Work Composition after Spine Surgery

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Low back pain (LBP) is currently the leading cause of disability worldwide and the most common reason for workers' compensation (WC) claims. Studies have demonstrated that receiving WC is associated with a negative prognosis following treatment for a vast range of health conditions. However, the impact of WC on outcomes after spine surgery is still controversial.

disability insurance low back pain lumbar decompression lumbar fusion musculoskeletal disorders occupational health pain return to work satisfaction

1. Introduction

Musculoskeletal disorders (MSDs) are the highest contributor to global disability and represent a substantial portion of occupational injury claims with a steadily rising incidence [1]. Low back pain (LBP) is the single worldwide leading cause of disability, has a strong relationship with years lived with disability (YLDs) and, since it was first measured in 1990 [1], it is the most common reason for workers' compensation (WC) claims [2]. It causes limitations of daily activity and work capacity, with high rates of work absenteeism and considerable economic and health consequences, therefore representing a major critical issue in the context of occupational medicine and public health [3].

Surgical procedures are quite commonly used as a treatment for LBP unresponsive to conservative treatments or associated with worsening neurological deficits [4]. The success of a surgical intervention in orthopaedic medicine is influenced by several key factors, the most important of which are the appropriateness of the surgical indication and surgeon's experience with the specific procedure. However, in this regard, the patient's compensation status has also been suggested as a potential factor influencing surgical outcomes. Indeed, additional elements including demographic and socioeconomic variables, such as lower degree of education, higher body mass index, smoking and lower annual wages, have been described to negatively impact outcomes following surgery [5].

In countries with modern social safety and welfare systems, an integrated compensation policy is guaranteed for disabled people or workers who experience accidents at work or occupational diseases. Compensation strategies and methodologies are extremely variable among nations, but commonly all of them provide workers with healthcare services, wage-replacement support, and other social benefits [6]. Usually, a government authority or a private sector organization acting on its behalf, carry out the administrative decision-making process which, after verifying the possession of eligibility criteria for claims, certifies the release of the different compensation services.

Compensation approaches can be basically divided into two broad categories: cause-based systems typically require a correlation between occupational risk factors or work environment/activities and the resulting adverse health effects, whereas disability-based approaches provide benefits and services regardless of cause [7]. Therefore, WC benefits support the injured/sick workers by providing temporary aid, although in the most serious cases involving a high disability degree the type of compensation can also be permanent, until they can meet their respective clinical goals and return to work (RTW) as soon as possible with the least amount of disability. In this regard, it is important to note that the ability to RTW is one of the most clinically important outcomes in workers, in association with scores for disability, satisfaction and pain.

Nevertheless, it should be considered that available literature data provided evidence that the nature of compensation services and related methods of administration might adversely impact on health and work outcomes [8]. Indeed, several studies have demonstrated that receiving WC is associated with a negative prognosis following treatment for a vast range of health conditions [9][10][11][12][13][14]. Moreover, interactions of claimants with compensation authorities are often referred to by workers as stressful experiences that might induce poor mental health [8]. On the other hand, several procedural and bureaucratic features (e.g., delays in the claim processing times, strict and rigid procedures, lack of communication between workers and authorities) of the WC administrative process can increase the disability duration, thus delaying the reintegration of people into the workforce [15].

However, the influence of WC on the treatment of LBP is still controversial. Indeed, only a few studies have analyzed the impact of WC on outcomes after spine surgery, highlighting the importance of considering WC as a determining factor when evaluating outcomes of different spinal procedures [5][6][16]. Indeed, the reported strength of this association has widely varied from odds ratios of 1.31 to 7.22 among published studies [8][17][18].

2. Discussion

The association between compensation status and poor clinical outcomes after orthopaedic surgery has already been described in the literature. In a meta-analysis from Harris et al. [5], WC patients presented with an approximately four times higher odds of worse outcomes after common orthopaedic procedures including shoulder acromioplasty, carpal tunnel release, lumbar fusion and lumbar discectomy compared to NWC patients. Similarly, in a recent meta-analysis from Cheriyan and colleagues [19], outcomes related to patient satisfaction and RTW were investigated in WC and NWC subjects after spine surgery. In this study, authors concluded that WC patients showed a 2.10 RR of unsatisfactory outcomes and a 1.68 RR of delayed RTW after surgical procedures involving the cervical, thoracic, and lumbar spine. These data are congruous with the meta-analysis of de Moraes et al. [20], who reported that compensated patients undergoing lumbar discectomy with or without fusion presented a 1.90 RR of unsatisfactory outcomes after surgery.

In the present study, analysis of the effect of WC on clinical (pain, disability, and patient satisfaction) and work-related outcomes (RTW) following lumbar spine surgery. Consistently with previous studies, we reported that WC patients tended to exhibit higher post-operative pain (RR = 1.79) and disability (RR = 1.38) as well as lower

satisfaction after surgery (RR = 2.10) compared to NWC patients. WC patients demonstrated also a delayed RTW (RR = 1.68) with a significant socioeconomic burden on both work insurances and employers [21]. This latter data is particularly important when considering that the annual expenditure for treating LBP in the United States is greater than $100 billion, with lost wages and reduced productivity accounting for approximately two thirds of the amount [22]. Furthermore, lumbar injuries resulting in spine surgery are among the most expensive WC claims [23]. However, the total cost may not be strictly related to the type of surgery alone but seems also affected by the time between the injury and the surgical treatment. Indeed, Lavin et al. have found that more prolonged and costly WC claims were associated with an interval of more than a year between injury and surgery, hence concluding that timeline of surgical indication is equally important in this subset of patients [24].

It is also important to note that several studies have demonstrated that lumbar spine surgery and particularly fusion procedures are characterized by a variable rate of success [25][26][27][28]. Therefore, inadequate patient selection and/or surgical indication may negatively affect patients' outcomes independent of their compensation status.

Differences between clinical and work-related outcomes among WC and NWC patients may have multiple explanations and depend on both clinical and nonclinical factors. First, work accidents and/or occupational diseases usually have particularly serious adverse health consequences, and they are associated with high and severe degrees of temporary or permanent disability [29][30]. For example, WC patients are more likely to depend on opioids for pain relief [31] and present with worse symptoms, probably due to the increased injury severity in work environments [32]. The use of narcotics after occupational acute low back injury has been associated with an increased risk of chronic disability [2]. In a retrospective study by Anderson et al. [33], only 11% of WC subjects assuming chronic opioids (>1 year after surgery) sustainedly returned to work compared to individuals using opioids in the short post-operative term. Moreover, these patients showed an increased risk of psychiatric comorbidities, failed-back syndrome, and additional surgery, with substantially higher medical costs. In a recent study conducted by Kukreja and colleagues, 41.3% patients within a WC cohort underwent reoperation after lumbar discectomy and/or laminectomy following an on-the-job injury [34]. Thence, increased reoperation rate may additionally contribute to worsen surgical outcome and satisfaction in this population.

Moreover, the relevance of the psychological status in patients undergoing lumbar spine surgery has been outlined by recent studies and may thus have a significant role in this specific subset of patients [35]. Indeed, WC subjects undergoing lumbar fusion and diagnosed with depression demonstrated higher rates of other psychiatric disorders, narcotic utilization and additional lumbar surgery compared to patients without depression. These individuals required significantly higher medical expenses due to their condition, with a very low RTW rate [36]. However, the aforementioned clinical factors are not sufficient on their own to explain why in WC subjects are observed worse results both in clinical and work-related terms.

Indeed, in this regard, the available literature data call into question also numerous nonclinical factors that mainly include demographic and socioeconomic variables such as male gender [37], lower degree of education [38], higher body mass index [39], smoking history [40], longer working hours [37], higher physical demands [41], civil litigation, legal representation [22][33][36], lower annual income and need for financial assistance [42][43]. Furthermore, longer

compensation periods and higher compensation costs in WC patients may also depend on the fact that these subjects are more likely to conduct risky activities with higher chances of injury. A recent study by Khor et al. [44] proposed a prediction model for pain and functional outcomes following lumbar spine fusion surgery. Interestingly, they found that patients with worse improvements in pain and disability were more likely covered by WC and presenting with better preoperative ODI and NRS scores. In this regard, identifying presurgical risk factors and optimizing subject selection criteria for lumbar spine surgery in WC patients may help provide the most appropriate care for these individuals as well as to reduce the economic burden on national institutions providing WC.

At the same time, disputed and complex claims also represent an impeding condition for a prompt RTW. Indeed, they induce a sort of conflict of interest in workers since it is not in the claimant's interest to resume his working activity until the claim is resolved [42]. Several studies showed that a WC claim delays RTW [45][46]. In detail, data provided by our meta-analysis are in good agreement with previous published findings supporting the evidence that NWC returned fully to work at a faster rate than workers with recognized claims, especially after the request is denied [45]. However, studies on this topic commonly refer to NWC patients simply as individuals with no form of compensation, without specifying they did not possess the eligibility criteria or if, despite having made a claim, it was denied by the compensation authority. This is a substantial element to adequately understand the complex interaction between compensation status and health or work-related outcomes. Therefore, rather than comparing workers solely based on their compensation status, it would be useful to consider also claim processing time or any possible appeals made by workers in case of claim rejection. Indeed, some studies suggested that the observed negative association with the recognition of a compensation state could depend on an inefficient, long, and overly bureaucratic claim management [47]. Furthermore, claim processing times (and consequently RTW) might be also influenced by other factors related to the worker, workplace or the nature/severity of the work accident or occupational disease. For example, in the case of cause-based system compensations, it is not always easy or obvious to define a link between adverse effects suffered by workers and their working activities or exposure to certain occupational risk factors, especially when workers are elderly and have often important comorbidities [48][49].

On the other hand, it can be postulated that these patients, thanks to the financial support provided by WC and prolonged abstention from work, may be more likely to experience a full recovery without undertaking harmful activities.

This study has some limitations. Firstly, the overall level of evidence of the studies included is low due to the absence of RCTs comparing WC and NWC populations. Moreover, the NRCTs included were classified as "low quality" according to GRADE and single studies ranged from "low" to "high" risk of bias according to ROBINS-I. The small sample size of some included articles and the high heterogeneity among studies (I^2 = 55%, 62%, 82% and 67% for pain, disability, RTW and satisfaction outcomes, respectively), downgraded the overall quality of our results and may have led to an overestimation of their effects. As observational studies constituted the main source of our analysis, selection bias and confounding due to diverse expectations in WC patients should be taken in consideration. In addition, the different definition of RTW and heterogeneous lengths of follow-up in the examined studies may generate further inconsistencies. Moreover, as regulations of WC in terms of expense coverage, compensation amount, claim duration profoundly differ among countries, it is difficult to generalize our results to all

compensation systems [50]. This is particularly true when considering the extreme fragmentation of the American compensation systems, especially in terms of coverage, benefit adequacy, disability determination and complexity of claims [51]. Furthermore, having excluded studies in languages other than English and Italian could have limited our understanding of the relationship between WC and surgical outcomes in different nations.

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