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List of Terms and Abbreviations

Hospital admission/discharge database	ADT
Body Fluid Exposures	BBFE
Center for Health Research	CHR
Employee Health Service	EHS
Health care worker	HCW
health record number	HRN
Institutional Review Board	IRB
Administrative information on all medical visits	KARE
Kaiser Permanente Northwest	KPNW
Membership Information Processing System	MIPS
Outside claims and reimbursements	OSCAR
Sharp-Instrument Injuries	SII
Pharmaceutical dispensings and pharmacy costs	TOPS

Abstract

The original study plan was to use detailed health records to explore links between sharp-instrument injuries (SII) and exposure to blood and body fluids (BBFE) among health-care workers (HCWs), and HCWs personal use of clinical services, but study investigators were unable to obtain access to any information identifying affected HCWs and thus were unable to query the electronic medical record for utilization and health-care related costs of the affected employees; therefore, the first primary aim of the study as proposed could not be accomplished, and the second was only partly feasible. Study investigators did obtain a de-identified copy of the Employee Health Service database containing reports of BBFE/SII incidents in 1997-2003. The study was suspended by the Institutional Review Board for several months over issues related to the process of obtaining access to the EHS database. The new PI was able to obtain IRB approval to reopen the study, but it was still not possible to obtain access to identifying information. The analyses presented here are summaries of the information contained in the incident record obtained from EHS, using the aggregate full-time equivalents (FTEs) for incident year and the job class reported by injured HCW's as the denominator for rate estimates. The reporting format was changed in 2000, leading to substantial missing data (as much as 95%) for various items in the database; we used only complete reports (k = 1469 incidents) in the analyses. Numbers and features of the incident reports were tabled by year, job class, and other features. The incidence density of BBFE/SII incidents (ln FTEs as offset) were modeled in Poisson regression as a function of year and job class, with significant effects for both predictors. The most striking contrast was that physicians had a rate 10 times that of nurses for SII/BBFE incidents. We also found a significant linear decline over years in the rate of SII/BBFE incidents (p=.0021).

Section 1

Highlights/Significant Findings. Physicians had a rate 10 times that of nurses for SII/BBFE incidents. We also found a significant linear decline over years in the rate of SII/BBFE incidents (p=.0021).

Translation of Findings. No information.

Outcomes/Relevance/Impact. No impact.

Section 2: Scientific Report:

Background

***SII/BBFE are Common and Yet Their Impact on Health Services Use is Not Well Understood*.** There is considerable information concerning the extent to which HCWs are exposed to SII/BBFE. Reports suggest these situations are not uncommon, but the frequency of the problem does not seem to be reflected in efforts to increase the accuracy of the information about it. Imprecise estimation of exposure is often cited as the major limitation to conducting more accurate epidemiological assessments of the impact of SII/BBFE, hampering the ability to detect the features of the environments that promote such incidents. Furthermore, the sequels of SII/BBFE in general health status are assumed to be considerable, and yet an objective assessment from a health services research standpoint has not been undertaken in a large population. Such information would allow better risk assessments for SII/BBFE, in tune with the quantitative approaches preferred by the Occupational Safety and Health Administration (OSHA).

***Infectious Diseases are Important Occupational Health Hazards*.** HCWs are at risk of infectious diseases, most importantly tuberculosis (TB), hepatitis B and C viruses (HBV and HCV), and Human Immunodeficiency Virus (HIV). While HCWs who work regularly with populations having increased rates of infectious diseases face increased risk from direct exposure, those with indirect exposure, such as laboratory workers, also are at risk. Because of the risk of occupational transmission of infectious diseases, accurate estimates of the impact of such diseases and understanding of the mechanisms of transmission are desirable. Occupational transmission of blood-borne pathogens occurs primarily by means of needle-stick injuries and other SII, but also through BBFE on mucous membranes. While the infectious diseases above are the commonest occupational diseases identified, other diseases may be associated with increased contact with patients. Because many of the studies assessing the impact of occupational diseases have relied on the documentation of clear-cut cases of occupational transmission and unequivocal identification of the infection source, more discrete scenarios have not been explored. Other diseases may have less obvious sequelae of health hazards, either on their own or in combination with, e.g., HBV and TB. This is even more important if we consider that occupation is a major risk factor for many transmissible infection among adults.

Substantial Knowledge Gaps Exist About the Impact of SII/BBFE in the Health Status of HCWs. Injuries occurring in smaller clinics and private offices remain undocumented, and there are various degrees of under-reporting of accidental exposures. Such underreporting may result from HCWs fear of reprisal and job discrimination, self-perceptions of the HCW with regard to the individual SII/BBFE incident, or the organization's failure to provide effective reporting systems . Many of those exposed will file claims for workers' compensation benefits. The cost of such claims is substantial, and yet an accurate appraisal of the true extent of the SII/BBFE is not available.

The implications of sustaining or reporting SII/BBFE are serious. For example, an HIV+ HCW jeopardizes job security and confidentiality by revealing his/her status. Discriminatory practices exist in employment and in obtaining health insurance. HCWs face a difficult choice: either risk forgoing benefits by failing to file a claim in time, or risk the consequences of, *e.g*., revealing HIV status before becoming symptomatic.

It has been estimated that over 80% of SII are preventable by existing means that have yet to be implemented nationwide. While KPNW systems to prevent and document SII/BBFE are fully compliant with existing OSHA regulations requiring employers to provide "engineering controls", the reporting systems that allow and encourage workers to report SII/BBFE have been unable to eliminate under-reporting of these incidents. The extent of, and the reasons for, this problem are not accurately known.

There is a Need to Identify Associations Between SII/BBFE and Increased Use of Clinical Services. Because of the scarcity of studies that establish whether or not an increased use of clinical services is associated with SII/BBFE incidents, we will base the study rationale on the limited existing information. Broadly speaking, there are four categories of charges: laboratory tests, immediate interventions post-incident (e.g., hepatitis B immunoglobulin, HBV immunization, HIV chemoprophylatic drugs), clinical services associated with treating the SII/BBFE situation (e.g., wound care and dressing after a SII), and other assorted costs (clinical or not). There have been no standardized definitions of what constitutes a charge or a cost, nor was a specific breakdown available for interventions performed. Indirect costs were not assessed, and clinical services and counseling needs arising from, but not directly ascribable to, the incident have not been factored into the calculations. The "true" cost of injuries may be much higher than suspected when every cost is factored in; despite such concern, a recurring feature of many studies is the lack of clear definitions as to what constitutes a cost, and/or the small size of most study environments.

The environment posed by the clinical setting and its various components (e.g, lab assays) is one of the determinants for SII/BBFE to occur. KPNW clinical protocols and the recently upgraded safety injection devices ensure that incidents of this type are effectively minimized. Over the past 10 years, SII/BBFE reports filed with the Employee Health Service (EHS) at KPNW have ranged between 205 and 430 per year (EHS/KPNW, 2000). Generally decreasing trends of SII/BBFE in the last 10 years notwithstanding, the overall goal is to create an environment that enables the individual HCW to use devices and protocols to protect self and the client effectively. This has generally been achieved by complying with OSHA and industry regulations. The next step would be to address the increased risks featured in specified clinical contacts.

The clinical contact can lead to three possible outcomes, one of which is no SII/BBFE incident. If the incident happens, it may lead to filing a report of an SII/BBFE with EHS. Sufficient documentation to accurately estimate the impact of the incident on immediate and long-term health status will be found in the EHS-specific databases, in the mainstream KPNW health records databases, or in both. In the system currently in place, feedback about the SII/BBFE incident and the measures undertaken immediately after the incident is passed to the 'Environment' and the 'Clinical Contact' areas shown in the model. Establishing the extent of the impact from a long-term perspective will help refine the protocols, procedures, and assumptions used by the EHS. Besides conducting a cost assessment of the sequels, we will examine the importance of SII/BBFE as occupational hazards. Contrasts across points in time, and across jobs, will allow a stable stratification of the risks associated with clinical positions, devices, and procedures.

Specific Aims

Specific Aim 1. To establish whether or not an association exists between reported Sharp-Instrument Injuries (SII) and Blood and other Body Fluid Exposures (BBFE) of health-care workers (HCWs) and use of clinical services. Such an association will be determined by:

a) a comparison of the number and nature of medical/pharmacy services used before and after the incident(s);

b) the frequency and severity of medical conditions directly linked to the SII/BBFE incident;

c) an estimation of the cost of medical and pharmacy services, both before and after the SII/BBFE incident, and specifically related to the SII/BBFE incident; and

d) a longitudinal estimation of the number, nature, and cost of medical and pharmacy services for persons who have filed an SII/BBFE report, and for controls.

Specific Aim 2. Establish the relative importance of risk factors associated with SII/BBFE incidents, such as the clinical task and shift when SII/BBFE happened; job description; purpose of offending device.

Research Design and Methods

To accomplish Aim 1, the PI, Dr. Maupomé, planned to do a case-referent study of all Kaiser Permanente Northwest (KPNW) members 1) who were employees of KPNW at some time between 01/01/89 and 12/31/01, 2) who were eligible for medical and pharmaceutical benefits at some time between 01/01/89 and 12/31/01, 3) with continuous eligibility for at least four years in total, and at least two years on either side of a SII/BBFE report, and 4) who filed a SII/BBFE report with Employee Health Service (EHS) between 01/01/89 and 12/31/01. This group would be the SII/BBFE cases.

Two sets of referents were planned. The first was unmatched controls with eligibility and employment during the study period. In the second approach, a pre-post design was planned to study change in clinical services utilization before vs. after the SII/BBFE incident report. The data to be analyzed for this project were to be derived primarily from computer-generated administrative files of KPNW. The health record number (HRN) would serve as the index variable to merge records from various databases. The planned result was profiles of medical care utilization for outpatient and inpatient categories that are associated with the cases and with the controls, and with cases before and after filing the SII/BBFE report. Identification of cases required match merging the EHS incident data with the electronic medical record (EMR) data using positive identifiers, such as the HRN. The next step was to strip the resulting dataset of personal identifiers and scramble the HRN as is customarily done during Center for Health Research (CHR) investigations.

Progress Report

***Personnel Changes*.** Dr. Gerardo Maupomé was removed as PI of this project in June 2005 and subsequently moved to another institution. Dr. Christina Gullion, a statistician, was appointed to lead the project during the remaining months. Dr. Gullion reviewed the work carried out under Dr. Maupomé's leadership and verified the results of analyses carried out by Dr. Perrin and Mr. Cheek, the project statistician and analyst respectively. These results are summarized here.

Human Subjects Protection and IRB Approval. IRB approval was suspended for about 10 weeks beginning March 21, 2005, while Dr. Maupomé was still PI. This occurred after the IRB learned that a project staff member potentially had access to the identified EHS data while creating a deidentified version of the SII/BBFE incident data on the EHS data management computer. This was carried out under the watchful eye of an EHS supervisor and no identified data were viewed or removed, but the IRB felt that procedures described in the protocol were misleading regarding potential confidentiality risk.

***Database*.** The project team did obtain a deidentified copy of the EHS SII/BBFE datasets, containing only incident data and an arbitrarily assigned identification number. It was not possible to link this SII/BBFE incident dataset to medical records data for the employees of Kaiser Permanente who were involved in these incidents. KPNW Human Resources viewed use of an EHS incident file containing positive identifiers as unacceptable because of the extremely sensitive implications of a KP division (CHR) examining employee medical records. It was their view that CHR personnel could not at any time have access to identified employee data linked to SII/BBFE incident data. In addition to the particularly sensitive nature of medical care of employees of a medical care provider, the EHS incident data contain information about hepatitis and HIV exposure and test results.

The EHS dataset did not contain HRNs, so a probabilistic match merge involving name, date of birth, and any other available identifiers would have to be undertaken. The computer where the

EHS incident report data were stored was a stand-alone computer with no network connection, hence at least one data file would have had to be copied to transportable electronic media and physically moved. Given the size of the EMR source databases and HIPAA concerns, these could not be copied. A copy of the EHS SII/BBFE without identifying fields was useless for purposes of linking to EMR records. Therefore, it proved technically impossible to carry out the merge and EMR record selection, and the planned analyses involving EMR data could not be completed. The results below are based only on the EHS SII/BBFE incident dataset.

Results

We evaluated the contents of the dataset, tabulated descriptive summaries, and compared employee categories and reporting years on rates relative to the entire employee sample.

The incident report data came from three computer files: an 'early' dataset covering both medical and dental HCW SII/BBFE incidents for the years 1997-2000, and separate 'later' datasets for incidents involving dental and medical HCW (respectively) covering 2001-2003. One medical report for 2001 appeared in the earlier dataset. No demographic data were available, as was noted in our previous progress report. Table 1 shows the sources of data for each year and major type (dental or medical).

The denominator for injury rates was the number of full time equivalent HCW in each of the six major job classes (Clerical, Dental, Medical, Nursing, Technical, and Allied) in each year, 1997 through 2003 inclusive. A full time equivalent HCW was defined as having 27 pay periods in 1998 or 26 pay periods in the other years. To establish numerators, we selected records from the EHS for the years of interest (1997-2003) and excluded reports that were marked incomplete. We excluded 90 reports in job classes other than the six major classes listed above and 2 reports with invalid year. Table 1 shows the year-by-year frequency counts and sources for incident reports.

Table 1. SII/BBFE incidents by year and data source

	Dental		Medical		
Yr of incident	Early	Later	Early	Later	Total
1997	59		150		209
1998	41		158		199
1999	55		152		207
2000	49		158		207
2001		33	1	203	237
2002		48		157	205
2003		44		161	205
Total	204	125	619	521	1469

The total number of incident reports is 1,469, or which 823 came from the early dataset and 646 came from the later datasets. Incidents reported by dental workers comprised 322 of these, with the balance (n=1,140) reported by medical workers.

Different variables were collected in the Early and Late datasets and in the Dental and Medical datasets, and there were also reports with partial missing data. Table 2 gives a tabulation of the missing data. Just 420 (28.6%) of the 1469 incident reports contained complete data on the variables in Table 2.

Table 2. Count and percentage of missing data by source dataset.

		Early Dental	Later Dental	Early Medical	Later Medical	Total	
# of incident reports		204	125	619	521	1469	
Mechanism of exposure	N	0	0	0	0	0	missing is blank
Incident occurred while	N	10	3	141	74	228	missing is blank or other/unknown (code 10)
	%	4.90%	2.40%	22.78%	14.20%	15.52%	
Purpose of instrument	N	5	0	112	105	222	missing is blank or unknown/na (code 8)
	%	2.45%	0.00%	18.09%	20.15%	15.11%	
Is source patient known?	N	33	0	85	0	118	missing is blank
	%	16.18%	0.00%	13.73%	0.00%	8.03%	
Shift	N	23	0	85	14	122	missing is blank
	%	11.27%	0.00%	13.73%	2.69%	8.30%	
Body part of worker	N	94	6	311	12	423	missing is unknown (code 4)
	%	46.08%	4.80%	50.24%	2.30%	28.80%	
Serostatus of source patient known?	N	193	1	549	0	743	missing is blank
	%	94.61%	0.80%	88.69%	0.00%	50.58%	
Does device have safety?	N	153	125	434	58	770	missing is blank
	%	75.00%	100.00%	70.11%	11.13%	52.42%	
Was the injured worker original user of device?	N	204	0	619	72	895	missing is blank
	%	100.00%	0.00%	100.00%	13.82%	60.93%	

* highlighted cells have >80% missing for source.

Number of injuries as a percent of the total workers within job class and year. The total number of incident reports is divided by the count of workers corrected for percent of full time (full time equivalents), for the same job class and year (see Table 3). Clerical and Allied job classes are omitted in Table 3 because of the very small numbers of incidents (52 over 7 years for clerical and 9 for allied health workers).

Table 3. Injury rates by year and job class

	Dental			Medical			Nursing			Technical		
Year	# of Injuries	# of Workers	Percent Injured	# of Injuries	# of Workers	Percent Injured	# of Injuries	# of Workers	Percent Injured	# of Injuries	# of Workers	Percent Injured
1997	58	425	13.6	50	143	35.0	51	1481	3.4	34	264	12.9
1998	39	498	7.8	63	154	41.0	54	1606	3.4	31	312	9.9
1999	53	566	9.4	58	168	34.4	49	1752	2.8	36	351	10.3
2000	47	633	7.4	46	186	24.8	66	1906	3.5	31	391	7.9
2001	33	687	4.8	79	201	39.3	73	2043	3.6	49	431	11.4
2002	48	707	6.8	59	212	27.8	62	2184	2.8	35	481	7.3
2003	44	711	6.2	65	223	29.1	50	2352	2.1	45	498	9.0

Circumstances of the injuries by job class and shift.

Dental Job Class

A tabulation of what the HCW was doing when injury occurred, by mechanism and dental job class is given in Table 4. Dentists and dental staff with patient contact typically work only during the day;

just 5 incidents were reported during evening shift. For an additional 23, shift was not reported. All incidents are tabulated here.

Table 4. Dental: When injury occurred by mechanism of exposure (N, %)

Dentists				Dental staff		
When injury occurred	mechanism of exposure			mechanism of exposure		
	Syringe involved	Other instrument (dental) involved	Total	Syringe involved	Other instrument (dental) involved	Total
During use of item	0	5	5	24	7	31
	0	19.23		12.18	7.07	
After use, disassembly	0	1	1	22	22	44
	0	3.85		11.17	22.22	
After use, before disposal	0	1	1	30	9	39
	0	3.85		15.23	9.09	
Between steps of multi-step procedure	0	13	13	35	17	52
	0	50.00		17.77	17.17	
After disposal, stuck in protruding item in container	0	0	0	0	5	5
	0	0		0	5.05	
After use, processing of reusable instrument	0	3	3	70	34	104
	0	11.54		35.53	34.34	
After disposal, protruding item in trash bag	0	0	0	0	2	2
	0	0		0	2.02	
After use, while recapping needle	0	2	2	7	1	8
	0	7.69		3.55	1.01	
Other/Unknown	0	1	1	9	2	11
	0	3.85		4.57	2.02	
Total	0	26	26	197	99	296

Medical Job Class

Table 5 shows the tabulation of mechanisms and uses for physician injuries by shift. Most injuries occurred during the day shift (80%). A syringes was involved in the largest proportion of injuries. Physicians were actually using the instrument about 44% of the instances in which an injury occurred, and about 37% of injuries were related to disassembly or disposal.

Table 5. Physicians: When injury occurred, by mechanism of exposure and shift*

	Day shift				Evening/night shifts			
	Mechanism of exposure				Mechanism of exposure			
When injury occurred	Syringe involved	Other instrument (medical)	Splash -- No instru-ment	Total	Syringe involved	Other instrument (medical)	Splash -- No instru-ment	Total
During use of item	44	50	2	96	2	7	0	9
	27.67	56.18	5.41		6.90	70.00	0	
After use, disassembly	5	0	0	5	1	0	0	1
	3.14	0	0		3.45	0	0	
After use, before disposal	44	9	0	53	11	0	0	11
	27.67	10.11	0		37.93	0	0	

Between steps of multi-step procedure	14	23	5	42	3	2	0	5
	8.81	25.84	13.51		10.34	20.00	0	
While putting item in sharps container	25	2	0	27	6	0	0	6
	15.72	2.25	0		20.69	0	0	
After disposal, stuck in protruding item in container	6	0	0	6	2	0	0	2
	3.77	0	0		6.9	0	0	
After use, processing of reusable instrument	7	2	1	10	0	0	0	0
	4.40	2.25	2.70		0	0	0	
After disposal, stuck in protruding item in trash bag	0	1	0	1	0	0	0	0
	0	1.12	0		0	0	0	
After use, while recapping needle	4	0	0	4	2	0	0	2
	2.52	0	0		6.90	0	0	
Other/Unknown	10	2	29	41	2	1	23	26
	6.29	2.25	78.38		6.90	10.00	100.00	
Total	159	89	37	285	29	10	23	62
*N=73 with shift unknown								

Nursing Job Class

Like physicians, nurses were most likely to be injured during the day shift (83%) and a syringe was most likely to be involved in an injury. About 38% of nurses' injuries occurred during use and 43% were associated with disassembly or disposal, the reverse of the pattern seen in the medical class.

Table 6. Nurses, When injury occurred by mechanism of exposure and shift* (N, %)

When injury occurred	Day shift				Evening/Night shift			
	Mechanism of exposure				Mechanism of exposure			
	Syringe involved	Other instru-ment (medical)	Splash -- No instru-ment	Total	Syringe involved	Other instrument (medical)	Splash -- No instru-ment	Total
During use of item	58	12	3	73	11	7	9	27
	24.89	25.53	6.00		39.29	41.18	60.00	
After use, disassembly	11	3	0	14	0	1	0	1
	4.72	6.38	0		0	5.88	0	
After use, before disposal	57	11	1	69	4	7	0	11
	24.46	23.40	2.00		14.29	41.18	0	
Between steps of multi-step procedure	28	11	4	43	4	0	1	5
	12.02	23.40	8.00		14.29	0	6.67	
While putting item in sharps container	26	2	0	28	4	0	0	4
	11.16	4.26	0		14.29	0	0	
After disposal, stuck in protruding item in container	8	2	1	11	1	1	0	2
	3.43	4.26	2.00		3.57	5.88	0	
After use, processing of reusable instrument	21	1	1	23	2	0	0	2
	9.01	2.13	2.00		7.14	0	0	
After disposal, stuck in protruding item in trash bag	3	0	0	3	0	1	0	1
	1.29	0	0		0	5.88	0	
After use, while recapping needle	7	0	0	7	1	0	0	1
	3.00	0	0		3.57	0	0	

Other/Unknown	14	5	40	59	1	0	5	6
	6.01	10.64	80.00		3.57	0	33.33	
Total	233	47	50	330	28	17	15	60

*N=15 with missing shift

Technical Job Class

The members of the technical job class typically have positions in the laboratory, imaging suites, operating room, and include phlebotomists. Only about 28% of technician injuries occurred during use of the item (either solo or in multi-step procedures), whereas over 50% were related to disassembly or disposal. Syringes were involved in injections, intravenous lines, and blood draws.

Table 7. Technicians, When injury occurred by mechanism of exposure and shift*(N, %)

	Day shift				Evening/Night shifts			
	Mechanism of exposure				Mechanism of exposure			
When injury occurred	Syringe involved	Other instrument (medical)	Splash -- No instru-ment	Total	Syringe involved	Other instrument (medical)	Splash -- No instru-ment	Total
During use of item	15	9	6	30	3	0	1	4
	13.51	23.68	18.18		8.33	0	9.09	
After use, disassembly	3	1	0	4	2	1	0	3
	2.70	2.63	0		5.56	4	0	
After use, before disposal	27	6	0	33	3	5	0	8
	24.32	15.79	0		8.33	20	0	
Between steps of multi-step procedure	16	8	2	26	4	3	4	11
	14.41	21.05	6.06		11.11	12	36.36	
While putting item in sharps container	23	4	1	28	9	0	0	9
	20.72	10.53	3.03		25	0	0	
After disposal, stuck in protruding item in container	3	2	0	5	1	1	0	2
	2.70	5.26	0		2.78	4	0	
After use, processing of reusable instrument	12	3	0	15	4	8	0	12
	10.81	7.89	0		11.11	32	0	
After disposal, stuck in protruding item in trash bag	0	0	0	0	4	5	1	10
	0	0	0		11.11	20	9.09	
After use, while recapping needle	1	0	0	1	1	0	0	1
	0.90	0	0		2.78	0	0	
Other/Unknown	11	5	24	40	5	2	5	12
	9.91	13.16	72.73		13.89	8	45.45	
Total	111	38	33	182	36	25	11	72
*N=7 with missing shift								

Features of the incident, by job class

Six features of the incident reports are tabulated in Table 8 for the four job classes with a substantial number of reported incidents. These suggest that different job classes face differing types of risks. Most obvious (section a) is the dental vs. medical difference in instruments used, with dental personnel rarely reporting injuries related to injections, which comprise a third or more of reported injuries to medical HCW.

In section 8.b the dental class looks different from the others in likelihood of the devise having a safety. However, 84% of the data are missing, so it seems inappropriate to draw any conclusion from this.

Section 8.c shows that about 55-60% of injuries occurred to finger or hand.

The dental class is different from the others in 8.d., regarding whether source patient was known to the injured HCW. This may reflect different work patterns in which dental staff were working with equipment after the patient had left the chair. The low rates of knowledge of serostatus (hepatitis or HIV) partially reflect not knowing who the source patient was and partially lack of access to medical history.

In 8.f., different patterns of instrument use, with some personnel have direct use and other more involved in disassembly or disposal, are reflected in the varying rates of original user, from a high (in reported instances) of 80% for physicians to a low of 50% for technicians.

Table 8. Features of the incident reports

8.a. What is the Instrument's purpose? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Injection through skin	2	135	141	18	296
	0.62	33.83	36.81	7.26	21.02
Injection to/from IV	0	39	65	60	164
	0	9.77	16.97	24.19	11.65
Finger/heel stick, draw blood or body fluid	0	10	24	49	83
	0	2.51	6.27	19.76	5.89
Suturing	0	75	37	11	123
	0	18.80	9.66	4.44	8.74
Surgical incision	0	42	38	15	95
	0	10.53	9.92	6.05	6.75
Dental procedure	316	0	0	0	316
	98.14	0	0	0	22.44
Other	0	41	35	46	122
	0	10.28	9.14	18.55	8.66
Unknown or n/a	4	78	65	62	209
	1.24	18.57	16.05	23.75	14.84
Total	322	420	405	261	1408

8.b. Does the device have a safety? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Yes	2	34	62	45	143
	0.62	8.10	15.31	17.24	10.16
No	48	217	164	106	535
	14.91	51.67	40.49	40.61	38.00
Missing	272	169	179	110	730
	84.47	40.24	44.20	42.15	51.85
Total	322	420	405	261	1408

8.c.What body part is affected? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Face	7	40	49	37	133

Table 8. Features of the incident reports					
8.a. What is the Instrument's purpose? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
	2.17	9.52	12.10	14.18	9.45
Finger/hand	209	248	234	143	834
	64.91	59.05	57.78	54.79	59.23
Arm/limb	8	11	14	12	45
	2.48	2.62	3.46	4.60	3.20
Unknown	98	121	108	69	396
	30.43	28.81	26.67	26.44	28.13
Total	322	420	405	261	1408

8.d. Is source patient known? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Yes	158	361	337	178	1034
	49.07	85.95	83.21	68.20	73.44
No	132	31	43	62	268
	40.99	7.38	10.62	23.75	19.03
Missing	32	28	25	21	106
	9.94	6.67	6.17	8.05	7.53
Total	322	420	405	261	1408

8.e. Is serostatus of source patient known? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Yes	4	30	24	16	74
	1.24	7.14	5.93	6.13	5.26
No/partially	131	202	186	127	646
	40.68	48.10	45.93	48.66	45.88
Missing	187	188	195	118	688
	58.07	44.76	48.15	45.21	48.86
Total	322	420	405	261	1408

8.f. Is injured worker original user of instrument? (N, %)	Job Class				Total
	Dental	Medical	Nursing	Tech	
Yes	75	145	108	57	385
	23.29	34.52	26.67	21.84	27.34
No	50	34	46	56	186
	15.53	8.10	11.36	21.46	13.21
Missing	197	241	251	148	837
	61.18	57.38	61.98	56.70	59.45
Total	322	420	405	261	1408

Results of modeling differences between job classes and years

We use aggregate data in a single Poisson model, with an offset of population size and two predictors: job classes and for years. The offset was the natural log (ln) of the number of full-time equivalents who worked in the same job class and year. We found significant differences

between categories for both predictors (p<.05). Table 9 shows the least square means (exponentiated to show the incidence density) and differences between means (right hand half-matrix). The bold face differences indicate significance at p < .0001. The difference between Dental and Technical was also significant, but at p = .041. The most striking difference is that physicians have a rate 10 times that of nurses for SII/BBFE incidents. Nurses have a significantly lower risk of an incident than any of the other groups.

Table 9. Least square means and differences for job class

		Differences between job classes		
Job Class	Incidence Density	Medical	Nursing	Technical
Dental	0.077	0.234	**2.512**	0.792
Medical	0.330		**10.739**	**3.385**
Nursing	0.031			0.315
Technical	0.097			

In contrast, there appears at first glance to be substantial similarity between years in the rates of SII/BBFE incidents. Only at an interval of 4-5 years does there appear to be a difference in overall risk. We confirmed with a post hoc contrast, that there was a significant linear decline over years in the rate of SII/BBFE incidents (F[1,18]=12.85, p=.0021).

Table 10. Least square means and differences for year of incident report

		Differences between years					
Year of incident	Incidence Density	1998	1999	2000	2001	2002	2003
1997	0.119	1.153	1.220	1.390	1.223	1.493	1.561
1998	0.104		1.058	1.206	1.061	1.295	1.354
1999	0.098			1.140	1.002	1.224	1.279
2000	0.086				0.880	1.074	1.123
2001	0.098					1.221	1.276
2002	0.080						1.045
2003	0.076						

Conclusions and Discussion

The planned study could not be carried out because it was not feasible in the institutional environment. KP promises its employees (who are also receiving all of their medical care at KP) complete privacy with respect to their medical record, and this was an immovable principal in their attitude toward this project. The EHS incident database provided some information into features of the incidents, but because of a major reformatting about halfway through the observation period as well as the nature of the database as an administrative record rather than a research document, the quality of the data do not rise to the level required of published reports.

Publications

None.

Inclusion of gender and minority study subjects.

Because KPNW is an equal opportunity employer, the workforce pool is diverse ethnically and racially and has a majority of female employees. However, since there were no demographic data in the EHS dataset obtained, we cannot give actual inclusion results.

Inclusion of Children.

Children ages 18-21 were unlikely to be a meaningful segment of this sample, as most health care workers in positions liable to suffer SII/BBFE are adults with post-secondary education. The research plan allowed for inclusion of children ages 18-21 to the extent that these occur in the case population. However, since we had access only to aggregate FTE information, we have no way of knowing if anyone under age 21 was in the population.

Materials available for other investigators. None