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Patient acuity as a determinant of paramedics' frequency of being exposed to physically demanding work activities

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ABSTRACT

Background: The purpose of this investigation was to examine if paramedics' frequency of being exposed to highly physically demanding activities, or their perception of physical, clinical, and emotional demands were altered by patients' acuity level, operationalized using the Canadian Triage and Acuity Scale (CTAS).

Methods: Physical demands descriptions (PDD) were compiled from thirteen services across Canada. The observation sessions took place during a minimum of two full-shift (12-h) ride-outs at each service. Data were obtained from 53 ride-outs, which included a total of 190 calls.

Results: Higher urgency calls (CTAS level I or II) required significantly more stretcher handling, equipment handling, and intravenous (IV) work, also prompting higher ratings of perceived clinical, physical, and emotional demand. Independent of CTAS level, stretcher loading with patient (15.0%), horizontal patient transfer (13.7%), and pushing/pulling the stretcher with patient (13.1%) were identified as the most physically demanding tasks.

Conclusions: Patient acuity is an important determinant affecting the frequency for which paramedics are exposed to work tasks with inherent ergonomic hazards (e.g., handling a stretcher with a patient). Patient acuity also affects paramedics' perceived clinical, physical, and emotional demands of a call.

1. Introduction

Paramedics, who provide emergency care to many Canadians each year, are responsible for assessing a patient's condition and providing treatment in the pre-hospital setting (Ontario Ministry of Health and Long-Term Care, 2007). Treatments can include, but are not limited to: cardiopulmonary resuscitation; spinal immobilizations and, the administration of intravenous medications and oxygen. These actions, however, can expose paramedics to situations that often challenge their physical health, as indicated by the high prevalence of burnout and injury reported within the profession (Aasa et al., 2005; Hegg-Deloye et al., 2014; Maguire et al., 2005). Evidence suggests paramedics are seven times more likely to claim an injury than the average worker, where most injuries are directly attributable to the physical aspects of the job (Maguire et al., 2014). Further, the likelihood that a paramedic will suffer a musculoskeletal injury, particularly at the lower back, is increasing (Robert et al., 2015).

Paramedic work requires a combination of prolonged sedentary time while waiting for a call, followed by bouts of highly physical demands when responding to a call (Coffey et al., 2016; Gamble et al., 1991). Despite the high variability in the tasks performed for any given call, there are certain actions that are common and may also expose paramedics to physical ergonomic hazards. When responding to a call, paramedics are often required to perform stretcher and patient related lifting tasks requiring considerable trunk flexion, lateral bend, and twisting (Prairie and Corbeil, 2014), well-established physical ergonomic hazards associated with an increased likelihood of low back injury (Marras et al., 2006). Further, lifting patients from the floor to the stretcher and loading the stretcher into the ambulance can cause loading on the back that can exceed the National Institute for Occupational Safety and Health (NIOSH) action limit (Cooper and Ghassemieh, 2007; Lavender et al., 2000). Indeed, lifting and pushing stretchers and

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stair-chairs increase paramedic's likelihood of sustaining an injury to the low back and arms (Hignett, 2015). Furthermore, perhaps not surprisingly, paramedics also perceive loading/unloading the stretcher, carrying patient care equipment, and pushing/pulling the stretcher as the most physically demanding tasks (Coffey et al., 2016a,b). Mechanical exposures sustained by paramedics as they perform specific activities like loading the stretcher with a patient into the ambulance may directly affect the likelihood of a paramedic sustaining an injury. While ongoing initiatives explore opportunities to reduce the mechanical exposures associated with these tasks (Sommerich et al., 2015) and to explore opportunities to improve lifting strategies (Arial et al., 2014), it is also useful to better understand upstream factors that determine the frequency of paramedics' exposures to these higher risk work activities.

Patient acuity provides an upstream work organization-based factor that may affect the nature of patient care required when attending to a call, also affecting the frequency of being exposed to high demand activities. Emerging evidence demonstrates that paramedics are exposed to more trunk motion, and may even adopt alternative strategies when providing pre-hospital care in more urgent situations (Prairie and Corbeil, 2014). Considering these emerging data from a single paramedic service, it is useful to determine if these findings can be generalized to the broader paramedic sector. Additionally, identifying how patient acuity level affects paramedic's frequency of exposure to high demand work activities can inform injury prevention initiatives. For example, supplementary rest breaks could be introduced to those exposed to consecutive high acuity calls. Lastly, improving our understanding of upstream factors that influence exposure to high demand activities, and ultimately mechanical exposures on the body that have well established relationships with injury, may strengthen opportunities to develop better models to estimate key exposures such as cumulative low back load, over the course of a work period. Equipped with models that are more inclusive of organizational and mechanical factors, such as discrete event simulation (Rego-Monteil et al., 2016), we can more readily explore a range of possible intervention, selecting those that maximize performance, but minimize injury risks.

In Canada, at the point of contacting 9-1-1 the patients' acuity is assessed using the Canadian Triage and Acuity Scale (CTAS). CTAS is a tool that enables emergency departments to prioritize patient care requirements and ensures the patients most in need receive care first (Beveridge et al., 1998). CTAS I (resuscitation) and II (emergent) levels indicate the patient has a condition that is a threat or a potential threat to life, limb, or function. Most CTAS I patients are non-responsive with absent or unstable vital signs, whereas CTAS II conditions can include head injury, severe trauma, and chest pain. CTAS III (urgent) calls include conditions that could possibly progress to a serious problem requiring emergency intervention, such as moderate trauma, asthma, and gastrointestinal bleed. Lastly, CTAS IV (less urgent) and V (non-urgent) calls include conditions such as minor trauma, ear ache, back pain, and headache (Beveridge et al., 1998). Since exposure to physically demanding tasks are known to increase injury risks (Cooper and Ghassemieh, 2007; Lavender et al., 2000), it is important to determine if the frequency of exposure to physically demanding paramedic activities are affected by the CTAS level of a call. Current research suggests paramedics are more likely to adopt poor postures and use a greater range of trunk motions in more urgent situations (i.e., CTAS I or II), but findings vary based on the specific task being studied; current evidence is based on relatively small sample sizes (Doormaal et al., 1995; Prairie and Corbeil, 2014).

A number of studies have considered the relationship between paramedics' perceived ratings of demand and the actual demands faced. Findings suggest that paramedics' perceived workloads are generally in agreement with the objectively assessed workload (Doormaal et al., 1995). As such we also explore paramedics perceived ratings of demand; physical, clinical, and emotional to provide a surrogate and general measure of workload.

This study aimed to describe the typical physical demands exposure profile for a call and to determine if exposures to physically demanding activities were determined by patient acuity (using CTAS). Additionally, we aimed to gather paramedic's perceived ratings of clinical, physical, and emotional demand, further exploring to determine how patient acuity may affect their ratings.

2. Materials and methods

2.1. Study design

A descriptive cross-sectional study design was employed to address the study objectives. Within this design, a total of 57 full-shift (12-h) observations were documented from 13 paramedic services across Canada. This process allowed us to capture data from 237 unique calls, where observers focussed their analysis on one attending paramedic. All observations within a service were typically conducted within a one-month period, where efforts were made to observe both day and night shifts. The total duration of the study was approximately one year.

2.2. Population and setting

Thirteen paramedic services from across Canada agreed to participate in the study. To ensure a wide geographical and demographical representation of data, the services were located in both rural, suburban and metro areas, including services from the east, west and central regions of Canada. One to five active-duty paramedics, hereafter referred to as 'observers', from each participating service volunteered to learn how to conduct field observations and to gather the physical demands data. All observers completed at least two full-shift ride-outs, observing the attending paramedics as they performed their duties. Table 1 summarizes the number of shifts and calls documented within each service, along with the approximate call volume of each service. Specific details about participating services are not provided to maintain anonymity. Queen's and Wilfrid Laurier University's Research Ethics Boards approved the study, and all observers provided informed consent to participate and to act as the data-gathering agent.

2.3. Experimental protocol

The observers were trained to accurately identify physical demands and to quantify relevant aspects of each demand during a 6-h Physical Demands Description (PDD) workshop. The workshop was based on the Occupational Health Clinics for Ontario Workers Incorporated (OHCOW) PDD manual (OHCOW, 2014) where a similarly derived approach has previously been shown to be effective at preparing trainees to effectively observe and report on physical demand elements (Coffey et al., 2016). Following the training, observers documented physical demand elements in a standardized recording booklet developed and provided by the research team. The booklet included spaces to record details about specific physical demand elements including: stretcher handling, patient handling, patient assessment, equipment handling, etc. The observers were asked to record quantifiable measures associated with each physical demand element, such as distance travelled while carrying equipment, number of stairs climbed, and the duration for which certain postures were held (e.g., kneeling), in as much detail as possible. In addition observers were also asked to record basic call information (i.e., time of the call, dispatch code,