Accident Analysis and Prevention 117 (2018) 32–39

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

The impact of opioid analgesic prescription uptake on the costs of recovery from injury: Evidence from compensable orthopaedic road trauma patients

Youjin Hahn[a], Gemma Tiernan[b], Janneke Berecki-Gisolf[c,*]

[a] School of Economics, Yonsei University. Postal address: 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, South Korea
[b] The Cube Group, Postal address: 7/136 Exhibition Street, Melbourne, VIC, 3000, Australia
[c] Accident Research Centre, Monash University, Postal address: MUARC, Building 70, 21 Alliance Lane, Monash University, Clayton, VIC, 3800, Australia

ARTICLE INFO

Keywords:
Road traffic injury
Injury burden
Compensation
Pain treatment

ABSTRACT

Long-term opioid prescribing after compensable orthopaedic injury may contribute to the 'long right tail' in the cost of recovery. The aim of this study was to estimate the effect of prescription opioid uptake on injury compensation cost, using orthopaedic road traffic injury claims data from Victoria, Australia. We used a maximum likelihood estimation that accounts for potential endogeneity associated with opioid uptake, utilizing information on the doctor's differential propensity to prescribe opioids when treating other compensable injury patients. Our results suggest that opioid recipients incurred significantly greater hospital costs, income compensation payments, and medical and paramedical expenses. Overall, income compensation was the primary driver of the claim cost difference between opioid recipients and non-recipients. The findings imply that there is scope to impose restrictions on long-term opioid usage, and to encourage the use of alternative pain relief medicines.

1. Introduction

Opioids are powerful analgesics prescribed to treat severe pain. Opioids are highly effective in the treatment of acute pain (Porter and Jick 1980, Macintyre et al. 2011); however, there is contention as to whether opioids are appropriate for the treatment of chronic pain (Ballantyne and Shin 2008). Systematic reviews of research regarding opioid use for chronic non-cancer pain have found little or no evidence to suggest that long-term opioid use reduces pain and improves functional status (Martell et al. 2007, Manchikanti and Singh 2008, Trescot et al. 2008, Kidner et al. 2009).

Despite this, opioid prescribing for chronic pain conditions has increased (Trescot et al. 2008). In the United States, chronic pain is the leading cause of disability, affecting an estimated 75 million people (National Center for Health Statistics 2006). In the US workforce, common pain conditions have been estimated to cost $61.2 billion per year due to lost productivity (Stewart et al. 2003). Given the economic and health impact of chronic pain, utilising potentially ineffective medicines to treat this condition may have considerable economic and public health consequences. Furthermore, misuse of prescription opioids in the United States has increased over the past two decades to reach what is now described as epidemic proportions (Skolnick 2018): in a national survey, an estimated 4.1% of adult Americans reported nonmedical prescription opioid use in 2012–2013 compared with 1.8% in 2001/2002 (Saha et al. 2016). In Australia between 2002 and 2009, annual opioid analgesic use increased from 13 to 16 defined daily dosages (DDD) per 1000 population per day (Hollingworth et al. 2015). In Victoria, Australia, prescription opioid use increased by 78% over the period 2006 to 2013; increases were most pronounced among older persons (Berecki-Gisolf et al. 2017). Adverse outcomes (deaths and hospital admissions) also increased in Victoria 2006–2014 but these were most common in the 24–44 year age group (Berecki-Gisolf et al. 2017). The prescription opioid trends in Australia are of concern, but have not resulted in a public health crisis as is currently observed in the United States.

A number of epidemiological studies have reported negative outcomes of opioid treatment for non-cancer pain. Webster et al. and Franklin et al. concluded that when covariates including injury severity were controlled for, early opioid use for acute low back claims was associated with longer disability duration (Webster et al. 2007, Franklin et al. 2008). Gross et al. reported an association between early opioids and delayed recovery, among injured workers claiming workers' compensation in Canada (Gross et al. 2009). Eriksen et al. assessed outcomes of opioid therapy for chronic non-cancer pain compared to a matched cohort of patients not receiving opioids (Eriksen et al. 2006). When demographic characteristics, concomitant use of anxiolytics and

* Corresponding author.
E-mail addresses: youjin.hahn@yonsei.ac.kr (Y. Hahn), gemma.tiernan@cubegroup.com.au (G. Tiernan), janneke.berecki-gisolf@monash.edu (J. Berecki-Gisolf).

https://doi.org/10.1016/j.aap.2018.03.032
Received 24 July 2017; Received in revised form 26 March 2018; Accepted 31 March 2018

antidepressants and pain intensity were controlled for, they found significant associations between opioid use and low levels of physical activity and employment, and high levels of healthcare utilisation. While outcomes associated with opioid use have been explored, less is known about the impact of opioid use on the comprehensive and direct cost of injury recovery. More importantly, the use of opioid analgesics may be endogenous to injury outcomes. If unobserved confounds are not accounted for, the estimate of opioid use on cost of recovery will be biased, even with a rich set of controls.

Our aim in this paper was to explore the impact of receiving opioid prescriptions on the costs of recovery after compensable injury, using key cost types including hospital, income compensation, medical and paramedical. It expands the knowledge generated in prior studies that reported on the association of opioid prescribing on medical and disability costs. While previous literature on opioid prescriptions focused on its effect on occupational chronic pain (Webster et al. 2007) and on the work disability of workers with back injuries (Franklin et al. 2008), this study focused on the effect opioid prescriptions received after orthopaedic transport injury and tracked its effect on the cost of recovery.

2. Materials and methods

2.1. Description of data

We analysed de-identified insurance claims and payment records collected by the Transport Accident Commission (TAC) in Victoria, Australia. The TAC was created by the Victorian Government in 1986 to provide road accident insurance. Victorians pay insurance premiums to the TAC as part of their annual motor vehicle registration. The TAC provides a 'no-fault' scheme: compensation is paid to people injured in a road traffic accident, regardless of who was at fault. The scheme covers income replacement, medical, rehabilitation and lifetime care costs relating to the transport injury. The initial AU $564 of medical expenses is not reimbursed by the scheme: a medical excess applies to medical and paramedical treatment costs. The medical excess does not apply to ambulance and hospital service costs; furthermore, it does not apply to patients who have been admitted to hospital. The Institute of Safety, Compensation and Recovery Research (ISCRR) hosts a de-identified research database, the Compensation Research Database (CRD), containing TAC claims and payments records. The CRD was used to conduct this research (Prang et al. 2016). Participant consent was not obtained as the records were de-identified. Ethics exemption (CF15/1099 – 2015000522**)** was granted by the Monash University Human Research Ethics Committee.

The TAC records demographic, accident and injury information for each claimant and claim, and the cost and description of each payment made. Age, gender, the claimant's role in the accident, their most serious injury, and the number of days they spent in hospital were recorded. Prescription drug payments contained an Australian Pharmaceutical Benefit Scheme (PBS) item code, which corresponds with a drug name, manner of administration, form and strength. A TAC-generated provider number recorded the healthcare professional who provided a given medical or paramedical service.

The TAC allocated each payment to one of 12 'benefit types'. The five major types for claimants who suffered fracture injuries were income, medical, paramedical, hospital and legal costs. 'Income' recorded income compensation for lost workdays, 'medical' recorded physician visits and surgery payments, 'hospital' referred to expenses incurred in hospital, 'paramedical' recorded rehabilitation expenses such as physiotherapy, and 'legal' recorded legal expenses. In our analysis, we focused on the first four types only as legal costs constitute only a very small portion of total claim payments. Within each payment type, each expense was then assigned a benefit category and code. There were some limitations placed on payments. For instance, income compensation was determined based on prior earnings, and was capped at a maximum threshold which was indexed annually in line with inflation. In 2010/2011 this amount was set at AU $1061 per week, which was roughly equivalent to full-time workers' average weekly earnings in Australia.

2.2. Selection of participants and study population

For this study, we selected TAC insurance claims with a road traffic crash dating between January 1 2007 and December 31, 2011. Adults (age ≥ 18 years at the time of the accident) with orthopaedic injury (bone fracture) as their most serious injury were included. This assessment of injury was made by the TAC during the claim lodgement process, but injury details were also provided by hospitals for hospital inpatients. Only those triaged into the TAC 'Recovery' claims management (those not expected to require long-term care) were included in this study: n = 15,940 over the five years.

Payments relating to claims were analysed over a two-year observation window (starting from the crash date). Loss of Earning Payments are payable for 18 months since the crash or injury manifestation: allowing for lags in onset of symptoms or disability, a two-year follow-up window was used to capture the majority of claim payments. In this timeframe, the TAC made 1,603,704 payments to the sample of injured claimants. Each of these payments was for the cost of a single service or product, such as a prescription medicine or a physiotherapy session. To account for differences in prices across the analysed time period, payments were adjusted for inflation using the Consumer Price Index (CPI); prices reported throughout this study are in Australian dollars indexed to June 2012 values.

2.3. Construction of variables

To identify opioid prescription payments, PBS codes were matched to corresponding Anatomical Therapeutic Chemical codes (ATC) (WHO Collaborating Centre for Drug Statistics Methodology). The ATC code for analgesics is 'N02' and 'N02A' for opioid analgesics. If a person received reimbursement for a prescription drug coded 'N02A' they were defined as having received opioids at least once over the course of their treatment. Thus, all prescriptions containing morphine sulphate, morphine hydrochloride, oxycodone, fentanyl, buprenorphine, tramadol or codeine were coded as 'opioid', regardless of the form, strength or dose of the medicine.

Two measures of claim duration were relevant to this analysis. Total claim duration was measured from the date of a claimant's crash to the date his or her final reimbursed product or service payment. As part of the de-identification process, only the month and year the crash occurred were supplied. To assign crash dates, we assumed every crash occurred on the first of each month. The duration of opioid prescription uptake was measured from the date of a claimant's accident to the date the claimant purchased his or her final (claimed) opioid prescription during the two-year observation window. Any opioid payments in the second half of the two-year observation windows were flagged as long-term opioid use. Chronic pain is usually defined as pain lasting longer than the time required for normal tissue healing, or about three to six months (Merskey 1974, Schaible and Richter 2004). A range of methods have been published identifying long-term opioid use, chronic opioid use and persistent opioid use (Von Korff et al. 2008, Boudreau et al. 2009, Svendsen et al. 2012, Yang et al. 2015). These mostly rely on a complete capture of all prescribed opioids: in the current study, the capture was incomplete due to the TAC medical excess; furthermore, opioids received during hospital stay are not captured. We therefore used a conservative definition of opioid prescription filling beyond one year after the accident as a marker for long-term opioid use: a similar approach was used in a workers' compensation study in Victoria, Australia (Berecki-Gisolf et al. 2014). Using this method, 542 claimants (5.2%) were identified as long-term opioid users.