

# Acute Pain Characteristics in Patients with and without Chronic Pain following Lower Extremity Injury

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## ■ ABSTRACT:

Many patients with injuries to lower extremities report chronic pain. High pain intensity at time of admission for injury is a risk factor for chronic pain, but it is not clear whether specific acute pain patterns following injury influence the development of chronic pain. To examine the relationship between the pain trajectory, the mean pain score, and the frequency of pain documentation during the immediate hospitalization following injury, with the report of chronic pain. This was a descriptive, retrospective cohort study of adults admitted with lower extremity fractures to an academic urban trauma center. Participants, 6-45 months postinjury, rated their current pain, worst pain, and average pain over the last 3 months. Pain scores from hospitalization associated with the injury were obtained through a retrospective chart review. The pain trajectory, mean pain score, and frequency of pain documentation was compared between patients with and without chronic pain. A total of 129 patients were enrolled in this study and 78% reported chronic pain at the site of injury. The mean pain score (5.1 vs. 4.2) and first pain score (5.6 vs. 3.4) were higher for patients with chronic pain compared to patients with no chronic pain. Consistent with other studies, high pain intensity at time of injury was associated with chronic pain. The findings contribute valuable information about acute pain characteristics associated with chronic pain and provide insight into the importance of early and adequate acute pain treatment.

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Many patients with traumatic injuries (62%) report chronic pain, with patients with injuries to the lower extremities reporting a higher proportion of chronic pain compared to patients with injuries to other body sites (Jenewein et al., 2009; Williamson, Gabbe, Cameron, Edwards, & Richardson, 2009). While acute pain serves a protective function, chronic pain is thought to be without apparent biological value and persists beyond the normal tissue healing time, which usually lasts 3 months (International Association for the Study of Pain, 2003). The consequences of trauma-related, chronic pain are significant with patients reporting a high incidence of physical disability, work absence, and frequent health care visits (Jenewein et al., 2009). In addition, persons with post-trauma chronic pain report high levels of pain intensity, anxiety, and depression (Stålnacke, 2011), and a considerable number (87%) state that pain interferes with their daily activities (Clay et al., 2010).

Studies examining associations between chronic pain and any traumatic injury have identified a number of risk factors, including older age, untreated anxiety and/or depression, female sex, fewer years of education, and high pain intensity at time of admission (Clay, Watson, Newstead, & McClure, 2012; Holmes et al., 2010; Rivara et al., 2008). Of these risk factors, only pain intensity is amenable to immediate treatment at the time of traumatic injury. Pain intensity is a subjective experience defined as the magnitude or strength a person assigns a painful episode and is most frequently assessed using the numeric rating scale (NRS; The Joint Commission, 2011).

The Joint Commission (2011) advocates that pain be assessed and documented at regular intervals as an important step in determining whether the patient is in pain as well as gauging the effectiveness of treatment. The NRS is advantageous in that it allows the quantification of pain and can be used for statistical analysis. Pain intensity scores documented with the NRS during hospitalization immediately following traumatic injury (pain intensity at time of admission) have been used to classify patients into high and low acute pain categories by calculating the mean pain score from all of the pain scores collected (Holmes et al., 2010; Rivara et al., 2008). The time period the pain scores are collected varies from the first 24 hours of admission to the entire hospitalization, which can span several days. However, condensing all documented pain scores into one number results in the loss of valuable information regarding whether there is a change in pain during hospitalization (Chapman, Donaldson, Davis, & Bradshaw, 2011).

An alternative statistical method is to plot pain scores over time using growth curve modeling, which

allows for the examination of within-patient change that explores how the outcome changes over time for each patient and between-patient differences that examine which predictors are associated with certain patterns of change (Curran, Obeidat, & Losardo, 2011; Singer & Willett, 2003). This statistical analysis allows for the calculation of trends or trajectories that can then be used to determine the rate of change over time, and patients can be classified into three groups: (1) those whose pain improved over time, (2) those whose pain remained at a constant level, and (3) those whose pain increased over time (Chapman et al., 2011).

While the pain trajectory has been found to independently contribute to the prediction of chronic pain in patients following surgery (Althaus, Arránz Becker, & Neugebauer, 2014), the relationship of acute pain trajectories to chronic, injury-site pain following a lower extremity traumatic injury remains unclear. The purpose of this study was to examine the relationship between the pain trajectory, the mean pain score, and the frequency of pain documentation during hospitalization with the report of chronic pain in patients with lower extremity injuries (Griffioen, 2015). We hypothesized that the acute pain trajectory would predict chronic pain status.

## METHODS

### Design and Sample

The university and hospital institutional review board approved a Health Insurance Portability and Accountability Act waiver of consent for screening for this retrospective cohort study of adult patients (21 years of age and older). Patients had at least one trauma induced lower extremity fracture and were admitted to a large, academic, urban trauma center between July 2011 and June 2014. The Abbreviated Injury Scale (AIS) score for each injury was limited to 1-5 for lower extremities and less than 3 for other body systems to minimize confounding from serious injures to other body sites than lower extremities.

Patients were enrolled 3 months to 4 years after injury; 3 months was chosen as the minimum time since injury to fit the definition of chronic pain as pain that lasts past 3 months (International Association for the Study of Pain, 2012). Patients were excluded if they had a first listed diagnosis of hip fracture related to a fall from the same level, fractures at body sites other than the lower extremities, head injury, were mechanically ventilated, had an injury that resulted in an amputation, length of stay shorter than 24 hours, and/or were admitted more than 24 hours postinjury. The trauma registry was

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