

ORIGINAL REPORT

NUMBER AND FREQUENCY OF PHYSIOTHERAPY SERVICES FOR MOTOR VEHICLE-INDUCED WHIPLASH: INTERROGATING MOTOR ACCIDENT INSURANCE DATA 2006–2009

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Objective: Whilst prognostic factors for recovery from whiplash associated disorders have been documented, factors related to high physiotherapy use are not well recognized. This study profiles predictors for high use of physiotherapy services from a large dataset from an Australian state insurer for motor vehicle accidents.

Method: A dataset of Motor Accident Commission claims in South Australia for whiplash associated disorders (2006–2009) was interrogated.

Results: The median number of physiotherapy services per claimant was 15 (range: 1–194). The typical high user of physiotherapy was female, aged 25–59 years, living in a high socio-economic area, with legal representation, who delayed obtaining physiotherapy for at least 28 days after the accident. The largest mean number of days between treatments (5.4 days) in the first 5 treatments related to the lowest subsequent use of physiotherapy services.

Conclusion: This represents the first review of physiotherapy service use based on an insurance dataset. A range of factors were related to high use of physiotherapy services. It is hoped that identifying the mean number and spread of physiotherapy interventions for whiplash associated disorders, and the profile of high users of physiotherapy will help gauge the success of strategies to maximize the efficacy of physiotherapy management of whiplash associated disorders.

Key words: whiplash injuries; physiotherapy; insurance claims.

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INTRODUCTION

The question of what constitutes optimal physiotherapy care for motor vehicle-induced whiplash associated disorders (WAD) continues to challenge researchers, clinicians, insurers and policy-makers. Quality physiotherapy care has been characterized as safe, effective, efficient, equitable, patient-

centred, timely and based on best-available evidence (1, 2). An important premise underlying the provision of physiotherapy treatment in rehabilitation is that there is benefit to be gained from it, i.e. the patient demonstrates improvement in his/her condition. How to determine the point at which physiotherapy treatment for WAD produces no further benefit, i.e. becomes ineffective, remains unclear, and there are few indicators of quality physiotherapy services that can be used as benchmarks by patients, referrers, therapists and insurers.

Three well-conducted systematic literature reviews have collated the research evidence on prognostic factors for recovery for patients with WAD (3–5). The first review by Scholten-Peters et al. (5) reported that the only strong evidence for delayed recovery was high initial pain intensity. The effect of other commonly cited factors associated with an adverse prognosis and/or greater amounts of healthcare consumption (such as older age, female gender, high acute psychological response, angular deformity of the neck, rear-end collision, compensation) was not supported by this review. More recently, Carroll et al. (4) reported that approximately 50% of subjects with WAD report symptoms up to 12 months after the accident. This review concurred with Scholten-Peters et al. (5), that greater initial pain was related to slower recovery. It found evidence that slower or incomplete recovery was associated with more symptoms, greater initial disability and post-injury psychological factors. Kamper et al. (3) found that most subjects with WAD recover significantly in the first 3 months after the accident in terms of pain and disability, and after this time, recovery rates slow.

To provide further guidance on the time for expected WAD recovery, we reviewed the international clinical guidelines for the management of soft tissue neck injuries. We found 11 relevant guidelines (6–16), of which 2 reported on “expected” service consumption and/or predictive patterns for recovery (10, 16). These guidelines provided congruent evidence statements that the majority of patients should report demonstrable improvement within 4 weeks of the accident.

A recent review of the predictors for subjects with WAD who sought physiotherapy services, using a large dataset from the South Australian compensable fault-based insurer for motor vehicle accidents, identified that a typical consumer

of physiotherapy services for WAD was a female driver of a sedan (saloon car), who wore a seat belt at the time of injury, was aged between 40 and 79 years, lived in upper-middle or high socioeconomic suburbs, with legal representation, and with severe injury (17). Her accident occurred on hard dry road surfaces, and was likely to be a front-on collision (i.e. not at an angle).

This motor vehicle accident insurance scheme is provided under an "at-fault" compulsory third-party (CTP) insurance system. This system compensates injured victims of motor vehicle accidents where the owner or driver of a South Australian registered vehicle was at fault. It does not provide cover for damage to vehicles or property.

South Australia has a common law scheme based on the principles of negligence; therefore an injured person must prove that another (insured) person was at fault before being eligible for compensation. A driver in a single vehicle, single occupant accident is usually ineligible for compensation, whilst a passenger in a single vehicle crash, if they can attribute blame to the driver is entitled to claim compensation. CTP insurance premiums are paid when motor vehicles are registered.

Whilst there is evidence for the time for expected WAD recovery, claimant characteristics for delayed recovery, as indicated by high physiotherapy usage, remain unknown. This paper aims to identify predictors from claimant data, for high physiotherapy service use. This information may underpin better rehabilitation strategies for MVA-induced WAD and allow identification of flags for claim build-up (18). At the "pre-data mining stage", i.e. when claims are received, these flags could be used to identify those claims for MVA-induced WAD requiring further evaluation, i.e. target claims (19).

Two specific research questions were tested in this analysis.

- Can a profile be developed to identify possible high users of physiotherapy services? To address this question, the influence of each independent variable was considered, relevant to consuming greater than the median number of physiotherapy treatments.
- Are there early service delivery patterns that predict high use of physiotherapy services? This question was addressed using the hypothesis that the frequency of treatment within the first 4 weeks (28 days) would predict the amount of service consumed.

MATERIAL AND METHODS

Data

Data derived from Motor Accident Commission claims in South Australia were interrogated for whiplash injuries occurring between 2006 and 2009. Ethics approval was not required as data was provided by the motor accident insurer in de-identified form, and did not allow identification of any claimant or health provider.

General inclusion criteria

Data for analysis was limited to:

- claimants with South Australian residential postcodes,
- closed claims (i.e. the claimant has completed seeking compensation

for the WAD, allowing the claim to be closed),

- car/vehicle accidents (excluding claims by motorbike riders and pillion passengers), and
- totally accepted claims (liability = 100%). As the aim of this analysis was to examine the characteristics of high-end physiotherapy users for WAD within the South Australian compensable fault-based insurance system for motor vehicle accidents, it was felt that only those claimants who satisfied the system requirements should be included. Partial acceptance of claims may introduce a confounding bias to the analysis and these subjects were therefore omitted.

Independent variables

There was information on claimant date and country of birth, gender, postcode of residence, legal representation and the date on which legal representation was engaged. There was information on date of accident and date of lodging a claim for injury compensation, role in the accident (driver, passenger), whether seatbelt or helmet were worn, whiplash severity, make and type of vehicle involved in the accident, road and weather conditions. Insurer data was available on predicted and actual claims costs, agreed accident liability status, the health service types consumed by claimants, and dates of these services.

Physiotherapy inclusion criteria

All physiotherapy services were provided by private practitioners, whose patients were mostly referred by general medical practitioners, or less commonly, by medical specialists. In South Australia compensable patients (motor vehicle accident or workers compensation) are not treated within the public hospital environment, but are treated in the "private" medical system. Private practitioner physiotherapists work as "first contact" practitioners, with most physiotherapists in Australia employed within the private medical system. Payment for physiotherapy services for MVA-related claims is billed, by practitioner provider number, to the insurer directly.

This paper reports on data of claimants who consulted only one physiotherapist. This was the most robust group on which to establish physiotherapy service delivery patterns for whiplash, as the services were theoretically not "contaminated" by different management strategies by different physiotherapists, or by "therapist-shopping", where claimants sought different opinions, and/or had overlapping episodes of care. It excluded claimants who consulted more than one physiotherapist and claimants with co-interventions (conservative (massage, acupuncture, psychology or chiropractics) or invasive procedures (surgery, injections etc.)). "Discharge" from physiotherapy was identified when the claimant consumed no further physiotherapy services that could be tracked within the dataset. Because the claimants had all their costs covered by the insurer, it is unlikely that claimants ceasing physiotherapy services in the MAC dataset went on to consume physiotherapy services elsewhere in the public system.

Coding

Coding was required to assist in the interpretation of a number of data items. This paper provides a summary of coding used only.

Injury severity. Motor accident claims with medical evidence (doctors' letters, medical records, hospital notes, etc.) are coded by accredited injury coders. Up to 7 injury codes can be used to describe whiplash, and the more codes recorded for a claimant indicated an increasingly severe injury.

Socioeconomic status. Claimants' socioeconomic status was described as the Index of Relative Socio-Economic Advantage/Disadvantage (20). This approach segments Australian postcodes into electoral divisions, and then assigns a socioeconomic indicator to the electorate. Relatively disadvantaged areas have low index values. Socioeconomic status was determined in 4 categories (relative index of advantage/disadvantage provided for each electorate):

- High (Adelaide (1059.3), Boothby (1054.1), Sturt (1039.0))

- Upper middle (Hindmarsh (1006.2), Mayo (1008.8))
- Lower middle (Makin (984.8))
- Low (Barker (924.6), Grey (920.6), Kingston (949.7), Mallee (941.4), Port Adelaide (910.8), Wakefield (895.8))

Accident mechanisms. These were analysed as: (i) car hit from behind, (ii) the car hitting something front on, (iii) a side-mechanism, and (iv) not known.

Road and weather conditions. Weather conditions were analysed in categories of fine and overcast/wet (combined because of small numbers). Road conditions were analysed in categories of good, dry or hard top, icy/muddy/oily/wet or loose gravel.

Accident time. This was reported in a 24-h clock, and analysed in 6-hourly segments: early morning (24.00–06.00 h), daylight morning (06.00–12.00 h), daylight afternoon (12.00–18.00 h) and evening (18.00–24.00 h).

Statistical analysis

The frequency distribution of physiotherapy service use was examined, and classified into clusters of services largely based on quartiles. To answer the first research question, univariate logistic regression models were constructed to identify significant independent predictors of high use of physiotherapy services. Associations were reported as odds ratios (OR). Significant associations were established by 95% confidence intervals (95% CI), which did not span 1. Consumption of physiotherapy services, and putative predictors were divided into independent binary forms for this analysis.

Confounding influences on associations that were found to be significant during this step were then tested using multivariate logistic regression models. A possible confounder was identified as a variable that did not have a significant association itself with the outcome (high treatment consumption), but which was plausibly biologically related to it, as well as to the significant predictor. A potential confounder could not be a proxy for either variable. Confounding effects were identified when the strength of association between the significant predictor and high treatment consumption changed by 10% or more by the addition of the potential confounder to the logistic regression model. Where required, to examine influences in subgroups, χ^2 analysis or analysis of variance (ANOVA) models were applied, with p -values < 0.05 used to identify significant differences.

To answer the second research question, the frequency of physiotherapy services provided in the first and second week of the episode of care was reported per cluster, and compared, using ORs (95% CIs) derived from independent levels of predictors in univariate logistic regression models.

RESULTS

Data was provided on 6,906 whiplash claimants, of whom 2,818 met the study inclusion criteria, i.e. claimants with WAD codes only, who were drivers or passengers (excluding motor-bike riders and pillion passengers), who had closed claims and for which all liability had been accepted by MAC.

Physiotherapy users

A total of 1,688 claimants (59.9% of total whiplash claimants) used at least one physiotherapy service.

Frequency of physiotherapy consumption

Of the claimants consuming physiotherapy, 58.9% consulted only one physiotherapist, 26.2% consulted two physiotherapists

during their episode of care, and 9.3% consulted 3 physiotherapists. Decreasing numbers of claimants consulted more physiotherapists: $n = 140$ (3.2%) consulted 4 physiotherapists; $n = 68$ (1.6%) consulted 5 physiotherapists $n = 17$ (0.4%) consulted 6 physiotherapists; $n = 1$ (0.02%) consulted 8, 9 and 10 therapists each, and 2 claimants (0.05%) consulted 11 physiotherapists. The multiple therapists may have all worked in the same physiotherapy practice and shared client care. However, the unique provider numbers and lack of opportunity to link providers to place of work precluded identification of care based in one clinic, shared by multiple providers. As described, this paper reports on the claimants who consulted only one physiotherapist.

Considering all physiotherapy services provided to claimants in this dataset, the median per-claimant number of physiotherapy services was 14 (25%–75% 1–194). The median per-claimant cost of physiotherapy services was 683.00 AUD (25%–75% 319.60 AUD–1,459.95 AUD). There was a small and non-significant association between the number of whiplash codes (denoting severity of injury) and the number of physiotherapy services consumed ($r^2 = 4.8\%$), and the total cost of services ($r^2 = 4.5\%$). There was an anticipated strong positive association between the number of services provided in an episode of care and the costs of claims ($r^2 = 86.7\%$).

Physiotherapists and services

In South Australia 230 physiotherapists provided services to whiplash claimants between 2006 and 2009. This represents 13.5% of the 1,700 physiotherapists registered in South Australia. The median number of services provided per physiotherapist, independent of number of claimants, was 7 (25%–75% 2–28). The 90th was 174, and the maximum number of services provided by any one physiotherapist was 5,432.

Per-claimant service consumption

The median per-claimant number of physiotherapy services to “discharge” was 14. The minimum number of services was 1 (25%–75% 7–32). The 90th was 53 and the maximum number of treatments provided by one physiotherapist for one claimant was 194.

Physiotherapy service consumption data categories

Data was classified into 5 categories for analysis, broadly using 3 divisions at the 25th percentiles, and dividing the fourth quartile into 2 smaller categories (at 53 treatments), to capture any changes of association at the margin in this extreme service consumption group: 1–7 treatments ($n = 456$), 8–15 treatments ($n = 405$), 16–32 treatments ($n = 411$), 33–53 treatments ($n = 261$) and more than 53 treatments ($n = 155$).

Factors associated with high use of physiotherapy services

Table I reports the univariate strength of association of putative predictors with high use of physiotherapy services. In summary, in order of strength of association:

- Having legal representation was the strongest univariate predictor of high service consumption (OR 2.9 (95% CI 2.1–4)).

Table I. Univariate determinants of high users of physiotherapy services (> 53 treatments)

| Variable | Interpretation | Odds ratio | 95% CI |
|---|----------------------------|------------|---------|
| Role in vehicle | Driver | 1.1 | 0.8–1.6 |
| Socioeconomic status compared with low SEO status ^a | Lower middle | 0.8 | 0.5–1.3 |
| | Upper middle | 1.0 | 0.7–1.5 |
| | High ^a | 1.4 | 1.1–1.7 |
| Injury status | Severe | 1.1 | 0.8–1.4 |
| Accident mechanism compared with being hit from the rear (OR = 1) | Hitting something directly | 0.8 | 0.3–2.0 |
| | Angular accident | 1.0 | 0.8–1.4 |
| | Unknown | 0.9 | 0.5–1.8 |
| Road surface | Hard dry | 1.1 | 0.7–1.8 |
| Seat belt | Wearing one | 1.3 | 0.9–1.2 |
| Gender ^a | Female | 1.8 | 1.5–2.3 |
| Age (years) compared with <25 year group (OR = 1) ^a | 25–39 | 1.4 | 0.9–2.0 |
| | 40–59 ^a | 1.6 | 1.1–2.3 |
| | 60–79 | 1.4 | 0.9–2.3 |
| | 80+ | 0.4 | 0.1–4.1 |
| Legal representation ^a | Yes | 2.9 | 2.1–4.0 |
| Delay in reporting the accident (days) | < 10 | 0.8 | 0.4–1.6 |
| Delay in seeking physiotherapy (days) ^a | > 28 | 1.5 | 1.1–2.2 |

^aSignificant univariate associations are identified by 95% CI not encompassing 1. SEO: socioeconomic; OR: odds ratio; CI: confidence interval.

- Being female was the next strongest significant predictor of high service usage, compared with being male (OR 1.8 (95% CI 1.5–2.3)).
- The 40–59-year age group was significantly associated with high service consumption, compared with the youngest group (<25 years) (OR 1.6 (95% CI 1.1–2.3)). There was no difference in strengths of association between any of the other age groupings and the youngest group.
- Delay in seeking physiotherapy treatment was strongly associated with high service consumption (OR 1.5 (95% CI 1.1–2.2)).
- High socioeconomic status was a significant predictor of high service consumption compared with low socioeconomic status (OR 1.4 (95% CI 1.1–1.7)), although there was no difference between strengths of association of lower and upper middle socioeconomic status levels and low status.

No other potential predictors of high service consumption were significantly associated with it.

We then considered the strong predictors in the 5 categories of service consumption, to examine trends that may not have been evident from the binary division of service consumption data at 53 treatments.

Legal representation. There was a clear and increasing pattern of legal representation associated with physiotherapy service consumption groupings, as outlined in Fig. 1. This indicates that there was double the percentage of claimants with legal representation who consumed more than 53 treatments, com-

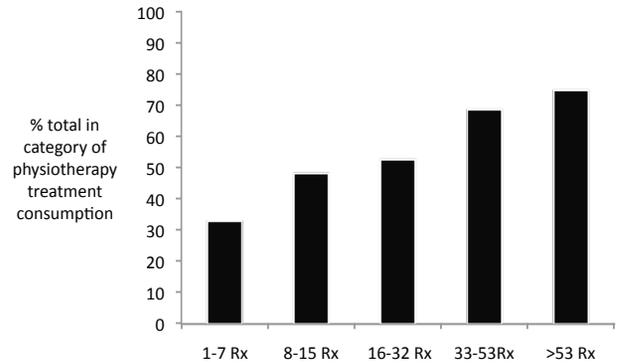


Fig. 1. Percentage of claimants with legal representation in service delivery groupings. Rx: number of treatments.

pared with the legal representation of those who consumed only 1–7 treatments.

Gender. There was an increasing linear trend for women to consume higher numbers of physiotherapy services.

Age. An elevated effect of age was observed for the 25–59-year-olds, in that a higher percentage of these claimants occurred in the higher service provision groups.

Delay in seeking physiotherapy. There was a significant association between the lag time between accident and first physiotherapy attendance across the 5 service provision groups. The shorter the time that elapsed between the accident and presentation at physiotherapy, the fewer the physiotherapy treatments provided. The median values of lag time and the 25th and 75th are illustrated in Fig. 2. There was twice the likelihood that a lengthy delay between accident and attendance at physiotherapy would result in lengthy service consumption (OR 2.1 (95% CI 1.5–3.0)).

In the subset of claimants who had a lengthy delay between accident and presentation at physiotherapy (>28 days), there was a significant linear increase in the percentage of claimants with legal presentation, across the service delivery groupings (Fig. 3). Having legal representation significantly confounded

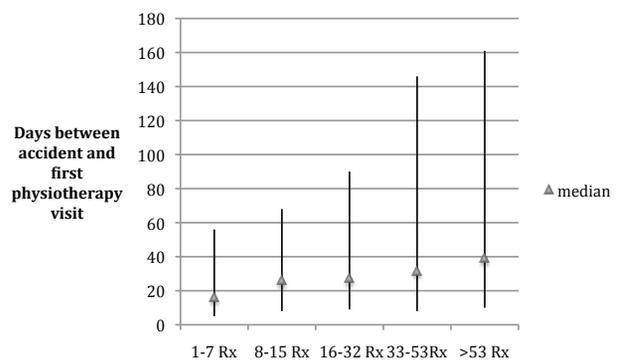


Fig. 2. Median (25th to 75th) delay between accident and first physiotherapy treatment across the treatment profile groups. Rx: number of treatments.

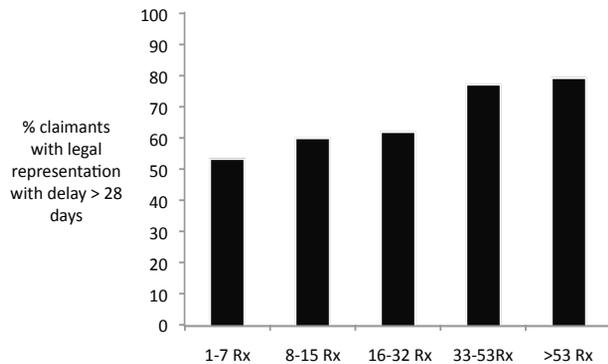


Fig. 3. Percentage of claimants with legal representation, who delayed seeking physiotherapy for >28 days, over the service. Rx: number of treatments.

the association between a lengthy delay between injury and presentation at physiotherapy, and lengthy service consumption (> 53 treatments). The adjusted OR 1.5 (95% CI 1.0–2.2) altered the crude OR by more than 10%.

In the first 4 service provision clusters, there was a similar percentage of women/men in the long delay subset (considering women only: 1–7 treatments (Rx) 63.3%; 8–15 Rx 63.6%; 16–32 Rx 68.0%; 33–53 Rx 65.9%). However, in the longest service provision grouping (53+ treatments), the percentage of women increased to 74%. This increase was not significant ($p > 0.05$) when tested using χ^2 analysis with an assumption that the expected percentage of women to men in each subset would be 60%/40%. There was no confounding influence of gender on the association between lengthy delays and physiotherapy service consumption, as the adjusted OR was no different from the crude OR.

There are many reasons why subjects with whiplash may delay attending physiotherapy. One is the severity of the injury. A more severe injury may require health services prior to consulting the physiotherapist (e.g. medical services, radiology, hospitalization). More severe injuries were identified in this dataset as incrementally more than one injury code recorded for the claimant. There was a significant difference in the number of injury codes comparing the smallest service provision group and the largest group (ANOVA model, $p < 0.05$). The mean (standard deviation (SD)) injury score for each group is reported in Table II. This table highlights that a lengthy delay in the highest service provision group (greater than 53 physiotherapy treatments) was associated with the highest injury score (a mean of 3.3 injury codes).

Table II. Injury severity scores for the service provision clusters in which there was >28 days delay between accident and physiotherapy attendance

| Number of treatments | | | | |
|----------------------|-----------|-----------|-----------|-----------|
| 1–7 | 8–15 | 16–32 | 33–53 | >53 |
| Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| 2.4 (1.4) | 2.6 (1.4) | 2.5 (1.4) | 2.7 (1.5) | 3.3 (2.0) |

SD: standard deviation.

However, having 3 or more severity codes was not a confounder in the association between lengthy physiotherapy service consumption (>53 treatments) and a delay of 28 days or more between accident and presentation at physiotherapy (less than a 10% change between the crude OR (2.1 (95% CI 1.5–3.0)) and the adjusted OR 2.0 (95% CI 1.4–2.9) (adjusted by injury severity).

Socioeconomic status. There was a decreasing relationship between being in the middle and lower socioeconomic groupings, and consuming physiotherapy services, with the decrease occurring around the 15 treatment cluster. However, a different pattern was observed for the high socioeconomic cluster, with a sharp and steady increase occurring after the 15 treatment cluster (Fig. 4).

Early service delivery patterns as predictors of high physiotherapy service use

First 5 treatments in the episode of care. There was an inverse relationship between the mean number of days between each of the first 5 treatments in the episode of care, and the service consumption clusters. The lowest service consumption cluster had the largest number of days on mean between treatments (5.4 days). The mean number of days decreased almost linearly between treatments, as the service consumption clusters increased (Table III). This table also reports the median number of days between treatments 1 and 5 for each service delivery cluster.

Fifth to tenth treatments in the episode of care. The mean number of days between the 5th to 10th treatments was similarly calculated for each service consumption cluster. This continued to demonstrate the pattern that was observed in the first 5 treatments, that there was an inverse relationship between days between the 6th to 10th treatments, and the service consumption clusters. It was not possible to calculate the mean numbers of days between the first 10 treatments for the lowest service consumption cluster, as this had only 2 further treatments (occasions of service 6 and 7) before the episode of care ceased. Considering the remaining treatment clusters, the mean number of days/treatment was largest for the next shortest service consumption cluster (7–14 Rx (5.7 days/treatment)), and then

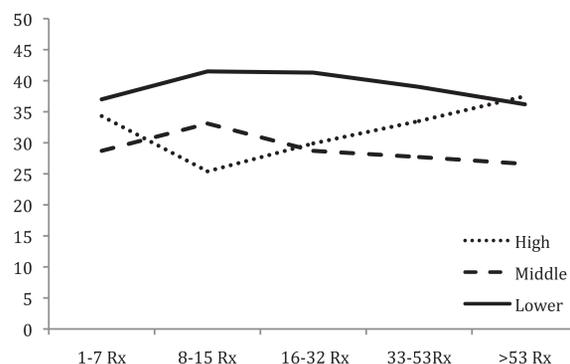


Fig. 4. Service consumption trends for socioeconomic groups. Rx: number of treatments.

Table III. Mean number of days between each of the first 5 treatments, for each service delivery cluster

| | Number of treatments | | | | |
|--|----------------------|----------|----------|----------|----------|
| | <7 | 7–14 | 15–32 | 33–53 | >53 |
| | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Length of each treatment in the first 5 treatments, days, mean | 5.4 | 3.8 | 3 | 2.8 | 2.8 |
| Time between first and fifth treatment, days, median | 27 | 19 | 15 | 14 | 14 |

decreased linearly (15–32 Rx (4.4 days/treatment); 33–53 Rx (3.5 days/treatment); > 53 Rx (3.2 days/treatment)).

DISCUSSION

This analysis provided a rare opportunity to identify predictors of physiotherapy service use for WAD in a large, complete and consecutively collected dataset from a whole-of-state insurer of motor vehicle accidents. Specifically, this study aimed to examine if a profile of high physiotherapy service users could be identified and if there were early service delivery patterns that predicted high use of physiotherapy services.

A significant number of claimants were excluded from the analysis, as they failed to satisfy the inclusion criteria as they had injuries other than WAD, had open claims, did not have a totally accepted claim, saw more than one physiotherapist, or had other co-interventions (conservative (massage, acupuncture, psychology or chiropractics) or invasive procedures (surgery, injections, etc.)). Whilst this is an acknowledged limitation of this analysis, it reduced the potential for contamination of data by multiple physiotherapy management strategies or by other service providers. This “physiotherapy pure” cohort forms a basis for further comparisons with other claimant sub-groupings. The pragmatic decision to focus on closed claims may introduce a potential bias; however, we do not believe that this would have significantly favoured any of the subgroups.

In an effort to ensure rigour of the sample subgrouping for this analysis 40% of the total WAD-related physiotherapy service using sample were omitted as they saw more than one physiotherapist. This represents a limitation of the dataset as we were unable to differentiate between service provisions within a multiple practitioner clinic, as commonly exist in South Australia, or across multiple clinics. The use of multiple practitioners has already been identified as a factor related to poor prognosis following WAD (21).

The median number of physiotherapy services per claimant was 15 (range: 1–194). A breakdown of the individual physiotherapist treatment numbers shows a tendency towards a small number of practitioners seeing the majority of claimants. Independent of claimant numbers the average physiotherapist provided 7 treatments (range 1–5,432).

This analysis identified that a typical user of high numbers of physiotherapy services for WAD (i.e. 75th percentile, >32 services) was female, aged between 40 and 59 years, living in a high socio-economic area, with legal representation, who

delayed obtaining physiotherapy for at least 28 days after the accident. Her injury severity was not related to her consumption of physiotherapy services, and she could have been either driver or passenger in the car. Wearing a seatbelt at the time of the accident had no association; neither did the road surface on which the accident occurred, or the mechanism of the accident. Any delay in reporting the accident had no association with service consumption.

The relationship between early service delivery patterns and subsequent physiotherapy service use patterns was less clear-cut, with the largest mean number of days between treatments (5.4 days) in the first 5 treatments related to the lowest service consumption. This trend continued over treatments 5–10, with the mean number of days between treatments decreasing linearly over the service use groups.

A range of factors may influence the physiotherapy service provision pattern following a motor vehicle accident. Some of these are secondary to the nature of the accident and subsequent WAD; others may be related to separate factors. This analysis identified a range of factors that appeared to be linked to high use of physiotherapy services, some of which could be linked to the nature of the accident and subsequent WAD (i.e. gender (female), age range (40–59 years), and delay in accessing physiotherapy services), whilst others appear likely to be related to other factors (socio-economic status, legal representation).

A range of factors that are accident/injury-related, appeared not to be related to subsequent physiotherapy service use, including injury severity, position in car (driver or passenger), wearing a seatbelt, the road surface on which the accident occurred, and the mechanism of the accident.

WAD severity, as indicated by number of injury codes, was not related to subsequent physiotherapy service use. Whilst the number of injury codes allocated to a claimant is not a direct measure of injury severity, it appears, on face value, to be a valid measure of extent of injury, i.e. claimants with a greater number of injury codes would be expected to have sustained a greater level of injury than those with one injury code. However, given the lack of relationship with number of physiotherapy service uses this must be questioned. Alternatively, it may indicate that “severe” WAD injuries are not managed by physiotherapists alone, and are referred on to other service providers, providing co-interventions.

In conclusion, the findings of this analysis differed from those of the 3 recent systematic reviews on prognostic factors for recovery for patients with whiplash (3–5). Females, who were broadly aged between 40 and 79 years, who had legal representation, and whose first 3 treatments had a mean of 3 days apart, were significantly likely to consume more than the median number of physiotherapy treatments than other WAD claimants. This suggests that the prognostic factors for high physiotherapy use were different from those for recovery from WAD.

The lower service usage in those patients who had the largest mean number of days between treatments (5.4 days) in the first 5 treatments suggests that more frequent treatments in the

early stages of rehabilitation do not necessarily relate to better long-term prognosis. It may be prudent for physiotherapists to encourage self-management early in the rehabilitation process, rather than developing a treatment dependency in the WAD patient. However, as we were unable to directly quantify WAD severity from the dataset, this finding should be accepted with caution.

It is hoped that identifying the mean number and spread of physiotherapy interventions for WAD, and the profiles of high end physiotherapy users forms the basis from which to gauge success, or otherwise, of strategies to maximize the efficacy of physiotherapy management of WAD.

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