

Work-related injury among Direct Care occupations in British Columbia, Canada.

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Work-related injury among direct care occupations in British Columbia

ABSTRACT

OBJECTIVES: To examine how injury rates and injury types differ across direct care occupations in relation to the healthcare settings in British Columbia (BC).

METHODS Data were derived from a standardized operational database in three BC health regions. Injury rates were defined as the number of injuries per 100 Full-Time Equivalent (FTE) positions. Poisson regression, with Generalized Estimating Equations, was used to determine injury risks associated with direct care occupations (registered nurses, licensed practical nurses, and care aides) by healthcare setting (acute care, nursing homes, and community care).

RESULTS: Care Aides (CAs) had higher injury rates in every setting with the highest rate in nursing homes (37.0 injuries per 100 FTE). Licensed practical nurses (LPNs) had higher injury rates (30.0) within acute care than within nursing homes. Few LPNs worked in community care. The registered nurse (RN) highest injury rates (21.9) occurred in acute care, but their highest (13.0) musculoskeletal injury (MSI) rate occurred in nursing homes. MSIs comprised the largest proportion of total injuries in all occupations. In both acute care and nursing homes, CAs had twice the MSI risk compared to RNs. Across all settings, puncture injuries were more predominant for RNs (21.3% of their total injuries) compared to LPNs (14.4%) and CAs (3.7%). Skin, eye and respiratory irritation injuries comprised a larger proportion of total injuries for RNs (11.1%) compared to LPNs (7.2%) and CAs (5.1%).

CONCLUSIONS: Direct care occupations have different risks of occupational injuries based on the particular tasks and roles they fulfill within each healthcare settings. CAs are the most vulnerable for sustaining MSIs since their job entails mostly of transferring and repositioning tasks during patient/resident/client care. Strategies should focus on prevention of MSIs for all occupations as well as target puncture and irritation injuries for RNs and LPNs.

KEY WORDS nursing occupations, injury rates, time-at-risk, health settings, nature of injury.

Direct care occupations comprise the largest proportion (58%) of health care employees in Canada and consist of registered nurses (RNs), licensed practical nurses (LPNs) and care aides (CAs).¹⁻³ Engkvist et al., (1998) describe a similar grouping of nursing occupations in Sweden with general registered nurses (RN), state registered nurses (LPN) and auxiliary nurses (care-aides).⁴ Healthcare occupations work in different settings (acute care, nursing homes, and community care) across the health care system. These settings, providing care specific to the needs of patients/residents/clients^a, have dissimilar task requirements. Shortages in the direct care occupations place workers in a position to choose where they prefer to work. While wage differentials may influence recruitment and retention, as Spetz (2003) has noted, wage increases are not viable solutions for resolving the workforce shortages; work conditions were more important factors for recruiting and retaining personnel.⁵ Thus a study of differential risk of injuries for the various direct care occupations in different health settings is warranted.

RNs can work as independent practitioners in all settings or as team members that assign clients and/or client care functions appropriately. LPNs do not work in isolation but as team members and must exercise clinical judgment in accepting assigned client care functions within their own level of competence.⁶ In many nursing homes, LPNs have previously been used interchangeably with CAs. Care

^a The designation varies according to the environment or healthcare setting in which the care-receiver resides (e.g., patient in acute care; resident in nursing homes; and client in community care – whether in Assisted Living or in the person's home).

aides must work with the support of RNs and LPNs in providing help to patients/residents/clients with their activities of daily living (such as assistance with personal hygiene, dressing, eating and mobility). This often involves the lifting, transferring and repositioning of patients/residents/clients.

In the health sector across Canada in 2004, 62.5% of RNs were working in acute care, whereas 13.4% were working in community health and 10.5% in nursing homes.⁷ Jansen et al (2000) report that LPNs were predominantly (57%) in acute care, 33% in nursing homes and 10% in community care.⁸ CAs were predominantly working in nursing homes with some in community care and a smaller proportion in acute care.⁹ In the future, more nurses will likely be required to work in nursing homes or community care because of policy changes that focus on reducing the number of chronic care residents in acute care settings and an aging population who will need ongoing care whether in their home, assisted living or nursing homes. RNs and LPNs may choose not to work in these settings if they perceive these work environments have higher injury risks than acute care.

Changes in the nature of care provided to patients/residents/clients and shifts in work patterns have a great impact on the nursing profession.¹⁰ Because of the different tasks and roles for the three nursing occupations within different care settings, each nursing occupation may have different injury experiences.^{8,11-12} Identifying these different patterns of injury through sub-group analysis by care types may allow for more effective targeting of prevention efforts as well as help nursing staff make informed decisions. The aim of the present study is to examine how injury characteristics and incidence among the three nursing occupations may differ in relation to acute care, nursing homes and community care settings in British Columbia, Canada. Time-at-risk data can provide more accurate injury rates than general rates published by Workers' Compensation Boards in Canada and the USA.

METHODS

The Occupational Health and Safety Agency for Healthcare (OHSAH), established in 1999 and jointly governed by healthcare employers and healthcare unions, has the mandate to reduce workplace injuries, illness and time-loss in the healthcare sector. OHSAH collects injury incident data among healthcare workers through the Workplace Health Indicator Tracking and Evaluation (WHITETM) database. This web-based surveillance system was developed by OHSAH in collaboration with University of British Columbia (UBC) researchers to facilitate analysis of workplace incidents and injuries and provide healthcare stakeholders with comparative performance indicators on workplace health and safety. WHITETM data includes: descriptions of incidents; demographics of the workplace and injured worker; contributory factors related to location and circumstance of injury; nature of injury, body part involved, type of device, etc. Detailed analysis (stratified by occupation, age, health sector, location, body part, circumstance, etc.) was possible through an On-Line Analytical Processing (OLAP) database that merged WHITE, payroll, and WorkSafeBC (formerly Worker's Compensation Board) databases. OLAP could disaggregate productive hours (denominator values) to the individual level and thus enable rates to be linked to any of the variables associated with injury. Data were cleaned and checked for completeness. Payroll data enabled linking time-at-risk (productive hours) with each person and each injury. Ethical review was obtained through the UBC ethical review committee. The administrative databases used in OLAP have only encrypted individual identifiers within an operational tracking system.

This analysis includes 1-year incident data for three large health regions from October 2004 to September 2005: Fraser Health, Northern Health and Interior Health. Incidents that resulted in time-loss or medical care were extracted from WHITE for direct care occupations, and rates were calculated using productive hours obtained directly from the health regions. Facility productive hours were converted into Full-Time Equivalent (FTE) positions (1,879.2 productive hours were deemed equivalent to 1 FTE) and injury rates were expressed as injuries per 100 FTEs. Productive hours are defined as paid and overtime hours minus vacation, sickness absence, time-loss injury and any paid hours not doing regular healthcare

task. There is agreement amongst government authorities, health employers and unions that 1,879.2 productive hours equate to one full-time equivalent position. The generally accepted calculation is 7.2 hours per day for 261 workdays (e.g., excluding week-ends and statutory holidays) equal 1,879.2 productive hours. In order to adjust for reporting bias, in this study we only examined injury claims that resulted in compensation or medical costs. Poisson regression with Generalized Estimating Equations (GEE) was used to determine the relative risks for injuries associated with the healthcare sub-sector (i.e., acute care, nursing homes, or community care).

RESULTS

During the study period, there were 2,784 injury incidents (time-loss and/or healthcare): 1,697 in acute care, 355 in community care and 732 in nursing homes among the three nursing occupations. These incidents resulted in injury rates (per 100 FTE) of 24.3 in acute care, 15.1 in community care and 31.6 in nursing homes. Table 1 shows that CAs had the higher all-injury rates in every sector with the highest rate in the nursing home sector (37.0). LPNs had the next highest all-injury rate, with greatest injury risk in acute care (30.5 per 100 FTE), followed by 26.8 in nursing homes. LPNs were under-utilized in community care with no associated time-loss injury incidents. RNs had the lowest all-injury rates with their highest injury risk (21.9) occurring in acute care. There was a trend of lower injury rates with increased age among RNs and CAs in acute care as well as among LPNs and CAs in nursing homes. Overall, female nurses had higher injury rates than their male counterparts for all occupations and health settings with the exception of RNs in acute care.

Table 2 presents the proportion of different injury types for the nursing occupations according to the healthcare setting. Musculoskeletal injuries (MSIs) comprised the highest proportion of injuries for each nursing occupation and in each sector. MSIs can be separated as locomotor system accidents (MSIs) or locomotor system diseases without a former accident (e.g., chronic back pain among especially the nurse aides). In our data there were no identified locomotor system disease claims, likely as these claims are very rarely allowed, and as such most workers cite specific traumatic events as having precipitated exacerbations and resulting time lost from work. Thus all MSIs were related to a traumatic event. For RNs, the MSIs ranged from 75.9% of all their injuries in the nursing homes sector to 52.1% in acute care. For LPNs, the MSIs contributed to a very similar proportion of all their injuries in acute care and nursing homes (71.4% and 69.4%, respectively). For CAs, the MSIs represented 73% of all their injuries in the nursing home and Community Care sectors but only 60.8% of injuries in acute care.

Aggregating all the sectors (Table 2), RNs had a higher proportion of total injuries comprised of puncture injuries (21.3%) compared to LPNs (14.4%) and CAs (3.7%). Of note, RN puncture wounds comprised a similar proportion of all injuries in acute care and community care, and a lower proportion in long-term care. Irritation and allergy incidents were highest amongst RNs (11.1%) followed by LPNs (7.2%) and CAs (5.1%). Other injuries (the aggregate of: burns, cuts, bruises, infections and psychological trauma) were highest amongst CAs (14.7%) followed by RNs (13.7%) and LPNs (7.5%).

Table 1. Demographics Factors and Injury rates by occupational sector for RNs, LPNs and CAs

	Acute care		Community health care		Long term care	
	No. of injuries	Rates per 100 FTE	No. of injuries	Rates per 100 FTE	No. of injuries	Rates per 100 FTE
Registered Nurse (RN)						
Age group (yrs)						
<30	145	28.3	5	7.5	1	8.8
30 – 39	243	25.2	20	8.9	10	15.4
40 – 49	352	22.3	27	6.2	24	19.9
50 – 59	305	18.5	42	8.1	41	18.6
60 +	52	17.0	10	9.5	7	10.5
Gender						
Male	64	23.3	4	5.0	1	3.4
Female	1033	21.8	100	7.9	82	18.1
Overall Registered Nurse	1,097	21.9	104	7.7	83	17.2
Licensed Practical Nurse (LPN)						
Age group (yrs)						
<30	28	30.1	No data	No data	13	34.6
30 – 39	56	36.9	No data	No data	20	32.8
40 – 49	75	28.5	No data	No data	21	23.6
50 – 59	78	28.8	No data	No data	15	21.6
60 +	11	31.4	No data	No data	3	25.6
Gender						
Male	18	23.0	No data	No data	4	22.2
Female	230	31.3	No data	No data	68	27.1
Overall LPN	248	30.5	No data	No data	72	26.8
Care-Aide (CA)						
Age group (yrs)						
<30	26	43.5	17	23.1	40	49.5
30 – 39	70	34.0	42	26.5	110	42.1
40 – 49	126	32.4	77	26.2	219	35.7
50 – 59	114	27.5	89	24.3	193	37.8
60 +	16	21.0	26	26.1	15	15.9
Gender						
Male	31	29.4	14	21.1	19	15.7
Female	321	30.9	237	25.6	558	38.8
Overall Care-Aide	352	30.7	251	25.3	577	37.0
All Direct Care	1,697	24.3	355	15.1	732	31.6

RN represents registered nurses; LPN represents licensed practical nurses; CA represents care-aides, nursing assistants, community health workers; Direct Care comprised of RNs, LPNs and CAs. 1 FTE = 1 Full Time Equivalent position representing 1,879.2 productive hours

Table 2 – Nature of injury for RNs, LPNs and CAs by sector of employment

Injury Outcome	FTEs	MSI *	Irritation and allergy **	Other injuries (burn, cuts, bruise, psych trauma)	Puncture
RN					
Acute care	5,015	571 [52.1]	136 [12.4]	147 [13.4]	243 [22.2]
Community Care	1,348	58 [55.8]	5 [4.8]	20 [19.2]	21 [20.2]
Nursing homes	484	63 [75.9]	2 [2.4]	9 [10.6]	9 [10.8]
RN overall	6,847	692 [53.9]	143 [11.1]	176 [13.7]	273 [21.3]
LPN					
Acute care	814	177 [71.4]	21 [8.5]	17 [6.9]	33 [13.3]
Community Care	9	No data	No data	No data	No data
Nursing homes	269	50 [69.4]	2 [2.8]	7 [9.7]	13 [18.1]
LPN overall	1,092	227 [70.9]	23 [7.2]	24 [7.5]	46 [14.4]
CA					
Acute care	1,146	236 [60.8]	31 [8.0]	56 [15.9]	29 [8.2]
Community Care	992	199 [73.3]	7 [2.8]	37 [14.7]	8 [2.8]
Nursing homes	1,561	462 [73.0]	26 [4.3]	80 [13.9]	9 [1.4]
CA overall	3,699	897 [69.4]	64 [5.1]	173 [14.7]	46 [3.7]
Direct Care	11,638	1,816 [65.2]	230 [8.3]	373 [13.4]	365 [13.1]

RN represents registered nurses; **LPN** represents licensed practical nurses;

CA represents care-aides, nursing assistants, community health workers; **Direct Care** comprised of RNs, LPNs and CAs

***MSI** represents any incident (single or multiple nature of injury) that includes MSIs

****Irritation and allergy** represents the combined incidents comprised of the nature of injury: Skin irritation, Skin/mucous membrane exposure (including eye), eye irritation, allergic response, and respiratory irritation.

! **Other multiple injuries** are included with burns, cuts, etc...

Square parentheses [] represent row percentage for nature of injury.

1 **FTE** = 1 Full Time Equivalent position representing 1,879.2 productive hours

Table 3 shows the distribution of ‘nature of injuries’ in acute care departments for RNs, LPNs and CAs. Examining total injuries revealed differences across the nursing occupations by department in which injuries occurred and this distribution reflected the utilization of RNs predominantly in these areas. For RNs the majority of injuries (59.8%) occurred in General Medical wards and Surgery. For LPNs the majority (41.5%) of injuries occurred in General Medical wards although a substantial amount occurred in Rehab/extended care (18.5%), Surgery/OR (15.7%) and in ‘Infection Control and related areas’ (12.9%). For CAs the predominant departments for injury were Rehab/extended care (38.6%) and ‘Infection Control and related areas’ (24.4%).

Table 3. Acute Care Nature of Injury by RNs, LPNs and CAs

	MSIs*	Irritation and allergy**	Other injuries!	Puncture	All Injuries
Registered Nurse (RN)					
ICU	47 (8.3)	19 (14.0)	7 (4.8)	22 (9.2)	95 (8.7)
ER	69 (12.2)	20 (14.7)	15 (10.2)	21 (8.8)	125 (11.5)
Rehab/extended care	20 (3.5)	2 (1.5)	5 (3.4)	5 (2.1)	32 (2.9)
General medical	197 (34.7)	50 (36.8)	46 (31.3)	76 (31.8)	369 (33.9)
Surgery/OR	127 (22.4)	29 (21.3)	38 (25.9)	88 (36.8)	282 (25.9)
Psych	30 (5.3)	3 (2.2)	13 (8.8)	2 (0.8)	48 (4.4)
IC & Related	42 (7.4)	6 (4.4)	9 (6.1)	16 (6.7)	73 (6.7)
Other	23 (4.1)	4 (2.9)	7 (4.8)	4 (1.7)	38 (3.5)
Float Staff	12 (2.1)	3 (2.2)	7 (4.8)	5 (2.1)	27 (2.5)
Total Acute RN	567 [52.1]	136 [12.5]	147 [13.5]	239 [21.9]	1,089
Total Non-Acute!!	4 [50.0]	0	0	4 [50.0]	8
Total RN Overall	571 [52.1]	136 [12.4]	147 [13.5]	243 [22.2]	1,097
Licensed Practical Nurse (LPN)					
ICU	1 (0.6)	0	0	1 (3.0)	2 (0.8)
ER	9 (5.1)	2 (9.5)	1 (5.9)	2 (6.1)	14 (5.6)
Rehab/extended care	37 (20.9)	4 (19.0)	3 (17.6)	2 (6.1)	46 (18.5)
General medical	73 (41.2)	11 (52.4)	6 (35.3)	13 (39.4)	103 (41.5)
Surgery/OR	28 (15.8)	3 (14.3)	2 (11.8)	6 (18.2)	39 (15.7)
Psych	0	0	1 (5.9)	0	1 (0.4)
IC & Related	20 (11.3)	1 (4.8)	3 (17.6)	8 (24.2)	32 (12.9)
Other	3 (1.7)	0	0	0	3 (1.2)
Float Staff	6 (3.4)	0	1 (5.9)	1 (3.0)	8 (3.2)
Total Acute LPN	177 [71.4]	21 [8.5]	17 [6.8]	33 [13.3]	248
Total Non-Acute!!	0	0	0	0	0
Total LPN Overall	177 [71.4]	21 [8.5]	17 [6.9]	33 [13.3]	248
Care Aide (CA)					
ICU	1 (0.5)	2 (7.7)	0	0	3 (1.0)
ER	10 (4.8)	2 (7.7)	2 (4.3)	1 (4.2)	15 (5.0)
Rehab/extended care	89 (43.0)	5 (19.2)	20 (43.5)	3 (12.5)	117 (38.6)
General medical	18 (8.7)	2 (7.7)	5 (10.9)	2 (8.3)	27 (8.9)
Surgery/OR	17 (8.2)	1 (3.8)	2 (4.3)	2 (8.3)	22 (7.3)
Psych	4 (1.9)	1 (3.8)	2 (4.3)	0	7 (2.3)
IC & Related	41 (19.8)	10 (38.5)	8 (17.4)	15 (62.5)	74 (24.4)
Other	22 (10.6)	3 (11.5)	6 (13.0)	1 (4.2)	32 (10.6)
Float Staff	5 (2.4)	0	1 (2.2)	0	6 (2.0)
Total Acute CA	207 [68.3]	26 [8.6]	46 [15.2]	24 [7.9]	303
Total Non-Acute!!	29 [59.2]	5 [10.2]	10 [20.4]	5 [10.2]	49
Total CA Overall	236 [67.0]	31 [8.8]	56 [18.5]	29 [8.2]	352

RN represents registered nurses; LPN represents licensed practical nurses;

CA represents care-aides, nursing assistants, community health workers.

*MSI represents any incident (single or multiple nature of injury) that includes MSIs

**Irritation and allergy represents the combined incidents comprised of the nature of injury: Skin irritation, Skin/mucous membrane exposure (including eye), eye irritation, allergic response, and respiratory irritation.

!Other injuries include: burns, cuts, bruises, psych trauma and unspecified injuries.

IC & Related represents Infection Control, Sterile Processing, Housekeeping, Laundry, and cleaners

!! These are Home Care RNs and CAs who work out of an office situation in an acute care facility.

Round parentheses () represent Acute Department column percentages.

Square parentheses [] represent row percentage for nature of injury.

Table 4. Association of health sector with the risk of total injuries and MSIs by nursing occupations

Occupation	Sector	%Of occupation	Injury rate per 100 FTE	Adjusted-RR for all-injuries (95% CIs) *	Adjusted-RR for MSIs (95% CIs) *
RNs	Acute care	73.2	21.9	1.00 (ref.)	1.00 (ref.)
	Community Care	19.7	7.7	0.38 (0.33, 0.43) p<0.0001	0.41 (0.31, 0.55) p<0.0001
	Nursing homes	7.1	17.2	0.87 (0.62, 1.21) 0.4046	1.30 (0.80, 2.10) p=0.2897
LPNs**	Acute care	74.5	30.5	1.00 (ref.)	1.00 (ref.)
	Community Care	No data	No data	No data	No data
	Nursing homes	24.6	26.8	0.81 (0.73, 0.90) p<0.0001	0.81 (0.77, 0.86) p<0.0001
CAs	Acute care	31.0	30.7	1.00 (ref.)	1.00 (ref.)
	Community Care	26.8	25.3	0.80 (0.66, 0.96) p=0.0202	0.96 (0.87, 1.06) p=0.3925
	Nursing homes	42.2	37.0	1.22 (0.92, 1.63) p=0.1686	1.42 (1.09, 1.85) p=0.0086

Notes

RN represents registered nurses; LPN represents licensed practical nurses; CA represents care-aides, nursing assistants, community health workers.

RR = relative risk; **CI**s = confidence intervals.

RRs, 95% CIs and p-values were derived from Poisson regression model with GEE (Generalized Estimating Equations).

* Adjusted variables: gender and age; health region were treated as cluster variables in the model.

** LPNs were under-utilized in community care. There were very few LPNs requested for community care posted positions (CLPNBC, 2004). The combined productive hours in three health regions produced the equivalent of 9 person-years. This indicates that in community care for LPNs there was only enough time-at-risk hours equivalent to a total of nine people across three health regions working full-time for a year. The data is insufficient to make any calculations of relative risk.

For RNs the highest adjusted relative risk for all-injuries was in acute care, but the risk for MSIs was highest in the nursing homes (Table 4). For LPNs the highest relative risk of all-injuries and MSIs was in acute care. For CAs the highest risk of MSIs was in nursing homes compared to acute care. The risk of all-injuries and MSIs was low among RNs and CAs in the community care compared to similar injuries in acute care.

Table 5 presents injury risk by occupations within each healthcare sector. In acute care, CAs had the highest relative risk of all injuries (RR 1.40, p<.0001) and MSIs (RR 1.82, p<.0001) followed by LPNs (RR 1.33, p<.0001 and RR 1.75, p<.0001 respectively). In the nursing homes, CAs had twice the injury risk compared to RNs for all-injuries (RR 2.06, p<.0001) and MSIs (RR 2.16, p<.0001). Compared to RNs, the injury risk for LPNs was higher for all-injuries (RR 1.43, p=.01) but for MSIs, the difference in injury risk was not statistically significant (RR 1.28, p=.12).

Table 5. Association of nursing occupations with the risk of total injuries and MSIs by health sector

Sector	Occupation	FTEs	% in this Sector	Adjusted-RR all Injuries (95% CIs) *	Adjusted-RR MSIs (95% CIs) *
Acute care	RNs	5,015	71.9	1.00 (ref.)	1.00 (ref.)
	LPNs	814	11.7	1.33 (1.10, 1.60) p=0.0026	1.75 (1.42, 2.16) p<0.0001
	CAs	1,146	16.4	1.40 (1.20, 1.64) p<0.0001	1.82 (1.56, 2.12) p<0.0001
	Total Acute Care	6,975	100%		
Community Care	RNs	1,348	57.4	1.00 (ref.)	1.00 (ref.)
	LPN**	9	0.4	No data	No data
	CAs	992	42.2	3.27 (2.44, 4.37) p<0.0001	4.76 (4.35, 5.21) p<0.0001
	Total Community Care	2,349	100%		
Nursing homes	RNs	484	20.9	1.00 (ref.)	1.00 (ref.)
	LPNs	269	11.6	1.43 (1.08, 1.87) p=0.0112	1.28 (0.94, 1.75) p=0.1150
	CAs	1,561	67.5	2.06 (1.69, 2.51) p<0.0001	2.16 (1.54, 3.03) p<0.0001
	Total Nursing homes	2,314	100%		

Notes

RN represents registered nurses; LPN represents licensed practical nurses; CA represents care-aides, nursing assistants, community health workers.

RR = relative risk; **CI**s = confidence intervals.

RRs, 95% CIs and p-values were derived from Poisson regression model with GEE (Generalized Estimating Equations).

*Adjusted variables: gender and age; health region were treated as cluster variables in the model.

** LPNs were under-utilized in community care. There were very few LPNs requested for community care posted positions. The combined productive hours in three health regions produced the equivalent of 9 FTEs (CLPNBC, 2004).

DISCUSSION

This is one of the first studies that examined injuries across all direct care occupations by specific healthcare setting with data analyzed from a very large healthcare study population. The rates in our study are high compared to published rates by WorkSafeBC, as our rates are calculated from actual productive hours for each occupation and therefore provide a more accurate measure of time-at-risk per person and per accident. WorkSafeBC uses a different denominator that is not comparable. Published rates by Workers' Compensation Boards in Canada and the USA generally report injury rates based on Labor Force Survey denominator values and as such the rates are not occupation-specific (including many occupations in a group). These generalized denominator values inevitably dilute the exposure rate by lumping low-risk occupations with high-risk occupations. This leads to lower calculated injury rates. WorkSafeBC also report 'time-loss only' whereas this study accounted for any injury requiring time-loss or health care. Our data included all healthcare workers working in hospitals and nursing homes affiliated to the publicly funded health regions.

Our study findings confirmed that the different risks for occupational injuries may be based on the particular tasks and roles each occupation is required to fulfill within each healthcare sub-sector.¹³⁻¹⁴ This is consistent with MSIs being found as the most common (54 to 71%) type of injury across all direct care occupations in all healthcare sub-sectors. RNs were the least vulnerable for all-injuries and MSIs. CAs were the most vulnerable occupation for sustaining most work-related injuries. WorkSafeBC (2006) reported that 4,040 (60%) of 6,731 compensation claims first paid in 2005 within the British Columbia health care and social assistance sector, were related to overexertion and bodily motion injuries.¹⁵ Though MSIs comprise the major portion of time-loss injuries, other injuries are also commonly experienced

among direct care occupations.¹⁵⁻¹⁶ Injuries not related to musculoskeletal disability (including burns, bruises, abrasions, cuts, punctures, skin/mucous membrane irritation, respiratory irritation, allergies, infections, psychological trauma, etc.) accounted for 40% of compensation claims. Our study examined incidents by nature of injuries (e.g., MSI, puncture, irritation, etc.), whereas the WorkSafeBC reports were typically based on cause of injury (e.g., exertion, fall, machinery, material handling, etc.). As expected the department in which injuries occurred (Table 3) reflected the different utilization of each direct care occupation across the acute care departments. The prevalence of injuries specific to each direct care occupation is dependent on the number of people in that occupation in each department but we present only the relative proportion of injuries across departments because breaking down the number of injuries by 3 occupations, 3 sub-sectors and by 5 injury categories and 9 departments would not leave enough numbers to calculate meaningful rates.

Studies have long indicated that work-related musculoskeletal injuries (MSIs) are predominant amongst nurses and other direct care occupations.¹⁷⁻²⁰ Low back injury is the most frequent MSI in nurses, followed by neck and shoulder problems.²¹ Nursing work is physically demanding, requiring heavy lifting, bending and twisting, and other awkward postures that are associated with MSIs.²²⁻²⁴ Physical demands increase the odds of injury due to creation of compression, rotation, and shear forces that exceed body tolerances.²⁵⁻²⁹ Psychological job demands can also amplify the effects of physical exertion and thereby increase injury risk.³⁰⁻³² Appropriate workplace interventions must be in place to entice direct care occupations so that the different employment sub-sectors offer comparable work opportunities for direct care healthcare workforce. Our study enables the comparison of injury rates for various types of injury across the healthcare sub-sectors by occupation and provides guidance which of them requires higher and urgent attention.

The literature reports a high risk of work-related MSI among nursing personnel in a number of healthcare settings, including acute care,^{5,22} nursing homes²² and community care settings.^{22,33} The US Bureau of Labor Statistics (BLS) reported that 2004 incidence rates were 9.7 injuries per 100 FTE for nursing homes and residential care facilities whereas hospitals had a rate of 8.3.³⁴ WorkSafeBC (2002)³⁵ reported higher risk for workers in nursing homes (9.0/100FTE in 2001) compared to 7.0 for acute care. The higher nursing home injury rates are attributed to the provision of care for more vulnerable elderly residents who require much lifting and transferring. Fuortes et al (1994)¹⁴ reported that occupational duties requiring twisting and lifting increased the risk of low-back injury by 4.84 times. Bongers et al. (1993)¹³ as well as Fredriksson et al. (2002)²⁵ found that increased exposure to twisting, lifting and diminished recovery time between exposures increased the likelihood of worker injury. RNs and LPNs have medical/nursing/administrative tasks that take priority over the lifting and transferring of residents/patients- the predominant tasks of care aides (CAs). Since CAs perform lifting and transferring more frequently than RNs or LPNs and consequently have shorter periods to recover between events, it is expected that CAs would have higher injury rates. Fuortes et al. (1994)¹⁴ found the incidence of low-back injury in CAs was 3.3 times higher than in RNs and LPNs. Ostry et al. (2003)³⁶ found that in acute care, LPNs aggregated with CAs were more likely than RNs to experience: any injury (1.59 times), patient-care injury (1.80 times) and violence-related injury (3.25 times). The different tasks between occupations may explain injury differences between occupations and these differences agree with the findings from previous studies using facility-specific data (e.g., Ostry et al.).³⁶ However, as suggested above, facility-specific data produce higher injury rates than rates reported by Workers' Compensation Boards, as the generic denominator data used by Compensation Boards tend to result in lower injury estimates than the actual exposure risk.

Among CAs in the acute care and nursing home sectors and among RNs in acute care, age was found to protect workers from injury. But this relationship might be confounded by experience, healthy worker effect or the fact that older workers were holding the safer positions. The relationship of work-related injury and age was explored by the Canadian Institute For Health Information (CIHI).³⁷ The

average age of the British Columbia nurses (45.8 years) is higher than any other Canadian province and Canada in general (44.6 years).³⁷ Across Canada in 2004, a total of 36% of the registered nurses (RN) were older than 50 years.³⁷ Rahim-Jamal (2001)⁹ reported that the LPN age distribution in BC was: 2.0% for those younger than 25 years, 13.3% for those 25-34, 29.9% for those 35-44 and 54.8% for those 45 years or older.

Our study population was largely female and comparable to the overall Canadian nursing workforce. Females represented 95% of the Canadian RN population in 2004 and this gender ratio has been consistent since 1999.³⁷ The relationship of work-related injuries and gender was similar to results reported by Gluck and Oleinick (1998)³⁸ as well as Islam et al (2001).³⁹

We should interpret the findings of this study with some limitations kept in mind. The study population appears comparable to the workforce in other BC health regions but differences in utilization of RNs, LPNs and CAs across other health regions may cause differences in injury risk across the healthcare sub-sectors. A one-year period also restricted the identification of long-term trends especially for LPNs, since the LPN workforce is in transition from being under-utilized in some healthcare sub-sectors to being used to full potential in all sub-sectors. The composition of direct care occupations in acute care workforce is currently changing to incorporate more LPNs and CAs because of the aging patient population.

Injuries and disabilities among nurses and nursing shortages tremendously affect the quality of healthcare delivery and create strain on the available healthcare workforce. In BC, there were only 28,289 RNs serving a population of 41 million.⁷ The 1:148 ratio of RNs to population is lowest in BC compared to the ratios for Prince Edward Island (1:100) or Newfoundland/ Labrador (1:95).⁷ The BC ratio has been consistent over the last couple of years.⁷ The ratio of nurses to population is actually worse if we consider the fact that only half of the nurses are working full-time in Canada and BC. Amongst the 28,289 RN in BC, only 14,122 were working full-time in 2004. We did not have data available in this study to measure familiarity with the workplace. It is conceded that familiarity with the workplace would reduce injury rates. This is partially demonstrated by the lower injury rates of older healthcare workers.

British Columbia has fewer LPNs in proportion to RNs than any other province. In 1998, there were 4,424 LPNs in BC representing a ratio of 1 LPN to 6.4 RNs compared to the Canadian average of 1 LPN to 3 RNS. More than 80% of LPNs were over the age of 35 and 51% were older than 45. Jansen et al., (2000)⁷ found that employers underutilized the following LPN certified competencies: administering oral medications, dressing simple wounds, catheterizations, psychogeriatrics, subcutaneous injections, and performing certain assessments. Higher utilization of competencies was in: administering topical medications and assisting with deep breathing and coughing.

According to the College of Registered Nurses of BC (CRNBC), RNs are required to complete the baccalaureate training and successful completion of the Canadian Registered Nurse Examination and be a registrant with the CRNBC.⁶ LPNs enter practice after completing a one-year certification program and the successful completion of the Canadian Practical Nurse Registration Examination.³⁹ The certification program has shifted from a task-oriented model to one that emphasizes critical thinking and independent problem solving. To work as an LPN in British Columbia, the worker must be a registrant with the College of Licensed Practical Nurses of BC.⁴⁰ The certificate program for CAs was standardized to 20 weeks and was designed to enable a combined Resident Care Attendant program and Home Support Worker (HSW) credential.

Prevention of occupational injuries among the healthcare workforce is vital to provide quality patient care service, improve employee morale, and enhance productivity by reducing time-loss and other absenteeism.⁴¹ This study identified vulnerable groups within the nursing occupation across healthcare settings. Results indicate that rather than focusing only on acute care settings, more attention is required to target injury prevention efforts in nursing homes and community care. Among the many factors that increase risk of injury among healthcare personnel are organization causes (staffing shortages, and stress

due to organizational change) and individual causes (an aging workforce and patients, sicker and obese patients, etc). Due to the increase in chronic diseases amongst the aging workforce and the aging care-recipients, the direct care workforce is more susceptible to injury while the aging patients/residents/clients require more help with activities of daily living.

Our findings indicate that reduction of injuries may be more easily achieved by targeting the high injury rate of care aides. Since MSIs are the prevalent type of injury, opportunities for reduction of injuries can be optimized by ensuring that all direct occupations, especially older nurses, have easy access to equipment (such as floor and ceiling lifts) to reduce stress on muscles, joints and back. With better understanding of the injury risks across occupations and healthcare sub-sectors, policy makers, union representatives and compensation officials will be better able to implement strategies to enable direct care occupations to choose safer workplaces that match their career goals and interests with the needs of the care-recipient population.

Main Messages:

1. Time-at-risk databases provide higher occupational injury rates than those published by Workers' Compensation Boards in Canada and the USA.
2. Musculoskeletal injuries comprised the majority of time loss injuries in each of the direct care occupations.
3. Nursing homes were the setting of highest injury rates for RNs and Care Aides.
4. Acute care was the setting of the highest rates of all the other types injury.
5. Care Aides had the highest injury rates of the direct care occupations especially in nursing homes and community care.

Policy Implications:

1. Time-at-risk databases should be accessed by Workers' Compensation Boards whenever they publish injury rates. The use of Labor Force Surveys as denominator values in calculating injury rates derive low values and misrepresent the actual injury risk for occupational groups.
2. With an aging healthcare workforce it is essential to reduce musculoskeletal injuries through environmental design and increased access to lifting devices especially in nursing homes and community care).
3. The acute care setting produces the most injuries related to 'irritation & allergy', burns, cuts, bruises, psychological trauma and puncture injuries. Injury reduction strategies must target a broad spectrum of injury types requiring changes in practice protocols (safe needle technology, injection and needle disposal procedures) as well as musculoskeletal injury reduction as stated above.

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