

Analysing Service Trajectory of Claims to Investigate Compensation Outcomes of Claims with Elective Surgeries

[Compensation Outcomes of Claims with Elective Surgeries]

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13 June 2015

Research report #: 131.1-0515-R01

Accompanying documents to this report (10pt)

Title	Report number
Presentation 1: Elective Surgeries – 11 Cases	131.1-0515-P01
Presentation 2: Elective Surgeries – Common Law and Impairment Benefits	131.1-0515-P02
Presentation 3: Elective Surgeries – IPT and SF	131.1-0515-P03

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This research report was prepared by Behrooz Hassani-Mahmooei and Samantha Barker, Institute for Safety, Compensation and Recovery Research for Health and Disability Strategy Group and WorkSafe Victoria.

Acknowledgements

The help, advice and comments received from Kyle Jones, Lauren Roberts, Justin Gillick, Catherine Roberts, Tehn Chin and Tina Lim-Chin as well as Lee Hatherell, Khic-houy Prang, and Adrian Buzgau are acknowledged and appreciated.

ISCRR is a joint initiative of WorkSafe Victoria, the Transport Accident Commission and Monash University. The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of WorkSafe Victoria or ISCRR.

Table of Contents

Key messages.....	1
Purpose & Rationale	2
Methods	2
Results: Phase 1	5
Results: Phase 2	9
Implantable Pain Therapy	9
Spinal Fusion	13
Conclusions, Limitations and Suggestions	17

Key messages

The aim of this study was to investigate the effectiveness of elected surgeries on the outcomes of WorkSafe claims in terms of return to work, physical and mental health and management of pain. Analysis was conducted using WorkSafe data from ISCRR's Compensation Research Database (CRD).

Evidence from this project shows the impact of elective surgeries on the claim journey is mixed; some surgeries are followed by significant improvement in the client's health, while some others have limited or no impact across different compensation health service use categories.

In summary, Hernia, Knee Reconstruction, Knee Replacement, Shoulder Repair, and Knee Arthroscopy surgeries seem to have a positive impact on the client's mental and physical health, as well as facilitating return to work and management of pain.

On the other hand, for Spinal Fusion and Implantable Pain Therapy, the surgery are only followed by lower levels of physical treatment service use and partial incapacity, but the impact on return to work for clients with total incapacity, pain management, and mental health were either minor or insignificant.

The report suggest further investigation using matched cohorts to explore the differences in outcomes between clients that have received the surgery and clients that have not. Also, some findings, such as trends in opioid intake, should be interpreted carefully and take into account the limitations of the data which are known to the schemes.

Purpose & Rationale

The Health and Disability Strategy Group (HDSG) requested ISCRR to conduct this research to investigate the impact of specific surgeries on the claim journey and client outcomes.

There were two phases to this research project. Phase 1 focused mainly on the potential application of the administrative data in investigating the role of surgery in recovery. Phase two aimed to answer specific questions about two specific surgery types: Implantable Pain Therapy and Spinal Fusion.

The results are expected to be used to better understand how the available administrative data can be used to investigate changes in service use dynamics before and after elective surgeries - for example, how the timing of surgery alongside the characteristics of the claim (such as age of the claimant or type of injury) may lead to better management of the claims as well as providing early insight into future planning and resource allocation to claims which receive surgical services from the selected elective surgery groups.

Methods

The study analysed WorkSafe Victoria data from the Compensation Research Database (CRD) housed at ISCRR. Analyses were undertaken on eleven pre-defined surgery categories, as agreed with WorkSafe, with consideration to: surgery cost, accident-surgery time gap, client numbers, costs and access to compensation, treatment and medication before and after surgery, surgery recurrence rates, and some stratified results based on claimant and injury characteristics.

The eleven pre-defined surgeries included in the analysis were:

- Shoulder Repair
- Shoulder Replacement
- Knee Arthroscopy

- Knee Replacement
- Knee Reconstruction
- Spinal Non-Fusion
- Spinal Fusion (SF)
- Implantable Pain Therapy (IPT)
- Hernia
- RFD Neurotomy
- Carpal Tunnel

The Medicare items for each of the above surgeries are listed below in Table 1.

Table 1: Medicare items included in each surgery category

Surgical Category	MBS Items							
Shoulder Repair	48951	48960	48909	48906	48954	48957	48948	48933
Shoulder Replacement	48921	48915	48924					
Knee Arthroscopy	49561	49562	49560					
Knee Replacement	49518	49521	49517	49533	49530			
Knee Reconstruction	49542	49539						
Spinal Non-Fusion	40301	40303	40300	40306				
Spinal Fusion (SF)	48684	48687	48654	48657	48660	48663	48666	48669
Implantable Pain Therapy (IPT)	39134	39126						
Hernia	30609	30614	30405	30403	30468	30238	30600	
RFD/Neurotomy (RFDN)	39118	39323						
Carpal Tunnel	39331							

The first phase of the project included all claims with an injury date between January 1st 2008 and December 30th 2011, which had at least one elective surgery listed in Table 1 between January 1st 2010 and December 30th 2011. This ensured at least two years of pre- and post-surgery information for every claimant was available. Claims that had received any common law or impairment benefits were excluded.

The focus of the analysis was on the first elective surgery, so for clients who had multiple surgeries from one surgical category, only the first surgery was considered as the reference point to determine service use before and after surgery. If a client had two surgeries from two separate categories, then each is treated as a separate surgery. The final sample size had 6175 claims, for 6101 clients. There was a total of 12,403 Medicare items across 45 procedure types.

For the second phase of the project, which focused on IPT and spinal fusion only, the injury date interval was extended to January 1st 2006 and December 30th 2011, so more claims could be included in the analysis. Also, claims with common law or impairment benefit payments were included in the analysis.

In both project phases, four compensation outcomes were measured for each client, including:

- Return to Work: measured using weekly income compensation received. The payments are categorised as: 1) Any payment, 2) Only Type 1, and 3) Only Types 2 and 3.
- Physical Health: measured using the physical treatment service use of PHYSIOTHERAPY, CHIROPRACTOR, OSTEOPATHY
- Mental Health measured using the mental health service use of PSYCHOLOGY and PSYCHIATRY
- Pain: measured using the intake of opioid analgesia

Moreover, two main time intervals are investigated: 1) The gap between the date of injury and the date of first surgery and 2) the gap between the day of first surgery and the last payment of any type.

Results: Phase 1

Table 2 presents the frequency, median age, and gender composition for the selected surgery categories. The last two rows provide the similar indicators for all the claims with at least one elective surgery as well as all claims between January 1st 2008 and December 30th 2011.

Table 2: Age and Gender for claims with elective surgeries

	N of Claims included	Median Age	Male/All
Shoulder Repair	1,636	48.32	69%
Shoulder Replacement *	6	56.17	67%
Knee Arthroscopy	2,462	46.04	76%
Knee Replacement	103	55.24	71%
Knee Reconstruction	238	35.27	79%
Spinal Non-Fusion	354	45.30	72%
Spinal Fusion	120	47.03	72%
Implantable Pain Therapy *	6	37.67	50%
Hernia	1,128	46.76	97%
RDFN	51	43.73	53%
Carpal Tunnel	353	45.98	56%
All claims with elective surgery	6,175	46.44	77%
All claims in the period	57,839	42.71	62%

** The results for Shoulder Replacement and IPT should be interpreted with caution as there were only 6 claims in each category.*

Figure 1 presents the gap measured between the date of injury and the date of first elective surgery in number of days. As the figure shows, there are clear differences between the categories. Some, such as IPT and RFDN, are offered much later in the lifetime of a claim compared to Hernia and Knee Reconstruction. The smaller than expected gap between injury and surgery date in cases such as Spinal Fusion is due to the fact that some of the Medicare items included in these categories are offered in the acute setting.

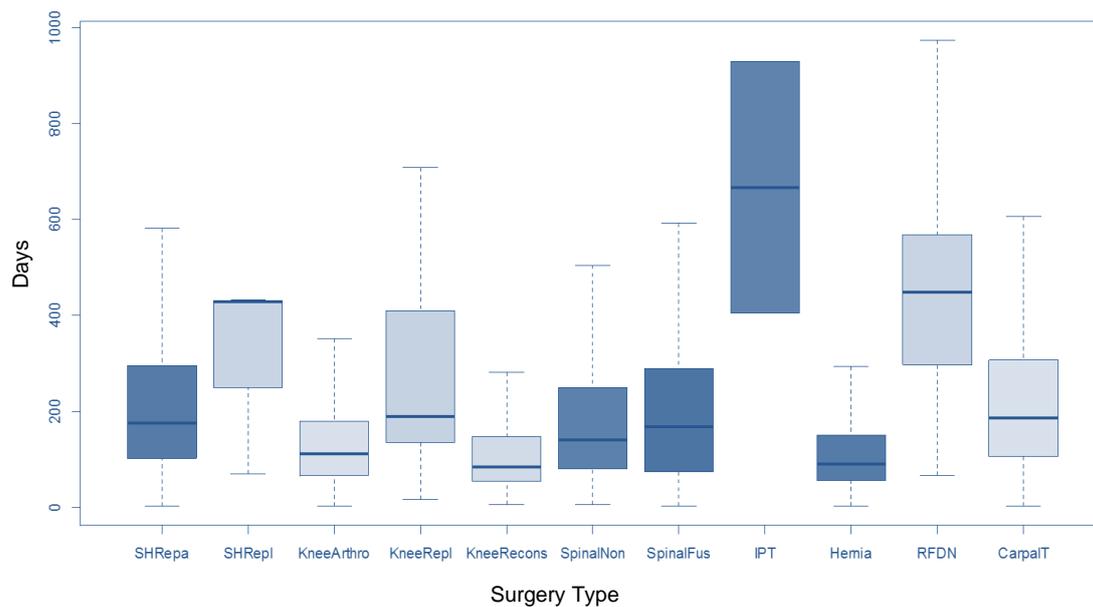


Figure 1: Distribution of gap measured between the date of injury and the date of first elective surgery in number of days across all surgery categories

Figure 2 over the page presents the number of mental health services received by clients per week from 54 weeks before the surgery to 60 weeks post-surgery. As the figure shows, mental health service use started to drop significantly three months after the elective surgeries.

Figure 3 over the page shows the use of physical treatments by clients who had a Shoulder Repair surgery. As the figure shows, service use peaks 12 weeks before the surgery, then decreases just before the surgery is conducted, remains unchanged until 12 weeks post surgery, and then consistently decreases. The results are presented for one specific type of surgery only, to showcase the dynamics of service use but the analyses are replicable for all other surgery categories.

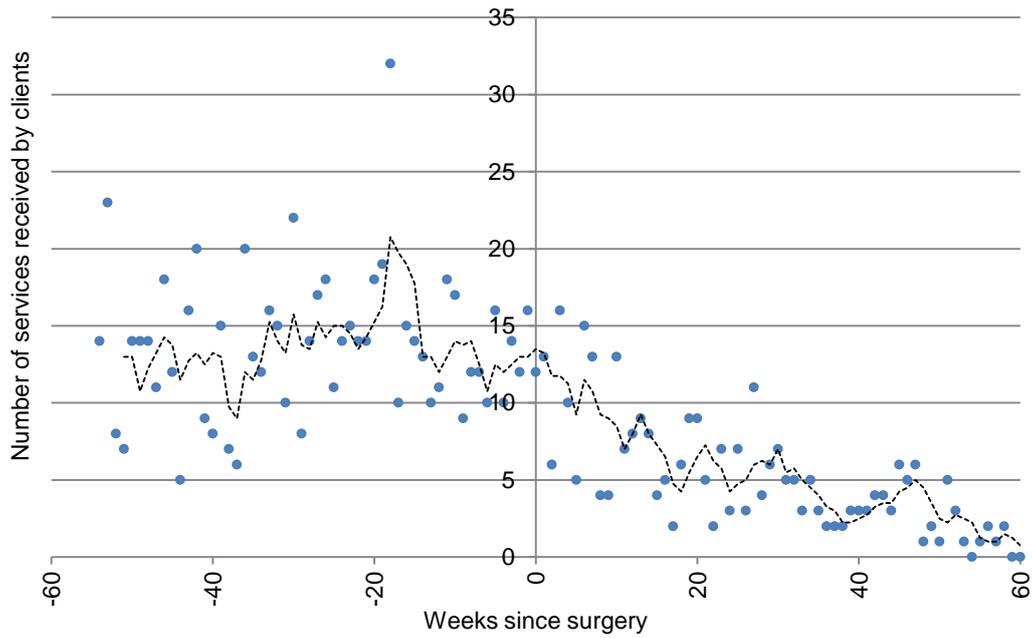


Figure 2: Numbers of mental health services received by clients per week for all surgery types. Dotted line shows 4-week moving average.

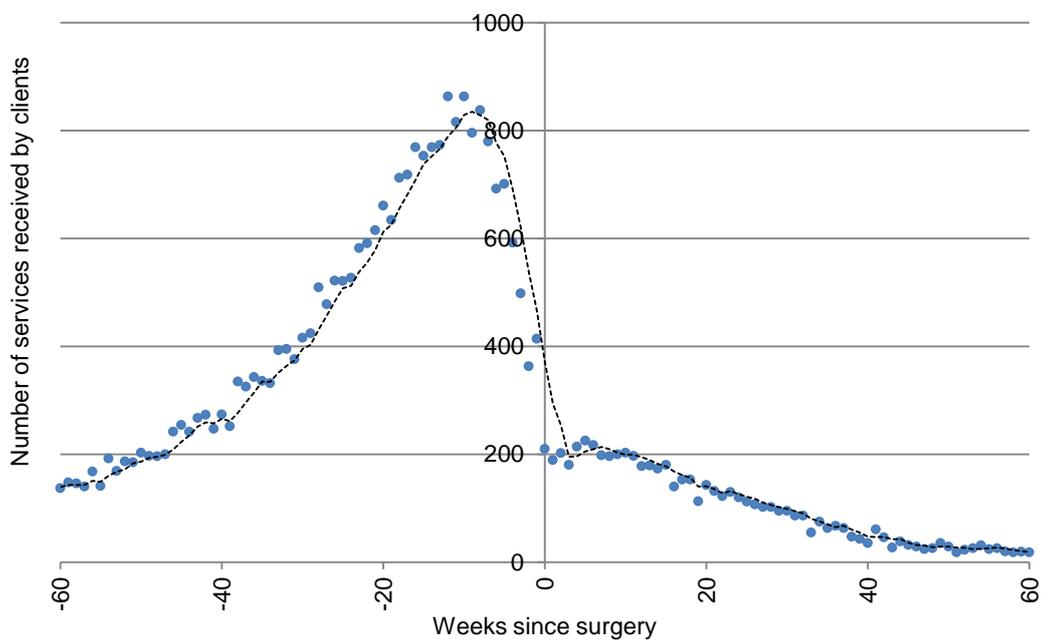


Figure 3: Use of physical treatments for clients who had at least one Shoulder Repair procedure. Dotted line shows 4-week moving average.

Overall, the first phase of the project highlighted the advantages and challenges of using claim payment data to study outcomes following elective surgery. More specifically it was concluded that:

- The available scheme administrative data has great potential to be used to measure the effectiveness of surgery by using the trajectory of service utilization as a proxy for claim outcomes.
- There is substantial variation in the amount of clients who receive different types of surgeries, and also the client recovery journey before their surgery is highly variable. One main challenge during the data analysis was therefore preparing a homogenous sample to ensure that any observed impact of surgery can be confidently attributed to the surgery and not to other types of benefits or services, such as a common law or impairment payment.
- While use of Medicare items provides a credible way of identifying the procedures, it may be misleading as to the circumstances of the surgery, e.g. whether the surgery is offered in the acute setting or not. For future work the knowledge of HDSG as well as expert medical opinion (e.g. surgeons) will be crucial to ensure forming the right client sample based on the type of procedure as well as analysing the data and interpreting the results.
- Health service utilisation after surgery varies according to the type of surgery. In some cases, such as Hernia, Knee Reconstruction, Knee Replacement, Shoulder Repair, and Knee Arthroscopy, surgeries seem to be associated with an improvement in both client mental and physical health, as well as return to work and management of pain. In others, the evidence is mixed and effectiveness of the service is likely to depend on who is receiving the service, when the service is provided and the potential interaction between the surgery and other types of benefits a client may receive.

Phase 1 of the project concluded with one clear message – there is great opportunity to utilise the available the data to measure client outcomes following elective surgery, and the opportunity to design, develop and undertake research in this area would be invaluable.

Results: Phase 2

Following discussion of results from Phase 1 on claim outcomes following surgery, HDSG expressed interest in learning more about the dynamics of claims and payments for two specific types of surgeries - IPT and Spinal Fusion. This analysis also utilised data available in the CRD. This section presents the results for the second phase of the study.

Implantable Pain Therapy

For IPT Medicare items 39134¹ (NEUROSTIMULATOR or RECEIVER) and 39126² (INFUSION PUMP) were included in the analysis.

The main characteristics of the sample are presented in Table 3 on the next page. Overall, 27 claims for 27 clients with total of 41 Medicare items were included. In this phase, clients who received common law or impairment benefits are included. Almost two-thirds of the sample (62%) had a musculoskeletal injury, 70% were working full time before getting injured, and 55% were female.

The total cost of these claims by end of 2014 was \$14.3 million, 27% of which was the cost of weekly compensation (\$3.8 million), and 31% paid as lump sums (\$4.5 million). Only 14% of clients had returned to work (based on the 'resumed work date' within the data), 89% reached 104 weeks of income benefits (may or may not have returned to work), 14 have at least one common law related payment, and six are labelled as 'Common Law Completed'.

The minimum gap between the injury and surgery is 404 days, with an average (median) of 1163 days (~3.2 years) - three-quarters of clients receiving IPT surgery 116 weeks post injury, half received it 181 weeks post injury..

¹ NEUROSTIMULATOR or RECEIVER = subcutaneous placement of, including placement and connection of extension wires to epidural or peripheral nerve electrodes, for the management of chronic intractable neuropathic pain or pain from refractory angina pectoris

² INFUSION PUMP - subcutaneous implantation or replacement of, and connection of the pump to an intrathecal or epidural catheter, and filling of reservoir with a therapeutic agent or agents, with or without programming the pump, for the management of chronic intractable pain.

Table 3: The key statistics for claims included for IPT analysis. All the figures are based on the data available until December 31st 2014.

Title	Value
Number of Claims	27
Non-musculoskeletal injury	38%
Working full time before injury	70%
Female Ratio	55%
Total cost claim	\$14.3 million
Share of Weekly Compensation of total cost	27%
Share of Lump Sums of total cost	31%
Share of Claim Reached 104 Weeks	89%
Number of Common Law Completed	6
Min gap between injury and surgery	404 days
Median gap between injury and surgery	181 weeks

Figure 4 over the page shows the likelihood of receiving any type of income benefit before and after IPT surgery. The black line is the four-week average. As the figure shows, less people will receive income compensation over time after IPT surgery, although the decrease is not continuous and stops almost a year after surgery. The results show a peak before surgery, so it is not clear whether the observed change is due to the surgery itself. Further investigation showed that the decrease is mainly due to the drop in Types 2 and 3 compensation (partial incapacity), while the levels of Type1 compensation (no capacity) do not change almost at all post-surgery.

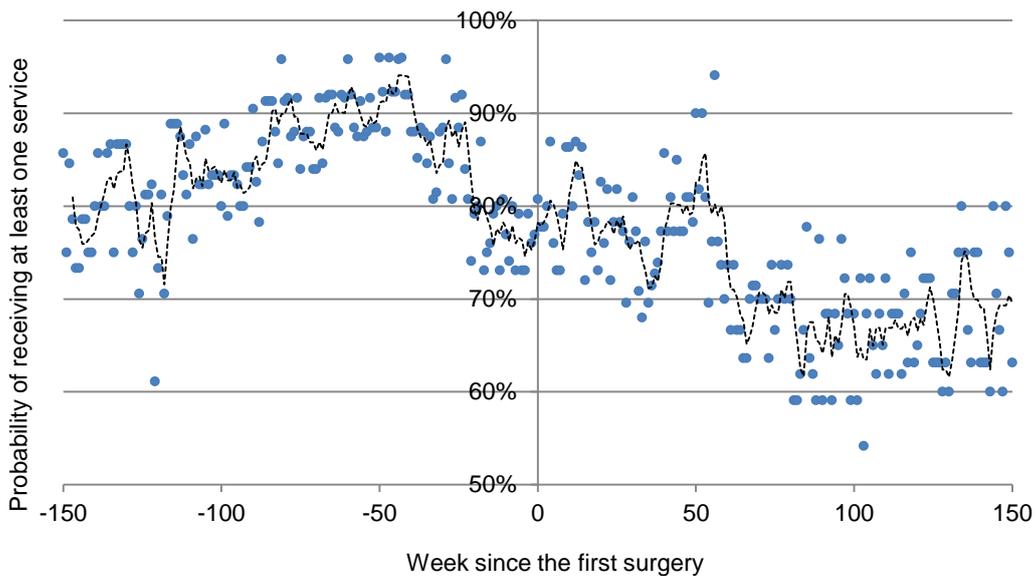


Figure 4: The likelihood of receiving any type of income benefit for clients who received IPT. Dotted line shows 4-week moving average.

As Figures 5 and 6 below and over page show, the probability of receiving physical treatments (physiotherapy, osteopathy, and chiropractic services) and mental health services over a month substantially drops after IPT surgery. Interestingly, the level of drop for both physical and mental health services is similar, from more than 35% to less than 10%. The figures are presented using monthly data since many of the physical and mental health services are not received on weekly basis and the sample size is not large enough to support weekly visualization.

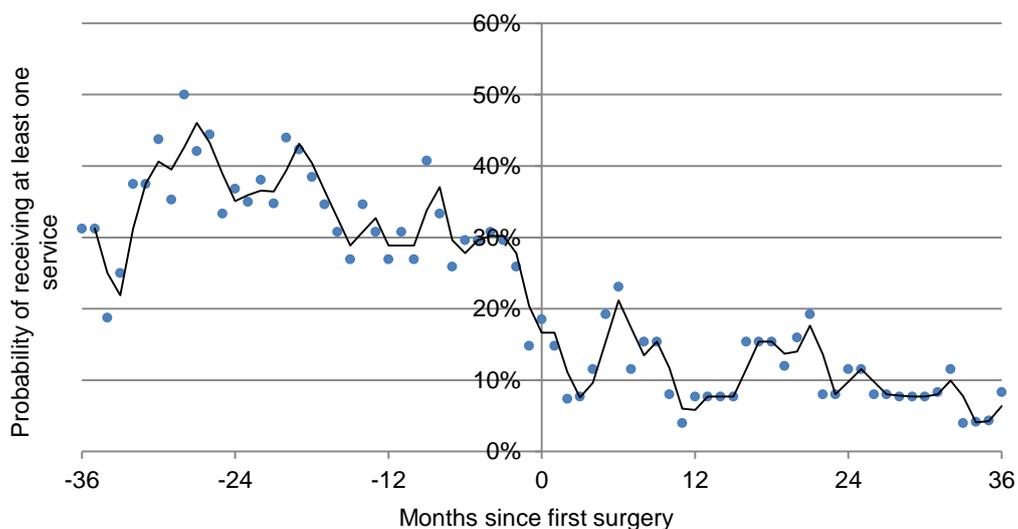


Figure 5: The probability of receiving physical treatments for clients who received IPT. Dotted line shows 4-month moving average.

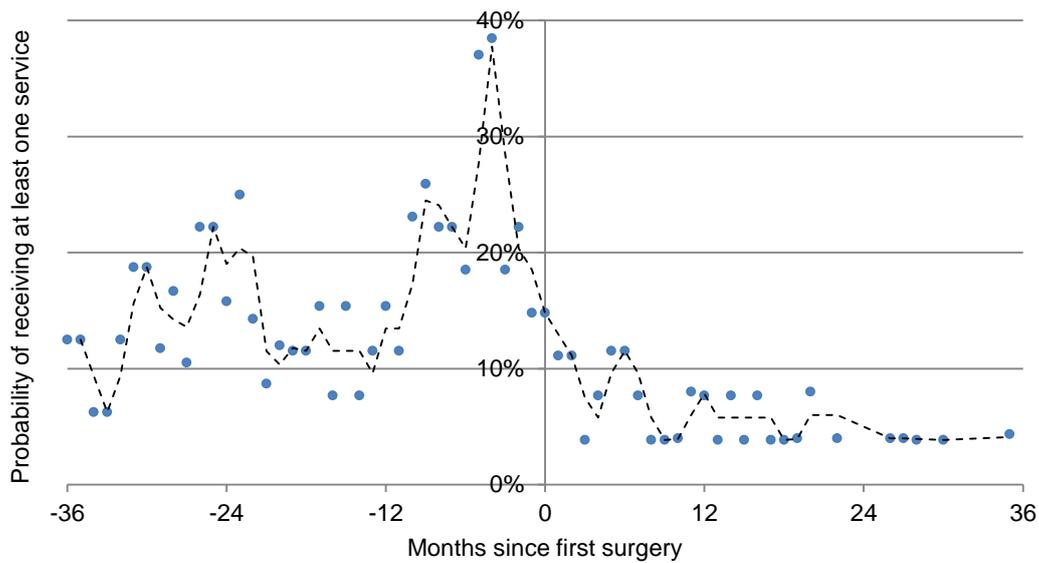


Figure 6: The probability of receiving mental health services for clients who received IPT. Dotted line shows 4-month moving average.

Figure 7 below shows the probability of a client being prescribed an opioid 36 months before and after the surgery. Overall, there is no clear evidence of a decrease in opioid prescriptions after surgery. Both the number of prescriptions, as well as the morphine equivalent amount of the prescriptions, seems to be steady over time - and in some cases increasing. Further investigation of the data is recommended, to study other potential contributors to opioid intake such as age or development of opioid dependency.

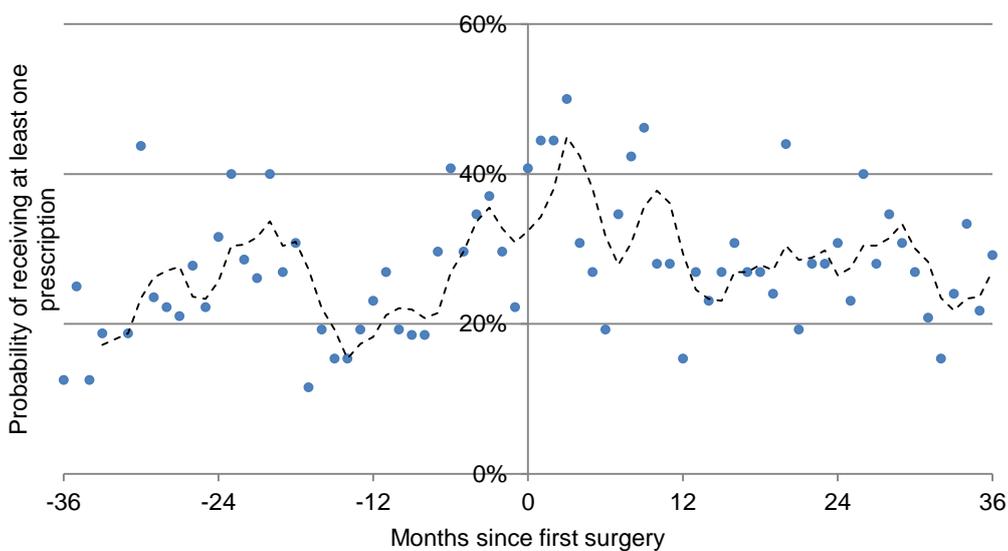


Figure 7: Probability of a client being prescribed an opioid prescription for IPT clients. Dotted line shows 4-month moving average.

Spinal Fusion

For Spinal Fusion the following eight Medicare items are included:

- 48684: SPINE, segmental internal fixation of, other than for scoliosis, being a service associated with a service to which any one of items 48642 to 48675 applies - 1 or 2 levels
- 48687: SPINE, segmental internal fixation of, other than for scoliosis, being a service associated with a service to which items 48642 to 48675 apply - 3 or 4 levels
- 48654: SPINAL FUSION (posterior interbody), with partial or total laminectomy, 1 level
- 48657: SPINAL FUSION (posterior interbody), with partial or total laminectomy, more than 1 level
- 48660: SPINAL FUSION (anterior interbody) to cervical, thoracic or lumbar regions - 1 level
- 48663: SPINAL FUSION (anterior interbody) to cervical, thoracic or lumbar regions - 1 level - principal surgeon
- 48666: SPINAL FUSION (anterior interbody) to cervical, thoracic or lumbar regions - 1 level - assisting surgeon
- 48669: SPINAL FUSION (anterior interbody) to cervical, thoracic or lumbar regions - more than 1 level

The main characteristics of the sample are presented in Table 4 over the page. Overall, the analysis had 340 claims for 340 clients, and 877 Medicare items were found for these clients. Clients who received common law or impairment benefits are included. In the sample 82% had musculoskeletal injury, 78% were working full time before the injury, and 70% were male. The total cost of claims by the end of 2014 was \$121.4 million - 27% of this was the cost of weekly compensation and 38% was lump sum. Only one-third of clients had a 'resumed work date' in the data, 32% reached 104 weeks. Of the 340 claims, 59 are labelled 'Common Law Completed', 54 are labelled as fully returned to work, and 63 are labelled as 'Medical Only claims'.

The time between injury and surgery dates ranged from zero days to 1975 days (almost 5.5 years), with an average gap of 530 days (approx. 1.5 years). One-quarters of clients received SF surgery within 191 days after the injury, and 50% received the surgery within 384 days after the injury.. In almost half of the claims the first surgery was undertaken less than a year after the injury. Claims that had the surgery in the first year post injury were removed. After excluding those surgeries the minimum gap increased to 367 days, with 75% of the clients receiving SF surgery within 494 days after the injury, and 50% received surgery within 729 days after the injury. The average gap is 841 days (approx. 2.3 years), and maximum gap to the first surgery remained at 1975 days (almost 5.5 years).

Table 4: The key statistics for claims included for IPT analysis. All the figures are based on the data available as of December 31st 2014.

Title	Value
Number of Claims	340
Non-musculoskeletal injury	18%
Working full time before injury	78%
Male Ratio	70%
Total cost claim	\$121.4 million
Share of Weekly Compensation of total cost	27%
Share of Lump Sum of total cost	38%
Share of Claim Reached 104 Weeks	32%
Number of Common Law Completed	59
Min gap between injury and surgery	0 days
Median gap between injury and surgery	384 days

As seen in Figure 8, similar to IPT, no significant pattern was evident for SF surgery in the Type 1 (total incapacity) compensation payment trend and the surgery only was followed by a decrease in Types 2 and 3 income benefits (partial incapacity). Type 1 income compensation substantially increased during and directly after surgery, but returned to, on average, pre-surgery levels.

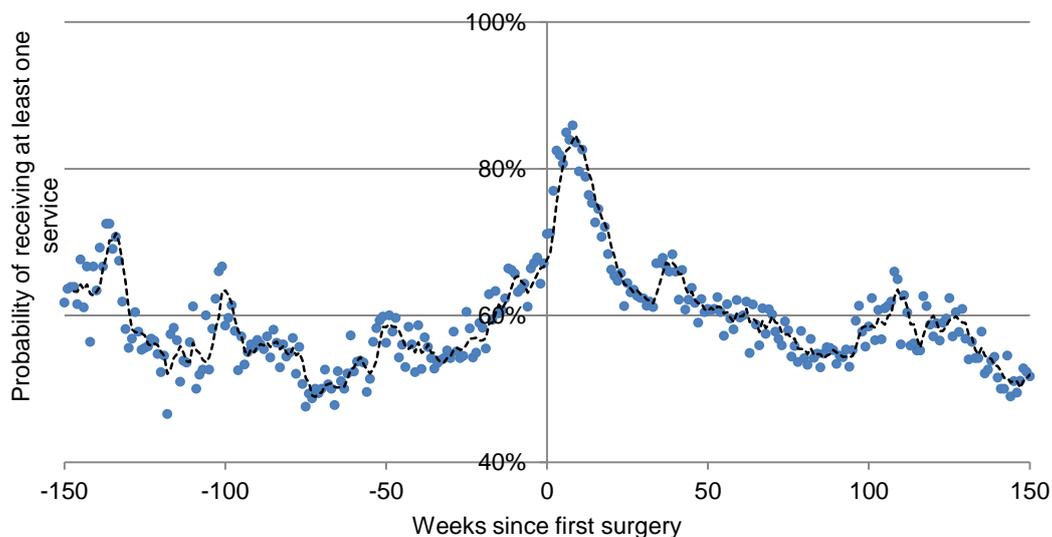


Figure 8: The likelihood of total incapacity payment for clients who received Spinal Fusion. Dotted line shows 4-week moving average.

Figure 9 presents the differences in use of physical treatments by clients pre- and post-surgery as four different stages:

1. Pre-surgery, the probability of a client receiving a treatment is 25% per week. In other words, one in four clients would have at least one service per week.
2. During the surgery week and right after the surgery the probability drops to less than 10%.
3. It then increases to the pre-surgery level of 25% and stays steady for ~1.5 years.
4. Finally, it starts decreasing and almost halves over the following 1.5 years.

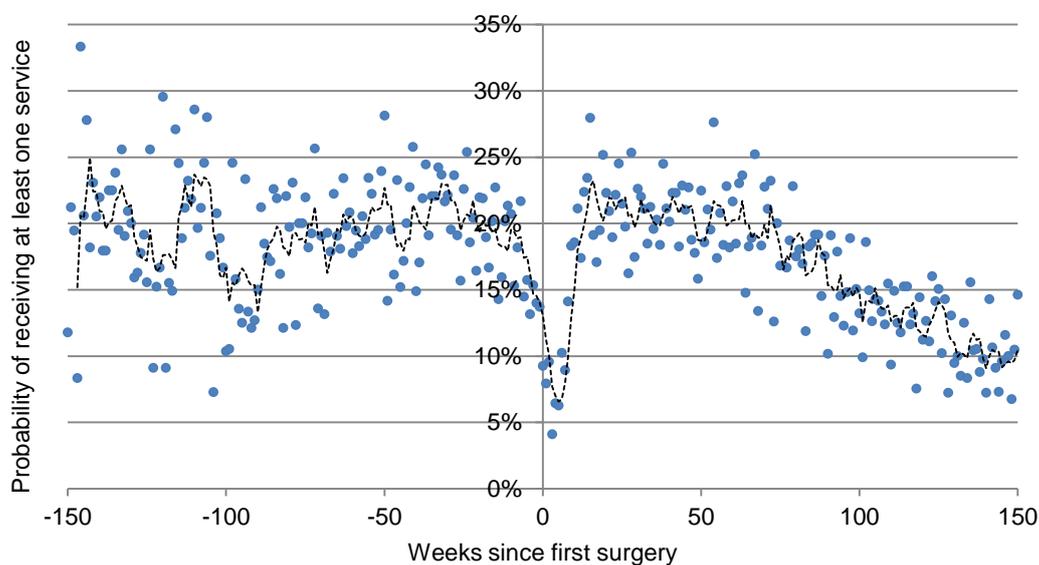


Figure 9: The probability of receiving physical treatments for clients who received Spinal Fusion. Dotted line shows 4-week moving average.

Further investigation is needed to determine whether the decrease in service use is due to the surgery, or other factors, such as a benefit policy, considering the delay between receiving the surgery and drop in service use.

The mental health service use patterns for Spinal Fusion clients are very different from physical treatments, as shown in Figure 10. Here, interestingly, the number of psychologist visits per client substantially increases after SF, although it appears the trend is non-linear, and returns to the level of pre-surgery in almost two years.

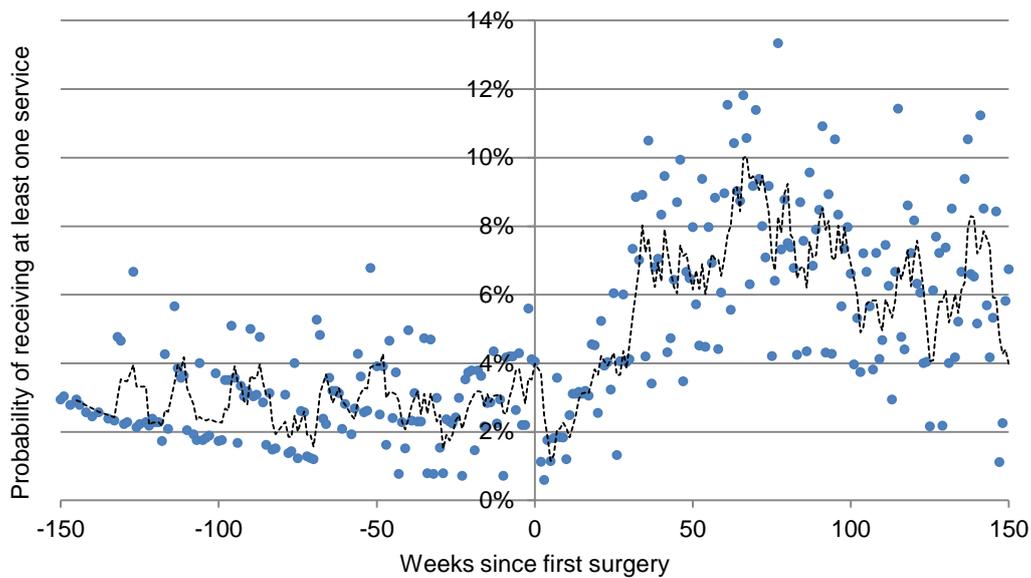


Figure 10: The probability of receiving mental health services for clients who received Spinal Fusion. Dotted line shows 4-week moving average.

Finally, Figure 11 presents the number of weekly opioid prescriptions per client. The figure does not present any decrease in the prescription trend and it seems that the prescription level remains stable at pre-injury levels for the first year after surgery. However an increase in the number of prescriptions is observed in the second and third year.

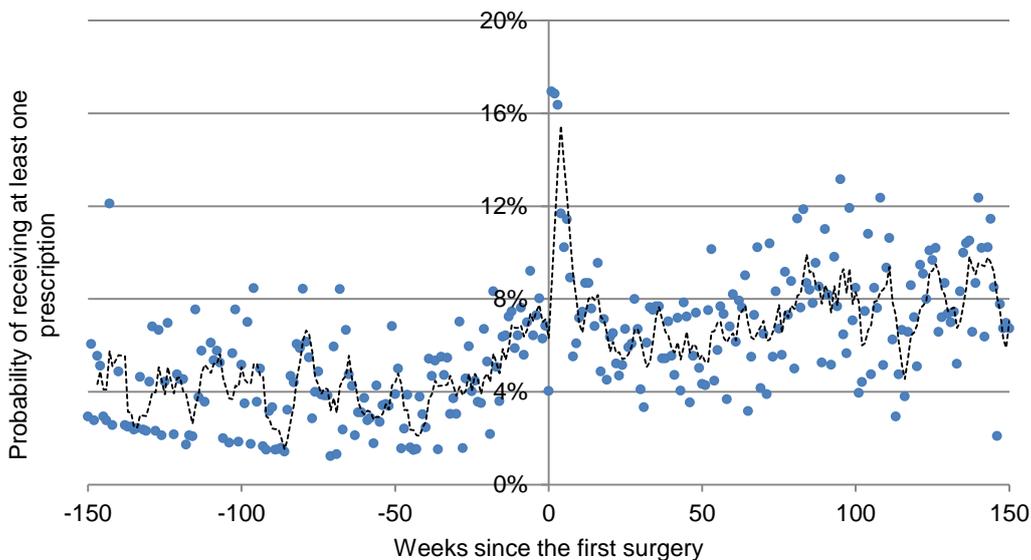


Figure 11: Probability of a client being prescribed an opioid prescription for IPT clients. Dotted line shows 4-week moving average.

Conclusions, Limitations and Suggestions

Evidence from this project shows the impact of elective surgeries on the claim journey is mixed; some surgeries are followed by significant improvement in client health, while some others have limited or no impact across different health service use categories.

In summary, Hernia, Knee Reconstruction, Knee Replacement, Shoulder Repair, and Knee Arthroscopy surgeries seem to have a significant association with improved mental and physical health of the client, as well as facilitating return to work and management of pain.

On the other hand, for Spinal Fusion and Implantable Pain Therapy, the surgery only is only followed by lower levels of physical treatment service use and partial incapacity, but the association with improved return to work for clients with total incapacity, pain management, and mental health were either minor or insignificant.

This exploratory piece can help HDSG and WorkSafe strengthen their understanding of the claim journey before and after elective surgeries and investigate the effectiveness of an elective surgery in terms of changes in service use patterns. It has provided evidence on how the available data can be utilized for this purpose.

Important limitations to note

These results should be interpreted and used cautiously for three main reasons.

Firstly, this project used administrative data to study the impacts of a medical event on compensable medical, paramedical and income benefit payment patterns. While the applied data has been successfully used to respond to many research questions previously, interpreting its dynamics still needs substantial attention as to how the data is collected and what it really presents.

Furthermore, it should be emphasized that the clients were not interviewed as part of this project and the presented compensation outcomes are solely measured by applying service use patterns as a proxy for recovery. This is one of the areas which future research can address by including the client-reported outcomes in the analysis.

Finally, it is accepted that a majority of clients who receive elective surgeries experience a complex claim before and after the surgery with many legal, medical, paramedical and administrative benefits and payments interacting over time. As a result, attributing the outcomes of their claim to a single event such as a surgery would be inappropriate.

Authors expect that a future extension of this project will include better selection of the sample, more detailed categorization of the Medicare items, better definition of the outcomes and finally using more sophisticated analytical approaches as well as receiving further medical advice and consultation. This will help to inform a more detailed and practical study, under which results can be used to improve decision-making regarding elective surgery.

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