ORIGINAL ARTICLE

An evaluation of hospital discharge records as a tool for serious work related injury surveillance

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Objectives: To identify and describe work related serious injuries among sawmill workers in British Columbia, Canada using hospital discharge records, and compare the agreement and capturing patterns of the work related indicators available in the hospital discharge records.

Methods: Hospital discharge records were extracted from 1989 to 1998 for a cohort of sawmill workers. Work related injuries were identified from these records using International Classification of Disease (ICD-9) external cause of injury codes, which have a fifth digit, and sometimes a fourth digit, indicating place of occurrence, and the responsibility of payment schedule, which identifies workers' compensation as being responsible for payment.

Results: The most frequent causes of work related hospitalisations were falls, machinery related, overexertion, struck against, cutting or piercing, and struck by falling objects. Almost all cases of machinery related, struck by falling object, and caught in or between injuries were found to be work related. Overall, there was good agreement between the two indicators (ICD-9 code and payment schedule) for identifying work relatedness of injury hospitalisations ($\kappa=0.75$, $p < 0.01$). There was better concordance between them for injuries, such as struck against, drowning/suffocation/foreign body, fire/flame/natural/environmental, and explosions/firearms/hot substance/electric current/radiation, and poor concordance for injuries, such as machinery related, struck by falling object, overexertion, cutting or piercing, and caught in or between.

Conclusions: Hospital discharge records are collected for administrative reasons, and thus are readily available. Depending on the coding reliability and validity, hospital discharge records represent an alternative and independent source of information for serious work related injuries. The study findings support the use of hospital discharge records as a potential surveillance system for such injuries.

Workers' compensation claims data represents an important source of information on work related injuries. Compensation statistics are compiled using only officially reported and accepted claims. However, several recent studies in the USA^{1–5} and Canada⁶ have found that workers injured in the workplace do not always report injuries or file a claim for workers' compensation. Work related injuries may not be reported to compensation systems for numerous reasons, such as discouraging supervisors and coworkers, job insecurity, legal status, procedural complications, unawareness about the system, high odds of having a claim rejected, injury not serious enough, and social stigma.^{5–7} Additionally, workers' compensation does not accept all of the claims filed.^{3,7}

In addition to workers' compensation claims data, other sources of information including emergency department reports, physician claims data, police reports, newspaper clippings, surveys, and workplace incident reports have been explored as a means to determine the number of non-fatal work related injuries.^{8–13} Hospital discharge records represent yet another readily available source of data for the monitoring of severe non-fatal injuries. Hospital discharge records have detailed information on the nature, cause, and severity of injuries, and the records are collected objectively outside of the contentious arena of attribution. Despite their potential to capture work related injury, little research has been carried out on their validity and completeness.^{14–15} In Canada, a few studies have attempted to identify work related events using hospital discharge records, but have focused on capturing a specific range of injuries, such as those related to agricultural machineries, or occupational asthma.^{16–18} According to our knowledge, studies in Canada have neither used hospital

data for more general injury surveillance nor validated its use against other available indicators. Hospital discharge records have the potential to be a useful data resource for surveillance because of the public healthcare system in Canada, and the comprehensive coverage of hospitalisations at the population level.

The challenge in utilising hospital discharge data for work related injury research is differentiating work from non-work related injuries. The International Classification of Disease Revision 9 Clinical Modification (ICD-9 CM)¹⁹ coding scheme includes external codes or "E" codes that indicate the source of injury (for example, motor vehicle, machinery, fire, etc) for injury related diagnosis. Some of these E codes can be used to specify the work relatedness of an injury. Additionally, starting in April 1989, hospitals in the Canadian province of British Columbia (BC) began to code a fifth digit indicating whether or not the injury occurred at a workplace for certain E codes. The hospital discharge records in BC also contain a responsibility for payment schedule, which includes the option of selecting the provincial workers' compensation agency—the Worker's Compensation Board of BC (WCB). The availability of two indicators also provides the opportunity of estimating the hospitalised cases that would remain unascertained through an appropriate statistical method, such as the capture–recapture method.¹²

The sawmill industry in British Columbia represents an important workplace setting to investigate the use of hospital discharge records for work related injury surveillance, because of both its hazardous work environments and importance to the local economy. In the province of British Columbia, about 2% of the workforce was working in the logging and forestry industry during 1993–98.²⁰ Sawmills and

other lumber mills are hazardous work environments due to the nature of the work processes, the types of equipment used, and materials handled.²¹ From 1993 to 1997, the average accepted time-loss claim rate was 7 injuries per 100 full-time equivalent workers in BC sawmills compared to the overall provincial average of 5.4 injuries.²²

A large cohort study on sawmill workers in BC, initially started in the 1980s to investigate the risk of cancer associated with the use of chlorophenol fungicides,²³ was expanded to investigate a wide variety of occupational health issues in the forest industry.²⁴ This study used two study populations: (1) the full cohort, which included members who might not be working in sawmills at the time of hospital admission (moved out of the study sawmills at some point during the follow up period); and (2) a sub-set of the cohort members who were working in the study sawmills at the time of hospital admission. This investigation captured and described work related serious injuries using the indicators available in hospital discharge records from 1989 to 1998. It compared the agreement and capturing patterns of the work related indicators (E codes and responsibility for payment), and investigated whether the agreement between the two indicators in this surveillance system varied by causes of injuries or types of populations. It also attempted to estimate the number of hospitalised injuries that were undetected by both sets of indicators.

METHODS

The sawmill cohort

The BC sawmill cohort originally includes 28 827 workers employed for at least one year between 1950 and 1998 by one of 14 large BC sawmills. There were 7496 cohort members who died, were lost to follow up, or left the province prior to April 1989. Thus, for this study, the population base was the remainder of the cohort members (21 301). From the work history records, 6512 cohort members were selected for the second set of analysis, all of who were working in sawmills on or after April 1989. The study populations were followed up from April 1989 for health outcomes to study end date (December 1998), date of death, or date of last observation, whichever occurred earlier. Hospital discharge records were extracted for an injury diagnosis between April 1989 and December 1998. Injuries among the cohort members captured hospitalisation incidents that occurred while the cohort members were employed in study sawmills, in other sawmills, in another industry, or were out of work.

Figure 1 Study populations for analysis of work related hospitalisations.

British Columbia Linked Health Database

The British Columbia Linked Health Database (BCLHD) is a health data resource created and maintained by the University of British Columbia Centre for Health Services and Policy Research.²⁵ It contains datasets recording physician visits, hospital discharges, deaths, and births, as well as extended care, drug usage, and workers' compensation claims from 1985.²⁵⁻²⁶ The data sets are all linked to a central registry file of all persons in the province covered by the BC Medical Services Plan (MSP).²⁶ Almost all eligible residents of BC (over 4.1 million people) are enrolled with MSP.²⁷ The MSP processes claims for insured services submitted by physicians, supplementary healthcare practitioners, hospitals, laboratory services, and diagnostic procedures.²⁷ The hospital discharge dataset used in this study came from the BCLHD. As part of previous studies, 19 972 members of the BC Sawmill Cohort Study were linked with hospitalisation records using the BCLHD by April 1989. They were linked to the BCLHD by probabilistic linkage using names, birth dates, and where available, Social Insurance Numbers as identifiers.²³ Among the 6512 cohort members actively employed on or after 1 April 1989, a total of 5876 members were linked with their hospitalisation records.

Hospital discharge data

The hospital discharge dataset consists of all separations (discharges, transfers, and deaths) for inpatients or day surgery patients admitted to acute care hospitals in British Columbia.²⁵ An injury related hospital admission is described by cause of injury (E codes) and nature of injury (ICD-9 codes). External causes of injury and poisoning (E800-E998) codes are applicable to describe the accident, circumstance, event, or specific agent, which caused the injury or other adverse effect.¹⁹ These E codes are used in addition to the nature of injury or poisoning codes (ICD-9 codes), which range between 800 and 999.¹⁹ Up to 16 diagnoses are available using the ICD-9 codes to describe the nature and cause of a hospital admission. The principal diagnosis for the patient's stay in a hospital was used to designate the nature of an injury for this analysis. This diagnosis code was accompanied by E codes present in one or more of the 15 other fields; the first E code in order of presence was used to identify the cause of an injury.

Of the 40 806 hospital discharge records, extracted among the full study cohort, there were 3317 cases (8.13%) where the principal diagnoses were injury (ICD-9 codes ranged between 800 and 999), and of these, 3305 (99.6%) were E coded (fig 1). From the E coded segment of the total hospitalisation records (3305), a subset of hospitalisation records with cause of injury codes that have a minimal probability of being occupational in nature were excluded from our analysis (fig 1).

In this study, work related injuries were identified by two indicators. The first indicator relied solely on the ICD-9 CM E codes. Table 1 lists the indicators of work relatedness available in the digits of the E codes.¹⁹ The second indicator used to describe work related injuries in the hospital discharge records was the field indicating the agency responsible for payment of the patient's hospitalisation. The second indicator was considered as a surrogate of workers' compensation claim filed for that injury, as at that point, no further information was available to know whether an injury related claim was essentially filed or compensated subsequently.

Analysis

Each injury was classified as work related using E codes and then again using payment schedules. Next, the relationship of work relatedness with the demographic and hospital

Table 1 E codes, injury categories, and means of identifying work relatedness (responsibility of payment field was available for all categories)

Category description	E code	Indicator of work relatedness ¹⁹
Railway	E800–E807	4th digit: 0 = railway employee
Water transport	E930–E938	4th digit: 2 = crew, 6 = dockers and stevedores
Air/space transport	E840–E845	4th digit: 2 = crew, 8 = ground crew
Powered vehicles used solely within industrial and commercial buildings	E846	Primarily occupational by definition
Motor vehicle traffic/non-traffic/other road vehicle	E810–E829	No work related E codes indicating work relatedness (only payment field used for these records)
Vehicle accidents not elsewhere classifiable	E847–E848	
Other poisonings	E860–E869	5th digit, available April 1989 or later
Falls	E880–E888	
Fire/ flame	E890–E899	1. Farm
Natural/environmental (e.g. cold, heat, pressure)	E900–E909	Buildings, land under cultivation
Drowning/suffocation	E910–E913	Excludes: farmhouse and home premises of farm
Foreign body in eye	E914	
Foreign body in other orifice	E915	2. Mine and quarry
Struck by falling object	E916	Mine, quarry, gravel pit, sand pit, tunnel under construction
Struck against	E917	
Caught in/between	E918	
Machinery related	E919	3. Industrial place and premises
Cutting/piercing	E920	Building under construction, industrial yard, loading platform (factory) (store), dockyard, dry dock, industrial plant, factory, railway yard, factory building, premises, shop–place of work, warehouse, garage–place of work, workhouse
Explosions/firearms/explosive/hot substance/corrosive/caustic/steam/electric current/radiation	E921–E926	
Overexertion	E927	
Other/unspecified (noise and vibration)	E928	

characteristics was explored for both study populations. Demographic characteristics included age, sex, and race; hospitalisation characteristics included type of admission (for example, elective, urgent, emergency), level of care (for example, acute care, day care surgery), and length of stay. The concordance of the two work relatedness identifiers (E code versus payment schedule) was examined by cause of injury. The kappa statistic was calculated to measure the agreement between the two work related indicators.²⁸

Capture–recapture methods were used to estimate the number of injuries that were unreported in both the study populations. The capture–recapture method estimates the extent of incomplete ascertainment using population based data from two independent and overlapping sources. This

methodology originated in wildlife biology and demography, and has been tailored into epidemiology to determine population parameter estimates derived from two or more imperfect sources.¹² This method was described by Hook and Regal.²⁹ It attempted to estimate the number of hospitalised work related injuries that were undetected by both sets of indicators.

The study was approved by the behavioural research ethics board of the University of British Columbia.

RESULTS

Of the 1885 hospital records selected for the first set of analysis, 547 (29%) were identified as work related by either the E codes or the payment fields. For the active sawmill

Table 2 Demographic and hospital characteristics of study populations

Characteristic	Full study population (n = 19972)		Active sawmill workers (n = 5876)	
	Total hospitalisations (%)	Work related hospitalisations (%)	Total hospitalisations (%)	Work related hospitalisations (%)
n	1,885	547	370	173
Sex				
Male	1,868 (99%)	541 (99%)	363 (98%)	170 (98%)
Age (years)				
Mean (95% CI)	50 (50–51)	43 (42–44)	41 (40–42)	42 (41–44)
Median	47	43	40	41
Race				
White	1,795 (95.2%)	520 (95.1%)	330 (89.2%)	156 (90.2%)
South Asian	82 (4.4%)	24 (4.4%)	37 (10%)	15 (8.7%)
East Asian	8 (0.4%)	3 (0.5%)	3 (0.8%)	2 (1.2%)
Length of stay (median)	3 days	3 days	2 days	3 days
Admission category				
Elective	290 (15%)	89 (16%)	72 (20%)	29 (17%)
Urgent	949 (50%)	279 (51%)	181 (49%)	84 (49%)
Emergency	646 (34.5%)	179 (33%)	117 (32%)	60 (35%)
Level of care				
Day care surgery	346 (18%)	115 (21%)	82 (22%)	33 (19%)
Fatal cases	46	2	3	0

Work related hospitalisations were identified by either the E codes or the payment schedule.

workers, 173 (47%) of the 370 hospitalisations were identified as work related (table 2). Table 2 shows important demographic and hospital characteristics of the work related and total injury related hospitalisations records for both study populations. The active sawmill workers were significantly younger and the proportion of Asians among this group was higher than that in the full study cohort.

In the full study population, there were no significant differences in the distribution of hospitalisations by sex, race, admission category, level of care, or length of stay for any hospitalisation compared to work related hospitalisations. There were no major differences in the distribution of hospitalisations by sex, age, admission category, or level of care for any hospitalisation compared to work related hospitalisations in active sawmill workers.

Among the cohort members who were not working in the study sawmills any longer, almost half of all injury hospitalisations among people aged 30–34 years, and one third among those aged 25–29 and 35–59 years were found to be work related (fig 2). The work related injury hospitalisations were notably greater for the active sawmill workers who were <20 years or 45–64 years compared to other cohort members. More than half of all hospitalisations among workers <20 years, 45–54 years, and 60–64 years were work related among the active sawmill workers (fig 2).

Table 3 compares the two sources of work related injury identification by the cause of injury categories for the full cohort. The payment field identified 83.9% (n = 459) of the total work related cases (n = 547), and E codes identified 84.4% (n = 462) of the work related cases. The indicators provided the same assessment in 68.3% (374) of the total cases. For some causes of injury, such as “struck by a falling object”, “other/unspecified”, and “railway/water/air/powered vehicles”, the payment field picked up more work related cases, and for others, such as “struck against, machinery related” and “cutting and piercing”, the E code field was able to identify more work related cases. The two sources had relatively poor concordance for injuries, such as “machinery related”, “struck by falling object”, “overexertion”, and “caught in or between”, as measured by the kappa statistic. There was better agreement for injuries, such as “struck against”, “drowning/suffocation”, “foreign body in eye”, “other foreign body”, “fire/flare”, “natural/environmental”, and “explosions/firearms/hot substance/electric current/radiation”. For the full study population, there were 324 records for which E codes did not have information on work relatedness; thus the agreement between the two sources in determining work relatedness of injuries was calculated for the rest of the 1561 records. The agreement between them was found to be good (kappa = 0.75; $p < 0.01$).

Table 4 compares the two indicators of work related injury identification by the cause of injury categories for the active sawmill workers. The payment field identified 86.7% (150) of the total work related cases (n = 370), and E codes identified 91.33% (158) of the cases as work related injuries. Both of them agreed on 78.03% (135) of the total cases. By either of the two sources, almost half (47%) of all hospital visits for injuries were identified as work related. Both fields were able to capture proportionately more work related events among actively employed people. In these active sawmill workers, for all causes of injury, except “other/unspecified”, E codes were able to identify equal or more numbers of work related cases. There was relatively poor concordance for injuries, such as “machinery related”, “struck by falling object”, “caught in/between”, and “railway/water/air/powered vehicle”. For the active sawmill workers, there were 44 records for which E codes information was not available; thus the agreement between the two sources in respect to identifying work relatedness was calculated for the rest of the 326 records. The agreement was also good (kappa = 0.77; $p < 0.01$).

To obtain an unbiased estimate for the number of unascertained cases for the full cohort population by these two sources, a capture–recapture method was applied. The results of the capture–recapture method suggested that there were 16 (1%) more work related cases that went undetected by either of these two indicators. Therefore, adding these 16 to our already identified cases resulted in an estimated 563 hospitalisations for work related injuries in our full study population. Application of the capture–recapture method also suggested that there were 2 (0.61%) more work related cases that were undetected by the two sources, increasing the total work related injury admissions to 175 among those actively employed in the sawmill industry.

DISCUSSION

Both E codes and payment schedules available in hospital discharge records were useful in capturing work related severe injury incidents in the active sawmill workers and full cohort populations. Interestingly, the E codes in hospital records picked more work related injury cases than the responsibility of payment field for the active sawmill workers. However, identification by payment field picked up equal or more cases for several injury categories in the full study group. The E codes and payment fields have been examined in other studies as a tool for injury surveillance. Sorock and colleagues¹⁴ found 11% of hospital discharge records with external cause of injury codes. Smith and colleagues³⁰ found 13.9% of hospital discharge records with at least one injury related diagnosis or health service code, and 99.3% of them were E coded. These findings are consistent with the results

Figure 2 Age and work related injury. Non-active sawmill workers are cohort members who were not working in study sawmills during injury.

Table 3 Identification of work related injury hospitalisation among the full study population by cause of injury

Injury category	Frequency of hospital admissions	Payment indicates work relatedness (%)	E codes indicate work relatedness (%)	Kappa statistic (p value)	Either payment or E codes indicate work relatedness (%)
Falls	663	117 (18)	116 (18)	0.77 (<0.01)	139 (21)
Motor/road vehicle	324	15 (5)	NA	NA	15 (5)
Overexertion	188	47 (25)	46 (24)	0.59 (<0.01)	61 (32)
Machinery related	154	102 (66)	114(74)	0.54 (<0.01)	123 (80)
Struck against	137	40 (29)	44 (32)	0.86 (<0.01)	46 (34)
Cutting and piercing	108	29 (27)	39 (36)	0.70 (<0.01)	41 (38)
Drowning/suffocation, foreign body in eye/ other foreign body	45	4 (9)	4 (9)	1.00 (<0.01)	4 (9)
Struck by falling object	44	27 (61)	23 (52)	0.45 (<0.01)	31 (70)
Fire/flame/natural/environmental	42	13 (31)	16 (38)	0.84 (<0.01)	16 (38)
Caught in or between	39	27 (69)	28 (72)	0.57 (<0.01)	31 (79)
Explosions/firearms/hot substance/electric current/radiation	34	18 (53)	19 (56)	0.94 (<0.01)	19 (56)
Railway/water/air/powered vehicle	27	8 (30)	6 (22)	0.81 (<0.01)	8 (30)
Other poisonings	17	4 (24)	5 (29)	0.85 (<0.01)	5 (29)
Other/unspecified	63	8 (13)	2 (3)	0.37 (<0.01)	8 (13)
Total	1885	459 (24)	462 (25)	0.75 (<0.01)	547 (29)

from this study. Snizek and colleagues³¹ suggested that E coded hospital discharge data systems were potentially one of the most effective and feasible means available to collect data needed for injury surveillance. Smith and colleagues³⁰ recommended that with uniform guidelines and better training of coders, the E coding system could provide a valuable, cost effective method of identifying non-fatal injuries. Baker and colleagues¹⁵ used a California hospital discharge database to identify hospitalised ocular injury, and used workers' compensation as principal payer to identify work relatedness. Sorock and colleagues¹⁴ suggested that the payment field in hospital data might be a good to excellent indicator of work relatedness of hospitalised injuries.

The most frequent causes of hospitalisations in our study populations were "falls", "motor/road vehicle", "overexertion", "machinery related", "struck against", and "cutting and piercing". The most frequent causes of work related hospitalisations were "falls", "machinery related", "overexertion", "struck against", "cutting and piercing", and "struck by falling objects". Among the workforce employed in sawmills, the two indicators identified almost all cases of "machinery related", "struck by falling object" and "caught in or between" injuries as work related.

From 1993 to 1997, the Workers' Compensation Board of BC accepted a total of 11 685 time loss claims from sawmills, with most being for "overexertion", "struck by", "caught in", and "falls".²² There are two main reasons why injuries captured by hospital discharge records and workers' compensation authority might be different in terms of severity and nature. First, the WCB has its own way of coding injury information. Second, there are injuries which might result in time loss without requiring a hospital visit.

People with work related injuries were younger compared to those with any hospitalisation in the full study population. Younger people are more likely to be active sawmill workers. An international literature review of 63 nonfatal studies by Salminen³² found that younger workers had a higher injury rate than older workers. The injury rate for young male workers (the number of short term disability claims per 100 person-years of employment) was higher than the overall provincial average during 1976 to 1997 in the province of British Columbia.³³ This study captured work related injury among workers who were less than 20 years or age. There were 17 workers who were below 18 years during their injury admission in the full study population; two of them had work related injury. In our study, the work related indicators failed

Table 4 Identification of work related injury hospitalisation among active sawmill workers by cause of injury

Injury category	Frequency of hospital admissions	Payment indicates work relatedness (%)	E codes indicate work relatedness (%)	Kappa statistic (p value)	Either payment or E codes indicate work relatedness (%)
Falls	84	25 (30)	29 (35)	0.84 (<0.01)	30 (36)
Struck against	53	21 (40)	23 (43)	0.85 (<0.01)	24 (45)
Machinery related	52	44 (85)	45 (87)	0.30 (<0.01)	49 (94)
Motor/road vehicle	44	1 (2)	NA	NA	1 (2)
Overexertion	40	13 (33)	15 (38)	0.78 (<0.01)	16 (40)
Cutting and piercing	25	7 (28)	9 (36)	0.82 (<0.01)	9 (36)
Other/unspecified	17	5 (29)	2 (12)	0.49 (0.02)	5 (29)
Struck by falling object	14	11 (79)	11 (79)	0.15 (0.57)	13 (93)
Caught in or between	11	8 (73)	8 (73)	0.54 (0.07)	9 (82)
Fire/flame/natural/environmental	10	6 (60)	7 (70)	0.78 (0.01)	7 (70)
Railway/water/air/powered vehicle	6	2 (33)	1 (17)	0.57 (0.12)	2 (33)
Drowning/suffocation/ /foreign body in eye/ other foreign body	6	3 (50)	3 (50)	1.00 (0.01)	3 (50)
Explosions/firearms/hot substance/electric current/radiation	6	3 (50)	4 (67)	0.67 (0.08)	4 (67)
Other poisonings	2	1 (50)	1 (50)	1.00 (0.16)	1 (50)
Total	370	150 (41)	158 (43)	0.77 (<0.01)	173 (47)

Main messages

- Work related injuries are not always reported for workers' compensation, and workers' compensation agencies do not compensate all claims filed to them.
- Hospital discharge records—a readily available source of data—is a potential resource for injury surveillance because of the detailed information on the nature, cause, and severity of injuries.
- ICD external cause of injury codes and payment schedule available in hospital discharge records are able to effectively identify serious work related injuries requiring hospital admissions.
- The work relatedness capturing patterns of ICD external cause of injury codes and payment schedules varied by causes of injury and working status of the population.

to identify any work related injuries among the individuals of 65 years or older. This adds validity to our case definition of a work related hospitalisation in this study as the province of BC has a mandatory retirement age of 65 years.

The findings of this study should be interpreted carefully due to the following limitations. It excluded from analysis certain injuries that had a small likelihood of being work related. For example, we could have missed some work related injuries coded as “medical adverse events”, “violence”, and “medical misadventure”. The records with the workers' compensation in payment field were used in this study as a proxy for claims actually compensated by the workers' compensation agency. It was not possible to verify this as we did not have the real compensation claims data for the study populations. Given the prevailing external cause of injury coding patterns, work related injury identification would more be feasible for manufacturing industries. For capture–recapture analysis, source dependency should be avoided.¹² Provided that different coders coded the ICD-9 codes and payment field on the same dataset, some independency was ensured, though there were chances of cross-contamination. Also, about 10% of the active sawmill workers were not linked to the BCLHD, and the linkage rate was found to be lower for young people, females, and South Asians.

The principal diagnosis for the patient's stay in a hospital was used to designate the nature of an injury for this analysis. Whereas this might create some measures of misclassification for cases which had more than one equally significant diagnosis, we decided to depend on the judgement of the attending physician who determined which code should be the principal diagnosis. For acute and severe injury requiring hospitalisation, the first diagnosis should ideally represent the more immediate and real nature of an injury.

Our study depended heavily on the accuracy of the codes available in hospital data. Studies outside Canada^{14–15 30} and inside Canada^{16–18} used hospital discharge datasets. The reliability and validity of hospital records were examined by some studies.^{34–37} Also, a review by Virnig and McBean³⁸ recommended the use of electronically available administrative data for surveillance purposes. However, since some of the hospital discharge codes, especially the fifth digit E codes were introduced only in 1989 in British Columbia, it might somewhat under-report the work related cases for the first few years.

Provided that the responsibility of payment field worked well as a surrogate for workers' compensation claims, the

Policy implications

- Depending on the reliability and validity of the ICD coding scheme and payment schedule, hospital discharge records represents an independent and alternative surveillance tool for serious work related injuries.
- Knowing the causes and nature of work related injuries independent from workers' compensation agencies is helpful to employers, compensation officials, and other stakeholders in order to identify vulnerable groups of workers and work processes, and subsequently help targeting preventive measures within an industry.

hospital discharge records support some degree of under-reporting of work related injuries by the official workers' compensation agency statistics. There is no gold standard for work related injury surveillance tools as the workers' compensation agency does not capture, accept, or report on all injuries. While there are complaints of underreporting against the workers' compensation authority, it should be sensitive enough to capture information on injuries severe enough to reach a hospital. Matching of a work related hospital record with actual WCB claim can help validate hospital records as a potential surveillance tool.

Hospital discharge data are collected for administrative reasons, and thus are readily available. They are especially suitable for retrospective studies covering longer periods of observation. Depending on the coding reliability and validity of specific databases, hospital data represent an alternative source of information for compensation related statistics for serious work related injuries.

Knowing the causes and nature of injuries that remain unreported will be helpful to employers, compensation officials, and other stakeholders to identify vulnerable groups, and subsequently target preventive measures within an industry. Accurate reporting of work related injuries could impact regulatory processes and prevention strategies by estimating the actual size of the problem faced by both employers and the workforce. If injuries among employed persons are not documented as work related, policy and prevention decisions may not be based on accurate or complete evidence; employees may not receive needed compensation and rehabilitation services, and the cost of some work related injuries may end up being paid by other parts of the social safety net (for example, the publicly funded healthcare system).

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