FINAL PROGRESS REPORT

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Project Title: Just-In-Time Methods for Understanding Near-misses, Injuries & Risk Factors

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LIST OF TERMS AND ABBREVIATIONS

BMI: Body Mass Index

CI: Confidence Interval

CC: Cincinnati Children's (formally Cincinnati Children's Hospital Medical Center)

DVRs: Digital Voice Recorders

Injuries: An event that inflicts physical damage as a result of an employee performing work-related duties. Blood borne pathogen exposures are included. (CCHMC injury reporting policy)

IRB: Institutional Review Board

ISS: Institutional Surveillance System

Med/Surg: Medical/Surgical

MHSs: Mental Health Specialists

MSD: Musculoskeletal Disorder

Near-misses: 1) incidents that did not reach a staff member (e.g. prior to lifting a 601b patient, staff remembered to use lift equipment) or 2) incidents that reached staff but did not cause harm (e.g. an aggressive patient bites on the arm but did not cause harm due to use of Kevlar gloves.

NIOSH: National Institute of Occupational Safety and Health

NWHS: Nurses' Worklife and Health Study

OSHA: Occupational Safety and Health Agency

PCAs: Patient Care Assistants

PHCPs: Pediatric healthcare providers

Psych: Psychiatry

RA: Research Assistant

RNs: Registered Nurses

ABSTRACT

Healthcare personnel routinely encounter work hazards with outcomes that affect the employee through: turnover, job satisfaction, and overall health. Employee health consequences can further impact the patient through poor quality of care and safety; and the organization through lost work-time, compensation claims, and job replacemenUtraining. Accurate data on the incidence of near-misses and injuries and their risk factors are essential for developing interventions to reduce the burden of work-related health outcomes. The importance of near-misses has long been integrated in the surveillance systems of high-risk industries such as aviation, nuclear facilities, and the military because each occurrence contributes to an understanding of potential failure patterns that may be antecedents of more severe injuries. However, research has shown that injury under-reporting in healthcare is common due to time constraints, reluctance to report, symptom self-management, a sense of 'normalcy' of being injured, and fear of reprisal. To facilitate accurate and timely injury reporting, surveillance systems need to be supported by clear practice policies encouraging injury *and* near-miss reporting, that if ignored may lead to harm for both staff and patients. To address these issues our study's aims were to: 1) Determine the number of near-misses and injuries experienced by pediatric healthcare providers (PHCPs) due to the lack of research for this population; 2) Compare voice recording of near-misses and injuries to conventional data collection; 3) Evaluate the feasibility of active injury surveillance based on voice recording; and 4) Evaluate the association of individual and work factors on near-misses and injuries. To achieve these aims, 652 randomly selected PHCPs in medical/surgical and psychiatric units recorded near-misses and injuries on hand-held digital voice recorders. Injuries reported through the institution were compared to voice-recorded reports to examine under-reported injuries. Surveys and focus groups assessed reporting preference and feasibility. Surveys at baseline and study completion measured risk factors. Overall, the rate of injuries was 70.7 events/1000 days - nearly twice as high as for near-misses at 35.6. Injuries and near-misses were primarily physical at 53.1, 32.5 respectively. A preference of using active surveillance for event reporting (68.2%); a nearly 22-fold increase in injury reports; and findings that employees experienced 1,314 near-misses/100 employees/year established feasibility for using voice recording and active surveillance. Finally, individual and work factors were primary risk factors for injuries while no factors showed significant associations for near-misses alone. All but four risk factors (i.e. breaks/day, missed work, physical work demands, and safety culture) were associated with both near-misses and injuries indicating possible common causal risk pathways. Findings emphasize that PHCPs experience high rates of injuries like their adult-care colleagues, albeit different injury types with different primary risk factors. The majority of risk factors examined are associated with both near-misses and injuries providing important information for prevention and mitigations strategies. Finally, real-time, active surveillance of both injuries and near-misses can successfully supplement passive injury surveillance and can capture information not previously available through traditional reporting systems.

SECTION 1

Significant (Key) Findings

The following are the most important results of the project presented under each specific aim.

Specific Aim 1: Determine the number of near-misses experienced by PHCPs.

The rate of near-misses reported by participants using DVRs was 35.6 near-misses per 1000 days compared to 70.7 injuries/1000days. The majority of near-misses were physical in nature (rate: 32.5) and occurred in psych units (rate: 55.6) among MHSs (rate: 95.0). Overall, PHCPs 45 years of age (rate: 49.7), males (rate: 64.2), and those with a BMI between 25-29 (rate: 48.3) reported the most near-misses.

Specific Aim 2: Compare voice recording and conventional data collection.

We calculated ratios of the number of events reported using DVRs with the number of events expected based on incidents reported to the ISS. Overall, the number of injuries reported using DVRs was 21.7 times higher than those reported to the ISS. Ratio.s that were statistically significant ranged from nearly 4 times higher for RNs in psych units to nearly 53 times higher for RNs in med/surg units.

Specific Aim 3: Evaluate the feasibility of an active surveillance system based on voice recording

Results from focus groups examining feasibility and ease-of-use of DVRs for reporting injuries and near-misses showed 56% of participants would use the DVRs to capture 'some' or 'all' injuries (N=36), 49% for near-misses (N=39), and 30% for psychological injuries (N=34). Forty percent of participants (N=25) preferred to use DVRs over the ISS and 90% (N=40) stated that using DVRs to report did not impede their work and were not bulky or hard to use (83%, N=29). Based on the modified NWHS question, "What data collection method did you prefer?", 68.2% prefer using DVRs either as an alternative or a complement to the existing ISS. Voice recording resulted in a near-miss rate of 36/1000 days, which is equivalent to 1,314 near-misses /100 employees/year. Finally, as stated in Aim 1 using the DVRs resulted in a 21.7 increase in the number of injury reports over the expected reports from the ISS.

Specific Aim 4: Evaluate the association of individual and work factors on near-misses and injuries on medical/surgical and psychiatry units.

The top reported risk factors for injuries were due to patient interactions (32%) and work conditions and procedures (29%); and for near-misses, patient interactions (78%) and the work environment (13%). Certain individual factors (e.g. pre-existing musculoskeletal pain, number of medications taken for musculoskeletal pain, seeing a doctor for musculoskeletal pain) were nearly two to three times at higher risk of injury. Job characteristics (e.g. psychological, physical, safety culture) significantly increased risk for injury (nearly 3-fold). Taking two breaks per day decreased the risk of experiencing a near-miss by less than half (Odds Ratio=0 .38) while taking one type of medication for musculoskeletal pain increased the risk by over two times (OR=2.29). Having pre-existing back pain almost doubled the risk of a near-miss (OR=1.77)

Overall, 32 of the 36 types of risk factors studied were associated with *both* near-misses and injuries. Only four risk factors: taking two breaks per day (which increased risk of only near-misses by 3-fold); high physical demands of daily work tasks, missing work, and a low perception of the organization's safety culture (which increased risk of only injuries by 2 to 2.58-fold respectively) did not show an association with *both* near-misses and injuries.

Translation of Findings

Our results highlight the risks that pediatric healthcare providers are exposed to, warranting increased focused on research targeting this population. The average employee in this study experienced 13 near-miss events per year. The **risk** of these incidences resulting in an injury is compounded by the psychological impact of being exposed to this high number of near-misses. Indeed, the high number of near-misses alone may be cause for staff turnover.

Given the nearly 22-fold increase in observed injuries and the high number of near-misses collected, using active surveillance will enrich the data collected in a cost-effective manner and provide safety professionals with the necessary information to prevent these incidents. A policy-driven requirement to report psychological injuries would further enhance the surveillance process and improve future preventative strategies. Our results provide the necessary support for requesting a change in institutional policy and expanding implementation to fully integrate active surveillance with passive institutional surveillance. Furthermore, providing healthcare workers with a user-friendly method of reporting incidents, while significantly increasing the number of reports, may lessen the tendency to under-report injuries. Finally, 78% of focus group participants reported patient involvement in a near-miss or injury. This highlights the importance of future research examining the relationship between employee safety and patient safety.

Prior to our current work, only a handful of studies included this population or dismissed the risks faced by providers treating children. Rates of injuries and associated risk factors are comparable to the adult-care population. Although types of injuries and risk factors may differ, the exposure to hazards and subsequent outcomes still occur and warrant studies that further examine risk and implement interventions to mitigate or eliminate adverse outcomes.

Outcomes/Impact:

Potential outcomes: Establishing feasibility of using active injury surveillance allows healthcare workers to report incidents immediately without impacting work-flow and can alleviate under-reporting. Hospitals can also improve the accuracy and timeliness of injury data so targeted interventions and prevention strategies can be implemented. Enhancing injury surveillance systems with data on near-misses and psychological outcomes provides more comprehensive elements to injury surveillance and a richer understanding of the health and well-being of workers. Additionally, a method of real-time active surveillance can be also used for patient safety, by other healthcare facilities, and translatable to High Reliability Organizations (e.g. chemical, manufacturing, construction, aviation).

Future research should examine relationships of types of injuries and near-misses (i.e. physical, psychological, bodily fluids) and specific risk factors for targeted interventions. Associations of employee health outcomes and patient safety indicators (e.g. medical errors, missed care) can be examined to provide evidence of the link between employee and patient safety.

Intermediate outcomes: Dissemination of results will address the knowledge gap in injury rates and risk factors among PHCPs, and near-misses as potential antecedents to injuries that share common risk factors. Plans to present findings to executive hospital leadership and CC's Safety Council are planned for December 2016 and participating units in early 2017. Discussion of the results and the significant increase in reports from the use of DVRs has heightened interest from CC's health and safety department to incorporate the necessary technology (e.g. speech recognition, decision algorithms) to develop an active surveillance system. In fact, plans for a research and operational partnership to submit a larger grant (R01) to integrate data active surveillance, passive surveillance, and a newly established surveillance system of environmental factors (e.g. average daily census, staffing, overtime) to create early-warning systems is currently underway. Since the project is in alignment with institutional goals, our results will have direct impact on policies and procedures for injury reporting and injury prevention.

Finally, focus group/interview participants highlighted that study involvement increased awareness of injuries for themselves and encouraged advocating for the safety of their co-workers.

End outcomes: At the time of this report, no documented reductions in exposure or incidents have occurred due to study results, as the methods introduced in this study were for feasibility purposes.

2. INTRODUCTION/STATEMENT OF THE PROBLEM

Work-related causes of injury in health care settings are varied and include physical (e.g. overexertion, radiation), psychological (e.g. stress, anxiety), biological (e.g. blood borne pathogens), and chemical hazards (e.g. latex allergens, ethylene oxide).[1 3] Although occupational hazards faced by adult healthcare providers are commonly studied, their pediatric provider counterparts have been all but excluded from these investigations.[4] This lack of research emphasis implicitly confirms the false assumption that the pediatric setting is safer or more controlled. On the contrary, pediatric healthcare providers (PHCPs) face many of the same hazards as their adult-care colleagues, with additional risks that are unique to the pediatric setting: children are a vulnerable population requiring more personal involvement of the providers; increased family involvement, presenting opportunities for patient mismanagement or miscommunication; child care may be more demanding and hazardous, as it often requires holding the patient for feeding or carrying during procedures; consoling the patient; and addressing developmental/cognitive variation among others. The paucity of pediatric-specific research is accompanied by the lack of specific risk management standards and guidelines, preventing significant progress.[4 9]

We have found only eight studies over three decades of injury research in healthcare (1983 to the present) targeting PHCPs. Three studies investigated cytomegalovirus (CMV)[1 0 12] among pediatric nurses caring for infants shedding CMV but with inconclusiv results. earlier et al.[6] investigated trunk function in a population of pediatric nurses (N=50) and found 85% complained of low-back pain; 62% had moderate pain and 22% severe pain. More recently, Haglund et al.[13] studied the implementation of a pediatric safe patient-handling program to minimize the frequency of occupational injuries associated with patient-handling tasks. An analysis of workers' compensation claims showed that the rate of incidents decreased by 71.4% after implementation of the program. At the University of Virginia Health System, 8% of 1,146 sharps injuries were sustained by pediatric workers.[14] Other adult-care personnel studies combined results from neonatal and pediatric units and found them to be low risk.[15 16]

Findings from the study presented here will not only enhance the understanding of risks and conditions associated with PHCP injuries, but establishes the feasibility of active reporting of injuries *and* near-misses to supplement passive injury reporting systems generally applicable to other industries. The following provides an overview of the study followed by the specific aims guiding this research with detailed findings and discussions.

2.A. Study Overview:

Using digital voice recorders (DVRs), registered nurses (RNs), patient care assistants(PCAs) and mental health specialists (MHSs) recorded near-misses and injuries and completed pre-and post-surveys - the modified Nurses' Worklife and Health Study scale (NWHS) (see Appendix) - collecting data on individual (e.g. demographics, lifestyle) and work factors (e.g. work, culture) to determine their association with near-misses and injuries.[17 18]

2.A.1. Setting and Sampling Strategy:

The setting was a freestanding academic pediatric hospital. All RNs, PCAs and MHSs in medical/surgical (med/surg) (1844 RNs and 208 PCAs) and psychiatry (psych) units (85 RNs, 16 PCAs and 144 MHSs) were eligible for the study. Participants were randomly selected from rosters of eligible individuals within the study units. Med/surg units cover a variety of conditions e.g. gastroenterology/colorectal surgery, solid organ transplant, cardiac step-down. Psych units include inpatient child, adolescent, neurological and residential treatment. MHSs typically only work in psych units unless they are accompanying a psychiatric patient to a

med/surg unit. The purpose of the sampling strategy was to obtain a representative sample of person-time in each of the units selected for the study, within which to compare active reporting using DVRs with the institutional surveillance system (ISS). Cincinnati Children's (CC's) current system requires staff to call a number (513-803-SAFE, formally OUCH) and answer a series of questions regarding the injury. Depending on the injury, the call can last anywhere from 1Oto 45 minutes.

2.A.2. Data Management

The totals of injuries and near misses that were coded and transcribed from voice recordings were summarized on the basis of the recording interval for each participant (including intervals with no recorded injuries or near misses). Data by interval were merged with the applicable interval-associated modified NWHS scale.

2.A.3. Definitions:

Near-misses were defined as: 1) incidents that did not reach a staff member (e.g. prior to lifting a 601b patient, staff remembered to use lift equipment) or 2) incidents that reached staff but did not cause harm (e.g. an aggressive patient bites on the arm but did not cause harm due to use of Kevlar gloves).[19]
Iniuries were defined per CC's policy: "an event that inflicts physical damage as a result of an employee performing work-related duties. For the purposes of this policy, blood borne pathogen exposures are included."

2.B. Specific Aim 1: Determine the number of near-misses experienced by PHCPs working at a freestanding pediatric hospital on medical/surgical and psychiatry units.

Hypothesis 1: An enhanced surveillance system based on voice recording will measure near-miss occurrences.

2.8.1. Background

Injuries are considered more serious events in an array of possible outcomes that include minor injuries and near-misses.[20] This view suggests that significantly more near-misses occur than actual injuries. Therefore, collecting near-miss occurrences has advantages for promoting health and safety due to: a greater frequency of events, allowing for quantitative analysis; increasing potential for identifying common causal pathways with injuries; greater inclination to report since there was no injury to the patienUworker; the lack of apparent error or damage to the environment; and an opportunity to improve practice by examining areas at risk due to environment or practices.[19] [21] [22]

The concept of a near-miss is easily cast in the sufficient cause/component cause model proposed by Rothman [23] and widely adopted in epidemiology. The model represents sufficient causes as "causal pies" and component causes as "slices" of the pie. According to the model, an event such as an injury occurs when a causal pie is completed by assembling the necessary component causes. A near-miss is intuitively represented by an incomplete pie, perhaps with just one missing slice (component cause). It is important to note that an incomplete causal pie may be the result of a dangerous combination of causes that fails to achieve its ultimate effect, thus indicating the potential for risk in a certain work environment (should the missing slice join the combination and complete the causal pie), but may also be the result of an effective intervention on a modifiable risk factor, and the indication that the intervention has succeeded in preventing the **assembly of a sufficient cause. i\nother consideration is that the model does not require the existence of a** "causal iceberg" whereby near-miss events are necessarily more frequent than actual injuries. The ratio of near-misses to injuries may be high in an environment where certain component causes are infrequent, or

where preventive interventions are effective in removing component causes; whereas it may be low in work environments where sufficient causes of injury are easily assembled. These observations highlight the importance of monitoring near-miss events in work environments, as they may provide insight into the prevalent risk factors, and help with monitoring the impact of environmental changes, including interventions aimed at reducing the incidence of injuries.

Reporting near-misses and minor injuries/exposures and their importance has long been integrated in the surveillance systems of non-healthcare, high-risk industries such as aviation, nuclear power plants, the military, and construction.[21 22 24] These sectors acknowledge the importance of near-miss events because each occurrence contributes to a better understanding of potential patterns of failure that may be antecedents of more severe workplace injuries.[17 212225 26] However, there is limited understanding of the potential effect of employee near-misses in the healthcare industry. This specific aim establishes the frequency and rate of employee near-misses for a broad range of occurrences in healthcare.

2.B.2. Methods

Prior to participation each participant was assigned a unique identifier and a recorder with pre-coded labels with that participant's identifier. Using DVRs, randomly selected RNs, PCAs, and MHSs from psych and med/surg units recorded near-misses and injuries for two weeks' worth of shifts. That is, full-time staff recorded for approximately six shifts and part-time staff recorded for approximately eight shifts. Based on a power analysis, to achieve 80% power, a total of 1000, two-week shifts were collected.

Upon consent, participants were educated on the definition of a near-miss and injury, how to operate the DVRs and what information to provide. To reduce the likelihood of missing data, daily emails and in-person reminders were carried out. Participants were also provided with a "pocket crib sheet" with a list of potential near-miss events and injuries. Sampling new participants each two-week period, rather than following a small set of employees for an extended peri<;>d allowed for a more diverse and representative group, greatly reducing the potential for attrition during the study. Also, the likelihood of the same group getting injured each interval was small and seasonal effects were captured using this method.

At the beginning and end of the shift we asked participants to record the date and any current pain or discomfort. This information allowed researchers to differentiate between a day with no events (near-miss or injury) and a skipped or forgotten day. If an event occurred during their shift, participants briefly recorded the event (near-miss or injury) including: the type (e.g. sprain, patient interaction, slip/trip/fall), and the following:

- What happened in the 30 seconds prior to the near-miss/injury?
- For each near miss/injury, if a patient:
  - was not involved at all
  - was almost hurt
  - was hurt
- If a patient was involved participants provided the following if known at the time of recording:
  - diagnosis
  - age
  - gender
  - weight
  - history of staff interactions

A review of the information to be recorded was also included in the pocket crib-sheet provided to each participant. Participants were not required to record injuries or near-misses occurring to co-workers. After

reaching the required number of shifts, each participant returned their DVR to a locked box located on each unit that were collected weekly by the research team. A Research Assistant (RA) downloaded the data to a laptop computer at the end of each week. If an RA retrieved the DVRs in person (i.e. handed a recorder by a participant, not through the locked box) a separate RA downloaded the data to avoid the potential for bias.

2.8.2.i Analysis

To measure the incidence of near-misses and injuries, voice recordings were transcribed and coded based on pre-defined event categories. For injuries: physical, psychological, bodily fluid exposure; near-misses: physical and bodily fluid exposure. We computed rates and 95% confidence intervals (Cl) of the rates by various work and individual variables (e.g. age, BMI, job role, work area}, assuming that the numbers reported were Poisson-distributed. We recognize that the sampling scheme required a fairly large number of two-week periods of observation which resulted in 260 employees participating more than once (199 participated twice, 60-three times, and one subject participated four times}, violating the assumption of independence.

2.B.3. Results

2.8.3.i Sample:

Tables 1 and 2 show the majority of participants were female (86%) between the ages of 25-29 (31%) working as RNs (72%) in med/surg units (77%). Figures 1 and 2 show participation and data overview.

Table 1. Sociodemographic and anthropometric characteristics of the study group at baseline. N=607

	N	%	IQR
Gender			
Male	75	12	
Female	522	86	
Missing	10	2	
Age			
<25	144	24	
25-29	189	31	
30-34	106	17	
35-44	90	15	
>=45	61	10	
Missing	17	3	
Race/ethnicity			
Non-Hispanic White	493	81	
Non-Hispanic Black	76	13	
Other Groups	23	4	
Missing	15	2	
Smoking			
Never	485	80	
Past	103	17	
Current	5	1	
Missing	14	2	
Education			
High school	5	1	
Associate/vocational	43	7	
Some college	74	12	
College degree	423	70	
Post-graduate	61	10	
Missing	1	<1	
Marital Status			

	N	%	IQR
Never Married	316	52	
Married	240	39	
Divorced/Separated	37	6	
Widow	2	<1	
Missing	12	2	
Dependents			
No	357	59	
Yes	236	39	
Missing	14	2	
Weight (lb), Median, [IQR]	589	155	[135, 185]
Height (in), Median, [IQR]	575	66	[63, 68]
BMI	N	%	
<25	282	47	
25-29	139	23	
>=30	141	23	
Missing	45	7	

Table 2. Employment characteristics (N=607)

	N	%	
Current position			
Registered Nurse	437	72	
Mental Health Specialist	81	13	
Patient Care Attendant	89	15	
Shift type			
8-hr	187	31	
12-hr	242	40	
Both 8-hr and 12-hr	177	29	
Other schedules	1	<1	
Daily schedule			
Days	177	29	
Evenings	39	6	
Nights	119	20	
Days, Evenings	121	20	
Days, Nights	38	6	
Evenings, Nights	43	7	
Days, Evenings, Nights	66	11	
Unit of employment			
Medical-Surgical	465	77	
Psychiatry	142	23	
	N	**Median**	**IQR**
Years in **current position,** Median [IQR]	601	2	[1,5]
Years at CCHMC, Median [IQR)	604	3	[1,7]
Hours worked in a typical day, Median [IQR)	607	12	[8, 12]
Hours worked in **a typical week,** Median [IQR]	607	36	[32,36]
Sick days year	604	2	[1,4]
Vacation days/year	599	5	[0,10]

Overall 18 eligible employees that were approached refused to participate (Table 3). The researchers attempted to obtain demographics on all, but six of the 18 did not provide information.

Table 3. Summary demographics of refusals

	Unit type	Position	Experience (years)	Education (years)	Sex
1	Med/Surg	PCA	NA	2	Female
2	Med/Surg	**RN**	1	4	Female
3	Med/Surg	**RN**	7	4	Female
4	Med/Surg	**RN**	0	4	Female
5	**NA**	RN	13	4	Female
6	Psych	**RN**	2	4	Female
7	Med/Surg	RN	13	2	Female
8	Psych	MHS	2	4	Female
9	Med/Surg	RN	3	4	Female
10	NA	NA	NA	NA	Female
11	NA	NA	NA	NA	Female
12	**NA**	**NA**	**NA**	**NA**	Female

2.8.3.ii Incidence Rates:

All incidence rates were reported as the number of injuries per 1000 days, with lower and upper 95% confidence intervals (CI).

Overall, the majority of the incidents reported through the DVR were injuries at (70.7; CI:66.4-75.1) (Table 4)and physical in nature (53.1; CI:49.5-57.0). Most reported near-misses were also physical (32.5; CI:29.7-35.6) (Table 5).

2.B.3.iii Near-misses:

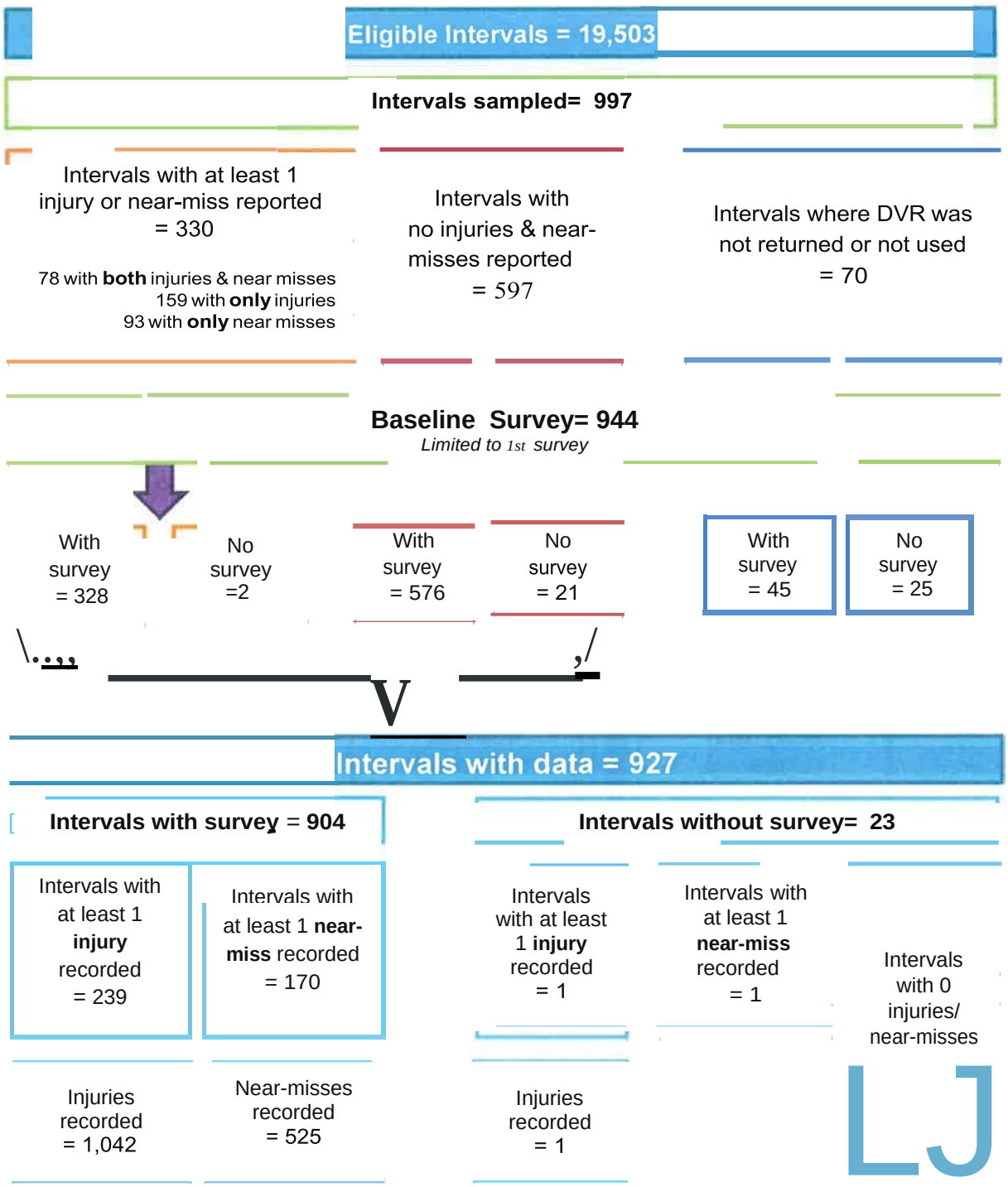
A detailed analysis depicting near-miss rates by various demographic variables (e.g. unit type, job role, age, gender, BMI) are shown in Tables 5-7. The majority of near-misses occurred in psychiatric units (55.6; CI49-65) among MHSs (95.0; CI:82.7-108.7). Overall, PHCPs 45 years of age (49.7; CI: 39.4-61.8), males (64.2; CI:53.8-75.9), and those with a BMI between 25-29 (48.3; CI:41.2-56.2) reported the most near-misses.

Table 4. Overall Incidence Rates per 1000 recording days (N=14,767 Total Recording Days; 927 Recording Intervals)

Event	Frequency	Rate	LCI	UCI
Injuries	1043	70.7	66.4	75.1
Near-Misses	526	35.6	32.7	38.8

Table 5. Type of Near-Misses (N=927 Intervals)

Type	Frequency	Rate	LCI	UCI
Physical	480	32.5	29.7	35.6
Bodily Fluid Exposure	38	2.6	1.8	3.5
Other	8	0.5	0.2	1.0


Eligible Intervals = 19,503
Intervals sampled= 997
Intervals with at least 1 injury or near-miss reported = 330
78 with both injuries & near misses
159 with only injuries
93 with only near misses
Intervals with no injuries & near-misses reported = 597
Intervals where DVR was not returned or not used = 70
Baseline Survey= 944
Limited to 1st survey
With survey = 328
No survey =2
With survey = 576
No survey = 21
With survey = 45
No survey = 25
Intervals with data = 927
Intervals with survey = 904
Intervals without survey= 23
Intervals with at least 1 injury recorded = 239
Intervals with at least 1 near-miss recorded = 170
Intervals with at least 1 injury recorded = 1
Intervals with at least 1 near-miss recorded = 1
Intervals with 0 injuries/ near-misses
Injuries recorded = 1,042
Near-misses recorded = 525
Injuries recorded = 1
LJ

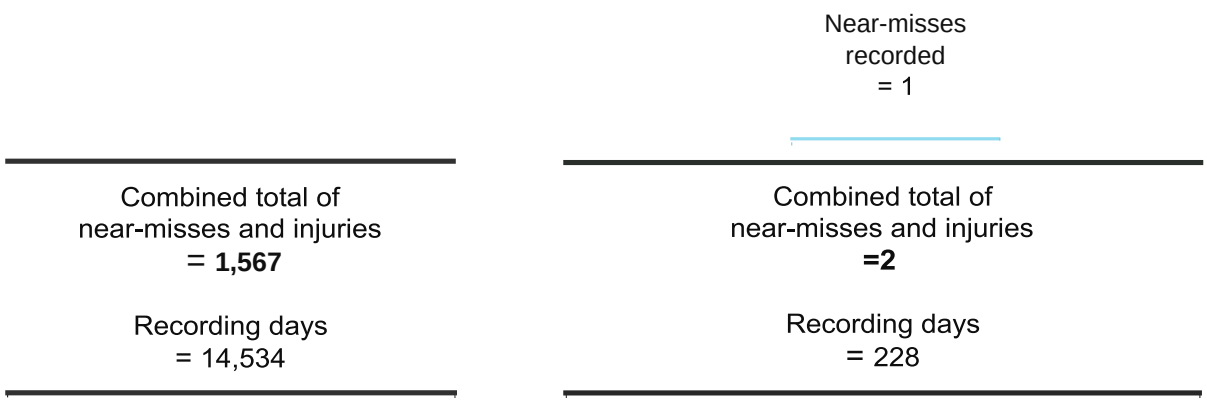


Figure 1. Participation Overview

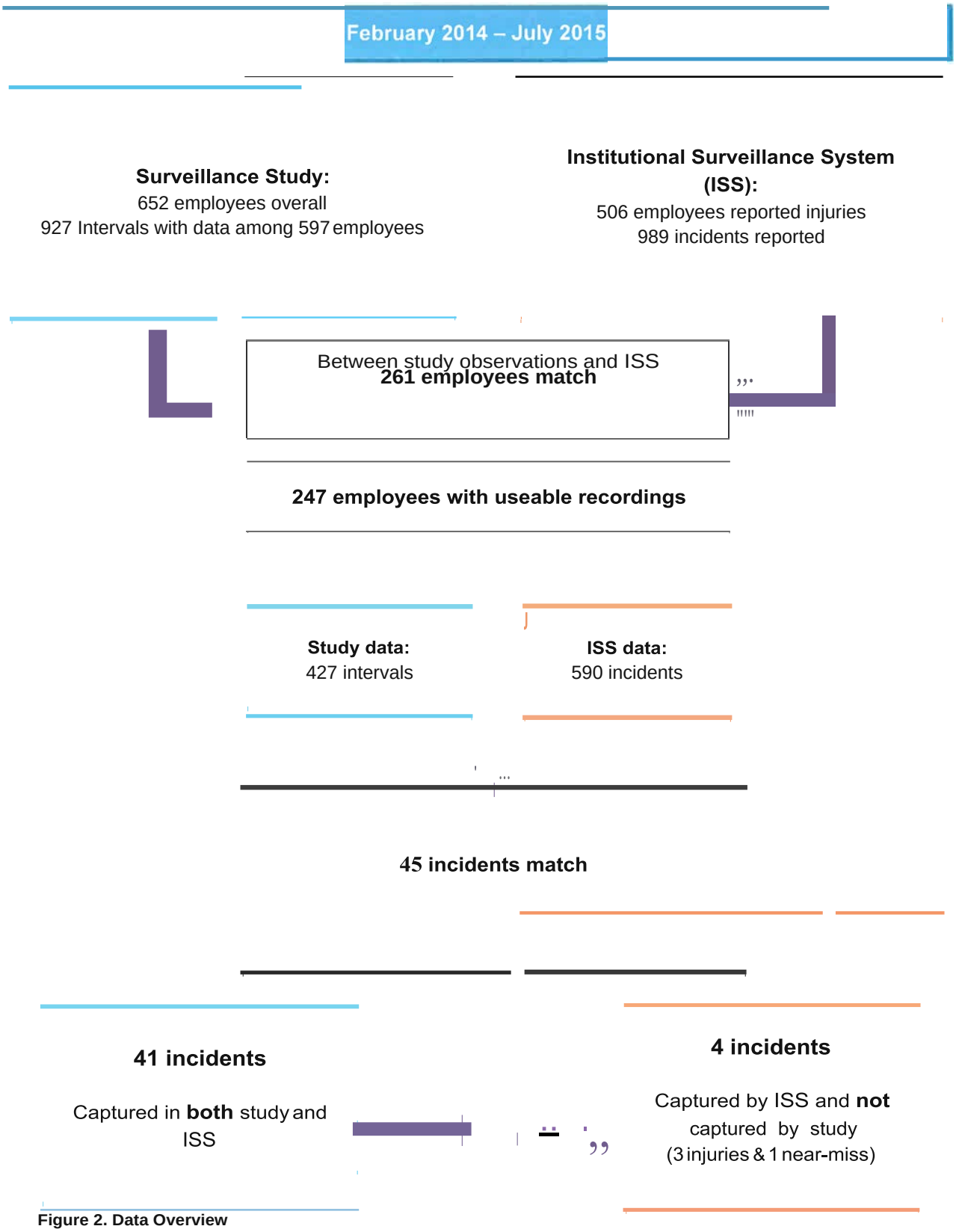


Figure 2. Data Overview

Table 6. Near-miss rates by Unit type, Role, Age, and BMI				
Category	**Total**	**Rate**	**LCI**	**UCI**
Unit Type (N=904)				
Medical- Surgical	327	29.6	26.5	33.0
Psychiatry	198	56.6	49.0	65.0
Role (N=904)				
MHS	213	95.0	82.l	108./
PCA	46	21.1	15.5	28.2
RN	266	26.3	23.2	29.7
Age (N=891)				
<25	92	26.7	21.5	32 .7
25-29	133	30.3	25.4	35.9
30-34	115	42.4	35	50.9
35-44	97	44.8	36.3	54.6
>=45	80	49.7	39.4	61.8
BMI (N=856)				
<25	210	3 1.3	27.2	35.8
25-29	164	48.3	41.2	56.2
>=30	119	32.9	27.2	39.3

2.B.3.iv lniuries:

Tables 8-1O show results for injuries. Again, most injuries occurred in psych units (84; Cl:74.7-94.1), among MHSs (83.4; Cl:71.9-96.3). Overall, PHCPs

29 (85.9; Cl:76.4-96.4) reported the most injuries.

Table 8. Type of Injuries (N=927 Intervals)				
Type	**Frequency**	**Rate**	**LCI**	**UCI**
Physical	784	53.1	49.5	57.0
Psychological	238	16.1	14.1	18.3
Bodily Fluid Exposure	21	1.4	0.9	2.2

Table 7. Near-miss rates by Dependents, Education, Marital Status, Race, Sex and SmokinQ				
	Total	**Rate**	**LCI**	**UCI**
Dependents (N=894)				
Yes	161	28.2	**24**	32.9
No	356	41	36.8	45.4
Echu:iitinn (N=903)				
High School	8	77.7	33.5	153
Trade or Associates	31	29.7	20.2	42.1
Some college	33	18	12.4	25.3
Graduate College	411	40	36.2	44.0
Post-Graduate	42	33.1	23.9	44.8
Marital Status (N= 898)				
Never Married	278	37.1	32.9	41.7
Married	187	31.8	27.4	36.7
Divorced or Separated	49	46.7	34.6	61.8
Widowed	2	95.2	11.5	344
Race (N=895)				
Non-Hispanic White	405	34.2	30.9	37.6
Non-Hispanic Black	99	49.5	40.3	60.3
Other Groups	10	17.8	8.5	32.8
Sex (N=900)				
Male	136	64.2	53.8	75.9
Female	381	30.8	27.8	34.1
Smoker (N=897)				

between 30-34 years of age (110.9; Cl:98.7-124.2),

females (74.3; Cl:69.6-79.3), and those with a BMI 25-

Table 9. Injury rates by Unit type, Role, Age, and BMI				
Variable	**Total**	**Injury Rate**	**LCI**	**UCI**
Unit Type (N=904)				
Medical-Surgical	748	67.8	63.0	72.8
Psychiatry	294	84.0	74.7	94.1
Role (N=904)				
MHS	187	83.4	72.0	96.3
PCA	69	31.7	24.6	40.1
RN	786	77.7	72.4	83.3
Age (N=891)				
<25	177	51.2	44.0	59.4
25-29	294	67.0	59.5	75.0
30-34	301	110.9	98.7	124.2
35-44	147	67.8	57.3	79.7
>=45	111	68.9	56.7	83.0
BMI (N=856)				
<25	434	64.6	58.6	71
25-29	292	85.9	76.4	96.4
>=30	268	74	65.4	83.4

Table 10. Injury rates by Dependents, Education, Marital Status, Race, Sex and Smoking

	Total	**Rate**	**LCI**	**UCI**
Dependents (N=894)				
Yes	293	51.3	45.6	57.5
No	747	86.0	79.9	92.3
Education (N=903)				
High School	3	29.1	6.0	85.1
Trade or Associates	54	51.7	38.9	67.5
Some college	116	63.3	52.3	75.9
Graduate College	703	68.4	63.5	73.7
Post-Graduate	166	131.0	111.8	152.5
Marital Status (N= 898)				
Never Married	639	84.9	78.5	91.8
Married	357	60.7	54.5	67.3
Divorced or Separated	43	41.0	29.7	55.2
Widowed	1	47.6	1.2	265.3
Race (N=895)				
Non-Hispanic White	907	76.5	71.6	81.6
Non-Hispanic Black	82	41.0	32.6	50.9
Other Groups	40	87.3	64.6	115.5
Sex (N=900)				
Male	121	57.1	47.4	68.2
Female	919	74.3	69.6	79.3
Smoker (N=897)				
Never	757	64.8	60.2	69.6
Past	265	101.6	89.7	114.6
Current	10	66.2	31.8	121.8

2.B.4. Discussion

In 2010, the healthcare and social assistance industry reported more injury and illness cases than any other private industry sector.[27] For that reason, identifying ways to improve injury surveillance among healthcare workers is essential. Understanding the incidence and context of near-misses in addition to injuries will provide information to allow health and safety professionals to design effective reporting systems. Data can also be provided to understand and improve the health and safety of health care providers (which also impacts patient safety) by identifying failures in systems, equipment, and processes which create the potential for an injury or near-miss to occur.

Results here show that the proportion of near-misses was nearly half that of reported injuries, contrary to prior research indicating near-misses occur 3-300 times more frequently than injuries.[21] However, in the only study found providing rates for a broad range of near-misses among healthcare workers, Alamgir et al.[22] found only 19.7% of all reports (N=9489) were near-misses, the majority physical in nature. A possible explanation for the lower proportion of near-miss occurrences, or more accurately, near-miss reports, may be found from Williamsen (2013)[26] that states if an organization does not have approximately 50 near-miss reports for every injury, then there may be significant barrier's within an organization's culture preventing them from learning lessons from near-miss information. Emphasizing the importance of near-miss awareness and reporting with increased education, policies, and a formal method of reporting can reduce workplace injuries.[29]

Healthcare workers in pediatric institutions show to have comparable injury rates to their adult-care counterparts with physical injuries (e.g. musculoskeletal, slips and falls, patient aggression) comprising 75% (N=1043) of all reports. Recent research shows musculoskeletal disorder rates vary between 43-63%[3,0,32] and as high as 89% in a recent study on a Portuguese nurse cohort.[33] Notably, in this study, psychological injures were ranked second in the most reported injuries (2.3%) similar to that found by Alamgir et al. (2.4%).[22]

2.8.5. Conclusions

Our results highlight the risks that PHCPs are exposed to, warranting increased focused on research targeting this population. The average employee in this study population experiences 13 near-miss events per year. The risk of these incidences resulting in an injury is compounded by the psychological impact of being exposed to this high number of near-misses. Indeed, the high frequency of near-misses alone may be cause for staff turnover. Prior to our current work, only a handful of studies included this population or dismissed the risks faced by providers working with children. Relatively high injury rates may or may not be indicative of higher risk, but the lack of attention and interventions in pediatrics, if allowed to continue, may lead to increased incidence rates.

2.C. Specific Aim 2: Compare voice recording and conventional data collection.

Hypothesis 2: the number of injuries recorded via continuous voice recorder monitoring will be higher than the number of injuries reported through institutional surveillance mechanisms.

2.C.1. Background

Injury under-reporting among healthcare personnel is a serious concern,[17 3-4 39] that may be the result of time constraints, reluctance to report, self-management of symptoms, peer pressure, frustration with workers' compensation procedures, a sense of 'normalcy' of being injured, and fear of reprisal.[17 3-4 a3] Geiger-brown et al.[17] found that 40% of nurses (N=1,163) would not report an injury, and 26% would consider the time it would take before deciding whether to report. Nurses were also less likely to report injuries when management did not show attention and commitment to staff safety. Others reported an even lower reporting rate of 17% (N=1105) with similar re.asons for non-reporting.[36]

The Occupational Safety and Health Act of 1970 (29 CFR 1904) requires employers to keep records of work-related injuries/illnesses that result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, loss of consciousness or involving a significant injury/illness diagnosed by a physician or other licensed health care professional.[40] Many institutions go beyond the federal requirements and develop surveillance systems to record all types of injuries/illnesses to gather information for planning and development of interventions. This intent is congruent with the CDC definition of surveillance: "-the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practices"... "Data disseminated...can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses."[41] It is CC's policy to document work-related employee injuries/illnesses, assist in obtaining appropriate medical treatment, if necessary, and alert appropriate individuals of work-related injuries/illnesses to prevent recurrence.

2.C.2 Methods

All data recorded on the DVRs were transcribed into a database verbatim using NVIVO (QSR International). A member of the research team coded the events (e.g. near-miss, injury, risk factor) and entered into a database that also included pre- and post-study NWHS data. Random selections (10% of all data) were verified for accuracy by the RA that did not enter/transcribe the original data. Events recorded in the ISS were linked with those recorded via DVR and the information in the ISS on all eligible employees provided the necessary comparative information. To ensure coding of injuries by the research team was equitable to that of the ISS, 20 randomly selected transcriptions including injury information were compared using the research teams coding method and the ISS team methods. This resulted in a 1:1 match on all 20 transcriptions in injury type and

frequency. Additionally, two members of the ISS team observed three of the research team's coding sessions to ensure coding accuracy.

2.C.2.i Analysis

Totals of near-misses and injuries coded and transcribed from voice recordings were summarized on the basis of the recording interval for each participant (including intervals with no recorded injuries or near misses). Data by interval were merged with the applicable interval-associated with the modified NWHS scale. We compared the number of events reported by employees during the active data collection intervals with the number of events expected on the basis of the incidents reported in the ISS by all eligible employees. We did not plan to compare the number of voice-recorded injuries with the number of injuries reported by the same employees in the ISS because the expectation was that employees who report using DVRs also reported it through the ISS, even if, in the absence of voice recording, they may have refrained from reporting the injury. To compute expected events, we first computed the job group- and unit type-specific rate of injuries reported (per two-week interval) through the ISS during the same period, and multiplied each rate by the number of active two-week intervals in the corresponding stratum of the sample of employees participating in the study. Observed-to-expected ratios measured the impact of active recording on injury detection; statistical inference was based on the Poisson distribution.

2.C.3. Results

Table 11 shows the overall ratios of observed injuries as collected from the DVRs compared to injuries collected from the ISS. The data does not include 'psychological injuries' since institutional policy does require reporting of these outcomes, although not discouraged. Overall, the number of injuries reported using DVRs was 21.7 times higher than those reported to the ISS. Statistically significant ratios of observed injuries to expected injuries ranged from nearly four times higher for RNs in psych to nearly 53 times higher for RNs in med/surg units (Table 13). A more conservative depiction of the ratio is in Table 14, which examined observed to expected injury ratios but limited injury reports to one injury report per day per employee. This removes any discrepancies in interpretation since an employee may incur several injuries during one event. An example may be an MHS interacting with an aggressive patient that may punch, kick, and spit during one interaction. If these incidents occurred on separate days, the events would be counted separately. However, if these events occurred at one time with one patient, they may be interpreted as three separate injuries or as a single injury depending on the ISS call handler receiving the report. Ratios here were slightly lower ranging from 1.68 - 40.94 with all ratios showing statistical significance except for PCAs in psych. Tables 15 and 16 provide the same information as Tables 13 and 14 but include psychological injuries.

Table 11. Comparing observed injuries to number expected by ISS reports. Psychological injuries excluded.

Observed injuries/interval	Expected injuries	Observed:Expected Injury Ratio	L95%CI	U95%CI	P-value
513	23.6397	21.70	21.68	21.74	<.0001

Table 12 Comparing observed injuries to number expected by ISS reports - limited to one report/day/employee and excluding psychological injuries

Observed injuries/interval	Expected injuries	Observed:Expected Injury Ratio	L95%CI	U95%CI	P-value
402	23.6397	17.01	16.98	17.04	<.0001

Table 13: Comparing observed injuries to number exJJected bv ISS reJJorts

Discipline Group	Unit type	Observed injuries/ interval	Expected injuries	Observed:Expected Injury Ratio	L95% CI	U95% CI	P-Value
MHS	Psych	93	22.3197	4.17	4.15	4.20	<.0001
PCA	All Units	36	1.0539	34.16	33.78	34.86	<.0001
PCA	Med/Surg	35	0.7436	47.07	46.52	48.06	<.0001
PCA	Psych	1	0.5955	1.68	1.15	2.84	0.4487
RN	All Units	383	11.7480	32.60	32.55	32.68	<.000·1
RN	Med/Surg	333	6.3265	52.64	52.55	52.78	<.0001
RN	Psych	50	13.3870	3.73	3.70	3.79	<.0001

Table 14. Comparing observed injuries to the number expected by ISS reports limited to one report/day/employee

Job type	Unit	Observed injuries /interval	Expected injuries	Observed:Expected Injury Ratio	L95% CI	U95% CI	P-Value
MHS	Pysch	69	22.3197	3.09	3.07	3.13	<.0001
PCA	All Units	29	1.0539	27.52	27.14	28.21	<.0001
PCA	MedSurg	28	0.7436	37.65	37.12	38.64	<.0001
PCA	Psych	1	0.5955	1.68	1.15	2.84	0.4487
RN	All Units	303	11.7480	25.79	25.75	25.87	<. 0001
RN	MedSurg	259	6.3265	40.94	40.86	41.07	<.0001
RN	Psych	44	13.3870	3.29	3.26	3.34	<.0001

Table 15: Comparing observed injuries (including psychological injuries) to the number exJJected bv ISS reports

Job type	Unit	Observed injuries/ interval	Expected injuries	Observed:Expected Injury Ratio	L95% CI	U95% CI	P-Value
MHS	All Units	116	22.3	5.20	5.18	5.23	<.0001
PCA	All Units	43	1.10	40.80	40.41	41.51	<.0001
PCA	Med/Surg	40	0.74	53.79	53.24	54.79	<.0001
PCA	Psych	3	0.60	5.04	4.46	6.20	0.0227
RN	All Units	506	11.7	43.07	43.02	43.15	<.0001
RN	Med/Surg	417	6.3	65.91	65.82	66.06	<.0001
RN	Psych	89	13.4	6.65	6.61	6. 71	<.0001

Table 16: Comparing observed injuries (including psychological injuries) to the number expected by ISS reports r,m,ted to one reportld ay,'/.emp,loyee

Job type	Unit type	Observed injuries /interval	Expected injuries	Observed:Expected Iniury Ratio	L95% CI	1J95% CI	P-Value
MHS	All Units	82	22.3197	3.67	3.65	3.71	<.0001
PCA	All Units	34	1.0539	32.26	31.88	32.96	<.0001
PCA	Med/Surg	32	0.7436	43.03	42.49	44.02	<.0001
PCA	Psych	2	0.5955	3.36	2.79	4.52	0.1204
RN	All Units	372	11.7480	31.67	31.62	31.74	<.0001
RN	Med/Surg	302	6.3265	47.74	47.65	47.87	<.0001
RN	Psych	70	13.3870	5.23	5.20	5.29	<.0001

2.B.4. Discussion

Active surveillance involves a process in which injury cases are sought out by contacting individuals and requesting information.[42] This method is usually more successful than passive surveillance.[43] However, to the research teams' knowledge no studies have examined active and passive surveillance simultaneously and compared data collected, i.e. observed vs. expected outcomes as conducted in this study. Results here range from a 4 to 53-fold increase in injuries reported (5 to 66-fold if including psychological injuries), therefore confirming the need for an active component to the current passive surveillance system. The lower ratio of observed to expected injuries in psych units may be due to the increased focus and heightened awareness of injuries due to aggressive patients and increased efforts to mitigate those injuries. Indeed, over the past four

years the organization has strongly encouraged employees working in psych to reporting injuries *and* near-misses and provided educational sessions on situational awareness with regards to employee safety.

2.B.5. Conclusions

Although active surveillance systems allow the retrieval of a higher number of injuries[43] passive injury surveillance systems require less expenditure of resources. However, given the increase in observed injuries through active surveillance and the high prevalence of injuries in healthcare, the method of using active surveillance on a sampling basis may enrich the data collected in a cost-effective manner. Furthermore, providing healthcare providers with a user-friendly method of reporting incidents, while significantly increasing the number of reports, may lessen the tendency to under-report.

2.D. Specific Aim 3: Evaluate the feasibility of an active surveillance system based on voice recording

Hypothesis 3a: Healthcare personnel will prefer using the real-time recorders to the current institutional reporting system

Hypothesis 3b: It is possible to integrate current passive surveillance with some form of active surveillance (e.g., on a sampling basis) that permanently implements the method piloted in this proposal at the institutional level.

2.D.1. Background

Employee injuries are commonly under-reported,[17 34 3] and so, health and safety practitioners need to incorporate innovative methods to obtain accurate data on the incidence of injury occurrences. Prior attempts at improving reporting have been through wellness-initiatives, educational programs, incentives for reporting, among other efforts. Although research examining active reporting, or active surveillance, show an increase in the number of reports,[44 45] practitioners and researchers alike have not investigated adding an active component to surveillance systems. This may be due to the resources required to implement active surveillance[42] and subsequent feasibility.

The World Health Organization defines surveillance as the ongoing and systematic collection, analysis, and dissemination of health information[46] that can be incorporated into the ongoing activities of an institution or organization. The goal of this specific aim was to test the feasibility of active injury surveillance, in accordance with the above definition: to seek out of employee injury information on an ongoing basis to incorporate into the institutional collection, analysis, and dissemination of employee injury and near-miss information.

2.D.2. Methods

To establish feasibility of the utilization of real-time active incident reporting, the modified NWHS post survey included a question regarding participant preference of an injury reporting method. Additionally, focus groups involving a random selection of 40 participants from med/surg (N=20) and psych (N=20) were conducted when data collection was concluded to examine the effectiveness, ease-of-use, and preference of using DVRS to record injuries and near-misses. Each focus group/interview session began with an introduction of the study team and their roles, an explanation of the goals of the session, and ground rules pertaining to anonymity and confidentiality (e.g. using an alias when communicating).

2.D.2.i Analysis

Hypothesis 3a: We analyzed responses to preference questions in the NWHS and compared the proportions of employees who prefer voice recording (including those who preferred both digital and ISS reporting) with the number who prefer ISS reporting only and tested against the null hypothesis of 50%. Respondents were only required to answer the question regarding preferred reporting method one time. However, if respondents participated more than once, the opportunity to answer the question again was allowed since there was at least a two-month period between participation. We also examined it preterence changed after participating more than once.

Hypothesis 3b: The main questions and selected answers from the focus group/interview sessions are provided in the Results section (2.D.3.i). Focus group interviews were transcribed verbatim by RAs with at least 90% inter-rater agreement. Qualitative content analysis employed codes developed from the interview data for similar and common words or phrases. Consensus was reached on any discrepancies so that each code had a clear definition. From the data organized under each code, categories and sub-categories were formed from common themes found in the data. Supplemental verbatim quotes from the participants are also provided.

The following criteria was used to determine feasibility: 1) If >50% of the participants prefer voice recording as determined from the NWHS survey questions, *and* 2) voice recording leads to identifying a substantial number of near-miss events (>5 per 100 employees/year), and 3) results show a statistically significant increase in the number of injury reports from voice recording over the expected ISS.

2.0 .3. Results

2.0 .3.i Focus Groups:

The focus groups included RNs, MHSs, and PCAs from two divisions with 40 total randomized participants: 20 were from psychiatry units and 20 from med/surg units. Five of the participants were male and 35 were female. Sixteen individuals participated in a focus group setting (i.e. more than one participant), and there were six groups in total. Due to scheduling conflicts and difficulties removing direct-care staff from the unit, the remaining 24 individuals participated in interviews. The focus groups were conducted across a nine-month time span, beginning in June of 2015 and ending in March 2016.

Table 16 shows that participants were able to use the DVRs to capture 'some' or 'all' injuries (56%, N=36), near-misses (49%, N=39), and even psychological injuries (30%, N=34) with 40% (N=25) preferring to use DVRs over calling the institution's injury line. Ninety percent (N=40) stated that using DVRs to report injuries or near-misses did not impede their work and were not bulky or hard to use (83%, N=29).

Table 16. Responses to focus group question

For one shift, how many injuries were you able to capture compared to how many injuries you sustained?	**36**	
All	10	28
Some	10	28
None	0	0.0
Did not sustain anv iniuries	16	44
For one shift, how many near-misses were you able to capture in relation to how many near-misses you actually sustained?	**35**	
All	7	20
Some	10	29
None	9	26

Table 16. Responses to focus group question

Did not experience anv near-misses	9	26
Do you think it is a good idea to report near-misses?	**39**	
No	2	5
Yes	37	95
For one shift, how many psychological injuries were you able to capture in relation to how many psychological injuries you actually sustained?	**34**	
All	3	9
Some	7	21
None	16	47
Did not experience any psychological injuries	8	24
Were you comfortable recording osycholooical iniuries?	**27**	
Not comfortable	5	19
Comfortable	22	81
Is using voice recorders an effective way of capturing informatio n about psychological injuries?	**27**	
Depends on the oerson	2	7
Different Method	5	19
No	6	22
Yes	14	52
Do you prefer speaking to an actual oerson when recording a near-miss or iniurv?	**40**	
No, not for near-misses nor injuries	4	10.0
Yes, for both near-misses and injuries	8	20.0
Yes, for injuries: not for near-misses	12	30.0
No for iniuries: yes, for near-misses	0	0.00
Did not soecllv	16	40.0
Were there any times where one method of recording was preferred?	**25**	
Institutional Surveillance System	8	32
Voice Recorder	10	40
No Preference	7	28
Were the recorders bulky in shape or hard to use?	**29**	
Didn't Answer	1	3
No	24	83
Yes	4	14
Did you feel getting the recorder out and taking the time to r cord woul d be a hassle?	**22**	
No	14	64
Yes	8	36
How often was a patient involved in a near-miss or injury?	**35**	
All	10	29
Most	9	26
Few	8	23
None	8	23
Were there barriers to reporting?	**34**	
No	16	47
Yes	18	53
Did recording impede your work?	**40**	
No	36	90
Yes	4	10
Did you develop a pattern of recording?	**21**	
No	9	43
Yes	12	57

The following are actual participant quotes for selected questions.

Do you think it is a good idea to report near-misses?

- *"I do because near misses can lead to bigger things happening, and if you capture them in the beginning and fix the problem, then you can have not as many."*

- *"I definitely agree, and part of our higher liability group on our unit, and it's the whole idea of being preoccupied with failure, you know? And looking at, what are we doing? Why do we do it? How are we doing it? And definitely near misses."*

How comfortable were you recording psychological injuries?

- *"I don't feel like I reported psychological outcomes. And I think because it's such* a *stretch for how we practice. I mean, I think it's very much there, but I think the- just the comfortableness with even just discussing- like, even thinking, 'oh yeah, I should report that,' just seems very foreign. And I'm not saying that that's not important, because I think it's very important, but I think that's how foreign it is to how we practice. Which gives you* a *key of how much we don't take care of ourselves. That's just- like I said, I think this is incredibly important study."*
- *"Actually after I was done recording, and I didn't really think about this because you know, as* a *nurse you expect to have some stress in your job. There were* a *few people that I found out were on medical leave for nervous breakdowns, and I'd never- that had never happened before. It wasn't our unit but people talk, so we heard that that had happened and I don't know how much of it was actually related to their job, but they had to take time off for* a *while and I was thinking about it like I don't know if the amount of stress we endure while we're working, if we really take that into consideration as like an injury."*
- *Me I'm the type of person I would rather bring it to that person's attention versus like recording it or saying something else because if it's between me and them at the end of the day only me and them can work it out so I can only address it with them so I'm like "Hey this is what took place today, I didn't like it, this is how I felt." Now after that if it's* a *continuing process where they continue to do the behavior then that's when I feel like I have to take it to the next level.*
- *Oh, I would do it. I feel like maybe I needed* a *little prompt or something though or like to remind myself at the end of the day to record it like, maybe like* a *text or something to record it. Like I said when you're actually doing- when you're in the instance you're not going to be like "Wait one second" and then like in order to record it.*

Is this an effective way of capturing information about psychological injuries?

- *"I think for some people it would be* a *good way, but I think some people would probably be nervous like to say, you know like it's always in the back of your mind like if I say this then possibly you know my job can be- you know? That's always in the back of people's minds so I think* a *lot of people don't speak on this issue because that nervous factor. So they're not going to be honest so I think even if you had it as the recording and an anonymous drop box, if you had an anonymous- I think that it would never be* a *full representation of what you would really need to get* a *good,* a *solid, um, quality data out of it because people wouldn't be honest with it."*
- *"I'm not really sure. I feel like it all goes into how much someone's willing to share and sometimes people aren't willing to share or admit that they're feeling stressed or scared anything, just because I guess they're worried about their job."*
- *"I think that if you truly care about your employees that ultimately care for your patients, then yes you give them the tools and the education in order to do that- to better take care of themselves. Definitely. I was trying to piggyback on something that you said, that's terrible, you just- oh, I was thinking about journaling. You know, thinking that if that's* a *way to collect that information might be helpful. Once again, I feel like for everyone that took part in this study, it feels different, which I think is interesting given that it was only two weeks."*

- *"The only thing I can think of is um having like maybe just like* a *space, or even just allowing like it to be taken home, or something. Like I didn't really think about whether that was appropriate or not while I was doing the study, but even just you know taking five minutes after you get home from* a *shift and after being able to, you know, be in this safe space where you didn't feel like, you know, people would overhear or you know, the only people there are your family that, you know, you could take* a *minute to step away and they can respect that you need some time to just kind of go through your feelings from that shift."*
- *"Um, yeah. Almost like- to record* a *psychological injury I feel like it would almost be using that like as* a *day-to-day verbal journal. Like just feelings throughout the day which I would say would be more effective than trying to report any specific instances."*

Were there barriers to reporting?

- *"The barriers would probably be just finding somewhere quiet or somewhere where you don't have all of the commotion going on in the background.* So *I used to go in the bathroom most of the times. Just wait till everybody clears out the staff office, but then literally you would have to wait for that to happen."*
- *"Um, not for me personally, but I know like our floor is very high acuity so it's very busy.* So *I don't know, there could have been times when nurses didn't have time to record right away just from the, you know, the nature of the work."*
- *"Um, no, no barriers beyond, you know, my own forgetfulness."*

Did you develop a pattern of recording?

- *"I did it more at the end of the day, just time frame and everything like that."*
- *"I would tend to record in between, like if I had some down time, especially when I was charting I would try to record and then kind of like recap at the end of the day."*

Do you prefer speaking to an actual person when recording a near-miss or injury?

- *"I think that if your requirement would be* a *call you would probably pick up less of the very small things where I'm like I don't know if this is worth an entire phone call. Whereas I might record it on the recorder if it's just in my pocket and it's going to take ten seconds to do it."*
- *"Um, yeah. And I think that there's certain instances in which like if it was* a *huge event clearly I would want to speak to another human being.*
- *"It would depend on the injury and I felt like I wanted some advice of what I needed to do about that injury. If it was just* a *simple injury that I was recording because I was worried I would wake up tomorrow and something hurt, recording into,* a *non-person would be fine. But if I actually knew that I got injured I would want to talk to* a *real person."*

Hypothesis 3a:

Based on the survey question 'What data collection method did you prefer?", 68.2% preferred using the DVR either as an alternative or a complement to the existing ISS (Table 17).

Table 17. What data collection method did you prefer?	N=557) (Missin =3)			
Method Preference	**Frequency**	%	**Cumulative Frequency**	**Cumulative %**
Digital voice recorder	161	28.90	161	28.90
Institutional Surveillance Svstem CISS)	174	31.24	335	60.14
Both methods are necessary to capture injury and near-misses	219	39.32	554	99.46
Other*	3	0.54	557	100.00

Examples of the response for 'Other' include:

- *"the digital voice recorder was easy to use- have not had to use 803-ouch (ISS)."*
- *"I feel it would have been nice to collect info for longer and I preferred writing info down rather than trying to find a place to record, therefore I'd leave it for after work and was not as detailed. I was not able to carry recorder on myself with the phones/pagers trackers etc. needed already for the job. I also felt my being pregnant impacted my reporting but I was not really able to report that."*
- *"I think an online reporting method would be more efficient and we already use the computer for so much. It would be easier to put one in. Also, I, along with many others, hate making phone calls."*

Hypothesis 3b:
The following criteria were used to evaluate the feasibility of integrating an active surveillance system with the current passive surveillance system:

1) If >50% of the participants prefer DVRs as determined from the modified NWHS post-survey question regarding method preference. Table 18 shows that 68.4% preferred using the digital voice recorder as an alternative or a complement to the existing system.

2) Voice recording leads to >5 near-miss events per 100 employees/year. Calculations from Specific Aim 1 show the near-miss rate was 36/1000 days, with 95% Cl: 33-39. This rate corresponds to 1,314 near-misses/100 employees/year (Cl: 1,204-1,423).

3) Results from Specific Aim 2 (Table 11) show 21.7 increase (p< 0.0001) in the number of injury reports from voice recording over the expected ISS.

Table 18. Method preference (Missinq=3)

. **Preferred digital (includes preference of both)**

DVR	Frequency	%	Cumulative Frequency	Cumulative %
0	176	31.60	176	31.60
1	381	68.40	557	100.00

Binomial Prooortion	
DVR= 1	
Proportion	0.6840
ASE	0.0197
95% Lower Conf Limit	0.6454
95% Unner Conf Limit	0.7226
Exact Confidence Limits	
95% Lower	0.6436
95% Uooer	0.7225
Test of HO: Prooortlon = 0.5	
ASE under HO	0.0212
Z	8.6861
One-sided Pr> Z	<.0001
Two-sided Pr > 1Z1	<.0001

Since some employees participated in the study more than once, they also answered the question regarding their preference for reporting method in the modified NWHS multiple times. Table 19 and 20 show the number of times this occurred and how preference changed with repeated sampling. The proportion of those who wanted digital recording by itself or integrated with the current system increased from 71.7% (1st survey including repeated participation) to 78.3% (2nd survey).

Table **19. Total number of post survevs**				
#	**Frequency**	%	**Cumulative Frequency**	**Cumulative** %
1	300	53.57	300	53.57
2	199	35.54	499	89.11
3	60	10.71	559	99.82
4	1	0.18	560	100.00

Table 20. Change of preference from 1st **survey to** 2nd **survey (Missing=2)**					
Frequency % 1st **SurvP.v**	**2nd Survey**				
	Digital voice recorder	**155 (Current surveillance methnrO**	**Both methods are necessary to capture injury and near-miss !occurrences**	**Other**	**Total**
Digital voice recorder	32	6	26	0	64
	16.24	3.05	13.20	0.00	32.49
155	12	**24**	17	2	55
	6.09	12.18	8.63	1.02	27.92
Both methods are necessary to capture injury and	18	10	49	0	77
near-miss occurrences	9.14	5.08	24.87	0.00	39.09
Total	62	40	92	3	197
	31.47	20.30	46.70	1.52	100.00

2.0.4. Discussion

Fulfilling the feasibility criteria provides evidence-based support for integrating active with passive injury surveillance. This finding is supported by other types of systems successfully used in healthcare for surveillance of adverse drug reactions.[4,7,49] As in other instances using active surveillance typically results in an increase in cases[50] as was the situation in this study with a 4 to 53-fold increase in reports.

Dement et al.[51] integrated several injury-related data sources to improve a health surveillance system that comprised of active and passive methods but did not detail the active components of the system. Their methods included the collection of work-related stress from employee appraisals but not as discrete injury events as collected here (e.g. stress, anxiety, verbal abuse, bullying). Therefore, to the team's knowledge no studies have been conducted to test an active data collection process simultaneously with passive collection of injury cases that include a broad range of outcomes, including psychological injuries and near-misses; and none have tested the feasibility and ease-of use.

To further substantiate the integration of active and passive surveillance, the responses from focus group data show support of not only using DVRs for recording injuries in real-time but the importance of adding near-misses to help reduce injuries as in other industries. [29] Less than half of respondents stated they captured all or some of all possible near-misses (49%) and psychological injuries (30%), although, in the case of the latter, 81% were comfortable reporting. The relatively low percentage of participants using the DVR to report near-misses may be due to that lack of awareness of these types of outcomes as reporting is not required by institutional policy. Ease-of-use was established by 83% of participants reporting the DVRs were not bulky or hard to use and 90% stated their use did not impede their work.

2.D.5. Conclusions

Results here provide the team support for requesting a change in institutional policy and expanding implementation to fully integrate active surveillance with passive institutional surveillance, even on a sampling basis so not to be cost-prohibitive. Furthermore, a policy-driven requirement to report near-misses and psychological injuries would further enrich the surveillance process and improve future preventative strategies. Finally, 78% of focus group participants reported patient involvement in a near-miss or injury. This highlights the importance of future research examining the relationship between employee safety and patient safety.

2.E. Specific Aim 4 (secondary): Evaluate the association of individual and work factors on near-misses, reported and unreported injuries on medical/surgical and psychiatry units.

Hypothesis 4: The pattern of individual and work factors associated with near misses will be similar to that related to injuries [reported and un-reported). The comparison of factors associated with near misses with those related to injuries will lead to identifying potential targets for interventions.

2.D.1. Background

Aging, high workload, staff shortages, and turnover, combined with the complexity of the work environment contribute component causes to the causal framework for injuries among PHCPs. Research on injuries in healthcare has identified a broad range of risk factors (e.g. work, leisure time and person-based/individual factors),[25 5_2 56] and health improvement requires taking into account these risks.[57] In addition to risk, the different types of outcomes, i.e. near-misses and injuries, should be used to evaluate relationships with exposure, including the examination of common causal pathways for near-misses and injuries. Previous research tested this theory using occupational injury surveillance data from British Columbia.[22] Although there were differences, the top causes and activities involved were the same across near-miss, minor, and major musculoskeletal injuries.[22] This study will advance this line of research by focusing on PHCPs and including a broad-range of injuries.

2.D.2 Methods

At the beginning and end of each participant's data collection period, the modified NWHS was used to collect work characteristics and demographics. Survey completion took approximately 10-15 minutes. Tables 21 a&b and Table 22 provide a description of the variables and subscales used for analyses:

Table 21a. Description of Demographics and Individual Variables

Variable	Values
Sex	1=Male; 2=Female
Race	1=White non-Hispanic; 2=B1ack, non-Hispanic; 3=0ther
Age	1= <25; 2=25-29 ; 3=30-34 ; 4=35-44; 5= >45
Marital Status	1=Never married; 2=Married· 3=Divorced/separated; 4=Widowed
Dependents	O=No; 1=Yes
Smokin!:1	O= Never; 2=Past; 3=Current
BMI	1=<25; 2=25-29; 3=>30
Yrs in current position	0=<1; 1=1-4; 5=5-9 ; 10=>10
Yrs at CC	0=<1; 1=1-4; 5=5-9; 10=>10
Shift tvoe	1=8hrs; 2=12hrs; 3= 2 iobs; 4= other
Hrs worked/day	8=$8; 9=9-12; 13=>12
Hrs worked/week	1=<36; 2=36-39; 3=>40
Sick days/yr	O=O; 1 =1-2 ;3=3-4; 5=5+
Vacation days/yr	O=O; 1 =1-4; 5=5-9; 10=>10
# **of breaks/day**	1=;12=2;3=3+

Table 21b. Description of Individual Variables continued		
Variable	**Values**	**Description**
Medications for musculoskeletal disorders (MSDs)	0-4,>5	number of drug categories used in last 12 mos, as reported in baseline survey among: anti-inflammatory, steroids, benzodiazepins, narcotics, alcohol, muscle relaxants, anti-depressants, sleepino
See a Dr. for MSDs	O=No· 1=Yes	seeino a doctor in the last 12 months as a result of neck, shoulder or back problems
Missed work	O= No; 1=Yes	Missed work in the last 12 months as a result of neck shoulder or back problems
Change in Exercise	O= No; 1=Yes	Changing exercise pattern last 12 mos. as a result of neck, shoulder or back problems
Frequent pain	O=No; 1=Yes	freauent pain last 12 mos. as a result of neck. shoulder or back problems
Types of outcomes due to MSDs	0-4	number of outcome categories -seeing a doctor, missing work, changing exercise patterns, frequent pain - last 12 mos. as a result of neck shoulder or back problems
Neck pain	O= No· 1=Yes	pain last 12 mos. as a result of neck problems
Back Pain	O= No; 1=Yes	pain last 12 mos. as a result of back problems
Shoulder pain	O= No; 1=Yes	pain last 12 mos. as a result of shoulder problems
Pain catei:iories	0-3	number of pain cateqories - last 12 mos. as a result of neck. shoulder or back problems

2.0 .2.i Analysis

We evaluated the injury and near-miss reports recorded in the study with the respect to the risk factors reported "in context" by the employee. We reported frequency distributions of these "numerator-only" analyses and compared the distribution of self-reported risk factors among physical injuries, psychological injuries and near misses without making statistical inferences.

We compared employees who reported injuries and near-miss events through using DVRs with respect to the variables provided in Tables 21 a&b and Table 22. To do so, we classified the 927 recording intervals with data into three categories: 1) "injury intervals" were intervals during which at least one injury was recorded; 2) "near-miss only" intervals were intervals during which no injury, but at least one near-miss was recorded; and 3) "no injury or near-miss" intervals were intervals during which neither injuries nor near-misses were recorded. We used simple frequency distributions to compare the three categories with respect to specific risk factors, and simple inferential procedures. We used logistic regression to estimate odds ratios and 95% Cls for injuries and near-miss events from a pre-defined list of potential predictors as described above. We estimated ORs and Cis for three sets of comparisons: 1) injury intervals vs. no injury or near-miss; 2) near-miss intervals vs. no injury or near-miss, and 3) injury intervals vs. near-miss intervals. The first two contrasts independently asses risk factors for reporting injuries and near-misses, respectively, while the third contrast directly evaluates differences in risk factors between the two types of report. Because some employees were repeatedly sampled during the study and the outcomes of their recording intervals may not be independent from each other, these models included a random "subject effect" (i.e., a random intercept). The standardized Cronbach alpha coefficient was calculated to assess the internal consistency of the subscales listed in Table 22.

Table 22. Description of Work Characteristics			
Variable	**Value**	**Standardized Cronbach a**	**Description**
Work characteristics (7 items)	1=strongly disagree... 4=strongly agree 1=<2; 2=2; 3=>2.	0.62	-Job freedom, job variety, job say, job repetitiveness, job decisions, job skill, job fast, staffing, job security - higher scores indicated worse scenarios
Psychological demands (7 items)	1=strongly disagree...4=strongly agree 1= <2.5; 2=2.5-2.9; 3= <'.3.	0.70	- sufficient time, interruption, wait time, concentration, working hard, excessive work, conflicting demands - **highAr** c::rnr, c:: **inrlir::ab: ri** \M"re:A scenarios
Physical demands (5 items)	1=strongly disagree...4=strongly agree 1= <2.2; 2=>2.3&<2.6; 3=>2.6.	0.80	- Physical effort, physical activity, awkward head, arms, body positions, heavy loads

Table 22. Description of Work Characteristics			
Variable	**Value**	**Standardized Cronbach α**	**Description**
			- higher scores indicated worse scenarios
Physical demands of the daily work (7 items)	1=never...4=often 1=<2.5; 2=2.5-2.9; 3= 3	0.79	- lifting, bending, lifting heavy objects, static positions, repetitive tasks, applying pressure - higher scores indicated worse scenarios
Psychosocial environment (9 items)	1=strongly disagree...4=strongly agree 1=<3; 2=3-3.24; 3= 3.25.	0.89	satisfaction, supervisor: concern, attention, helpful, teamwork; coworkers: competent, friendly, helpful, teamwork -higher scores indicated better scenarios
Physical hazards (2 items)	1=never...4=often 1= 2; 2=>2&<4; 3= 4.	0.87	-Air quality, chemicals, blood, needles - higher scores indicated worse scenarios
Organizational Changes (4 items)	1=Decreased, 2=1ncreased, 3=Stayed the Same, 4=Not Applicable were recoded as 1=+1; 2=-1; 3=0; and 4=missing 1=<0.25; 2=>0.25&<0.666; 3= 0.66.	0.61	- responsibility, unfilled positions, layoffs, patient load, acuity, unlicensed personnel - higher scores indicated worse scenarios
PPE Availability (10 items)	1=No, 2=Yes, 3=Don't know/not sure, 4=Not Applicable were recoded as 1=O; 2=2; 3=1; and 4=missing 1= 1.75; 2=>1.75&<2; 3= 2.	0.68	- Lift team, transfer boards, adjustable beds, gloves, retractable needles, lift devices, Kevlar, goggles, masks, hats. - higher scores indicated better scenarios
Safety Training (6 items)	1=No, 2=Yes, 3=Not Applicable) were recoded as 1=O; 2=1; and 3=missing 1=<O.75; 2= 0.75&<1; 3= 1.	0.68	- Proper posture, PPE, workstation, hazards, stress, health - higher scores indicated better scenarios
Safety Culture (5 items)	1=No, 2=Yes, 3=Don't know/not sure were recoded as 1=O; 2=2; 3=1 1=<1.6; 2= 1.6&<2; 3= 2.	0.61	- procedures, updates, services, rewards committee, faulUblame - higher scores indicated better scenarios
Self- assessment of Health (5 items)	1=Definitely True... 4=Definitely False sickness and expectation were reversed 1=<1.75· 2=1.75-2; 3=>2.	0.67	- evaluations, sickness, expectation, excellence - higher scores indicated worse scenarios

2.D.3. Results

Figure 3 shows the distribution of reported risk factors by type of injuries and near-misses. The top two injury risk factors reported were: interpersonal-patient (32%) and work conditions/procedures (29%) and interpersonal-patient (78%) and environment (13%) for near-misses. Most injury reports did not specify, or did not provide sufficient information to specify, a risk factor or only reported 'pain' or 'injury' (35%), therefore the risk factor was classified as 'Unknown'. For near-misses, interpersonal-patient (78%) and the environment (13%) were the most reported risk factors. 'Unknown' sources of near-misses were also the result of the participant not proving enough detail to determine a risk factor.

Risk factors identified as 'interpersonal-patient' were due to an interaction or involvement with a patient that was not part of a medical procedure or treatment. This type of activity usually occurs when interacting with an aggressive patient whose actions lead to an injury (e.g. patient bites the provider) or a near-miss (e.g. patient swings at provider and does not make contact). The following provides a brief overview of the remaining risk factor definitions:

- **Environment:** factors from the work environment, e.g. wet floor, hanging cables or wires.

- **Work conditions/procedure:** factors emanating from work tasks or procedures, e.g. needle stick due to a blood draw, patient-handling, static postures.
- **Interpersonal-peer:** interaction or involvement with a colleague or peer at work, e.g. bullying, conflict.
- **Interpersonal-other :** interaction or involvement with a patient's family or visitor, e.g. argument, aggressive physical contact.

Figures 4 and 5 show the distribution of reported risk factors according to the type of injury and near-miss. Injuries were categorized as: physical, psychological, and bodily fluid exposure and near-misses as: physical and bodily fluid exposure. Interpersonal-patient was the most reported for all three types of injuries and near misses.

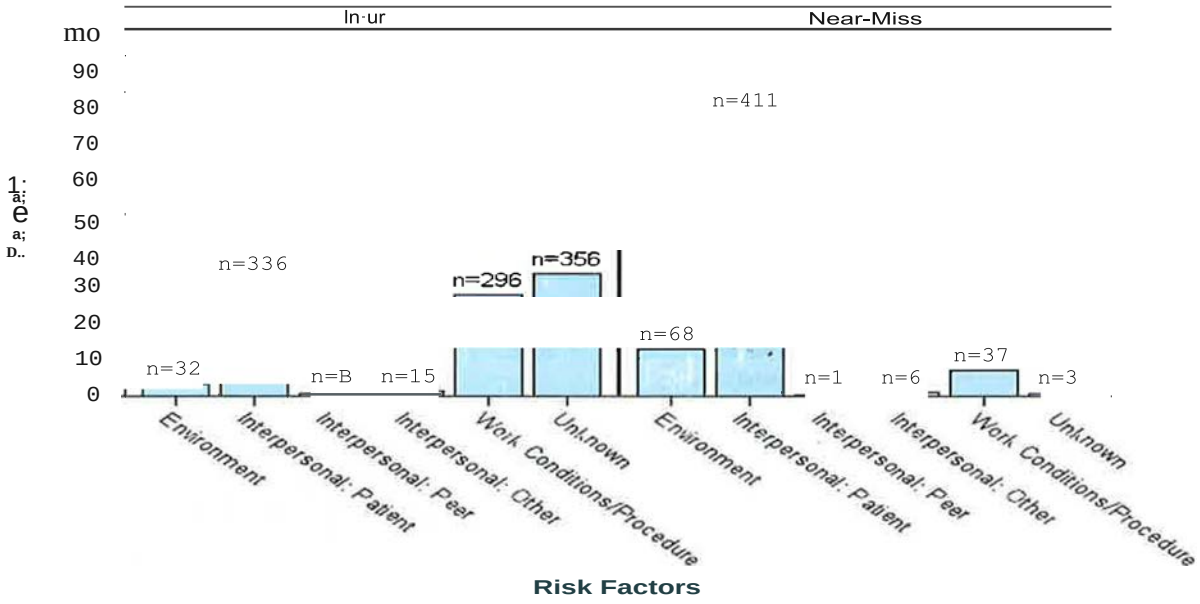


Figure 3. Distribution of risk factors by outcome: injury and near-misses

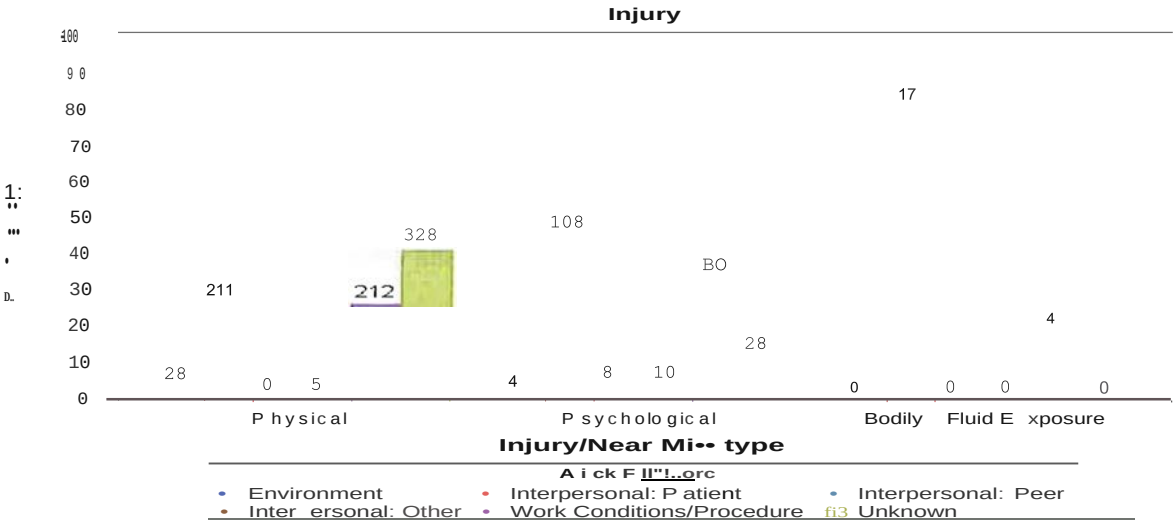


Figure 4. Distribution of **risk** factors by type of injury

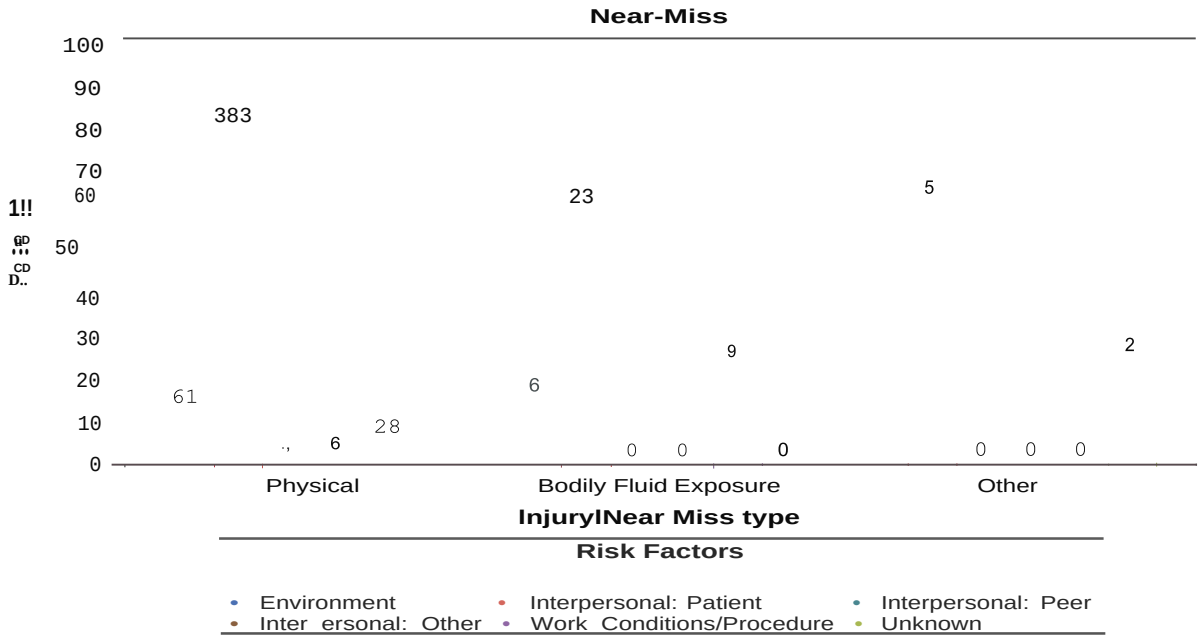


Figure 5. Distribution of risk factors by type of near-miss

Table 23 provides all estimates from a logistic regression models that evaluate each exposure at a time, and considers the duplicates by the same employees with a random intercept (a random "subject" effect). This reduces the precision of the estimates as appropriate, given that repeated outcomes of the same subjects tend to be correlated. There are three sets of odd ratio (OR) estimates, 95% Cls, and p-values for each risk factor: one is contrasting any injury (with or without near-misses) with no injury, the second contrasts near-misses only, with no injury, and the third directly contrasts injuries and near misses: when this contrast is significantly different from the null, the risk factor has clearly a different impact on injuries and near misses. Below is a summary of risk factors that showed overall significance of with each outcome, i.e. injury or near-miss. Significant relationships of the stratified levels of each factor are in bold (Table 23).

Risk factors associated with 'any injuries'

Results show that the category of 'any injuries' was significantly associated with the following variables:

Demographics and Individual factors:

- Years at CCHMC: Risk decreased with decreasing experience with <1-year experience acting as a protective factor (OR 0.36)
- Job group: PCAs were at decreased risk (OR 0.46) compared to RNs and MHSs
- Number (#) of sick days per year: As the number of sick days increased so did the risk of injury (OR 2.5) with the highest risk at 5 sick days.
- Number(#) of vacation days per year: Individuals taking 5-9 vacation days per year were nearly twice as likely to report an injury.
- Medications for musculoskeletal disorders (MSD) over the last 12 months: Taking two or more medications increased the risk for injuries by nearly 2.5 times.
- Seeing a doctor over the last 12 months as a result of neck, shoulder, or back problems: The OR was significant at 1.68 for those who visited a doctor for MSD pain.
- Missed work over the last 12 months: Those missing work due to MSDs were over 2.5 times more likely to report injuries.

- Had frequent MSD pain over the last 12 months were also over twice as likely to report injuries.

- Types of outcomes due to MSDs: The risk of injuries increases with an increase in the types of outcomes (i.e. seeing a doctor, missing work, changing exercise patterns, frequent pain) with the highest risk (OR 3.12) occurring when an individual experiences four of the mentioned outcomes.
- Pre-existing MSDs: Pre-existing shoulder (OR 1.73), back pain (OR 2.50), and having multiple MSDs (OR 2.04-2.84) were significantly associated with injuries.

Work-related factors:

- Psychological job demands: Higher scores indicated an increased demand on the employee and an increased likelihood of injury (OR 1.62-2.71).
- Physical demands of daily work: Higher levels of physical demand, ratings of 'sometimes' and 'often' increased the risk of injury by 1.8 times.
- Physical Hazards: The OR for increased exposure to physical hazards (chemicals, bodily fluids) ranged from 1.63 to 1.86.
- Organizational change: Higher scores, indicating a negative impact, were associated with a nearly two-fold increased risk of injury (OR 1.83).
- Training: Low levels of safety training opportunities were associated with an increased risk of injury (OR 1.73).
- Safety Culture: Lower scores for safety culture assessment were significantly associated with a higher risk of injury (OR 2.5)

Risk factors associated with 'near-misses':

Taking two breaks/day decreased the risk of a near-miss (OR 0.38) while taking one type of medication for MSDs (OR 2.29) and pre-existing back pain (OR 1.77) were associated with increased risk of near-misses. No work-related factors were associated with increased risk of reporting near-misses.

Table 23. Associations of risk factors and in·uries, near-misses, and injuries vs. nea -misses											
Variable name	Category	Any **Injuries**	**Near-misses only**	no injury or **near-miss**	**N** of **reports**	**OR any injury(95%CI)**	**p-value**	**OR near misses(95%CI)**	**p-value**	**OR injury vs. near misses(95%CI)**	**p-value**
Gender	**M**	30 (24%)	19 (15%)	77 (61%)	126	1.03 (0.59-1.81)	0.9161	1.76 (0.93- 3.35)	0.0843	0.56 (0.27-1.14)	0.1140
	F	205 (27%)	72 (9.3%)	497 (64%)	774	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Race/ethnicity	**Other groups**	11 (28%)	2 (5.1%)	26 (67%)	39	1.04 (0.42-2.61)	0.9313	0.41 (0.08-2.02)	0.3749	2.47 (0.45-13.5)	0.4917
	Black non-Hispanic	29 (25%)	9 (7.8%)	78 (67%)	116	0.90 (0.51-1.59)	.	0.68 (0.31-1.52)	.	1.34 (0.55-3.29)	
	White non-Hispanic	194 (26%)	79 (11%)	467 (63%)	740	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
A e	**45**	31 (33%)	14 (15%)	50 (53%)	95	**2.54 (1.25-5.14)**	0.0788	2.55 (1.06-6.09)	0.2693	0.96 (0.37-2.54)	0.9736
	35-44	36 (27%)	11 (8.3%)	86 (65%)	133	1.53 (0.80-2.91)	.	1.18 (0.50-2.82)	.	1.32 (0.49-3.56)	
	30-34	48 {28%)	18(11%)	104 (61%)	170	**1.85 (1.02-3.37)**	.	1.55 (0.71-3.37)	.	1.18 (0.48-2.86)	
	25-29	77 (28%)	31 (11%)	168 (61%)	276	**1.81 (1.06-3.08)**	.	1.68 (0.85-3.33)	.	1.07 (0.48-2.35)	
	<25	41 {19%)	17 (7.8%)	159 (73%)	217	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Education	**Less than college degree**	44 (24%)	13 (7.0%)	128 (69%)	185	0.76 (0.47-1 .23)	0.2683	0.55 (0.28-1.08)	0.0860	1.45 (0.68-3.13)	0.3420
	College degree or more	192 (27%)	79 (11%)	447 (62%)	718	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Marital status	**Divorced/ separated/widowed**	18 (31%)	4 (6.8%)	37 (63%)	59	1.32 (0.62-2.82)	0.7361	0.86 (0.27-2.76)	0.1518	1.51 (0.43-5.25)	0.2837
	Married	96 (27%)	47 (13%)	219 (61%)	362	1.10 (0.74-1.63)	.	1.60 (0.97-2.64)	.	0.69 (0.39-1.21)	
	Never Married	121 (25%)	40 (8.4%)	316 (66%)	477	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Dependents	**Yes**	80 (23%)	42 (12%)	220 (64%)	342	0.83 (0.56-1.22)	. 0.3410	1.33 (0.81-2.18)	0.2554	0.61 (0.35-1.06)	0.0837
	No	155 (28%)	49 (8.9%)	348 (63%)	552	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Smokin	**Ever**	47 (29%)	20 (12%)	98 (59%)	165	1.21 (0.75-1.97)	0.4383	1.38 (0.75-2.52)	0.2999	0.88 (0.45-1.72)	0.7106
	Never	186 (25%)	71 (9.7%)	475 (65%)	732	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
BMI	**30**	61 (28%)	15 (6.8%)	146 (66%)	222	1.02 (0.64-1.62)	0.8679	0.58 (0.30-1.13)	0.1957	1.76 (0.85-3.65)	0.1553
	25-29	51 (24%)	28 (13%)	136 (63%)	215	0.89 (0.55-1.45)	.	1.10 (0.62-1.96)	.	0.79(0.41-1.52)	
	<25	110(26%)	47(11%)	262 (63%)	419	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Yrs in Current Position	**<1**	21 (15%)	15(11%)	102 (74%)	138	**0.43 (0.19-0.94)**	0.0528	0.82 (0.32-2.13)	0.9551	0.53 (0.18-1.61)	0.4004
	1-4	125 (27%)	45 (9.6%)	298 (64%)	468	0.84 (0.45-1.57)	.	0.83 (0.37-1.89)	.	1.04 (0.43-2.56)	
	5-9	63 (32%)	20 (10%)	116 (58%)	199	1.08 (0.54-2.15)	.	0.94 (0.38-2.35)	.	1.16 (0.43-3.13)	
	10	27 (29%)	11(12%)	56 (60%)	94	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Years at CCHMC	**<1**	13 (13%)	9 (9.1%}	77 (78%)	99	**0.36 (0.15-0.83)**	**0.0240**	0.56 (0.21-1.48)	0.6764	0.65 (0.20-2.10)	0.5073
	1-4	115(26%)	44 (9.9%)	287 (64%)	446	0.86 (0.48-1.52)	.	0.73 (0.36-1.48)	.	1.21 (0.55-2.66)	
	5-9	74 (32%)	23 (10%)	133 (58%)	230	1.17 (0.63-2.18)	.	0.82 (0.37-1.80)	.	1.45 (0.61-3.45)	
	10	34 (27%)	16 (13%)	75 (60%)	125	1 (ref.)	.	1 (ref.)	.	1 (ref.)	

Table 23. Associations of risk factors and injuries, near-misses, and injuries vs. near-mis,ses											
Variable name·	**Category**	**Any Injuries**	**Near-misses only**	**no injury or near-miss**	**N of reports**	**OR any injury(95%CI)**	**p-value**	**OR near misses(95%CI)**	**p-value**	**OR injury vs. near mfsses(95%CIl**	**p-value**
Unit	**Med/Surg**	67 (31%)	18 (8.3%)	132 (61%)	217	1.41 (0.92-2.17)	0.1189	0.83 (0 .45-1.52)	0.5465	1.66 (0.86-3.20)	0.1311
	Psvch	169 (25%)	74(11%)	444 (65%)	687	1 (ref.)	.	1 (ref.}	.	1 (ref.)	
Job Group	**MHS**	41 (29%)	13 (9.3%)	86 (61%)	140	1.17 (0.70-1.98)	**0.0269**	0.85 (0.42-1.71)	0.1027	1.33 (0.62-2.84)	0.7383
	PCA	21 (17%)	7 (5.6%)	97 (78%)	125	**0.46 (0.25-0.84)**	.	**0.39 (0.17-0.93)**	.	1.21 (0.44-3.35)	
	RN	174 (27%)	72 (11%)	393 (62%)	639	1 (ref .)	.	1 (ref.)	.	1 (ref.)	
Shift Type	**Other**	85 (28%)	37 (12%)	180 (60%)	302	1.58 (0.97-2.57)	0.1759	1.51 (0.82-2.78)	0.3543	1.03 <0.51-2.06)	0.7186
	12hr	93 (27%)	31 (9.1%)	216 (64%)	340	1.39 (0.87-2.23)	.	1.08 (0.58-2.00)	.	1.29 (0.64-2.60)	
	8hr	58 (22%)	24 (9.2%)	179 (69%)	261	1 (ref.)	•	1 (ref.)	.	1 (ref.)	
Hours worked/day	**8hr**	76 (25%)	35 (11%)	196 (64%)	307	0.63 (0.32-1.24)	0.3444	1.00 (0.40-2.51)	0.7460	0.63 (0.24-1.67)	0.6076
	9-12	131 (26%)	49 (9.6%)	333 (65%,)	513	0.63 (0.33-1.19)	.	0.83 (0.34-2.01)	.	0.77 (0.30-1.97)	
	>12	29 *(35%)*	8 (9.5%)	47 (56%)	84	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
	<36	91 (24%)	44 (12%)	240 (64%)	375	0.79 (0.44-1.44)	0.7005	0.81 (0.40-1.66)	0.2043	0.99 (0.45-2.21)	0.2131
Hours worked/Week	**36-39**	111 (27%)	32 (7.9%)	262 (65%)	405	0.90 (0.50-1.63)	.	0.55 (0.27-1.15)	.	1.65 (0.74-3.72)	
	2:40	34 (27%)	16 (13%)	74 (60%)	124	1 (ref.)	.	**1** (ref .}	.	1 (ref .)	
Sick days/yr	**2:5**	63 (35%)	18 (10%)	98 (55%)	179	2.50 (1.33-4.71)	**0.0250**	1.03 (0.47-2.25)	0.8500	2.39 (0.98-5.81)	0.1631
	3-4	62 (23%)	30 (11%}	177 (66%)	269	1.33 (0.72-2.43)	.	0.96 (0.48-1.92)	.	1.39 (0.61-3 .20)	
	1-2	83 (28%)	25 (8.4%)	189 (64%)	297	1.69 (0.94-3.03)	.	0.78 (0.39-1.58)	.	2.16 (0.94-4.95)	
	0	28 (18%)	19 (12%)	110 (70%)	157	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Vacation days/yr	**2:10**	72 (29%)	31 (13%)	145 (59%)	248	1.61 (0.96-2.68)	**0.0230**	**2.08 (1.05-4.09)**	0.2067	0.78 (0.36-1.69)	0.2419
	5-9	78 (33%)	22 (9.4%}	134 (57%)	234	**1.96 (1.17-3.26)**	.	1.59 (0.77-3.27)	.	1.23 (0.55-2.73)	
	1-4	32 (19%)	21 (12%)	118 (69%)	171	0.96 (0.53-1.74)	.	1.74 (0.83-3.64)	.	0.54 (0.22-1.28)	
	0	51 (21%)	18 (7.3%)	176 (72%)	245	1 (ref .)	.	1 (ref.)	.	1 (ref.l	
Breaks/day	**1**	126 (26%)	63(13%)	296 (61%)	485	1.11 (0.52-2 .36)	0.9432	0.87 (0.38-2.02)	**0.0166**	1.33 (0.51-3.51)	**0.0341**
	2	83 (28%)	18 (6.0%)	199 (66%)	300	1.05 (0.48-2.29)	.	**0.38 (0.15-0.96)**	.	**3.00 (1.04-8.65)**	
	3	15 (22%)	10 (15%)	42 (63%)	67	1 (ref.}	.	1 (ref .)	.	1 (ref.)	
Drug categories for MSD problems	**2:2**	48 (38%)	11 (8.8%)	66 (53%)	125	**2.46 (1.45-4.19)**	**0.0006**	1.64 (0.75-3.57)	**0.0070**	1.56 (0.68-3.59)	0.2889
	1	102 (29%)	48 (14%)	203 (58%)	353	**1.85 (1.25-2.73)**	.	**2.29 (1.37-3.81)**	.	0.82(0.46-1.45)	
	0	87 (19%)	34 (7.6%)	328 (73%)	449	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Saw a doctor	**Yes**	73 (33%)	26 (12%)	122 (55%)	221	**1.68 (1.11-2.53)**	**0.0138**	1.51 (0.88-2.59)	0.1385	1.10 (0.61-1 .96)	0.7589
	No	164 (23%)	67 (9.5%)	475 (67%)	706	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Missed work	**Yes**	59 (44%)	8 (6.0%)	67 (50%)	134	**2.58 (1.62-4.11l**	**<.0001**	0.74 (0.33-1.66)	0.4590	**3.50 (1.53-7.98)**	**0.0038**
	No	178 *(22%)*	85(11%)	530 (67%)	793	1 (ref.)	.	1 (ref.)	.	1 *(ref.*l	
Changed exercise	**Yes**	112 (30%)	36 (9.7%)	225 (60%)	373	1.37 (0.96-1.97)	0.0847	1.07 (0.66-1.73)	0.7955	1.35 (0.79-2 .31)	0.2732
	No	125 (23%)	57 (10%)	372 (67%)	554	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Had frequent MSD pain	**Yes**	107 (35%)	34 (11%)	165 (54%)	306	**2.15 (1.48-3.13)**	**<.0001**	1.56 (0.94-2.57)	0.0848	1.39 (0.81-2.38)	0.2411
	No	130 (21%)	59 (9.5%)	432 (70%)	621	1 (ref.)	.	1 (ref.)	.	1 (ref.)	

Table 23. Associations of risk factors and injuries, near-misses, and iniuries vs. near-misses											
Variable name	**Category**	**Any Injuries**	**Near-misses only**	**no injury or near-miss**	**N of reports**	**OR any injury(95%CI)**	**p-value**	**OR near misses(95%CI)**	**p-value**	**OR injury vs. near misses(95%CI)**	**p-value**
Types ofMSD outcomes	**4**	22 (46%)	1 (2.1%)	25 (52%)	48	**3.12 (1.46-6.67)**	**0.0005**	0.32 (0.04-2.58)	0.1183	**9.07 (1.12-73.8)**	0.2124
	3	33 (38%)	11(13%)	44 (50%)	88	**2.77 (1.50-5.11)**	.	2.21 /0.97-5.06)	.	1 34 /0.57-3.19)	
	2	53 (33%)	18(11%)	89 (56%)	160	**2.28 (1.37-3.78)**	.	1.82 (0.92-3.58)	.	1 24 (0.59-2.60)	
	1	58 (23%)	31 (12%)	169 (66%)	258	1.25 (0.80-1 .96)	.	1.57 (0.89-2.80)	.	0 83 (0.43-1.60)	
	0	71 (19%)	32 (8.6%)	270 (72%)	373	1 (ref.)	.	1 (ref.)	•	1 (ref.)	
Neck pain	**Yes**	47 (33%)	14 (9.9%)	81 (57%)	142	1.53 (0.94-2.48)	0.0881	1.18 (0.61-2 .31)	0.6177	1 25 (0.61-2.53)	0.5441
	No	190 (24%)	79 (10%)	516 (66%)	785	1 (ref.)	.	1 (ref.}	.	1 (ref .)	
Shoulder pain	**Yes**	41 (36%)	13(11%)	60 (53%)	114	**1.73 (1.03-2.90)**	**0.0395**	1.45 (0.72-2 .93)	0.2969	1 22 (0.58-2.55)	0.6036
	No	196 (24%)	80 (9.8%)	537 (66%)	813	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Back pain	**Yes**	85 {39%)	26 (12%)	108 (49%)	219	**2.50 (1.66-3.74)**	**<.0001**	**1.77 (1.02-3.07)**	**0.0419**	1.42 (0.80-2.53)	0.2392
	No	152 (22%)	67 (9.5%)	489 (69%)	708	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
# **Pain cateqories**	3	20 (43%)	6 (13%)	21 (45%)	47	**2.84 (1.30-6.22)**	**0.0010**	2.07 /0.73-5.89)	0.3167	1.34 (0.47-3.85)	0.6806
	2	26 (35%)	7 (9.3%)	42 (56%)	75	**2.10 (1.12-3.94)**	.	1.30 (0.52-3.21)	.	1.61 (0.62-4.23)	
	1	61 (33%)	21 (11%)	102 (55%)	184	**2.04 (1.32-3.16)**	.	1.56 (0.86-2.81l	.	1.32 (0.70-2 .51)	
	0	130 (21%)	59 (9.5%)	432 (70%)	621	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Work characteristics	**>2**	95 (24%)	36 (9.3%)	258 (66%)	389	0.73 (0.48-1.10)	0.3058	0.64 (0.38-1.10)	0.1787	1.14 (0.63-2.07)	0.7358
	2	49 (26%)	16 (8.5%)	124 (66%)	189	0.79 (0.48-1.29)	.	0.60 /0.31-1.17)	.	1.34 /0.64-2.80)	
	<2	89 (28%)	39 (12%)	188 (60%)	316	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Psychological job demands	:?:3	60 (38%)	16 (10%)	82 (52%)	158	**2.71 (1.76-4.16)**	**<.0001**	1.32 (0.70-2.51)	0.6932	**2.05 (1.03-4.06)**	0.1039
	2.5-2.9	107 (27%)	39 (10%)	244 (63%)	390	**1.62 (1.14-2.31)**	.	1.08 (0.67-1.76)	.	1.50 (0.87-2 .59)	
	<2.5	66 (19%)	36 (10%)	244(71%)	346	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Psychosocial Environment	:?:3.25	93 (28%)	34 (10%)	206 (62%)	333	0.93 (0.57-1.51)	0.2407	1.28 (0.64-2.60)	0.7466	0.73 (0.34-1.58)	0.2717
	3-3.24	85 (22%)	42 (11%)	253 (67%)	380	0.70 (0.43-1.13)	.	1.28 (0.65-2.53)	.	0.55 (0.26-1.16)	
	<3	55 (30%)	15 (8.3%)	111 (61%)	181	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Physical job demands	:?:2.6	114(31%)	33 (9.1%)	217 (60%)	364	1.43 (0.94-2.16)	0.0618	1.00 (0.57-1.76)	0.7002	1.45 (0.78-2.70)	0.0927
	[2.2-2.6]	40 (20%)	25 (13%)	134 (67%)	199	0.83 (0.50-1.38)	.	1.26 (0.69-2.31)	.	0.67 (0.33-1.36)	
	2.2	79 (24%)	33 (10%)	219 (66%)	331	1 (ref.)	.	1 (ref.)	.	1 (ref.)	
Physical demands of daily work	:?:3	102 (35%)	25 (8.7%)	161 (56%)	288	**1.80 (1.13-2.87)**	**0.0031**	0.79 (0.43-1.45)	0.3664	**2.37 (1.21-4.66)**	**0.0432**
	2.5-2.9	73 (21%)	32 (9.3%)	239 (70%)	344	0.89 (0.56-1.41)	.	0.67 (0.38-1.17)	.	1.34 /0.70-2.59)	
	<2.5	58 (22%)	34 (13%)	169 (65%)	261	1 (ref.)	.	1 /ref.)	.	1 (ref.)	
Physical hazards	:?:4	89 (31%)	27 (9.5%)	168 (59%)	284	**1.86 (1.18-2.92)**	**0.0199**	1.18 (0.65-2.14)	0.6034	1.59 /0.82-3.09)	0.3917
	[2-4]	77 (28%)	31(11%)	168(61%)	276	**1.63 (1.04-2.56)**	.	1.34 (0.76-2.37)	.	1.24 (0.65-2.37)	.
	2	67 (20%)	33 (9.9%)	233 (70%)	333	1 (ref.)	.	1 (ref.)	.	1 (ref.)	

Table 23. Associations of risk factors and injuries, near-misses, and injuries vs. near-misses											
Variable name	**Category**	**Any Injuries**	**Near-misses only**	**no injury or near-miss**	**N of reports**	**OR any injury(95%CI)**	**p-value**	**OR near misses(95%CI)**	**p-value**	**OR injury vs. near misses(95%CIl**	**p-value**
Organizational chanQe	**2:0.66**	121 (33%)	34 (9.2%)	215 (58%)	370	**1.83 (1.19-2.79)**	**0.0196**	0.93 (0.54-1.61)	0.9358	**2.02 (1.09-3.75)**	0.0903
	[0.25-0.66]	51 (25%)	21 (10%)	135 (65%)	207	1.28 (0.78-2.09)		0.89 (0.48-1.67)		1.45 (0.71-2.99)	
	:S0.25	60 (20%)	35 (12%)	206 (68%)	301	1 (ref.)		1 (ref.)		1 (ref.)	
PPE availability	**<1.75**	81 (29%)	29 (10%)	172 (61%)	282	1.30 (0.84-2 .03)	0.4912	0.97 (0.55-1.72)	0.7451	1.43 (0.75-2.71)	0.4162
	r1.75-21	70 (27%)	23 (8.8%)	168 (64%)	261	1.18 (0.76-1.84)		0.80 (0.44-1.45)		1.48 (0.76-2.89)	
	:52	82 (23%)	39(11%)	229 (65%)	350	1 (ref.)		1 (ref.)		1 (ref.)	
Training	**<0.75**	80 (32%)	30 (12%)	138 (56%)	248	**1.73 (1.14-2.62)**	**0.0367**	1.57 (0.92-2.71)	0.1967	1.11 (0.61-2 . 02)	0.7832
	0.75-1]	37 (27%)	12 (8.7%)	89 (65%)	138	1.18 /0.71-1.97)		0.90 (0.44-1.85)		1.32 (0.60-2 .92)	
	2:1	115 (23%)	49 (9.7%)	341 (68%)	505	1 (ref.}		1 (ref.)		1 (ref.)	
Safety culture	**<1.6**	77 (38%)	15(7.4%)	111 (55%)	203	**2.50 {1.53-4.09)**	**0.0012**	0.93 (0.45-1.92)	0.2540	**2.57 (1.16-5.66)**	**0.0158**
	1.6-2]	96 (24%)	49 (12%)	254 (64%)	399	1.35 (0.88-2.08)		1.46 (0.85-2.50)		0.89 (0.47-1.68)	
	2:2	60 (21%)	27 (9.3%)	204 (70%)	291			1 (ref.)		1 (ref.)	
Injury reportinQ	**DK/NS**	4 (17%)	3 (13%)	16 (70%)	23	0.71 (0.20-2.52)	0.0911	1.06 (0.27-4.16)	0.6665	0.58 /0.11-3.19)	0.3828
	Never	50 (20%)	21 (8.4%)	178 (72%)	249	0.74 (0.46-1.18)		0.64 (0.35-1.16)		1.16 (0.58-2.31)	
	Rarely	35 (28%)	13 (10%)	78 (62%)	126	1.03 (0.59-1.79)		0.86 (0.42-1.78)		1.26 (0.56-2.83)	
	Depends	51 (37%)	11 (7.9%)	77 (55%)	139	1.65 (0.98-2.76)		0.76 (0.35-1.63)		2.15 (0.96-4.84)	
	Each time	92 (26%)	43 (12%)	218 (62%)	353	1 (ref.)		1 (ref.I		1 (ref.)	
Co-worker lnjurf report	**DK/NS**	62 (23%)	25 (9.2%)	185 (68%)	272	0.76 (0.48-1.21)	0.6052	0.76 (0.41-1.41)	0.8433	0.98 (0.49-1.96)	0.7928
	Never	5 (29%)	1 (5.9%)	11 (65%)	17	1.14 (0.33-3.99)		0.54 (0.06 -4.76)		1.96 (0.19-20 .0)	
	Rarely	27 (23%)	15 (13%)	78 (65%)	120	0.76 (0.42-1.39)		1.09 (0.52-2.27)		0.75 (0.33-1 .73)	
	Depends	63 (30%)	20 (9.6%)	125 (60%)	208	1.06 (0.65-1.72)		0.87 (0.45-1.69)		1.27 /0.61-2.62)	
	Each time	76 (28%)	30 (11%)	167 (61%)	273	1 (ref.)		1 (ref.)		1 (ref.)	
General health	**Fair**	10 (30%)	2 (6.1%)	21 (64%)	33	1.42 (0.49-4.11)	0.5270	0.72 (0.14-3.83)	0.1429	2.26 (0.37-13.9)	0.1707
	Good	78 (29%)	19 (7.0%)	175(64%)	272	1.58 (0.86-2.93)		0.85 (0.37-1.94)		1.98 (0.77-5.13)	
	Verv Good	120 (26%)	58 (13%)	283 (61%)	461	1.46 (0.82-2.61)		1.59 (0.77-3.27)		0.99 (0.42-2.33)	
	Excellent	25 (20%)	12 (9.4%)	90 (71%)	127	1 (ref.)		1 (ref.}		1 (ref.)	
Health self-assess score	**>2**	57 (32%)	16 (9.0%)	105 (59%)	178	**1.79 (1.07-3.02)**	0.0728	0.95 (0.48-1.89)	0.9551	1.92 (0.90-4.13)	0.1972
	1.75-2	114 (28%)	40 (9.7%)	260 (63%)	414	1.45 (0.95-2.21l		0.92 (0.54-1.57)		1.55 (0.84-2.85)	
	<1.75	62 (21%)	35 (12%)	204 (68%)	301	1 (ref.)		1 (ref.)		1 (ref.)	

Risk factors associated with both injuries and near-misses:

Except for the number of breaks/day, missed work due to MSDs, physical work demands, and safety culture, *all factors* are significantly associated to *both* injuries and near-misses with increased risk ranging from OR 0.53 for the number of ye[22]ars in the current position, OR 2.69 for working days and nights (schedule), to 9.07 for having multiple outcomes (e.g. seeing a doctor, missing work, etc.).

2.0.4. Discussion

In the only other study that examined injuries and near-misses in healthcare providers, Alamagir et al[22] found the top cause for injuries (major and minor) and near-misses were ergonomic factors. Findings here showed patient aggression as the main factor for both injuries and near-misses, and work conditions/procedures, consisting mainly of ergonomic factors rated second. Our results are not surprising since injuries due to violence and aggression have been an increased focus of recent studies due to the high prevalence of incidents among healthcare providers.[5-8 60] However, further research on PHCPs is necessary to show if this is a major distinction between PHCPs and adult-care providers with regards to risk factors since other studies also show ergonomics as the main risk factor for injuries.[30 33 61]

Work experience (at CC) of :::.1 year showed a decreased risk for injuries (OR 0.36). This may be due to the assignment of a lighter or less acute patient load because of a lack of experience. A reduce risk of injuries among PCAs (nursing aides) may also be a result of job role and assignment, however, this result does not agree with findings from Boden et al [16] which show aides at nearly five times the risk of injuries compared to nurses working in pediatric/neonatal units.

Taking two or more types of pain medication, reporting frequent MSD pain, and symptoms in multiple regions increased the risk of injuries. These may be indicators of the severity and/or chronicity of symptoms leading to increased risk of injury [56] due to forced change in behavior and activity as the result of altered coordination or concentration due to pain. [62]

Psychological work demands increased injury risk by 2-3-fold and a low perception of organizational safety culture increased risk (OR 2.5) as well, highlighting that physical aspects of pediatric healthcare work are not the only type of risk factor for injuries.

Risk factors and their associations between occupational injuries and near-misses for a broad range of individual and work characteristics have not been documented for PHCPs and this research is only the second study for healthcare providers as a whole.[22] Results here show that the opportunity for risk and injury reduction is considerable. Of 42 risk factors, only four showed a significant difference in association with both injuries and near-misses, substantiating the research in other industries that there may be common causes between near-miss incidents and injuries.

2.0.5. Conclusions

Results of this study show that the exclusion of PHCPs due to lack of risk or injuries in past research is not supported. Rates of injuries and associated risk factors are comparable to the adult-care population. Although types of injuries and risk factors for the most prevalent outcomes may differ, the exposure to hazards and subsequent outcomes still occur and warrant studies that further examine risk and implement interventions to mitigate or eliminate adverse outcomes.

3. LIMITATIONS AND RELEVANT INFORMATION:

3.A. Study Operational Issues

- The original tracking database was maintained in Excel. However, due to the size of the participant population and volume of information, a switch to an Access database was necessary.
- Forty new DVRs were purchased to supplement recruiting and participation efforts for a total of 80 recorders in circulation and utilized by participants.

3.B. Recruitment & Training Issues

- Multiple recruitment of three individuals in less than a two-month period due to a technical issue with the randomization program. The program was altered to ensure two months passed before an employee was eligible for recruitment after they completed an observation period.
- When attempting to recover a DVR from an active participant, often the participant would indicate they have not completed their required number of shifts. Depending on the willingness of the participant, we would instruct them to keep the recorder to obtain the required number of shifts. Maternity leave, planned vacation, medical leave, light duty, and being called off were factors that prevented staff from completing the protocol in the two-week window.
- Reasons for Withdrawal:
    - Newly hired, in training or orientation.
    - Individuals revealed they did not feel like they would be a good candidate for participation. They indicated they either were extremely forgetful, or were aware of their inability to adopt new habits successfully at work.
    - Some staff members indicated they were already overburdened with their normal day-to-day functions and would not complete the protocol if they participated.
- Rarely, a participant would be terminated from the institution while or after participating. These events were discovered when they needed to return the recorder or when they needed to complete a survey. We would attempt to contact the participant via telephone to schedule returning the recorder. Attempts were made to deliver incentives to these participants, if applicable.

3.C. Participant Management Issues

- Participants that changed their name due to a life event (e.g. marriage, divorce) introduced difficulties in locating and tracking since their emails would also change.
- Prior to the use of the Access database, some participants would still be randomized for recruitment, but were no longer employed in an eligible job group. Therefore, all participants were screened when approached for recruitment and subsequently removed in the system.

3.0. Data Issues

- OSHA recordables were not studied as the identification of these types of outcomes are at times not identified until 24-72 hours after reporting.
- Participation in the study may have increased awareness of injuries and reporting however this effect would also impact reporting to the ISS.

3.E. Relevant Institutional Information

- As of March 31, 2014, patient safety reporting is up 18% and employee safety reporting is up 98%. Combined, they are up an average of 25%
- In January 2015, the institutional event reporting line switched from 513-803-0UCH to 513-803-SAFE. And begins encouraging the reporting of near-misses.
- As of April 9, 2015, employee safety reporting was down 11% compared to the same period from FY14, but patient safety reporting was up 9%.
- As of May 11, 2015, employee safety reporting was down 5% compared to the same period from FY14, but patient safety reporting was up 10%.
- Employees are encouraged to use 513-803-SAFE to report both employee and patient safety incidents.
- As of June 8, 2015, employee safety reporting was down 5% compared to the same period from FY14, but patient safety reporting was up 10%.
- Record-setting census levels were seen between March and April of 2014.

INCLUSION ENROLLMENT TABLE (SEE APPENDIX)

PUBLICATIONS:

No publications at the time of report completion.

INCLUSION OF GENDER AND MINORITY STUDY SUBJECTS

Not applicable. However, no participant was excluded based on gender or minority status.

INCLUSION OF CHILDREN:

Children were not participants in this study.

MATERIALS AVAILABLE FOR OTHER INVESTIGATORS:

No materials are available at the time of this report.

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Modified WORKLIFE AND HEALTH STUDY

Please answer the following questions about yourself and your workplace. If no answer fits exactly, record your best estimate of the choices given. We realize that some of the questions may be ofa sensitive nature, but you cannot be identified or traced in ANY way from the questionnaire. Be sure to fill in the ovals completely.

1. Job Information

A. Your current position:

0 RN
0 Mental Health Specialist
0 Patient Care Attendant

B. Your working status (mark all that apply):

0 8-hour shift
0 12-hour-shift
0 Other___ _
0 Working two jobs

C. Your current UNIT:

0 Gastroenterology / Colorectal Surgery
0 Complex Surgery/Solid Organ Transplant
0 Cardiac Stepdown/Ortho/Urology
0 Pulmonary/Adolescent Medicine

0 Infant/Child School-Age Acute Medical
0 Neuroscience
0 Inpatient Adolescent
0 Inpatient Child (College Hill Campus)
0 Inpatient Adolescent (College Hill Campus)
0 Inpatient Neuro (College Hill Campus)
0 Residential Treatment (College Hill Campus)
0 Partial Hospitalization (College Hill Campus)
0 Other (specify)-_ _ _ _ _ _ _ _ _ _

D. Your highest educational preparation:

0 High School
0 Trade or Associates Degree
0 Some College
0 Graduated College
0 Post-Graduate

E. Year you became an RN/MHS/PCA _____

F. Number of years at CCHMC:_____

G. Number of years in current position:___ _

H. Number of hours worked in a typical day at CCHMC:___ _

I. **Number of hours worked in a typical week at CCHMC:** _ _ _ _

J. **Number of days worked per week at CCHMC:** _ _ _ _ _

K. **Number of weekends worked per month at CCHMC:** _ _ _ _

L. Schedule(s) you normally work:

D Days
D Evenings
0 Nights

M. In the past year, about how many days did you take as:

Sick days _____
Vacation days _____

N. During a typical workday, how many breaks lasting IO minutes or more (including meals), do you take?

a. None
b. 1
c. 2
d. 3
e. 4+

0. If **you take breaks, how often do you leave your unit/work area to take it/them?**

0 I never take a break
0 Rarely (1/4 of the time)
0 Sometimes (1/2 of the time)
0 Almost always (3/4 of the time)
0 Always

2. Work Characteristics

A. In my job I have...	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
very little freedom to decide how I do my work	0	0	0	D
a variety of different things to do	0	D	0	D
a lot of say about what happens on my job	0	0	0	0
an opportun ity to develop my own special abilities	L..1	0	[J	D
enough time to get the job done	0	0	0	D
tasks that are often interrupted before they can be completed	0	0	0	[ ]
to wait on work from other people or departments which often slows me down	0	0	0	0

B. My job...	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
requires that I learn new things	0	0	0	0
requires long periods of intense concentration on the task	0	0	0	0
involves a lot of repetitive work	0	0	0	0
requires working very hard	0	0	0	0
requires a lot of physical effort	0	0	0	0
requires me to be creative	0	0	0	0
allows me to make a lot of decisions on my own	0	0	0	0
requires a high level of skill	0	0	0	0
requires working very fast	0	0	0	0
requires rapid and continuous physical activity	0	0	0	0
has adequate staffing skills	0	0	0	D
is very satisfying to me	0	0	0	0
security is good	0	0	0	0

C. My supervisor...	Strongly Disagree	Disagree	Agree	Strongly Agree
is concerned about the welfare of those on staff	D	D	D	D
pays attention to what I am saying	D	D	D	D
is helpful in getting the job done on the unit	D	D	D	D
is successful in getting people to work together	D	D	D	D

D. My co-workers...	Strongly Disagree	Disagree	Agree	Strongly Agree
are competent in doing their job	D	D	D	D
are friendly	D	D	D	D
are helpful in getting the job done on the unit	0	0	D	D
are good team members	D	D	D	D

E. In my job, I am...	Strongly Disagree	Disagree	Agree	Strongly Agree
not asked to do an excessive amount of work	0	0	0	0
free from conflicting demands that others make	0	D	D	0
working for long periods with my **head or arms** in awkward positions	0	D	0	0
working for long periods _with my body in awkward positions	0	0	0	D
often moving/lifting very heavy loads	D	D	D	D

F. How often in a typical workday do you...	Never	Rarely	Sometimes	Often
lift or lower patients/objects to/from the floor	D	0	D	D
lift or lower objects to/from shoulder height	D	D	0	0
work while bent or twisted at the waist	0	D	D	D
push/pull heavy objects/people	D	D	D	D
stand in one place/static position for over 30 minutes	0	0	D	D
sit in one place for over 30 minutes	0	D	D	D
perform repetitive motions with hands/wrists	D	D	D	D
apply pressure with hands/fingers (e.g. to prevent bleeding)	D	D	D	D

G. In the <u>past year</u>, how often have you been exnosed to/exoerienced the foUowimr at work?	Never	Rarely	Sometimes	Often
poor air qualitv	D	D	D	D
toxic chem icals/.gas	D	D	D	D
unwanted sexual advances	D	0	D	D
blood/body fluids	0	0	D	D
needles/sharps	D	D	D	D

H. In the past year, have the following increased, decreased, or stayed the same?	Decreased	Increased	Stayed the Same	Not Applicable
Work/job responsibilities	D	D	D	D
Unfilled positions	D	D	D	D
Layoffs	D	D	D	D
Client/patient load	D	D	D	D
Patient acuity	D	D	D	D
Unlicensed personnel providing direct care	D	D	D	D

3. Neck Problems

A \ A

A. In the past year, how often have you had neck (see figure above) problems?

- D Daily
- D 3-4/week
- D once/week
- D once/month
- D every 2-3 months
- D every 6 months
- D Never

B. Was the first time you had a neck problem...

- D On this current job?
- 0 On a prior job?
- D Not on the job?
- D Don't know/Not sure

C. **In the past year, has this neck problem resulted in your.;.** *(Check **all that apply)***

- 0 Seeing a doctor or other provider
- 0 Missing work
- 0 Reducing/modifying work duties
- 0 Reducing non-work activity (e.g. climbing stairs, housework)
- 0 Reducing recreation (e.g. exercising)

4. Shoulder Problems

OA

A. In the past year, how often have you had shoulder problems?

- 0 Daily
- 0 Almost daily
- 0 Frequently (once/week)
- 0 Sometimes (once/month)
- 0 Rarely (every 2-3 months)
- LJ Aimost never (every 6 months)
- 0 Never

B. Was the first time you had a shoulder problem...

- D On this current job?
- D On a prior job?
- D Not on the job?
- D Don't know/Not sure

C.* In the past year, has this shoulder problem resulted in your *(Check all that apply):

- 0 Seeing a doctor or other provider
- D Missing work
- D Reducing/modifying work duties
- D Reducing non-work activity (e.g. climbing stairs, housework)
- D Reducing recreation (e.g. exercising)

5. Back Problems

A. In the past year, how often have you had lower back problems?

- D Daily
- D Almost daily
- D Frequently (once/week)
- D Sometimes (once/month)
- D Rarely (every 2-3 months)
- 0 Almost never (every 6 months)
- 0 Never

B. Was the first time you had a lower back problem....

- D On this current job?
- D On a prior job?
- D Not on the job?
- D Don't know/Not sure

C.* In the past year, has this lower back problem resulted in your: *(Check all that apply)

- D Seeing a doctor or other provider
- D Missing work
- D Reducing/modifying work duties
- D Reducing non-work activity (e.g. climbing stairs, housework)
- D Reducing recreation (e.g. exercising)

6. Pain Medications

In the past year have you used any of these and if so, for which reasons (pleasemark all that apply):	Yes (neck, shoulder, back pain	Yes (other reasons)	No
Non-steroidal anti-inflammatory (e.g. Motrin, Aleve, aspirin)	0	0	0
Steroids (cortisone)	0	0	D
Benzodiazepines (e.g. Valium)	D	D	D
Narcotic analgesics (e.g. Demerol, Tylenol with codeine)	0	0	0
Alcohol (5+ drinks per occasion)	0	0	D
Muscle relaxants (e.g. Flexeril, Skelaxin)	0	0	0
Anti-depressants (e.g. Zoloft, Prozac)	0	0	D
Sleeping pills (e.g. Halcion, Ambien, Marijuana)	D	D	D

7. Safety and Personal protective equipment

A. Does your workplace provide:	No	Yes	Don't Know/Not Sure	Not Applicable
A lifting team	0	0	0	D
Transfer boards/Sliding sheets	0	CJ	0	0
Adjustable beds	0	0	0	0
Non-latex or Powder-free exam gloves	0	0	CJ	0
Self-blunting, self-sheathing or retractable needles		0	CJ	
Mechanical lifting devices		0		D
Kevlar (gloves & sleeves)	0	0	D	0
Safety goggles	0	0	0	0
Mask	0	0	0	D
Hats				

B. In your current job, were you trained on:	No	Yes	Not Applicable
Correct work postures	0	0	0
Use ofPPE	0	0	D
Adjusting your workstation equipment	0	0	D
Recognizing workplace hazards	0	0	D
Stress reduction	0	D	D
Health promotion (e.g. diet, exercise)	CJ	0	0

C. Are the following located/occurring in your workplace:	No	Yes	Don't Know/Not Sure
Written safety procedures	D	D	D
Periodic safety updates	D	D	D
On-site occupational/employee services	D	D	D
Health and safety committee	D	D	D
Rewards or bonuses for a decrease in reported accidents /inj uries	LJ	LJ	u
Work-related injuries treated as the employee's fault	0	D	D

D. In your workplace, how often do you file an injury report?

- D Each time an injury/occurrence happens
- D Depends on the situation
- D Rarely
- D Never
- D Don't know/Not sure

E. In your workplace, how often do your co-workers file an injury report?

- D Each time an injury/occurrence happens
- D Depends on the situation
- D Rarely
- D Never
- D Don't know/Not sure

8. General Health

A. In general, would you say your health is:

- D Excellent
- D VeryGood
- D Good
- D Fair
- D Poor

B. How TRUE or FALSE is each of the following statements for you?	Definitely True	Mostly True	Mostly False	Definitely False
I am as healthy as anybody I know	D	D	D	D
I seem to get sick a little easier than other people	D	D	D	D
I expect my health to get worse	D	D	D	D
My health is excellent	D	D	D	D

9. Demographics

A. Gender

OMale

D Female

B. Marital Status

D Married

D Never married

D Divorced or separated

D Widowed

C. What is your ethnicity?

D Hispanic or Latino/a

D Not Hispanic or Latino/a

D. What best describes your race?

D White

D Black or African American

D American Indian or Alaskan Native

D Asian or Pacific Islander

D Other_____

E. Do you currently smoke *Yz* pack/day or more?

D Yes

0 No, but I used to smoke Y:z pack/day or more

D No, I never smoked that much

D I Never smoked

F. Are you caring for any dependents (e.g. elderly, children)?

0 No

D Yes

G. How tall are you? ___ feet ___ inches.

H. How much do you weigh?

D Less than 100 pounds

D 101-129 pounds

D 130-159 pounds

D 160-189 pounds

D 190+ pounds

I. **What is your age?___years**

Perception of Data Collection Methodology

Which data collection method did you prefer?

D Digital voice recorder

D 800-803-0UCH (Current surveillance method)

D Both methods are necessary to capture injury and near misses occurrences

D Other _____

View Burden Statement

PHS Inclusion Enrollment Report

This report format should NOT be used for collecting data from study participants.

0MB Number: 0925-0001 and 0925-0002
Expiration Date: 10/31/2018

***Study Title (must be unique):** jJust-in-Time Methods for Under s t a nd i ng Near Misses, Injuries, & Risk Fa c t o r s

* Delayed Onset Study? D Yes fZ! No

If ***study is not delayed onset, the following selections are required:***

Enrollment Type D Planned fZ! Cumulative (Actual)

Using an Existing Dataset or Resource |Z! Yes D No

Enrollment Location [X] Domestic D Foreign

Clinical Trial D Yes fZ| No **NIH-Defined Phase** Ill **Clinical Trial** D Yes |ZJ No

Comments:

Racial Categories	Ethnic Categories									
	Not Hispanic or Latino			Hispanic or Latino			Unknown/Not Reported Ethnicity			Total
	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	Female	Male	Unknown/ Not Reported	
American Indian/ Alaska Native	1	1	0	0	0	0	0	0	0	2
Asian	4	0	0	0	0	0	0	0	0	4
Native Hawaiian or Other Pacific Islander	4	0	0	0	0	0	0	0	0	4
Black or African American	55	18	0	0	0	0	2	0	0	75
White	436	48	0	3	1	0	0	1	0	489
More than One Race	1	1	0	6	5	a	0	0	0	13
Unknown or Not Reported	4	0	0	1	0	0	0	0	10	15
Total	505	68	0	10.	6	0	2	1	10	602

Report 1 of 2

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