000 h annually (Alaska Air Carriers Association, 2014). Pilots in Alaska face unique work-related risks when flying, including challenging terrain, unfavorable and quickly changing weather, and remote locations (National Transportation Safety Board, 1995). Furthermore, organizational pressures to fly in inclement weather or other potentially unsafe situations to sustain productivity and profits have been identified in Alaskan aviation operations (Bearman et al., 2009). Aircraft crashes have been consistently recognized as one of the leading causes of work-related fatalities in Alaska (Garrett and Conway, 1998; Lincoln et al., 2011). During 1990–2009, 35% of the nation's commuter and air taxi crashes and 20% of fatalities occurred in Alaska (National Institute for Occupational Safety and Health, 2015a).

Characteristics and risk factors associated with work-related aviation fatalities in the U.S. have been well-documented (Centers for Disease Control and Prevention, 2002; Centers for Disease Control and Prevention, 2011; Garrett and Conway, 1998; Garrett et al., 1998; Grabowski et al., 2005; Krebs et al., 1995; Wiant et al., 1991). Data for 2014 indicate that nationally, 82 aircraft pilots and flight engineers died from work-related injuries, resulting in a mortality rate of 64 deaths per 100,000 full-time equivalent workers (FTEs), over 19 times higher than the national average for all workers and only lower than the fatality rates for loggers and fishermen (Bureau of Labor Statistics, 2015b). To reduce the fatality rate in this high-risk industry, studies have analyzed pilot safety and factors influencing crash prevention and survival, with research in Alaska being no exception. As a result, although still high, the number and rate of crashes and work-related fatalities in Alaska has decreased (Mode et al., 2012).

According to the Bureau of Labor Statistics (2015a), approximately 452,700 people are employed in the air transportation industry nationwide. Occupations within the industry include aircraft mechanics, service technicians, pilots, flight engineers, ramp agents, and travel clerks (Bureau of Labor Statistics, 2015a). Nationally, workers in the air transportation industry experienced work-related nonfatal injuries and illnesses at a rate of 7.5 per 100 FTEs in 2013, more than twice the national rate for all workers (Bureau of Labor Statistics, 2015a).

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Studies of nonfatal injuries have highlighted the various work-related hazards and injuries experienced by aviation workers. Grabowski et al. (2005) analyzed data from the National Transportation Safety Board (NTSB) collected during 1983–2004 on major airlines, commuter air carriers, and air taxis, and reported a ground crew injury rate of 0.47 injuries per 1 million aircraft departures. Fatalities were most often the result of moving aircraft equipment (e.g., propellers), while nonfatal injuries occurred most often due to collisions with vehicles, including tugs, buses, and sweepers. Nearly two-thirds of injuries were classified as serious, meaning the worker was hospitalized for more than 48 h. These findings from Grabowski et al. (2005) highlight the hazardous work of ground crew workers. Additional studies have found that ground crew personnel, particularly baggage handlers, most commonly experience injuries from slips, trips, and falls and musculoskeletal injuries from overexertion and heavy lifting (Korkmaz et al., 2006; Ribak et al., 1995).

Research by Hobbs and Williamson (2002) found that thirty percent of aircraft maintenance workers reported sustaining at least one injury within the previous year. Skill-based errors, defined as those that occur while performing tasks of habit or routine, were identified as the leading predictor of injury (Hobbs and Williamson, 2002). According to Neitzel et al. (2008), aviation mechanics were found to be exposed to fall hazards while working on ladders, lifts, and the aircraft itself at heights ranging from 4 to 30 feet, and are sometimes noncompliant with fall protection standards.

Reported flight attendant injuries have been primarily due to turbulent conditions or emergency evacuations; however, in non-turbulent conditions, flight attendants were injured from slips, trips, and falls, or from pushing, pulling, or lifting during cabin service (Griffiths and Powell, 2012). McNeely et al. (2014) also explored the health of flight attendants. Results from a survey administered to flight attendants with two airlines in the U.S. found that, compared to the general population, flight attendants suffered more fatigue, depression, and other adverse health conditions (McNeely et al., 2014), which can impact safety and increase the risk of injury (Federal Aviation Administration, 2007).

Nonfatal injuries can have considerable negative effects on workers. The impacts on health status, medical costs, and productivity from nonfatal injuries can be substantial. For example, the Alaska Division of Workers' Compensation (2014) received over 19,000 reports of work-related injury and illness in 2013 and paid out $279.4 million in compensation benefits. In addition to significant financial burdens, nonfatal injuries can negatively affect the general well-being of the injured person and their social circle. A study by van der Sluis et al. (1998) documented long-term consequences of severe injuries that included changes in cognitive function, behavior, employment status, and participation in recreational activities.

In Alaska, occupational safety research and initiatives have historically concentrated on preventing fatal injuries. Consequently, relatively little is known about the nonfatal work-related injuries that occur in Alaska's aviation industry, particularly when not crash-related. A prior analysis of data from the Alaska Trauma Registry (ATR) collected during 1991–1995 showed that 69 work-related, nonfatal injuries occurred within the air transportation industry at an average annual rate of 0.19 injuries per 100 workers (Husberg et al., 1998). While this study identified high-risk industries for targeted safety recommendations, it did not provide an in-depth analysis of the types of injuries sustained by aviation workers, and did not differentiate crash-related injuries from non-crash injuries.

The main barrier to understanding the burden of nonfatal injuries within the Alaska aviation industry has been the difficulty of obtaining incidence data. The Alaska Occupational Injury Surveillance System (AOISS) is a database that has recorded all work-related fatalities that have occurred in the state since 1990, but it does not include nonfatal injuries (National Institute for Occupational Safety and Health, n.d.). Further, the NTSB has an accident database that is publicly available and contains information on injuries sustained while the aircraft is in flight, or with the intention to fly; however, this does not include injuries that occur while the aircraft engine is not running (e.g., maintenance, fueling) (Grabowski et al., 2005). The use of trauma registry data, as has been done previously, can offer insight into the most serious injuries that occur and require hospitalization, and to whom they occur. In addition, further detailed examination of these data, including the use of narrative fields, may enhance understanding of the work-related hazards faced by workers in the aviation industry.

The goal of this study was to support safety improvements for aviation workers in Alaska by determining the burden and nature of nonfatal injuries in Alaska's aviation industry that required hospitalization.

2. Materials and methods

2.1. Data source

Data for this study were obtained from the ATR. The registry is managed by the State of Alaska after receiving case data from acute care facilities in Alaska. To supplement employment information, a coding team from NIOSH separately coded the industry and occupation fields with North American Industry Classification System (NAICS) and Standard Occupation Classification (SOC) codes. The data analyzed in this study were from two datasets that contained patient and injury data from 1991 to 2009 and 2010–2013 respectively. The datasets were kept as two separate files for the duration of the study. The descriptive statistics in the study were calculated separately and merged after matching variables between the datasets.

2.2. Case definition

For this study, a case was defined as any nonfatal work-related traumatic injury resulting in hospitalization, sustained by a worker in the aviation industry, including aviation support services, throughout Alaska during 2000–2013. Patients who were noted as deceased in the dataset were excluded from the analysis. Workers could have experienced multiple injuries; however, only the primary and most severe injury was considered in the analysis. Aviation-related workers spanned a variety of industries and occupations as defined by existing classification mechanisms. The population of interest in the study included all workers that performed aviation-related duties, including preparing aircraft for departure, handling and loading bags, and performing aircraft maintenance. It has been estimated that about 20 workers are involved with a single flight, including dispatchers, gate agents, ramp agents, fuelers, and other employees (Fig. 1).

2.3. Case identification

The datasets were refined to include only cases that fit the case definition. First, cases were excluded if they were not identified as work-related, or resulted in a fatality as previously described. Next, census industry, census occupation, NAICS, and SOC codes present in the dataset were reviewed to identify any potential aviation-related codes. This process was meant to be extremely broad to reduce the chance of deleting cases. A list of aviation-related terms (e.g., hangar, aircraft, plane, pilot) was then developed and used to perform key word searches within the narrative fields of the datasets to capture additional potential cases. Cases that were a positive match for any of the key words were kept for further review to determine if they met the inclusion criteria for the study. A complete list of keywords and codes used for case identification can be found in Appendix A.

After the initial process of identifying potential cases, each case was manually reviewed. Two variables were added to the dataset: case (Yes, No) and confidence in making that determination (High, Medium, and Low). This process was repeated independently by two investigators to measure agreement in inclusion and exclusion classifications. Initial