Understanding Chronic Pain Following Injury – Epidemiological Perspectives

A/Prof Bamini Gopinath
John Walsh Centre for Rehabilitation Research
Overview of key points

1. Overview on importance of epidemiological research
2. Prevalence, economic impact and causes of chronic pain in Australia
3. Findings related to chronic pain from epidemiological studies of injury
4. Translating epidemiology into practice
The Need for Epidemiological Research

- Good epidemiological research on chronic pain provides important information on prevalence and risk factors.

- Inform our clinical management, limiting severity, and minimising disability.

- Allows development of healthcare strategies to reduce the burden of chronic pain.
It is the study of communities with chronic pain, rather than individuals, that will give insight into its distribution and determinants.

Chronic pain in an individual may have a single primary cause (e.g. injury), but many factors can influence the duration, intensity and spectrum of the effects of chronic pain.
Chronic Pain Contributes to Disease Burden

- Strong argument that recent estimates of global burden of disease have underestimated the contribution of chronic pain.

- By 2030, the WHO predicts that the 4 leading contributors of global burden of disease:
  - unipolar depression
  - coronary heart disease
  - cerebrovascular disease
  - road traffic accidents

- Chronic pain is an important co-morbidity associated with all of these diseases.
Overview of key points

1. Importance of Epidemiological Research

2. Prevalence, economic impact and causes of chronic pain in Australia

3. Findings related to chronic pain from epidemiological studies of injury

4. Translating epidemiology into practice
Prevalence of chronic pain is projected to increase as Australia’s population ages – from around **3.2 million Australians in 2007 to 5.0 million by 2050.**
The total cost of chronic pain in 2007 was estimated at $34.3 billion – or $10,847 per person with chronic pain.
## Causes of Chronic Pain

<table>
<thead>
<tr>
<th>Preceding Event</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>38</td>
</tr>
<tr>
<td>Sports injury</td>
<td>13</td>
</tr>
<tr>
<td>Work accident</td>
<td>4</td>
</tr>
<tr>
<td>Car Accident</td>
<td>8</td>
</tr>
<tr>
<td>Home Accident</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
</tr>
<tr>
<td>Health problem</td>
<td>29</td>
</tr>
<tr>
<td>Illness</td>
<td>11</td>
</tr>
<tr>
<td>Work-related (not involving an accident)</td>
<td>9</td>
</tr>
<tr>
<td>Other health problems</td>
<td>8</td>
</tr>
<tr>
<td>No clear reason/ don’t know</td>
<td>32</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1</td>
</tr>
</tbody>
</table>
Socio-demographic factors

- Female gender
  - Women consistently report lower pain tolerance
- Older age
  - Frequency of disabling chronic pain increases with age
- Lower socio-economic status
  - Chronic pain prevalence is inversely related to SES
- Employment status and occupational factors
  - Influenced by demands, expectations, control and fear of re-injury at work
Clinical and psychological factors

- Pain
  - Acute/chronic pain at a different site is a key risk factor
- Mental health
  - Anxiety, depression, and catastrophizing beliefs about pain are associated factors
- Multi-morbidity
  - Chronic pain more common among those with other chronic diseases than those without
- Genetic risk factors and heritability
  - Chronic pain conditions ‘run in families’
Overview of key points

1. Importance of Epidemiological Research

2. Prevalence, economic impact and causes of chronic pain in Australia

3. Findings related to chronic pain from epidemiological studies of injury by the JWCRR

4. Translating epidemiology into practice
Chronic pain after injury

- Persistent pain after a minor road traffic collision is common and a costly public health problem.

- Whiplash-associated disorders are typical road-traffic crash related pain disorders.

- A range of psychosocial factors are likely to negatively influence long-term levels of pain intensity.

- Lack of cohort studies that have examined a wide range of correlates associated with persistent pain outcomes.
Phase 1 Study

- Inception cohort of adults who had sustained mild/moderate injuries in motor vehicle crashes in NSW

- Recruited from the NSW Personal Injury Register database
  - Baseline (n=364)
  - 12 months (n=284)
  - 24 months (n=252)

- Establish the health and work status of claimants in the NSW Compulsory Third Party (CTP) motor accident scheme
ORIGINAL ARTICLE

Presence and predictors of persistent pain among persons who sustained an injury in a road traffic crash

B. Gopinath¹,², J. Jagnoor¹, M. Nicholas³, F. Blyth³,⁴, I.A. Harris⁵, P. Casey¹, I.D. Cameron¹

1 John Walsh Centre for Rehabilitation Studies, Sydney Medical School, University of Sydney, Australia
2 Centre for Vision Research, Department of Ophthalmology and Westmead Millennium Institute, University of Sydney, Australia
3 Pain Management Research Institute, Sydney Medical School, University of Sydney, Australia
4 School of Public Health, University of Sydney, Australia
5 South Western Sydney Clinical School, University of New South Wales, Liverpool Hospital, Australia

Correspondence
Bamini Gopinath
E-mail: bamini.gopinath@sydney.edu.au

Abstract

Background: There is a paucity of prospective studies with long follow-up that have examined a wide range of correlates associated with persistent pain outcomes in persons who sustained a mild or moderate injury in a road traffic crash. This study aimed to establish the independent predictors of pain severity over 24 months.

Funding sources
The study is funded by the Motor Accidents Authority of New South Wales.
Outcome and Predictor Measures

- Pain severity numeric rating scale (NRS) of 0 - 10

- Potential predictors of persistent pain
  - Socio-economic – age, sex, occupation type, education level
  - Health status – weight status, quality of life (SF-12), injury severity, whiplash, fracture, EQ-5D, and pre-injury health, illness and chronic pain
  - Pain-Related Self-Statements Scale-Catastrophizing Subscale (PRSS-Catastrophizing) and Orebro Musculoskeletal Pain Screening Questionnaire (OMPSQ)
  - Others – hospital admission, liability status
Phase 1 Results

- Mean (±SE) NRS scores at baseline, 12- and 24-month follow-up were: 5.3 (±0.13); 5.1 (±0.17); and 4.5 (±0.20), respectively.

- Correlates as significantly associated with higher mean NRS scores at 12 months:
  - Older age (45+ years)
  - No tertiary qualifications
  - Underweight status
  - Self-perceived fair/ poor pre-injury health
  - Pre-injury chronic illness and pain
  - Whiplash
## Phase 1 pain data

<table>
<thead>
<tr>
<th>Predictors at first assessment</th>
<th>Pain NRS at 12 months, $\beta$ (95% CI)</th>
<th>Pain NRS at 24 months, $\beta$ (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-12 PCS (per 1-SD increase)</td>
<td>-0.73 (-1.18, -0.28)</td>
<td>-1.11 (-1.67, -0.54)</td>
</tr>
<tr>
<td>$P$-value</td>
<td>0.002</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>EQ-5D VAS (per 1-SD increase)</td>
<td>-0.30 (-0.68, 0.08)</td>
<td>-0.45 (-0.90, 0.01)</td>
</tr>
<tr>
<td>$P$-value</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>PRSS-Catastrophizing (per unit increase)</td>
<td>0.54 (0.22, 0.86)</td>
<td>0.43 (0.04, 0.82)</td>
</tr>
<tr>
<td>$P$-value</td>
<td>0.001</td>
<td>0.03</td>
</tr>
<tr>
<td>OMPSQ score (per unit increase)</td>
<td>0.05 (0.04, 0.07)</td>
<td>0.06 (0.04, 0.07)</td>
</tr>
<tr>
<td>$P$-value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

PCS – Physical Component Score; VAS – Visual Analogue Scale; OMPSQ - Orebro Musculoskeletal Pain Screening Questionnaire; PRSS - Pain-Related Self-Statements Scale-Catastrophizing Subscale.
Summary of key findings

- Average NRS score of 4.5 at 24 months indicates persistent pain or non-recovery

- Multiple psychosocial factors are likely to have a negative, cumulative effect on long-term levels of pain intensity

- Pain catastrophizing and risk of developing work disability due to pain (i.e. OMPSQ scores) were key determinants

- SF-12 PCS at baseline predicted persistent pain over 24 months
Explanation of associations

- OMPSQ has moderate predictive ability in identifying persons at risk of developing chronic pain.

- Catastrophizing could influence pain intensity through appraisal or coping processes.

- Physical symptoms and resulting functional impairment due to the injury could increase the risk of psychological sequelae e.g. fear-avoidance symptoms of persistent pain.

- Persistent pain was not only determined by various health dimensions at the time of onset but also by the ‘premorbid’ state.
Phase 1 study implications

- Persistent pain or non-recovery was observed 24 months later

- Injury severity score was not an independent predictor of persistent pain

- Intervention strategies may need to focus on ‘holistic approach’ to managing pain outcomes

- Self-rated health indices could be useful screening tools to detect those at risk of persistent pain
Impact of pain on quality of life

- The adverse impact of chronic pain on subsequent quality of life outcomes has been well documented.

- Each 1-unit increase in pain NRS scores associated with:
  - 1.3-unit decrease in SF-12 PCS (physical functioning) 24 months later (p <0.001)
  - 1.0-unit decrease in SF-12 MCS (mental wellbeing) 24 months later (p=0.001)

- Pain is an independent predictor of QOL outcomes following mild to moderate injuries.
Pain severity influences claim settlement

- Duration between the crash date and claim settlement date, and categorized into:
  - <12 (early), 12-24 (medium) and >24 months (late)
  - 54%, 17% and 30% settled at <12, 12-24 and >24 months, respectively

<table>
<thead>
<tr>
<th></th>
<th>Time to claim closure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-12 months M Mean (SD)</td>
</tr>
<tr>
<td>Baseline pain NRS</td>
<td>4.45 (2.60)</td>
</tr>
</tbody>
</table>

- Minimising the severity of pain could reduce claim duration and claim costs
FISH Study

- Factors Influencing Social and Health Outcomes (FISH) after Land Transport Injury

- Cohort will be recruited from multiple settings within NSW (ED, GPs, insurance regulator database, police records)

- Surveyed at baseline (28 days within crash), 6, 12 and 24 months

- A wide range of demographic, pre-injury, injury characteristics, compensable status and fault status factors will be collected
Bicyclists versus motor vehicle users

- FISH data showed that cyclists had higher QOL scores and healthier lifestyle patterns.
- Evidence suggests that cyclists recover more readily than other road user groups.

<table>
<thead>
<tr>
<th>Pain NRS, mean (SE)</th>
<th>Type of road user</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicyclists</td>
<td>Car drivers/passengers</td>
<td></td>
</tr>
<tr>
<td>Baseline 4.13 (0.16)</td>
<td>4.82 (0.13)</td>
<td>0.001</td>
</tr>
<tr>
<td>6-month follow-up 1.54 (0.16)</td>
<td>2.45 (0.13)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
Factors associated with pain severity

- In cyclists, education level was associated with pain scores
  - Those with tertiary qualifications had the lowest pain ratings at 6 month follow-up
- Cyclists with pre-injury chronic illnesses had higher pain severity ratings at 6 months
- Being in hospital for >12 hours after the injury was significantly associated with higher pain scores at 6 months
- OMPSQ scores positively associated with greater pain severity ratings over 6 months
Overview of key points

1. Importance of Epidemiological Research

2. Prevalence, economic impact and causes of chronic pain in Australia

3. Findings related to chronic pain from epidemiological studies of injury

4. Translating epidemiology into practice
Translating Epidemiology into Practice

- Data from longitudinal epidemiological studies may hold promise of novel approaches to pain consultations and assessment following injury.

- Identify people at higher risk of chronic pain early; and consider targeted early intervention.

- Record self-rated health indices of people injured in motor vehicle crashes routinely.

- The need for a multidisciplinary approach to treatment of pain.
Take home messages

- Existence of individual- and population-level risk factors for onset or persistence of pain - opportunities for intervention exist at more than one level

- Biopsychosocial factors associated with chronic pain after injury are important in identifying, designing, and targeting relevant interventions

- Current research needs to integrate this epidemiological research towards the prevention and management of chronic pain
Acknowledgments

Phase 1 Investigators

- Ian Cameron, Chris Maher, Alex Collie, Michael Nicholas, Ian Harris, Luke Connelly, Nick Bellamy, Fiona Blyth, Sarah Derrett, Justin Kenardy, Maria Crotty, Darnel Murgatroyd, Petrina Casey

Research staff

- Keri Lockwood, Annelies De Wolf, Areen Kayaian, Margaret Mathers

State Insurance Regulatory Authority

- David Andrews, Tina Bidese, Jacquelin Capell, Phuong Dao

FISH investigators

Ian Cameron, Jagnoor Jagnoor, Sarah Derrett, Rebecca Ivers, Fiona Blyth, Belinda Gabe, Alex Collie, Chris Maher, Michael Nicholas, Genevieve Grant, Sarah Derrett, Justin Kenardy, Michael Dinh, Soufiane Boufous.

- Funded by the NSW SIRA

- We acknowledge the assistance of people with injuries in conducting this study
KEEP CALM AND CALL THE EPIDEMIOLOGIST

© 2013 KeepCalmStudio.com