



## Work-related musculoskeletal disorders in nurses working in South African spinal cord rehabilitation units



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### 1. Introduction

Musculoskeletal disorders (MSDs) are the leading cause of work-related injuries among nurses (Chung et al., 2013) and are associated with pain, loss of function and disability (Sorour & El-Maksoud, 2012). Musculoskeletal disorders derive from physically demanding tasks such as helping patients to adjust position, maintaining a bent forward twisted posture and lifting heavy patients (Cilliers & Maart, 2013; Jellad et al., 2013; Punnett & Wegman, 2004). Musculoskeletal disorders can be inflammatory and degenerative disorders affecting the muscles, tendons, ligaments, joints, cartilage, peripheral nerves, supporting blood vessels or spinal discs (Anap, Iyer, & Rao, 2013; Punnett & Wegman, 2004). In this study, we classified work-related MSDs as any of the above-mentioned injuries occurring on duty and during patient handling activities.

In the United States, work-related injuries occur twice as often among nurses than among the general population, with more than half of those being MSDs (Bhimani, 2016). Nurses have to care for their patients continuously, making nurses more vulnerable to musculoskeletal strains and disorders (Attar, 2014; Hinmikaiye & Bamishaiye, 2012). Aside from being physically demanding, nurses also work in stressful environments, which may lead to risky behaviours resulting in work-related MSDs (Cilliers & Maart, 2013; Israni, Vyas, & Sheth, 2013). Nurses mostly report lower back injuries and associated pain, with frequencies ranging from 44.1% (Tinubu, Mbada, Oyeyemi, & Fabunmi, 2010) to 74.5% (Jellad et al., 2013). Lower back pain is often attributed to nurses having to stand for long periods, lifting and moving patients, working in awkward postures and pushing or pulling heavy loads (Anap et al., 2013; Attar, 2014; Chung et al., 2013; Jellad et al., 2013; Munabi, Buwembo, Kitara, Ochieng, & Mwaka, 2014). Nurses working with rehabilitation patients (Bhimani, 2016), obese or overweight patients (Choi & Brings, 2016) and with patients that have restricted movement may be especially prone to work-related MSDs. Caring for rehabilitation patients is especially demanding, since they have to be moved around for multiple activities in a day and nurses often don't have enough time to meet the busy schedules of such patients (Bhimani, 2016). The occurrence of work-related MSDs therefore

needs to be contextualised (Bhimani, 2016) to understand patterns of injury amongst nurses.

Patients with spinal cord injuries (PWSCI) are functionally dependent on nursing staff to assist with activities such as transfers. The PWSCI also need to be frequently and regularly repositioned to prevent secondary complications such as pressure sores and chest infections. Nurses working in spinal cord injury rehabilitation units (NuSCI) routinely have to lift heavy loads as part of their rotation duties. Patients with spinal cord injuries are often heavier than other patients and the need to lift and turn them may mean that NuSCI are more prone to injury than nurses in other settings. These highly physical work tasks put NuSCI at risk of developing sudden, acute and gradual as well as chronic work-related MSDs. Demographic characteristics, such as weight, height and years of professional experience, may also influence the development of work-related MSDs (Engels, van der Gulden, Senden, & van't Hof, 1996).

Work-related MSDs in nurses are a serious health workforce challenge and the health care system cannot afford to lose nursing staff to extended absenteeism, other employment or early retirement. Intent to leave the nursing profession has been associated with the incidence of work-related MSDs (Fochsen, Hagberg, Toomingas, & Lagerström, 2006). Although a number of studies have been done to establish the prevalence of work-related MSDs among nurses worldwide, little information is available on the prevalence of work-related MSDs among NuSCI in the City of Tshwane metropolitan area. We determined the prevalence of work-related MSDs among NuSCI; the most commonly affected body regions; the perceived job risk factors and coping strategies in the prevention of work-related MSDs.

### 2. Methods

We conducted a quantitative, descriptive cross-sectional study, sampling four spinal cord rehabilitation units in the City of Tshwane metropolitan area simultaneously.

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### 2.1 Sample size and sampling method

We selected participants using a non-probability, total population sampling method. The population comprised of 86 NuSCI. Previous studies on work-related MSDs among nurses used sample sizes ranging from 118 to 212 (Anap et al., 2013; Tinubu et al., 2010). These studies did not target a speciality area of nursing. In South Africa, nurses working with PWSCI constitute a relatively small percentage of nurses. All NuSCI at the four rehabilitation centres were considered for inclusion. Student nurses in their first year of study were excluded.

### 3. Questionnaire

We collected data using a four section self-reporting questionnaire. The questionnaire was adapted from the Nordic questionnaire (Kuorinka et al., 1987) for this particular study by adding three questions to the demographic section (Section A) to suit the specific population in this study. Section D was adapted to include a four-part Likert scale compelling participants to think about their answer.

- In Section A, participants were required to complete questions regarding demographic characteristics such as age, gender, weight, height, rank and level of education.
- Section B requested information regarding occupational health in nursing practice and sought information regarding work status and setting, years of practice, patient population and nursing activities. This section also includes a modification of the standardised Nordic questionnaire (Kuorinka et al., 1987), which consists of questions on nine different body areas.
- Section C contains elements on perceptions of job risk factors, such as performing repetitive tasks and working in awkward positions.
- Section D requested information on coping strategies employed by nurses seeking to reduce the development of work-related MSDs.

The Nordic questionnaire has been adapted for use in other studies (Anap et al., 2013; Nkhata et al., 2015; Tinubu et al., 2010). We conducted a pilot study to pre-test the adapted questionnaire to evaluate face and content validity and feasibility, time and adverse events. We made minor adaptations to improve ease-of-use and to ensure clarity. We removed the following redundant questions in Section A: current area of practice, year of graduation and current work setting. We added a question asking if NuSCI perceive to have enough staff to perform their daily tasks. In Section B, we added a question asking which body area was affected (not within the previous 12 months). An insert was added instructing NuSCI who answered “No” to Question 2 to proceed to Question 8, as questions in the interim were not applicable to them. Following the pilot study, a follow-on question to Question 7 (Section B) was removed due to perceived redundancy. The Nordic questionnaire has a sensitivity and specificity ranging between 66% and 92% and 71% and 88% respectively (Ohlsson, Attewell, Johnsson, Ahlm, & Skerfving, 1994).

The researchers contacted the unit manager of each spinal cord injury rehabilitation unit to arrange dates to deliver the questionnaires. The unit manager distributed the questionnaires to potential participants who then had two weeks to consider whether or not they would like to participate in the study. The unit managers were contacted telephonically at least twice weekly to be reminded of the questionnaires and to assess whether more questionnaires were required. The answered questionnaires were placed back in envelopes once completed and placed in a box which was then locked the unit manager's office. This was done to ensure that the respondent's answers would be kept confidential. The questionnaires had no respondent's names to ensure anonymity in the event that someone would attempt to tamper with the completed questionnaires in the unit manager's office. Researchers collected the completed questionnaires on a weekly basis.

### 3.1. Statistical analysis

Data were analysed using both descriptive and inferential statistics on the SPSS version 23. Differences between groups were expressed using analysis of variance (ANOVA) tests and expressed as *F*. Scheffé post-hoc tests were used to compare the means of significant differences found and expressed as *M*. A confidence interval of 95% was reported. Results were significant if  $p < 0.05$ .

### 4. Ethical considerations

This study was approved by the Faculty of Health Science Research Ethics Committee of the University of Pretoria (Clearance number, 532/2015), and by management of the respective facilities. The informed consent forms were separate to the questionnaires to ensure that the participants completed the forms anonymously. This study had no foreseeable risks, as there were no interventions with potential adverse effects.

### 5. Informed consent

All participants received a preface outlining the research in the information leaflet and consent form together with the questionnaire. All the information and the questionnaires were presented in hard copy format and in English. Participants had the opportunity to request information via the contact details made available in the information leaflet. Participants were not obligated or forced to take part in the study. Participation was completely voluntary and participants could refuse to take part in the study or leave at any time without penalty. By completing the questionnaire, participants automatically gave informed consent. Once the completed questionnaires were in the possession of the researchers, the participants could not recall their consent and therefore the information obtained from the questionnaires were used in the study.

### 6. Results

We distributed 86 questionnaires to NuSCI. We collected 61 questionnaires representing a 70.9% return rate. We excluded two questionnaires that were completed by care-workers and not by nurses. The sample comprised of 49 female and 10 male NuSCI. As shown in Table 1, the mean age, height and weight of NuSCI were  $36.73 \pm 9.33$  years,  $1.59 \pm 0.16$  m, and  $77.09 \pm 15.42$  kg respectively. Regarding rank, 44.1% were enrolled nursing assistants; professional nurses and enrolled nurses comprised 22.0%, unit managers 5.1% and student nurses 1.7%. The mean amount of professional working experience with PWSCI was  $9.87 \pm 7.55$  years. The mean amount of hours per week that the nurses spent in direct spinal cord injured patient care were  $40.14 \pm 6.39$  h (Table 1). Of the NuSCI, 59.3% had previous training on kinetic handling and how to prevent occupational hazards.

In this study, 57.6% ( $n = 34$ ) of NuSCI experienced work-related ache, pain, discomfort or injury that lasted for more than three days in the last 12 months. Two-thirds (61%,  $n = 36$ ) of NuSCI reported that they had experienced a work-related ache, pain, discomfort or injury that lasted for more than three days, and was not within the previous 12 months. As shown in Table 2, 12-month prevalence rates of work-related MSDs were highest in the lower back (73.53%), followed by shoulders (41.18%), knees and ankles (26.47%), thoracic back (23.53%), wrists/hands (17.65), hips/thighs (17.65%), neck (8.82%), and elbows (2.94%).

Table 3 displays what NuSCI perceive to be job risk factors. Bending or twisting your back in an awkward way was most commonly perceived to be a major problem (61%). Almost half (54.2%) of NuSCI perceived treating an excessive number of patients, working in the same position and continuing to work while injured or hurt to be major

**Table 1**  
Employment profile of NuSCI (n = 59).

Variable		Frequency n (%)	Mean (SD)
Age (years)			36.73 (9.33)
Height (m)			1.59 (0.16)
Weight (kg)			77.09 (15.42)
Gender	Male	10 (16.9)	
	Female	49 (83.1)	
Rank	Unit Manager	3 (5.1)	
	Professional nurse	13 (22.0)	
	Enrolled nurse	13 (22.0)	
	Enrolled nursing assistant	26 (44.1)	
	Student nurse	1 (1.7)	
Professional experience (years)			9.87 (7.55)
Worked with SCI patients in the last 12 months	< 3 months	8 (13.6)	
	3–6 months	4 (6.8)	
	> 6 months	45 (76.3)	
Hours worked per week			40.14 (6.39)
Post basic qualification	Yes	4 (6.8)	
	No	49 (83.1)	
Enough staff	Yes	18 (30.5)	
	No	38 (64.4)	

**Table 2**

Body regions of NuSCI affected by work-related MSDs in the last 12 months whilst caring for PWSCI (n = 34).

Body region	Frequency n (%)
Lower back (lumbar/sacral)	25 (73.53)
Shoulder(s)	14 (41.18)
Knee(s)	9 (26.47)
Ankle(s)/Feet	9 (26.47)
Upper back (thoracic)	8 (23.53)
Wrist(s)/Hand(s)	6 (17.65)
Hip(s)/Thigh(s)	6 (17.65)
Neck	3 (8.82)
Elbow(s)	1 (2.94)

problems contributing to work-related MSDs.

Nurses caring for PWSCI mostly coped with work-related MSDs by adjusting the plinth/bed height to stretch and change posture (68%).

**Table 3**

Perceived job risk factors for work-related MSDs by NuSCI (n = 59).

Perceived job risk factors	Major problem (%)	Minimal to moderate problem (%)	No problem (%)	Not documented (%)
Bending or twisting your back in an awkward way	61.0	27.1	8.5	3.4
Treating an excessive number of patients in one day	54.2	35.6	6.8	3.4
Working in the same positions for long periods (Standing, bend over, sitting, kneeling)	54.2	32.2	10.2	3.4
Continuing to work while injured or hurt	54.2	35.6	8.5	1.7
Carrying, lifting or moving heavy materials or equipment (e.g. continuous passive motion machines)	45.8	37.3	10.2	1.7
Not enough rest breaks or pauses during the workday	40.7	42.4	11.9	6.8
Lifting or transferring dependent patients	40.7	49.2	8.5	5.1
Inadequate training on the injury prevention	39.0	40.7	13.6	1.7
Working with confused or agitated patients	37.5	39.0	11.9	6.8
Performing the same task over and over	37.3	37.3	18.6	6.8
Unanticipated sudden movement or fall by patient	37.3	47.5	6.8	8.5
Working in awkward and cramped positions	35.6	39.0	16.9	8.5
Working near or at your physical limits	28.8	50.8	15.3	5.1
Work scheduling (overtime, irregular shifts, length of workday)	28.8	39.0	25.4	6.8
Reaching or working away from your body	27.1	55.9	10.2	6.8
Performing manual orthopaedic techniques (joint mobilisations, soft tissue mobilisations)	23.7	47.5	11.9	16.9
Assisting patients during gait activities	22.0	47.5	18.6	11.9

Very few NuSCI warmed up or stretched before performing their nursing duties (Table 4).

## 7. Associations

Nurses who had lower back pain in the last 12 months were more likely to identify bending or twisting your back in an awkward way as a major problem ( $F = 3.207$ ;  $p = 0.048$ ). Nurses who experienced any work-related MSDs were more likely to perceive not having enough staff as a major problem ( $F = 3.611$ ;  $p = 0.033$ ). This association was confirmed by a post-hoc Scheffe test that revealed a statistically significant association between NuSCI not having enough staff and experiencing a work-related MSDs ( $M = 0.463$ ,  $SD = 0.5897$ ). A similar association was found between not having enough staff and experiencing work-related MSDs at some point in their occupational lives ( $M = 0.789$ ,  $SD = 0.4132$ ).

Nurses who reported a high prevalence of work-related MSDs in the last months were more likely to report working at or near their physical limits as a major problem ( $F = 6.013$ ;  $p = 0.004$ ). Nurses who worked more hours in a week were more likely to identify that continuing to work while injured was a major problem ( $F = 2.225$ ;  $p = 0.047$ ). Female nurses were more likely to request help with lifting heavy patients in order to cope ( $F = 6.468$ ;  $p = 0.014$ ).

## 8. Discussion

In our study, more than half (57.6%) of NuSCI experienced work-related ache, pain, discomfort or injury that lasted for more than three days in the last 12-months. This prevalence rate is comparatively less than injuries reported for nurses from India (81.0%), Saudi Arabia (85.0%), Uganda (80.8%), Zambia (68.9%) and Nigeria (78%) (Anap et al., 2013; Attar, 2014; Munabi et al., 2014; Nkhata et al., 2015; Tinubu et al., 2010). The injury rates in different countries may be attributed to differing workloads, the availability of equipment and support from management.

Nurses working with PWSCI in this study mostly reported lower back complaints in the last 12 months, followed by complaints of the shoulders, knees and ankles or feet. These results are similar to those reported by Tinubu et al. (2010) in Nigeria, who found the lower back to be the most commonly affected body region (44.1%), followed by the neck (28.0%), and knees (22.4%). Furthermore, Attar (2014) found similar results with the lower back (65.7%), ankles/feet (41.5%) and

**Table 4**  
Coping strategies employed by NuSCI to mitigate work-related MSDs (n = 59).

Coping strategies	Always (%)	Most of the time (%)	Sometimes (%)	Never (%)	Not documented (%)
I adjust plinth/bed height so I can stretch and change posture	67.8	11.9	15.3	5.1	0
I get someone else to help me handle a heavy patient	57.6	27.1	15.3	0.0	0
I modify patient's position/my position	52.5	30.5	6.8	1.7	8.5
I select techniques/procedures that will not aggravate or provoke my discomfort	42.4	23.7	15.3	16.9	1.7
I stop a treatment if it causes or aggravates my discomfort	40.7	8.5	16.9	32.2	1.7
I use a different part of my body in administering my nursing procedure	37.3	25.4	16.9	10.2	10.2
I modify my nursing procedure in order to avoid stressing an injury	37.3	15.3	28.8	15.3	3.4
I pause regularly so I can stretch and change posture	18.6	22.0	20.3	39.0	0
I warm up and stretch before performing my nursing duties	10.2	5.1	8.5	76.3	0

shoulders (29.0%) being the top three most affected body regions. This contrasts with a study done by [Nkhata et al. \(2015\)](#), where researchers found ankles and feet to be the most commonly affected body region with a frequency of 54.8%. Despite the similarities, nurses in our study reported higher frequencies of lower back work-related MSDs (73.53%) compared to other studies; 48.2% ([Anap et al., 2013](#)), 65.7% ([Attar, 2014](#)) and 44% ([Tinubu et al., 2010](#)). The high frequency of lower back pain in NuSCI (this study) may be attributed to the repetitive patient handling tasks required of this specialised group of nurses and a high workload.

The NuSCI in this study reported that treating an excessive number of patients per day was a major problem and thus the second highest perceived job risk factor (54.20%). The high workload may arise from an unbalanced nurse to patient ratio due to a recognised shortage of nurses. Being short-staffed may mean that NuSCI have to work longer hours, thus putting them at a higher risk of developing work-related MSDs or worsening existing injuries. We found that NuSCI who worked longer hours were also more likely to report that continuing to work while injured was a major problem. In contrast, [Cilliers and Maart \(2013\)](#) reported that 47.7% of the nurses in their study indicated that they would avoid any kind of activity until the pain subsides as a coping strategy.

Perceived risk factors identified in this study (such as bending or twisting the back in an awkward way) are similar to those reported by previous studies ([Anap et al., 2013](#); [Tinubu et al., 2010](#)). However, [Anap et al. \(2013\)](#) further identified that carrying, lifting, or moving heavy materials or equipment put nurses at risk of being injured. Nurses in our study were mostly female (83.1%) and were also more likely to ask for help to handle a heavy patient. This suggests that although NuSCI in this study perceived carrying heavy materials as a major problem (45.8%), they mostly asked for help to handle heavy patients. Nurses adopt coping strategies during patient handling tasks to compensate for, and to prevent aches, pain, discomfort or injury related to work-related MSDs ([Breakwell, 2015](#)).

Nurses caring for PWSCI employed various coping strategies. Nurses mostly adjusted bed height, asked for help, modified their position or chose to perform tasks that would not put strain on their injuries. These coping mechanisms are also employed by nurses in other settings ([Anap et al., 2013](#); [Nkhata et al., 2015](#); [Tinubu et al., 2010](#)). Nurses employed other strategies to a lesser extent, including using different parts of the body in administering nursing procedures (e.g. [Nkhata et al., 2015](#)). Nurses in our study were unlikely to stop or restrict their activities if their pain was aggravated, unlike nurses from Nigeria ([Tinubu et al., 2010](#)). Nurses from South Africa (this study; [Altmann, 2010](#)) seem to have a tendency of ignoring pain and continuing to work regardless of the symptoms. We noticed that interventions aimed at preventing work-related MSDs among nurses were in place in the rehabilitation centres where we conducted our research. Kinetic handling and ergonomics in the workplace are regularly addressed; but these interventions seem to have little effect on the incidence and prevalence of work-related MSDs among nurses.

Nurses working in understaffed units seem to link the incidence of

work-related MSDs to being understaffed and under-equipped (64.4% of NuSCI, this study). A 'catch-22' situation develops when there is a high prevalence of work-related MSDs and not enough nurses to fill in for injured colleagues. Nurses who are capable of doing strenuous tasks have to fill in, often resulting in a higher workload and a greater risk for work-related MSDs. Work-related MSDs lead to absence from work and reduced work input ([Himmikaiye & Bamishaiye, 2012](#)) placing more strain on the rest of the staff, as they must take on added responsibility ([Cilliers & Maart, 2013](#)).

## 9. Practical implications

Work-related MSDs are a serious health workforce challenge and the health care system cannot afford to lose nursing staff to extended absenteeism, other employment or early retirement. This study identifies the body areas most affected by work-related MSDs as well as the risk factors of work-related MSDs. Strategies to mitigate lower back pain and shoulder injuries are vitally important as these injuries require long recovery times. Patients with high acuity need more attending nurses to relieve the workload of nurses and prevent work-related MSDs.

## 10. Limitations

The questionnaire was only in English, which may have been a potential reason for NuSCI not completing all questions, perhaps due to lack of understanding. It was noted that NuSCI do not have much spare time during work hours and got agitated when asked to complete a 10 min questionnaire. We selected the four rehabilitation centres based on their accessibility. Our results are not generalizable outside of our study setting. Our conclusions are also based on a cross-section of nurses and our results might not be a true representation of the problems experienced at these centres, since data was not collected from retired NuSCI or from nurses that changed their area of speciality.

## 11. Recommendations

The researchers recommend compiling a shorter questionnaire for NuSCI to ensure a higher questionnaire return rate and to ensure that less time is spent away from their work or leisure time. Future studies can be expanded to rehabilitation centres in other provinces of the country. Future studies can also be extended over a longer period of time to accommodate NuSCI who are on prolonged leave of absence or on a rotation basis to non-rehabilitation wards. This study identified a possible continuous cycle where NuSCI experienced a high workload, placing them at an increased risk of developing work-related MSDs. Once injured, NuSCI would be away from work to recover, leading to shortage of staff resulting in an increased workload for the NuSCI on duty. The NuSCI who work through the pain may not be able to fully perform their duties adequately, resulting in poor execution and quality of work. It is therefore recommended that the employer take steps to mitigate the multiple challenges faced by NuSCI. Various strategies may need to be put in place by the employer to ensure that NuSCI are



adequately equipped to lower the risk of injury while still providing good services to PWSCI.

## 12. Conclusion

The most common work-related MSDs in NuSCI (this study) were lower back pain, followed by injuries to the shoulders, knees and ankles/feet. The most common perceived job risk factor was bending or twisting your back in an awkward way, which is a common movement used during patient-handling tasks, especially in PWSCI. The NuSCI in this study mostly adjusted bed height to allow for stretching and changing posture to prevent work-related MSDs. The NuSCI felt that they were working in units with a shortage of staff and were working at their physical limits. Nurses working with PWSCI need to be physically able to carry out their daily tasks. Physiotherapy interventions such as core and proximal muscle strengthening; and upper and lower limb strengthening can help to prevent and treat work-related MSDs. Nurses should also receive training on how to lift and transfer PWSCI. It is important that education on ergonomics and kinetic handling is tailored to each individual setting for effective prevention of work-related MSDs.

## Conflict of interest

The authors declare that they have no personal or financial relationship(s) that may have influenced them in writing this article.

## Funding sources

This study was personally funded by the researchers.

## Ethical considerations

This study was approved by the Faculty of Health Science Research Ethics Committee of the University of Pretoria (Clearance number, 532/2015), and by management of the respective facilities. The informed consent forms were separate to the questionnaires to ensure that the participants completed the forms anonymously. This study had no foreseeable risks, as there were no interventions with potential adverse effects.

## Acknowledgements

The authors would like to acknowledge all nursing staff, unit managers and respective rehabilitation centres for their cooperation, as well as Prof. Joyce Mothabeng from the Department of Physiotherapy for her continued guidance. Lastly, we would like to thank Marian Wagener and Dr. Cheryl Tosh for the editing assistance.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.ijans.2018.04.004>.

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