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CHICA-CANADA

INSIDE:

Surveillance: Three infection prevention and control perspectives

Annual Conference highlights

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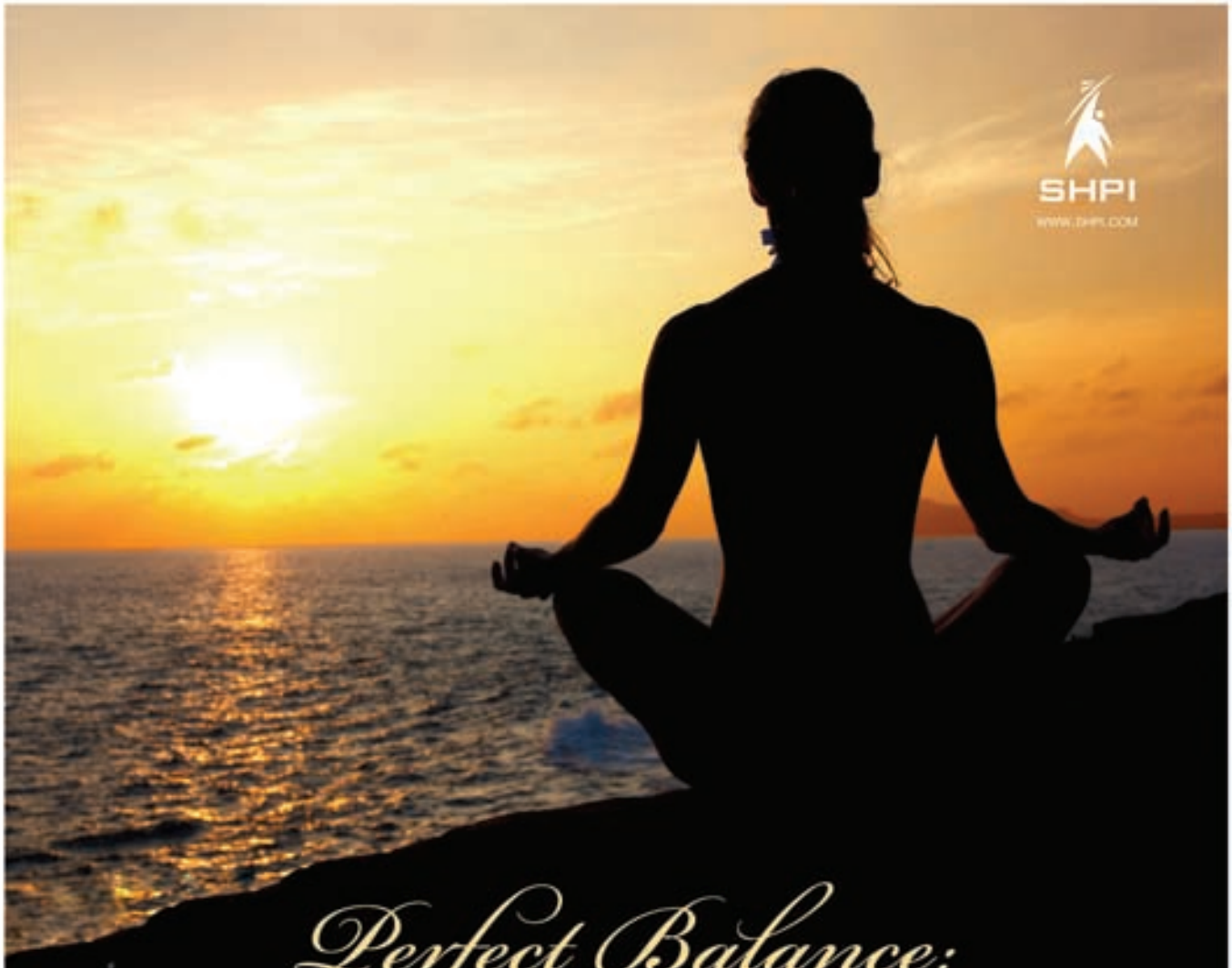

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1. Vernon MO, et al., Arch Intern Med. 13 Feb 2006;166:306–12.

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Another great conference

Congratulations to Rick Wray, Conference Chair; Elizabeth Henderson and Donna Moralejo, Scientific Program Co-Chairs and planning committee as well as CHICA-Northern Alberta and Gerry Hansen on a very successful conference. This is the first year that the CHICA conference was organized by a central planning committee; another step in the "Changing, Evolving and Improving" of CHICA-Canada. This new approach was reviewed by Dr. Henderson at the Chapter Presidents meeting and at the Town Hall meeting.

The conference had something for everyone from the novice to experienced practitioner and for ICPs from every sector. With 11 interest groups meeting at the annual conference it is clear that the breadth and scope of practice of infection prevention and control has certainly expanded into areas ranging from community to zoonoses.

There were several major events that also took place at the conference. These include:

- The launch of the Canada-wide Hand Hygiene Campaign, which is a joint initiative of CHICA-Canada, the Canadian Patient Safety Institute (CPSI), the Canadian Council on Health Services Accreditation (CCHSA) and the Public Health Agency of Canada (PHAC).
- Awarding of an honourary membership to Clare Barry who, in her acceptance speech, spoke passionately about the practice of infection prevention and control. This award was certainly a fitting tribute for a true leader and visionary in infection prevention and control.
- The 25th anniversary of the Certification Board of Infection Control (CBIC) which is chaired by Sheila McDonald, past president of CHICA-Canada.
- The IFIC run which raised over $3,000 to support deserving delegates to attend the IFIC meeting.

On a social note, those who attended the special event on Tuesday night were astounded to watch friends and colleagues become hypnotized and perform some hilarious antics. Then on Wednesday evening, participants spent an evening of fun and shopping at the West Edmonton Mall.

In less than one year, the next CHICA-Canada conference will be held in Montreal, Quebec from May 29 to June 5, 2008. Attendees at the Town Hall meeting were given a tantalizing preview of all that Montreal has to offer. Join us in Montreal as CHICA and AIPI host the 2008 conference! ●

Attendees enjoy a meal at Fort Edmonton Park.

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Joanne Laalo, RN, BSc N, CIC

New national education planning model a hit

Our National Education conference, entitled "Changing-Evolving-Improving" in Edmonton was the first time that CHICA-Canada used a "cross-Canada" model to plan our conference. Congratulations to Rick Wray as conference chair, scientific co-chairs Dr. Betty Ann Henderson and Dr. Donna Moralejo and CHICA-Canada's executive administrator Gerry Hansen who worked so hard as the leadership for this new model. Special thanks to the members of the Scientific Planning Committee for their tireless work and dedication to the development of an excellent program: Marion Yetman, Liz Werner, Diane Roscoe, Marilyn Albers, Ramona Rodrigues and Jim Gauthier. Thanks to the CHICA-Northern Alberta chapter for their hard work and making us feel welcome in their home town. The conference was well attended by 495 of our members and 68 exhibiting companies and we thank you all for your support.

The conference title reflects both our profession and our organization as we grow to over 1450 members. With the much-needed infusion of new infection prevention and control professionals in many areas, the addition of the "conference survival skills" presentation at the beginning of the novice and advanced practitioner days was well received and appreciated. At the beginning of the interest group meeting day, the interest group chairs and board members had the pleasure of an informal breakfast meeting with Dr. Parboosingh about the "communities of practice" theory and model. We learned that some of the interest groups were already functioning as "communities of practice" and that this model fits well within the interest group structure.

We are very pleased to advance one of our strategic goals through our partnership since 2005 with the Canadian Patient Safety Institute (CPSI), made possible by the work of our board members, Dr. Dick Zoutman, Rick Wray, Karen Hope, and Pearl Orenstein. A core group of CHICA-Canada members are also involved as the advisors or content experts for the work that CPSI does relating to infection prevention and control issues. We are very excited to partner with CPSI at our conference to host the introduction of the Canadian hand hygiene campaign as presented by Phil Hassen, CEO of CPSI.

An equally important partnership with the Canadian Council on Health Services Accreditation continues since 2005 with the major focus of developing a stand-alone infection prevention and control standard which some of our members will trial soon in their organizations. Those who engage in accreditation with the trial IPAC standard will have the opportunity to comment on the document so that we have the best possible standard.

Finally, I would like to thank my fellow board members who volunteer their time and expertise to move CHICA-Canada forward as we continue to grow. Planning has already begun for our conjoint conference with Association des infirmieres en prevention des infections (AIPI) in Montreal at the Palais des Congres, May 29- June 5, 2008, so mark your calendars. ●

Nouveau modèle national de planification de la formation – un franc succès

Notre congrès national de formation, qui s'est déroulé à Edmonton sous le thème « Changer, Évoluer, Améliorer », constituait une première pour CHICA-Canada : c'était la première fois que l'on faisait appel à un modèle « pancanadien » pour planifier le congrès. Félicitations à Rick Wray, président du congrès, aux coprésidentes du programme scientifique, Dre Betty Ann Henderson et Dre Donna Moralejo, ainsi qu'à l'agente administrative de CHICA-Canada, Gerry Hansen, qui a travaillé avec ardeur et assuré le leadership de la préparation de ce nouveau modèle. J'adresse mes remerciements sincères aux membres du comité de planification du programme scientifique pour leur inlassable travail et leur dévouement, qui se sont traduits par un excellent programme : Marion Yetman, Liz Werner, Diane Roscoe, Marilyn Albers, Ramona Rodrigues et Jim Gauthier. Merci à la section nord-albertaine de CHICA pour tout le travail accompli et merci de nous avoir réservé un si bon accueil. Le congrès a connu une bonne participation : 495 de nos membres et 68 entreprises exposant leurs produits. Merci à vous tous pour votre appui.

Le titre du congrès reflète aussi bien notre profession que notre organisation; nous passons le cap des 1 450 membres. Étant donné l'arrivée indispensable de nouveaux professionnels en prévention et en lutte contre les infections dans de nombreux domaines, la présentation sur les « techniques de survie post-congrès » au début de la journée destinée aux nouveaux venus et de celle destinée aux praticiens chevronnés a été très appréciée. Au début de la journée de réunions des groupes d'intérêt, les présidents de ces groupes ainsi que les membres du conseil d'administration ont eu le plaisir de participer à un petit-déjeuner informel en compagnie de Dr Parboosingh portant sur la théorie et le modèle de « communautés de pratique ». Nous avons appris que certains groupes d'intérêt fonctionnaient déjà selon ce modèle et que celui-ci se prête bien à la structure de groupes d'intérêt.

Nous avons eu le plaisir de voir un de nos objectifs stratégiques se concrétiser, à savoir notre partenariat avec l'Institut canadien sur la sécurité des patients (ICSP). Ce partenariat, en vigueur depuis 2005, a été possible grâce au travail de membres de notre conseil d'administration, les Drs Dick Zoutman, Rick Wray, Karen Hope et Pearl Orenstein. Un noyau de membres de CHICA-Canada ont également agi à titre de conseillers ou d'experts auprès de l'ICSP pour ce qui est du travail de cet organisme qui porte sur les dossiers liés à la prévention et la lutte contre les infections. Nous avons été très heureux de travailler comme partenaires de l'ICSP à l'occasion de notre congrès afin de lancer la campagne canadienne sur l'hygiène des mains, qui a été présentée par Phil Hassen, directeur général de l'ICSP.

Un autre partenariat tout aussi important, celui qui nous lie au Conseil canadien d'agrément des services de santé depuis 2005, se poursuit; l'accent est mis principalement sur l'élaboration d'une norme à part entière sur la prévention et la lutte contre les infections, norme que certains de nos membres mettront à l'essai bientôt dans leurs organisations respectives. Ceux qui se font accréditer pour la mise à l'essai de la norme auront l'occasion de présenter leurs commentaires sur le document de manière à ce que nous obtenions la norme la meilleure possible.

Pour terminer, j'aimerais remercier mes collègues du conseil d'administration qui ont donné de leur temps et de l'expertise afin de faire progresser CHICA-Canada. La planification en vue de notre congrès organisé conjointement avec l'Association des infirmières en prévention des infections (AIPI) à Montréal, au Palais des congrès, du 29 mai au 5 juin 2008, est commencée; notez ces dates à votre agenda. ●

Spotting variations in task-linked blood exposures

Efficiency of a surveillance system to detect significant fluctuations in task-linked occupational blood exposures in a cohort of 24,000 health workers over 10 years

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ABSTRACT

Objective: To reliably detect significant fluctuations in occupational blood exposures on a task basis.

Methods: A database has been documenting blood exposures among 24,000 health workers since 1996. Knowing the previous number of exposures sustained in a specific task, a Poisson model predicts the number of exposures that would occur during the current year. Significant thresholds were set at specific cumulated probabilities of that model: 10% for a significant decrease, 90% for a significant increase.

Results: Absolute figures showed that nurses and physicians sustained the highest number of injuries, accidents occurred mainly in the medical and surgical departments, and the most risky tasks were vacuum-tube blood drawing, subcutaneous injection, major surgery, assistance in surgery, and cleaning. Examining variation over time showed a regular fall in cleaning-related accidents but a regular rise in those related to major surgery and subcutaneous injections. The surveillance system spotted sudden falls or surges of the number of accidents (e.g., handling of intravenous infusions, blood-group testing), monitored their more or less regular increases (e.g., subcutaneous injections) or decreases (e.g., drawing capillary or venous blood, cleaning and handling waste), and detected their significant decrease after introduction of new devices (e.g., intravenous nursing acts) or implementation of specific guidelines (e.g., cleaning, handling waste).

Conclusion: Comprehensive surveillance and easy modeling can accurately monitor fluctuations of blood exposures in various tasks either to assess the efficacy of new safety devices or to evaluate the results of training or safety campaigns in particular hospital settings.

INTRODUCTION

Occupational blood-borne exposures (OBE) that may transmit hepatitis B, hepatitis C, and human immunodeficiency viruses are of great concern for health care workers (HCWs) (1), their families, and their managers, especially in large health institutions (2). Thus, these institutions bear a great responsibility in monitoring and preventing such exposures and "*Institutions seeking to reduce the risk of HCW seroconversion should conduct analyses of specific tasks associated with (the) high-risk factors, and safety interventions should be installed when tasks and devices increase the risk of seroconversion*" (3).

Indeed, specific surveillance systems are necessary to regularly monitor the number of accidents and evaluate the efficiency of specific safety devices and measures. Thus, more than a decade ago, several countries, including the USA, Canada, Italy, and France, undertook the surveillance of occupational exposure to sharps injuries and body fluids. Among these systems, we highlight the US National Surveillance System for Health Care workers (NaSH) that collects detailed data on percutaneous injuries and mucocutaneous exposures reported by HCWs mainly in large hospitals (4) and the Exposure Prevention Information Network (EPINet) that analyses data from forms filled with information on needlestick and other sharps injuries involving blood and body fluids mainly in smaller hospitals (5). In Italy, the SIROH is a large network of public hospitals that uses the EPINet program to monitor occupational risks of HIV and other blood-borne infections among HCWs (6). In the United Kingdom, one component of the campaign of the Royal College of Nursing was to establish a pilot study aimed at collecting comprehensive surveillance data on sharps

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injuries using the EPINet surveillance system (7).

In France, the Groupe d'Etude sur le Risque d'Exposition des Soignants aux Agents Infectieux (GERES) (8) and the Réseau Alerte Investigation Surveillance des Infections nosocomiales (RAISIN) (9) have made an inventory of OBEs in different hospitals. Within these French organizations, the Hospices Civils de Lyon; i.e., the grouping of all public hospitals of Lyon and its suburbs, has been monitoring HCWs exposed to blood and body fluids since 1996 (10) using the same tools and codes already developed by GERES. However, it wanted to further develop the current inventory by creating a task-based OBE surveillance project that, besides improving the monitoring of OBEs, would make it possible to target prevention toward the most risky tasks and to assess the efficiency of introducing new safety devices. The specificity of that project was to describe a threshold that shows the increase or decrease of OBEs by individual task.

The purpose of this article is to describe that threshold, present its use over 10 years to show yearly fluctuation of the number of OBEs, and suggest the possibility of its use to reveal the successes or failures brought about by new safety devices or preventive measures.

METHODS

Data collection

Our cohort study started in 1996 and was carried out within the Hospices Civils de Lyon, France. This public institution groups 21 health centers including several university hospitals. It employs about 24,000 HCWs and serves nearly six million people, one tenth of the French population.

All OBEs reported to the Occupational Health Department involved meeting the exposed persons individually in order to fill in a questionnaire and record personal details into a database. The questionnaire was administered by trained nurses and had nine parts: personal information, role and employment position of the worker on the day of the accident, detailed description of the accident circumstances, information on the serological status of the patient being nursed by the worker, medical response to the accident, description of the material used, the medical care context, the protective measures employed, and involvement of teammates. In this questionnaire, an OBE was defined as "any accident that involves percutaneous, mucocutaneous, or non-intact skin contact with blood or blood-containing body fluids." According to this definition, our study involved 8,616 accidents from January 1, 1996 to December 31, 2005.

Charts representing these OBEs by year and task were drawn for each health centre and for the whole group. For the purpose of this article, we have selected the tasks for which safety devices exist or standard precautions are recommended. Thus, 4,993 accidents were considered.

Data analysis

The occurrence of OBEs was described according to the Poisson distribution function usually used in statistics "to describe the occurrence of rare events or to describe the sampling distribution of isolated counts in a continuum of time or space." For a given year Y and a given task T, the mean of the Poisson distribution was the mean number of accidents that occurred during all the preceding years (1996 to Y-1). Exceptionally, for 1997, the mean was simply the number of accidents in 1996.
On each distribution, two thresholds were considered: i) a "rise" value: the number of OBEs over which the risk is considered to have increased, which is the 90% or the 95% cumulative probability of the distribution (pre-alert and real alert thresholds, respectively); and ii) a "fall" value: the number of OBEs under which the risk is considered to have decreased, which is the 10% or the 5% cumulative probability of the distribution.

In other words, for a given Y-T combination, the rise threshold is the number over which the probability (or risk) of occurrence of any additional OBE is lower than 10% (pre-alert), or 5% (real alert). Whenever the number of OBEs was higher than the rise threshold, the task was considered to have become more risky (See fig 1). The contrary of this interpretation would be applied for the "fall" threshold.

All statistical analyses were performed using SAS programs version 8.2 (SAS Institute Inc., SAS Campus Drive, Cary, NC 27513, USA).

RESULTS

Characteristics of OBE-affected subjects

Injuries occurred in a wide variety of HCWs and settings (Table 1). However, women sustained more OBEs than men. HCWs in the intermediate age range (25-35 years) and with more than five years' service-length were the most frequently affected. In terms of HCWs' occupation, nurses and physicians sustained the highest number of injuries (3,985 and 2,070 OBEs; that is, 47.18% and 24.51% of all accidents, respectively). In terms of specialty, the most affected persons were working in the medical and surgical departments (3,476 and 3,132 OBEs; that is, 41.92%, and 37.78% of all accidents, respectively).

Fluctuation of the number of OBEs over 10 years

Examining the absolute numbers of OBE shows that the "top five" tasks have always been drawing blood with vacuum-tube, subcutaneous injection, major surgery, assistance in surgery, and cleaning (Table 2). However, the fluctuations of these tasks throughout the 10 years were not similar: while OBEs in relation to cleaning were declining and OBEs in relation to major surgery and subcutaneous injections were rising, those linked to vacuum-tube blood drawing fell before rising again then falling and those linked to assistance in surgery increased before falling then rising. As to the other tasks, OBEs in obstetrical surgery remained stable before rising significantly while the trend relative to several other tasks was a general decrease. Transfusion-linked OBEs continued to be highly variable while OBEs in blood-group testing were stayed close to zero.

Examining the successive thresholds shows that OBEs during removal or placement of intravenous infusions underwent two important declines in 2002 and 2004 while three declines relative to vacuum-tube blood drawing occurred in 2000, 2002, and 2005. OBEs during transfusion were always variable. However, OBEs linked to blood-group testing showed a surge in 1998 followed by interesting successive drops in 1999, 2002, 2004, and 2005. Drawing blood led to fewer and fewer OBEs since 2000. OBEs in relation to subcutaneous injections were generally regularly rising while those in relation to cleaning or handling medical waste were regularly falling. Assistance in surgery showed four upsurges in 1997, 1999, 2001, then later in 2005. Interestingly, in obstetrical and major surgeries, in addition to the initial rises in OBE found in 1997, new increases were detected in 2004 and 2005. As for radiology and endoscopy procedures, a clear drop in OBEs was detected in 2002 and 2003.

DISCUSSION

This study was designed to show the importance of a task-based surveillance system in detecting yearly decreases or increases in OBEs in a relatively large group of hospitals as well as the ability of that system to assess the success or failure of introducing specific safety devices or implementing new safety guidelines in reducing OBEs.

The system succeeded in assessing the outcomes of new devices and guidelines. Indeed, the decline in OBEs linked with blood drawing with vacuum-tube and placement/removal of intravenous infusion may be explained by the progressive introduction of safety devices since 1994 but mainly by the generalization of their use since 2001. As well, drops linked with capillary blood drawing and blood-group compatibility testing may be associated with the adoption since 1993 of a specific safety device: the automatically retracting fingerstick instead of the manual or non-retracting spring-loaded lancet. Moreover, the constant decline in OBEs seen in radiology/endoscopy and in cleaning or handling containers and wastes may be attributed to enhanced safety measures and reinforcement of guidelines such

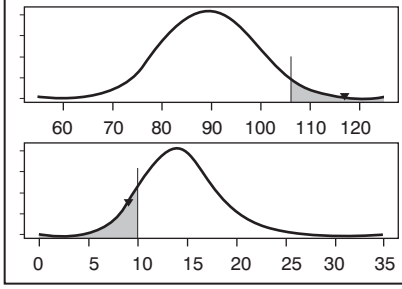
Table 1: Main individual and professional characteristics of subjects with occupational blood exposure.

Characteristics	Number	Percentage
Gender		
Male	1,955	22.69
Female	6,661	77.31
Age		
Less than 25 years	1,380	16.02
[25-35]	3,637	42.21
[35-45]	2,052	23.82
45 years or more	1,547	17.95
Length of service		
Less than 2 years	2,369	27.50
[2-5] years	2,369	27.50
More than 5 years	3,878	45.01
Specialty		
Medical and Surgical Emergency Unit	286	3.32
Intensive Care Department	444	5.15
Medical Department	3,476	40.34
Surgical Department	3,132	36.35
Geriatrics Service	33	0.38
Obstetrics Service	82	0.95
Pediatrics Service	78	0.91
Laboratory	447	5.19
Radiology	100	1.16
Maintenance staff	169	1.96
Other	44	0.51
Unknown	325	3.77
Occupation		
Nurses	3,985	46.25
Midwifes	188	2.18
Auxiliary nurses	934	10.84
Scrub nurses - Cleaners	312	3.62
Skilled workers	97	1.13
Laboratory staff	202	2.34
Student nurses	590	6.85
Physicians - Pharmacists - Medical students	2,070	24.03
Other / Unknown	238	2.76

Legend to figure 1

The upper graph represents the Poisson distribution of the number of occupational blood exposures in relation to "subcutaneous injections" to consider for 2003. The vertical bar at 106 shows the rise threshold for 2003; i.e., the 95% cumulative probability. The dark triangle points to the actual number of exposures; it reflects a significant augmentation that oversteps the alert threshold ($P<0.05$).

The lower graph corresponds to "radiology and endoscopy procedures" for 2003. The bar 10 shows the fall threshold value (10% cumulated probability of the Poisson distribution). The dark triangle at 9 shows the task-specific occupational blood exposures that occurred in 2003 and reflects a significant fall ($P<0.10$).



continued on page 100

Tasks	1997 OBE 1996	1997 OBE 1997	1998 Mean 96-97	1998 OBE 1998	1999 Mean 96-98	1999 OBE 1999	2000 Mean 96-99	2000 OBE 2000	2001 Mean 96-00	2001 OBE 2001	2002 Mean 96-01	2002 OBE 2002	2003 Mean 96-02	2003 OBE 2003	2004 Mean 96-03	2004 OBE 2004	2005 Mean 96-04	2005 OBE 2005
Removal of iv infusion	16	20	18	16	17.3	14	16.5	15	16.2	21	17	5 $^{--}$	15.3	14	16	5 $^{--}$	14.9	7 $^{--}$
Placement of iv infusion	11	16	13.5	9	12	13	12.2	12	12.2	9	11.7	5 $^{--}$	10.7	10	10.7	5 $^{--}$	10.1	7
Blood drawing:																		
- with vacuum-tube phlebotomy needle	77	70 $^{-}$	73.5	70	72.3	81	74.5	56 $^{--}$	70.8	69	70.5	42 $^{--}$	66.4	70	67.8	69	68.1	51 $^{--}$
- arterial	23	23	23	18	21.3	20	21	21	21	19	20.7	17	20.1	13 $^{-}$	19.2	12 $^{-}$	18.6	12 $^{-}$
- capillary	28	25	26.5	18 $^{--}$	23.7	31	25.5	16 $^{--}$	23.6	17 $^{-}$	22.5	12 $^{--}$	21	13 $^{--}$	20.1	12 $^{--}$	19.2	13 $^{-}$
- for blood culture	9	10	9.5	9	9.3	11	9.7	10	9.8	9	9.7	6	9.1	12	9.7	14 $^{+}$	10.1	3 $^{--}$
- venipuncture with standard needle	26	28	27	16 $^{--}$	22.3	13 $^{--}$	20	18	19.6	12 $^{--}$	18.3	8 $^{--}$	16.8	10 $^{-}$	16.1	9 $^{--}$	15.3	5 $^{--}$
- intravenous catheter	9	1 $^{--}$	5	6	5.3	6	5.5	5	5.4	5	5.3	4	5.1	1 $^{--}$	4.7	3	4.4	0 $^{--}$
Blood-group compatibility testing	5	2	3.5	10 $^{++}$	5.7	1 $^{--}$	4.5	5	4.6	2	4.2	0 $^{--}$	3.6	1	3.2	0 $^{--}$	2.9	0 $^{-}$
Transfusion	4	8 $^{++}$	6	2 $^{-}$	4.7	9 $^{++}$	5.7	2 $^{-}$	5	1 $^{-}$	4.3	7 $^{+}$	4.7	2	4.4	3	4.2	1 $^{-}$
Subcutaneous injections	77	67	72	94 $^{++}$	79.3	96 $^{++}$	83.5	98 $^{+}$	86.4	93	87.5	103 $^{++}$	89.7	117 $^{++}$	93.1	107 $^{+}$	97.1	113
Surgery																		
- Obstetrical	8	19 $^{++}$	13.5	12	13	12	12.7	9	12	16	12.7	11	12.4	11	12.2	26 $^{++}$	13.9	25 $^{++}$
- Assistance in surgery	23	39 $^{++}$	31	40 $^{+}$	34	54 $^{++}$	39	46	40.4	52 $^{++}$	42.3	50	43.4	39	43.1	40	43	56 $^{++}$
- Major surgery	56	90 $^{++}$	73	75	73.7	81	75.5	88 $^{+}$	78	69	76.5	67	75.1	85	76.4	95 $^{++}$	79.7	83
- Minor surgery	36	26 $^{-}$	31	25	29	36 $^{+}$	30.7	34	31.4	24	30.16	29	30	25	29.38	24	29	26
Radiology and endoscopy procedures	16	16	16	15	15.7	17	16	15	15.8	15	15.7	7 $^{--}$	14.4	9 $^{-}$	13.7	14	15.1	14
Cleaning - tidying the operating room	95	103	99	85 $^{-}$	94.3	83	91.5	77 $^{-}$	88.6	69 $^{--}$	85.3	80	84.6	76	83.6	64 $^{--}$	82.7	58 $^{--}$
Handling sharps containers	9	4 $^{-}$	6.5	9	7.33	9	7.7	8	7.8	4	7.16	3 $^{-}$	6.57	6	6.5	2 $^{--}$	6.3	4
Handling of medical/surgical waste	32	38	35	33	34.3	25 $^{--}$	32	27	31	23 $^{-}$	29.7	26	29.1	36 $^{+}$	30.2	27	30.9	14 $^{-}$

OBE: Occupational Blood Exposure - $^{+}$ Significant rise, P<0.10, pre-alert - $^{++}$ Significant rise, P<0.05, alert - $^{-}$ Significant drop, P<0.10 - $^{--}$ Significant drop, P<0.05 -

Table 2: Fluctuations of the number of task-specific occupational blood exposures from 1996 through 2004 (total: 4,993 cases).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as wearing gloves, goggles, and masks and to being more attentive to standard precautions and task organization.

On the contrary, the lack of success in reducing OBEs linked with subcutaneous injections may be explained by the fact that safety devices were present only for low molecular weight heparin since 1997. In surgery, a better coordination between operators and careful handling and disposing of sharps can enhance prevention. Prevention of OBEs might also be impacted by use of blunt suture needles but their use is not yet generalized to all institutions and they cannot replace curved suture needles.

The system succeeded also in its role as a warning system. Indeed, it was able to spot sudden increases in the number of OBEs in relation with several domains such as obstetrical surgery or major surgery as well as sudden decreases such as in radiology and endoscopy. It proved also to be a good indicator of continuous progressions or continuous declines such as subcutaneous injections and cleaning/handling activities, respectively.

The fact that nurses sustain the highest number of injuries and that most of these are associated with drawing venous blood, injections, or assisting with procedures is already well known (11). One interesting synthetic result of this study is that falls in OBEs occurred for tasks linked with blood vessels at bedside (drawing blood or injecting drugs) and was mostly beneficial to the nurses. This is an encouraging result for all those who attempt to limit OBEs by all possible means while performing their daily tasks. It is also encouraging for those who maintain and develop the surveillance system.

In the relevant literature, tasks are often examined in terms of OBE frequencies or injury rates (12) or sequence of task-related acts leading to OBE (13, 14) but, to our knowledge, there have been no threshold values designed to serve as warnings for dysfunction or disregard of guidelines. Besides, though device-specific injury rates were considered vs. the number of devices purchased to obtain different levels of risk associated with different devices (15), there was no clear criterion that assessed the success of introducing new devices. However, in 1997, a study by White and Lynch (16) assessed the outcome of preventive strategies among operating room personnel by comparing data obtained before and after strategy implementation and, more recently, Puro et al (17) used job-category- and work-area-specific occupational exposure rates to monitor the effectiveness of targeted interventions and measures. The method we present here, though more sophisticated, is also more efficient and flexible.

Indeed, besides the two above-cited major applications (outcome assessment and warning system), one advantage of our method is to be applicable to a specific personnel (such as surgeons), a specific workplace (such as the operating room), a whole process (such as a specific type of

surgery) or each of its details (such as suture removal), or each piece or type of material to be used (such as sharps). Another advantage is the possibility to adopt various degrees of rigor in defining the thresholds and to work on various time spans.

Nevertheless, the system seems to present a major limitation: its sensitivity to small variations in the number of OBEs, especially in the case of initially small frequencies. This limitation is less important over time; i.e., the longer are the time spans, the more reliable are the thresholds.

An immediate consequence of the already interesting results obtained is the need to revise our questionnaire so that it could provide more information and allow more accurate analyses. Another rapidly obtainable improvement of the analysis system is to make it readily reactive to specific threshold oversteps on every OBE declaration. A third further development would be to make the system sensitive to a task-personnel combination to trigger more focused surveillance, measures, or guidelines.

Prevention of OBEs should be of everyone's concern in hospitals and a special program – as part of an integrated strategy against nosocomial infections risk – should be developed in every health facility. Safer practices, barrier precautions, training, and monitoring are the best ways to prevent infection with HIV or other blood-borne pathogens. A surveillance and analysis system such as the one we present here is a valuable complement that improves the security of HCWs. Though the system can still be improved, it showed its efficacy in providing feedback on HCWs performance for avoidance of OBEs, in evaluating the effectiveness of prevention measures and safety devices, and in targeting prevention efforts towards more specific fields, tasks, or personnel.

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Surgical site infection surveillance program in the Calgary Health Region

ABSTRACT

Background: Surgical site infections cause considerable morbidity and increase medical costs.

Purpose: This study used a new home care surveillance methodology to examine the efficacy of in-hospital surgical site infection surveillance.

Methods: Prospective surgical site infection surveillance was undertaken on a cohort of patients aged 18 or older who underwent cardiac or orthopedic implant surgery and were admitted to home care in the Calgary Health Region (CHR) between January and June 2004.

Results: Of 1542 patients, 272 (17.6%) received post-surgical home care. The in-hospital and home care aggregate surgical site infection rate was 3.5%. In-hospital surveillance detected 50% of all surgical site infections.

Discussion: The Home Care Surgical Site Infection Surveillance Program is a worthwhile addition to the Infection Prevention and Control (IPC) Program in the Calgary Health Region.

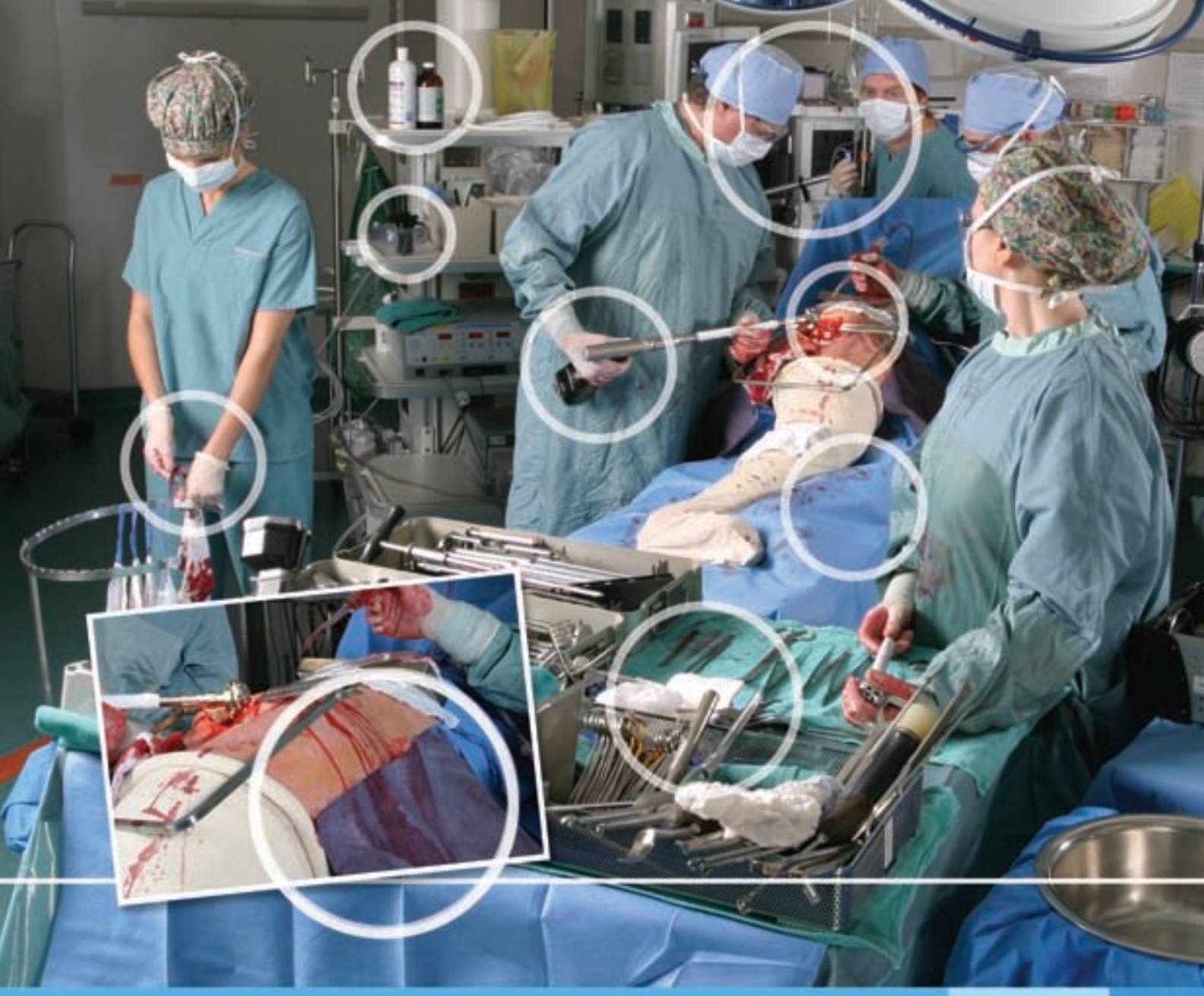
Key words: surgical site infection; home care; surveillance; cardiac; orthopedic.

INTRODUCTION

SSIs cause considerable patient morbidity, delays in discharge, loss of income, and increased hospital costs [1-3]. In-hospital, SSI is the second most common type of nosocomial infection accounting for about 24% of all infections that occur [4]. Active evaluation of infection control procedures and surveillance for infections are preventive measures for reducing such infections [5,6]. Surveillance systems aim to provide feedback to hospitals and stimulate infection prevention and control (IPC) activities [7]. Implementation of a surveillance program that provides feedback to healthcare providers has been shown to reduce SSI rates by 32% [8].

Most SSI surveillance is done in hospital settings. Only 10 published studies have separated out SSI rates according to pre- and post-discharge, and all have concluded that the majority of infections occur after hospital discharge [9-18]. These studies illustrated that the sensitivity of SSI surveillance is extremely low when post-discharge follow-up was not conducted. This leads to inaccurate SSI rates, as the CDC definitions of SSI specify that a diagnosis may be made within one year of the implant surgery.

At the time of the study, the CHR SSI Surveillance Program aimed to reduce the impact and incidence of surgical site infections through early detection, timely reporting of rates and support of evidence-based interventions to improve the quality of patient care; yet, its efforts were concentrated in hospitals. A prospective research study conducted in 2004 developed and tested a post-discharge surveillance model in home care clients who had cardiac or orthopedic implant surgeries and determined the efficacy of the current CHR hospital surveillance program. Prior to this study, individual home-care clients with surgical site infections were observed to ensure that their infections cleared, but there was no formal surveillance system. At that time, complete post-discharge surveillance was not feasible or cost-effective in the CHR; however, partial post-discharge surveillance *was* feasible and cost-effective. Consequently, this project's resources focused on home care post-discharge surveillance.



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METHODS

Study design and inclusion criteria

A standardized methodology was developed for a home care infection surveillance program that collected baseline data on SSIs in home care clients and linked it to the In-Hospital SSI Surveillance Program. The surgical cohort consisted of surgical procedures performed on patients aged 18 years and over, who resided in Calgary, and who underwent cardiac (coronary artery bypass graft or valve replacement) or orthopedic joint replacement (hip or knee) implant surgery between December 1, 2003 and May 31, 2004, at a hospital in the CHR. A subset of the surgical cohort, termed the home care cohort, was admitted to the CHR home care program while recovering at home from their surgery. All patients were followed for surgical site infection using active prospective surveillance between January 1 and June 30, 2004.

In-hospital SSI surveillance

Each Calgary hospital used standardized definitions of SSI based on the National Nosocomial Infections Surveillance System (NNISS) of the Centers for Disease Control and Prevention (CDC) that have been in existence since the 1970s and revised in 1999 [19-24]. Information from multiple data sources was pooled for case-finding, including: laboratory reports, clinical rounds on the surgical wards by infection control staff; communication with nursing staff and/or surgeons; inferential chart review; and kardex/white board review. In addition, emergency department visits, clinic visits, and readmissions to hospital due to complications were monitored for infections. Patients with SSI who were admitted to the Home Parenteral Therapy Program for intravenous antibiotic therapy were also reported to infection control. All detected infections were entered into the IPC Surgical Site Infection Surveillance database.

The CHR IPC acute care SSI surveillance worksheet that had been used for several years was used to collect in-hospital information on patients with a surgical site infection. This data collection form covered six aspects of the surgical patient's experience: (A) specific patient demographic information, such as name, hospital identification number, PHN, and date of birth; (B) surgical hospital information, such as hospital admission, surgery, discharge and readmission dates, ICD-9 (or -10) code, and NNIS score; (C) prophylaxis (ordered, given, doses, drug name(s)); (D) reported infection site(s) and severity; (E) the criteria used to determine infection based on CDC definition for SSI; and (F) culture information. A coded list was provided whenever the question required an answer where several choices were possible, such as the culture site (i.e., incisional, blood, etc.).

Home care SSI surveillance

The home care SSI draft definitions [25] were used for the home care cohort as they were the most appropriate for the information available in that setting, allowing combinations of clinical signs as evidence of infection when radiological or laboratory evidence may not be available [26-28]. The draft definitions of SSIs in home care [25] were based on the NNISS definitions used in hospitals [22], thus the comparison of these two SSI rates was possible.

The CHR home care SSI surveillance worksheet was based on the hospital model already in use. Ten specific home care staff from the skin and wound assessment team (SWAT) piloted the worksheet for two months prior to the start of data collection. Following the pilot program and review of the feedback, the data collection form was redesigned and various components were reworded to improve clarity. As part of their normal routine, SWAT completed the study's home care data collection if clients displayed evidence of active surgical site infections. The home care SSI surveillance worksheet covered six aspects of the client's experience: (A) specific client demographic information, such as PHN, gender, and age; (B) hospital and home care admission, surgery, discharge and readmission dates; (C) reported infection site(s) and severity; (D) the criteria used to determine infection based on CDC definition for SSI in home care; (E) topical and systemic antibiotic use; and (F) BWAT (Bates-Jensen Wound Assessment Test) score(s). A coded list was provided whenever the question required an answer where several choices were possible, such as the site of infection (i.e., hip, leg, etc.) or the location of the client when the infection was identified (i.e., home care, emergency department, hospital in-patients, etc.). Each item for the CDC criteria for infection required a yes/no response, as did the item regarding use of antibiotics. Antibiotic drug codes were also provided. The laboratory requisition protocol was outlined on the reverse side of the home care SSI surveillance worksheet.

Informing more than 500 home care staff about the surveillance project was undertaken using a multifaceted approach. Numerous presentations, meetings, newsletter articles, memorandums, emails, and voicemails were set up to introduce the study, to gain support, and to clearly explain the role of health care professionals in the study.

DATA ANALYSIS

The infection rates were calculated for each surgery type (CABG, valve, hip, and knee), and stratified by location of SSI detection (in-hospital, in home care, and the total). The total number of procedures that were positive SSI cases included those captured pre- and post-discharge by the in-hospital surveillance program plus the additional cases identified post-discharge in home care. Aggregate rates were calculated with 95% confidence intervals. Fisher's exact test was used to compare SSIs for the different types of implant surgery. All p-values were two-tailed, and a p-value of 0.05 or less was considered to be statistically significant. The calculated SSI rates were analyzed using Stata 7 for Windows (STATA Corp., College Station, TX).

Assessment of the surveillance system

Sensitivity and negative predictive value were determined for the current

In-Hospital SSI Surveillance Program relative to the total SSI surveillance program. The total number of procedures that were positive SSI cases included those captured pre- and post-discharge by the In-Hospital Surveillance Program plus the additional cases identified post-discharge in home care. Sensitivity was determined by dividing the number of procedures that were SSIs identified by the In-Hospital Surveillance Program by the total number of procedures that were positive SSI cases (i.e., in-hospital and home care). The negative predictive value of the In-Hospital Surveillance Program was also determined. This was defined as the number of total procedures that were identified as negative for SSI (i.e., in-hospital and home care) out of the total negative procedures identified by the In-Hospital Surveillance Program. Confidence intervals of 95% for the sensitivity and negative predictive value were determined.

Dissemination of results

Upon study completion, the findings were presented to the CHR infection prevention and control and to healthcare providers who influence patient care, such as home care staff, surgeons, surgical staff, and emergency department staff.

Ethical considerations

The project was reviewed and approved by the Conjoint Scientific Review Committee (CSRC) for scientific validity and institutional impact. Subjects' privacy and confidentiality were maintained by protecting all data and analyses under lock and key, removing patient names and PHNs from data, keeping all documents containing personal patient information confidential, and publishing all results in aggregate form.

RESULTS

Description of the surgical and home care cohorts

The Calgary Health Region (CHR) performed 1600 cardiac and orthopedic implant surgeries during the six months between December 1, 2003 and May 31, 2004. The eligible surgical cohort consisted of 1450 patients, aged 18 years and older who underwent 1542 cardiac and orthopedic surgical implant procedures. For the purposes of analysis, entry into the operating room for another surgical procedure was considered statistically independent, as the risk of post-surgical infection was primarily associated with the surgical procedure. The home care cohort consisted of 250 patients. Of the total 1542 cardiac and orthopedic implant surgeries, 272 (17.6%) were followed by home care surveillance (Figure 1). Significantly more patients undergoing hip replacement surgery were admitted to home care after hospital discharge (p=0.010).

SSI rates

Between January 1 and June 30, 2004, 54 SSIs (3.5%; 95% CI, 2.6%-4.4%) were found. Of the 1542 cardiac and orthopedic implant surgeries, 27 (1.75%; 95% CI, 1.1%-2.4%) SSIs were first captured by the in-hospital SSI surveillance system, while the remaining 27 (1.75%; 95% CI, 1.1%-2.4%) SSIs were first captured by the home care SSI surveillance program (Figure 2).

Location of surgical site infection detection

Approximately half (51.9%) of all SSIs occurred in cardiac implant surgery patients, while the remaining 48.1% SSIs occurred in orthopedic implant surgery patients. Of the 27 SSIs first captured by in-hospital SSI surveillance, the majority (63.0%) occurred in cardiac implant surgery patients, while the opposite trend was true of the 27 SSIs first captured by home care SSI surveillance, where only 11 (40.7%) occurred in cardiac implant surgery patients.

Infections associated with CABG and total knee replacements were significantly more likely to be detected first in home care than in hospital: CABGs (p=0.0005; RR, 4.0; 95% CI, 2.0-8.3); total knee replacements (p<0.0001; RR, 12.4; 95% CI, 5.1-30.2); and total SSIs (p<0.0001; RR, 5.7; 95% CI, 3.4-9.5). SSIs were 5.7 times (p<0.0001; 95% CI, 3.4-9.5)

Figure 1: Inclusion of post-surgical procedures into the home care cohort

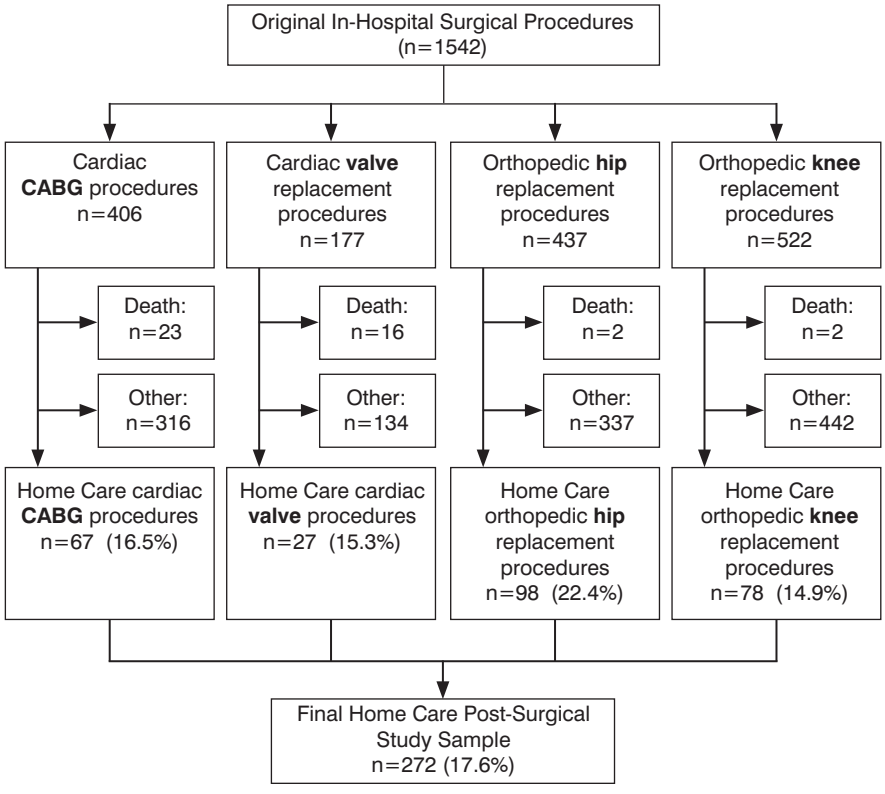
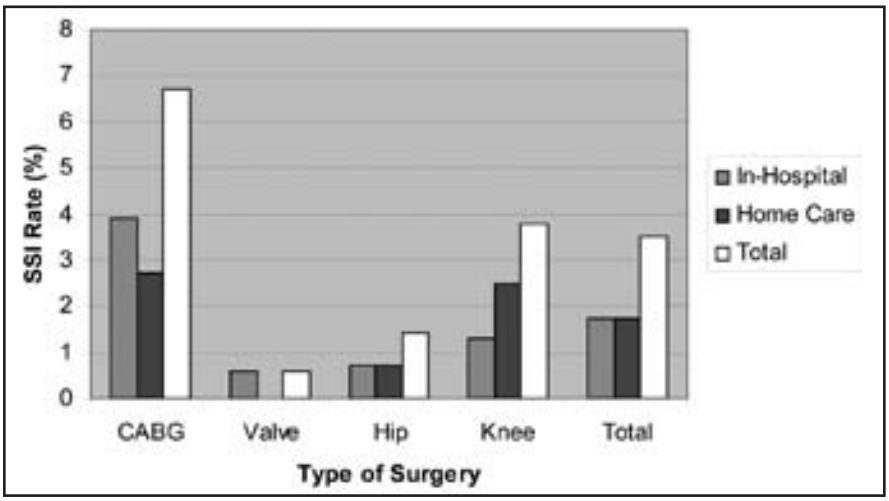


Figure 2: In-hospital, home care, and total SSI rates



more likely to be first detected by home care surveillance than in-hospital surveillance (Table 1).

Sensitivity and negative prediction value of in-hospital SSI surveillance for detecting total SSI

This study defined sensitivity as the probability of the in-hospital SSI surveillance system identifying a SSI, given its presence in the total SSI (Table 2). The sensitivity of the in-hospital SSI surveillance system for detecting all SSI was 50.0% (95% CI, 36.1%-63.9%). There was a significant difference between the efficacy of the CHR in-hospital surgical site infection surveillance program and the new CHR surgical site infection surveillance program that included both in-hospital and home care data ($p<0.001$). The negative predictive value was defined as the probability of the total SSI surveillance program not detecting SSI, given that the in-hospital SSI surveillance system did not detect the SSI. The negative predictive value was 98.2% (95% CI, 97.4%-98.8%) for the in-hospital surveillance. Neither specificity, nor positive predictive value could be calculated.

DISCUSSION

This project examined the feasibility of aggregating home care SSI surveillance data with current hospital-based surveillance data and developed a strategy and model for home care post-discharge SSI surveillance. The value of this new surveillance model was high as it succeeded in identifying previously unrecorded SSIs in the community, thereby allowing more accurate estimates of SSI rates that can be used for developing quality improvement programs for preventing nosocomial infections associated with surgery. The new program is a model of a non-funded quality improvement activity that minimized the use of limited hospital resources. The home care SSI program was effective at detecting SSIs missed by in-hospital surveillance, capturing 50% of all SSIs identified during the study. The SSI rate was underestimated prior to post-discharge patient follow-up. Some clients' SSIs were identified early in their development, and treatment was managed in home care without additional costs to hospitals. The data was disseminated to the relevant health care professionals.

Surveillance system attributes

The attributes of good surveillance programs include acceptability (willingness to participate); "representativeness" (to the total population); high sensitivity (percentage of cases detected); simplicity (structure and ease of use); flexibility (adaptable to changing disease, information needs); and timeliness (availability of information) [29]. Health care workers in home care had previously identified a concern for their clients with surgical site infections and thus were very willing to participate in the study. Home care patients were an ideal population to follow for post-discharge surveillance, as SSI surveillance was integrated into routine patient visits. No comparable studies in the literature exist, thus this sample size is satisfactory for a preliminary, exploratory study. As most information regarding SSIs comes from the US, Canadian post-surgical data is an important contribution to gaining a clear picture of SSI in Canada. Including post-discharge home care clients in SSI surveillance program increased the duration of SSI surveillance, thereby increasing the window of opportunity for SSI detection, capturing a value closer to the "true" SSI rate, and increasing the sensitivity of the overall SSI surveillance program. The home care SSI worksheet had a simple design: it was piloted to identify limitations prior to implementation, as well as assessing face and content validity of the instrument; it was one page, and required less than five minutes for completion. Home care was a good choice for sustainability because home care nurses were able to carry out surveillance in addition to their regular duties. It was not necessary to hire separate information staff for this study. The surveillance system was flexible and could easily accommodate other types of surgery. It was not possible to assess the timeliness of the information produced by the surveillance program for two reasons: (A) this project was exploratory and a pilot project to determine if surveillance of home care patients for SSI was feasible, and (B) SSI surveillance using home care clients has not been reported in the literature, so criteria to assess the timeliness was unavailable.

Sustainable home care SSI surveillance

There is no widely accepted benchmark for follow-up rates and published rates and methodologies vary widely for post-discharge SSI surveillance [10]. Some studies have demonstrated that

high follow-up rates can be obtained, although these required the expenditure of significant extra time and resources [15]. Studies of non-home care post-discharge implant patients are logistically difficult, labour-intensive, expensive, and unsustainable [9-19]. The methods developed and used in this study are highly sustainable. A survey of home care staff during the study showed the post-discharge population is easily accessed and monitored through home care and monitoring has a small impact on workload of home care staff.

Sensitivity and negative predictive value of the in-hospital surveillance system

Our study assumed that the in-hospital surveillance method currently used was the gold standard and the surveillance correctly identified all SSIs. Specificity and positive predictive value were not conceptually meaningful values given that the Home Care SSI Surveillance project made the assumption that all positive SSI cases identified from the In-Hospital Surveillance Program were indeed positive. Only sensitivity and negative predictive value were determined. Although predictive value is a function of prevalence, it is presented in our study because it is assumed that incidence approximates prevalence for SSIs due to the short duration of infection and the rarity of SSI.

The sensitivity of the In-Hospital Surveillance Program was 50.0%, and the negative predictive value was 98.2%. It was difficult to determine if the results of this study accurately represented similar home care activities in other Canadian cities, because very little literature exists on the inclusion of the Home Care Program in surveillance for surgical site infections in Canada or North America. Presently, the integration of Canadian Home Care Programs into surgical site infection surveillance is likely informal and unsystematic. Only 10 studies in the literature report estimates of the sensitivity of in-hospital SSI surveillance compared to surveillance that included post-discharge surveillance. These studies showed the sensitivity of in-hospital surveillance was low, ranging from 16.7% to 46.2% [9-18]. Our finding of 50.0% sensitivity for the In-Hospital SSI Surveillance Program is comparable. If our study had included all patients post-discharge, rather than only home care clients, more SSIs would have been captured and the In-Hospital SSI Surveillance Program compared to total surveillance likely would have had a lower sensitivity. Dependence solely on inpatient case-finding results in significant underestimation of the "true" SSI rates for implant surgeries.

Table 1: Incidence of SSI by location first detected: home care & in-hospital

Surgery Type	HC SSI / HC Non-SSI	Hospital SSI / Hospital Non-SSI	p-value*	RR (CI_{95})	Risk Difference (CI_{95})
CABG	11 (15.9%)	16 (3.9%)	0.0005	4.0	0.12
	58 (84.1%)	390 (96.1%)		(2.0-8.3)	(0.03-0.21)
Valve	0 (0%)	1 (0.6%)	1.0000	0.0	-0.01
	27 (100%)	176 (99.4%)		(---)	(-0.02-0.01)
Hip	3 (3.1%)	3 (0.7%)	0.0782	4.5	0.02
	95 (96.9%)	434 (99.3%)		(0.9-21.8)	(-0.01-0.06)
Knee	13 (16.7%)	7 (1.3%)	<0.0001	12.4	0.15
	65 (83.3%)	515 (98.7%)		(5.1-30.2)	(0.07-0.24)
Total	27 (9.9%)	27 (1.8%)	<0.0001	5.7	0.08
	245 (90.1%)	1515 (98.2%)		(3.4-9.5)	(0.05-0.12)

CI_{95}, 95% Confidence Interval; HC, Home Care; p-values* are from Fisher's exact test; RR, Risk Ratio; SSI, surgical site infection in location specified.

Table 2: Incidence of in-hospital, home care, duplicated and total SSIs

Surgery Type n = Total # of Surgeries	SSI Identified Only In-Hospital n (%) [95%CI]	SSI Identified Only in Home Care n (%) [95%CI]	Duplicated SSI n (%) [95%CI]	Total SSI n (%) [95%CI]
CABG (n=406)	14 (3.4%) [1.9% – 5.7%]	8 (2.0%) [0.9% - 3.8%]	5 (1.2%) [0.4% - 2.9%]	27 (6.7%) [4.4% - 9.5%]
Valve (n=177)	1 (0.6%) [0% - 3.1%]	0 (0%) [0% - 2.1%]	0 (0%) [0% - 2.1%]	1 (0.6%) [0% - 3.1%]
Hip (n=437)	3 (0.7%) [0.1% - 2.0%]	0 (0%) [0% - 0.8%]	3 (0.7%) [0.1% – 2.0%]	6 (1.4%) [0.5% - 3.0%]
Knee (n=522)	7 (1.3%) [0.5% - 2.7%]	7 (1.3%) [0.5% - 2.7%]	6 (1.1%) [0.4% - 2.5%]	20 (3.8%) [2.4% - 5.9%]
Total (n=1542)	**25 (1.6%) [1.1% - 2.4%]**	**15 (1.0%) [0.5% - 1.6%]**	**14 (0.9%) [0.5% - 1.5%]**	**54 (3.5%) [2.6% - 4.5%]**

n, number.

SSI rates comparisons

Of the 10 studies that reported both pre- and post-discharge SSI rates, the in-hospital rate ranged from 0.2% to 9.0%, the post-discharge rate ranged from 0.5% to 10.5%, and the aggregate rate ranged from 0.7% to 19.5% [9-18]. Although these studies involved other surgeries besides cardiac and orthopedic implant surgeries, all of our rates fall within these ranges. Our study had an in-hospital SSI rate of 1.75% (95% CI, 1.1 to 2.4%), a home care also SSI rate of 1.75% (95% CI, 1.1 to 2.4%), and an aggregate rate of 3.5% (95% CI, 2.6%-4.4%). The true total incidence rate of implant surgery SSI in the CHR was likely higher that than the 3.5% determined by our study, as non-home care post-discharge patients were *not* included in the calculation of the true total incidence rate of implant surgery SSI in the CHR.

The majority of the 10 studies that reported both pre and post-discharge SSI rates had higher post-discharge

SSI rates, and therefore higher aggregate rates as well, compared to our study [9-11,13,15-18]. One reason for higher total SSI rates reported in the literature is that these studies reported on the entire post-discharge population (although follow-up rates varied), rather than only home care clients in the post-discharge population. Another potential reason for the higher overall rate reported in the literature was that the definitions used to classify a patient as being positive for infection was far less strict than the criteria used for our study.

Study limitations

The limitations of this study are reflective of the reality of conducting a study that involved expansion and integration of a surveillance program across healthcare sectors. Limitations of this study include: wide variety of surgery types; low number of SSIs (short six-month data collection period); non-electronic system; untested inter- and intra-rater reliability of SSI identification; misclassification bias towards undiagnosed SSIs; and the lack of nationally accepted standard definitions and surveillance methods decreased the generalizability of the study findings outside of the CHR.

Study recommendations

The formation and organization of the CHR Home Care SSI Surveillance Program was a model of a non-funded quality improvement activity that has produced both inter-hospital comparative and predictor data. Recommendations resulting from the study for the continuation of SSI surveillance in Calgary home care are summarized in Table 3. The use of the home care SSI worksheets to identify SSI occurring in home care after discharge was found to be a very successful strategy given that the entire home care cohort was followed. The success of this strategy is uncommon in the literature and provides inspiration for a surveillance system that uses home care healthcare professionals as a valid means of identifying SSI while minimizing the use of limited hospital resources. Certainly, surveillance needs to be conducted with the intent of communicating the findings to professionals who have the power to make an impact on these rates. Further research needs to be done to determine the sensitivity of the home care surveillance program within the scope of an expanded definition of post-discharge.

Table 3: Recommendations for the continuation of the Home Care SSI Surveillance Program

I. Remove valve replacement surgeries from surveillance. The SSI rate is too low to be worth the time, effort, and money to conduct surveillance.
II. Expand home care surveillance efforts to other types of infections (e.g., urinary tract infections, bloodstream infections, etc.). Staff educational programs and patient/caregiver teaching programs and materials should be revised to accommodate project results before the program continues.
III. Increase accuracy and consistency of home care record keeping and database.
IV. Maintain training level of home care team regarding data collection form and laboratory specimen collection.
V. Maintain dissemination of surveillance system methods and results to relevant hospital and home care staff (i.e., SSI in implant surgery patients that occurs up to one year post-surgery is attributed to the procedure, NOT to home care.)
VI. Encourage multidirectional dialogue between hospital and home care staff. Compile a list of all relevant healthcare workers (e.g., surgeons, home care nurses, etc.) and introduce a regular reporting framework of surveillance results.
VII. Work at changing policy to decrease SSI rate (i.e. targeted methods against *Staphylococcus aureus*).

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Analysis of the impact of misclassification bias on hospital surveillance results

ABSTRACT

Infection control practitioners (ICPs) and epidemiologists often rely on hospital surveillance results to guide outbreak investigations and to evaluate the effectiveness of infection prevention and control practices. Unfortunately, surveillance results are highly vulnerable to systematic error due to misclassification bias because of the large numbers of health care providers involved in the data collection process, and because of low incidents of infection. Quantitative assessments of misclassification bias can demonstrate its impact on surveillance results and can help decide whether it is a plausible explanation for surveillance findings. The purpose of this paper is to provide an in-depth analysis of the effect of misclassification bias on data obtained from hospital surveillance. In order to do this, we used the 2004 Surrey Memorial Hospital Caesarian section outbreak investigation and a fictitious study of ventilator-associated pneumonia (VAP). Statistically insignificant variability between two groups of ICPs was shown to have important clinical significance because of major effects on the incidence of infection calculated. Valid and useful surveillance results were shown to only be obtainable when a single case definition with a high positive predictive value and a very high degree of clarity, sensitivity and specificity was consistently used by all health care professionals involved in the surveillance data collection process, and when surveillance was targeted to high prevalence infections.

The Centers for Disease Control and Prevention (CDC) defines surveillance as the "ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice closely integrated with the timely dissemination of these data to those who need to know"[1]. It is the method used by infection control practitioners and public health officers to detect fluctuations in dangerous or indicator infections within the hospital environment and in the community. The data gathered can be used to compare current rates to previous rates within the same environment or population, and to compare with regional, national or international rates. Surveillance findings can therefore be powerful tools for outbreak investigations, to evaluate control measures, for quality improvement and for supporting practice and policy changes at all levels within the health care system.

Nevertheless, the data collected using surveillance are only useful if they are valid and reliable[2]. Statistical methods of analysis often only account for random error and controllable confounding, and only explain a small portion of the total error that can affect surveillance results[3]. A large portion of the total error results from the measures used to seek out cases, as well as from the frequency of misclassification of cases and non-cases. The purpose of this paper is to provide an in-depth analysis of the effect of misclassification bias on the data obtained from hospital surveillance. Two surveillance scenarios will be used to illustrate why misclassification may occur and how misclassification bias may affect surveillance findings. Actual data from a recent outbreak of surgical site infections (SSI) was used for the first scenario, and data for the second senario was derived from literature on ventilator-associated pneumonia (VAP).

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Surveillance scenario 1: Surgical site infections

During the summer and fall of 2004, surgical site infections became the focus of intense public and media scrutiny when a patient from Surrey Memorial Hospital in British Columbia, developed a life-threatening infection of her Caesarian section incision shortly after surgery. Staff from the family birthing unit quickly called upon the hospital infection control practitioner to investigate this event and to make recommendations for preventing future infections.

Source of misclassification bias: Inter-rater variability

During the Caesarian section surgical site infection outbreak investigation at Surrey Memorial Hospital, inter-rater variability was quantified when two independent groups of ICPs reviewed all of the charts of women who may have developed a surgical site infection between April 1 and November 4, 2004. The first group of reviewers consisted of five ICPs with variable infection control experience from Fraser Health (FH), regional body of Surrey Memorial Hospital (i.e. three ICPs with 1-3 years of experience; two ICPs with >10 years of experience). The second group consisted of two experienced ICPs (i.e. >10 years of experience) from BC Children's and Women's Health Center (BCCW), a tertiary care hospital from the Coastal Health Authority of British Columbia. The women whose charts were reviewed had been identified by usual surveillance methods. These included women who had received positive laboratory cultures from abdominal incision swabs, as well as those who had returned to the emergency department or family birthing unit for problems related to their abdominal incision. Media attention also brought forth calls from many women who felt they may have developed an infection, and these charts were reviewed as well.

Both groups of reviewers used the same set of CDC definitions of surgical site infections to identify cases of infection. All three CDC categories of SSI: superficial incisional, deep incisional, and organ/space, were pooled so that all women who met any of the three definitions were counted as cases of infection. Table 1 describes the extent to which the two sets of reviewers agree or disagree in whether or not the women developed an SSI (see *Epidemiology* 3rd ed. by Leon Gordis [2004] for further information on observer or instrument variation tables). It shows that, out of 30 charts reviewed, 22 had concordant results (i.e. both sets of reviewers agreed that 11 women met one of the definitions for an SSI and 11 women did not meet any of the three definitions for SSI), while eight results were discordant (i.e. seven of the women classified as meeting one of the definitions for SSI by Fraser Health ICPs were classified as not meeting any of the definitions by BC Children and Women ICPs, and one of the SSIs from BC Children and Women ICPs did not meet any definitions for SSI according to the Fraser Health ICPs). The percent agreement, quantifying how much each group of reviewers agreed with each other, was then calculated. The result of this calculation shows that the two groups of experienced reviewers only agreed on less than three-quarters (73.3%) of the chart classifications when using the same case definition. In order to remove the effect of chance on the results a kappa statistic was also calculated and was found to be 0.487. "Kappa expresses the extent to which the observed agreement exceeds that which would be expected by chance alone (numerator) relative to the most that the observers could hope to improve their agreement"[1]. Although ratings of Kappa statistics are arbitrary, Richard Landis and Gary Koch [4] rate a kappa statistic between 0.41 and 0.60 as moderate strength of agreement. Using McNemar's test, we also calculated the probability that the proportions of surgical site infections found by each group of reviewers are the same. The McNemar's test statistic

$$M^2 = \frac{(|1-7|-1)^2}{1+7} = 3.125$$

(p = 0.077)

shows that there is not enough evidence in this small sample to reject this null hypothesis at $\alpha = 0.05$. This result further supports that there was a statistically significant degree of agreement between the two groups.

Table 1: Observed inter-rater variation between groups of ICPs from Fraser Health (FH) versus BC Children and Women's hospital (BCCW).

		FH ICPs		
BCCW ICPs		**SSI**	**No SSI**	Row Total
	SSI	11 *	1 **	12
	No SSI	7 **	11 *	18
	Column Total	18	12	30
Percent agreement = (11+11)/30 = 0.733 x 100 = 73.3%				

* Concordant results ** Discordant results

Source of misclassification bias: Low incidence of infection

We will now examine the effect of this statistically significant agreement (and therefore statistically insignificant variability in SSI classification) of the two groups of reviewers on actual surveillance results. There were 712 Caesarian sections done at Surrey Memorial Hospital between April 1, 2004 and November 4, 2004. During this period, the incidence of SSI varied from 1.69% when the charts were reviewed by the experienced team from BCCW, to 2.53% when the same charts were reviewed by the FH ICP team with varying experience. The incidence derived from the external BCCW reviewers was 33% lower than the incidence calculated from the Fraser Health reviewers. The 2003 National Nosocomial Infections Surveillance (NNIS) System Report from the CDC[5] states that the mean pooled incidence of Caesarian section infections in the US from January 1992 to June 2003 for patients at risk category 0 was 2.82 per 100 surgeries. Although the incidence rate at Surrey Memorial Hospital was not stratified by risk category, the incidence of Caesarian section SSI calculated

Table 2: Incidence rates calculated using the classification of surgical site infections (SSI) from Fraser Health ICPs versus BC Children and Women ICPs for the same time periods.

Period dates			# C. sections	# SSI with FH-ICPs	Incidence with FH-ICPs	# SSI with BCCW-ICPs	Incidence with BCCW-ICPs
Apr 1, 04	TO	Apr 22, 04	77	2	2.60	1	1.30
Apr 23, 04	TO	May 20, 04	89	0	0.00	0	0.00
May 21, 04	TO	Jun 17, 04	90	2	2.22	1	1.11
Jun 18, 04	TO	Jul 15, 04	90	4	4.44	4	4.44
Jul 16, 04	**TO**	**Aug 12, 04**	**82**	**2**	**2.44**	**3**	**3.66**
Aug 13, 04	TO	Sep 9, 04	102	1	0.98	1	0.98
Sep 10, 04	TO	Oct 7, 04	95	3	3.16	0	0.00
Oct 8, 04	TO	Nov 4, 04	87	4	4.60	2	2.30

by both groups of reviewers remained below the NNIS benchmark values for even the lowest risk category (i.e. risk category zero). Nevertheless, the variability in the results makes it very difficult to determine the true incidence of infection. The effect of varying levels of ICP expertise in surveillance would have been interesting to evaluate. The lower level of expertise of three of the five Fraser Health ICPs may have been responsible for the higher rate of SSI counted by that group of reviewers.

The problem of misclassification bias in surveillance resulting from low incidence rates is exacerbated when dealing with shorter time frames. Smaller denominators used in making calculations for shorter periods translate into large fluctuations in the incidence rates calculated. Table 2 shows that, when denominators lie between 77 and 102 Caesarian sections, misclassification of a single case results in a rate increase of 1.11 to 1.22 per 100 Caesarian sections. Specifically, between July 16 and August 12, 2004, Fraser Health ICPs identified two cases of infection for an incidence of 2.44 per 100 surgeries. For the same period, the BC Children and Women Health Center ICPs classified three patients as cases for an incidence of 3.66 per 100 surgeries. The difference in classification of a single case resulted in a change of incidence from below the NNIS benchmark of 2.82 per 100 surgeries for a risk category of zero, to an incidence well above the benchmark.

Source of misclassification bias: Case definition clarity and specificity

The important question is, if the two groups of experienced reviewers used the same case definition, why was there such discrepancy in the results? First, the NNIS definitions are not easily applicable to hospital surveillance[6]. Some of the information needed to decide whether a patient should be counted as a case is often missing. Nurses and physicians may not adequately describe observations of incisions in their charting and therefore reviewers may remain unclear regarding the appropriate classification. Also, physicians often prescribe antibiotics without taking a wound culture and without clearly describing the impetus for the prescription. Secondly, much of the problem stems from the interpretability of case definitions commonly used. For example, Table 3 describes the NNIS definition of a superficial incisional surgical site infection, used when reviewing the charts of women after they had received a Caesarian section. At first glance, this definition seems clear and specific, yet the following points show that there may actually be much room for interpretation[7].

Table 3: Centers for Disease Control (CDC) NNIS System criteria for defining a superficial surgical site infection (6)

Superficial incisional surgical site infections must occur within 30 days of procedure and involve only the skin or subcutaneous tissue around the incision.
Plus
At least one of the following criteria:
1. Purulent drainage from the incision.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the incision.
3. At least one of the following signs or symptoms of infection - pain or tenderness, localized swelling, redness or heat - and the incision is deliberately opened by a surgeon, unless the culture is negative.
4. Diagnosis of superficial incisional SSI by a surgeon or attending physician.

- The NNIS definition does not specify the color and consistency of the "purulent" drainage.
- Millions of organisms colonize healthy human skin and the same organisms can cause infections in surgical wounds. Most wound cultures will therefore grow some organisms even though there may not be an infection. The Centers for Disease Control document[8] that provides the definition for superficial surgical site infection warns that only "infections" should be counted, not "colonizations". Yet there is no direction on how to differentiate between a colonized and an infected wound, leaving this decision up to the reviewer.
- Incisions are painful when healing, and some swelling, redness or heat is usually present as part of the normal healing process. In addition, skin can also become red and warm from other factors such as allergic reactions to wound dressing tape.
- The physician diagnosis criteria can also lead to variations in classification. Some assume that the criterion of physician diagnosis is satisfied when antibiotic or surgical treatment is initiated[7]. Even when this assumption is not made,

the physician diagnosis criterion can increase the variability in the surveillance data. Confusion may occur when there are conflicting diagnoses from different physicians. For example, the emergency physician may have charted that there is an infection, while the surgeon's diagnosis is dehiscence. Individual surgeons and attending physicians may also not use the same definitions for diagnosing a surgical site infection as the surveillance team. The ICP then faces the situation of classifying a patient as a case of infection when the wound description and/or culture result do not meet any of the other definition criteria.

Source of misclassification bias: Multiple case definitions

Since hospital surveillance involves a multitude of health care professionals, the key to minimizing misclassification bias is to maximize the precision and clarity of case definitions used[9]. To have useful surveillance data, the same definition must be used by all health care workers who participate in the surveillance process. This includes nurses and physicians who need to describe infections using the same specifically defined vocabulary, physicians who diagnose infections, and ICPs or epidemiologists who collect and analyze the data. Wilson et al[7] illustrate the importance of using one clearly defined and precise case definition by comparing the results of surveillance obtained using four different commonly used definitions for surgical site infections: the CDC NNIS definition, the ASEPSIS scoring system, the "pus-only" definition, and the British Nosocomial Infection National Surveillance Service (NINSS) definition. Although the kappa statistic comparing the agreement between the CDC definition and the ASEPSIS scoring system was 0.43, and therefore "moderate" according to Landis and Koch[4], the average incidence of surgical site infections in 5804 surgical wounds varied from 19.2% using the CDC NNIS definition, to 6.8% using the ASEPSIS scoring system. The misclassification bias that would be introduced in surveillance data gathered without clearly specifying the case definition is therefore large enough to negate the utility of the results.

Surveillance scenario 2: Ventilator-associated pneumonia

Data from the literature have been used to create hypothetical ventilator-associated pneumonia (VAP) surveillance scenarios to exemplify additional issues of misclassification bias in hospital surveillance. When an institution decides upon one source for all of its surveillance definitions, the case definition for certain infections may still remain unclear. In this example, an institution decides to use the CDC NNIS system definitions and wants to define VAP. According to the references provided in the NNIS report published in December 2003 [5] (p.495), the resource used by NNIS to define infections under surveillance was the 2nd edition of *Hospital Epidemiology and Infection Control* by Mayhall CG[10]. Unfortunately, the pages quoted in the reference section only contain the definition for nosocomial pneumonia; not VAP. To exacerbate the dilemma, Chapter 15 of the same book describes three different definitions for VAP: the modified CDC definition, the Clinical Pulmonary Infection Score (CPIS), and two Memphis VAP Consensus Conference definitions; one for "definite" pneumonia and one for "probable"[11]. Mayhall states that, when these definitions were used to diagnose VAP simultaneously, the incidence varied from 22% of ventilated patients using the modified CDC criteria, to 0.4% of ventilated patients when using the Memphis definition for definite pneumonia.

Source of misclassification bias: Low case definition positive predictive value

When selecting a case definition, it is important to remember that surveillance data is only useful when it provides information about infections that have negative outcomes for patients and for health services[7]. Definitions that are sensitive but not specific enough result in a large number of false-positive cases due to misclassification, and this can cause unwarranted alarm. For example, Mayhall reported that only 50% of those classified as VAP cases using the Memphis definition for probable pneumonia met the definition of VAP using the modified CDC definition[10]. It was further found that withholding or discontinuing antibiotic treatment for patients who had been reclassified as non-cases by the Memphis definition did not increase morbidity or mortality, and were therefore not true VAPs as these would necessitate antibiotic treatment. If the Memphis definition for probable pneumonia is used as the gold standard definition for VAP, the CDC definition only has a positive predictive value (PPV) of 50%. To illustrate this point, Table 4 describes the results of a hypothetical VAP cohort study that was done using definitions that only achieve a 50% probability that a patient has pneumonia when they are classified as meeting the definition.

Table 4: Number of cases and non-cases of pneumonia for patients with and without exposures to a ventilator. Comparison of classification using definitions with a PPV = 50% vs gold standard with PPV = 100 (in brackets).

	Pneumonia	No Pneumonia	Row Total
Ventilator Exposure	20.4 (10.2)	979.6 (989.8)	1000
No Exposure	3.4 (1.7)	996.6 (998.3)	1000
Column Total	23.8 (11.9)	1976.2 (1988.1)	2000

Apparent Relative Risk = 6.0 / True Relative Risk = 6.0
Apparent Risk Difference = 0.017 / True Risk Difference = 0.009
Chi-square = 12.3 ($p<0.001$) / Chi-square = 6.12 ($p=0.013$)

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In contrast, the bracketed results are those that would have been obtained using gold standard definitions with a positive predictive value (PPV) of 100%. The study compares the rate of pneumonia in intensive care unit (ICU) patients exposed to a ventilator to the rate in ICU patients not exposed to a ventilator. The values in the tables are approximations from the 1997 CDC guidelines for the prevention of nosocomial pneumonia[12], and are not suggested to reflect actual rates of pneumonia. The use of case definitions with a PPV of 50% did not result in a change in relative risk, but it did result in a risk difference almost double the true value (0.009 versus 0.017). Therefore, the low predictive value of the definitions greatly inflated the portion of the risk of pneumonia attributable to ventilator exposure. The Chi-square test[13] results further show that, when the gold standard definition is used, there is much less evidence to reject the null hypothesis that the rates are the same between the two groups even though the sample size is large. This shows that valid and useful surveillance results can only be obtained when a single case definition with a high with high positive predictive value and a very high degree of clarity, sensitivity and specificity is consistently used by all health care professionals involved in the surveillance data collection process.

Source of misclassification bias: Low case definition sensitivity and specificity

Unfortunately, when the prevalence of infection is very low, a low positive predictive value can result even when using definitions that have very high sensitivity and specificity[14]. Assuming gold standard definitions are able to provide us with the true prevalence for pneumonia in the ICU, and assuming that all patients who truly develop pneumonia are diagnosed as cases (i.e. sensitivity = 100%), we can calculate the specificity to be 98.8%[13] even though the positive predictive value is only 50%. In most situations, those analyzing surveillance data are unaware of the numbers of true cases and true non-cases; they are only certain of the numbers of patients classified as cases and non-cases. However, estimates of the true numbers can be calculated using pairs of pre-specified screening sensitivities and specificities[3]. Since hospital surveillance data is gathered from cohorts of patients based on exposure, we can assume that case definitions have the same sensitivity and specificity for both cases and non-cases of infection[3]. Unless there were other errors in the data, this would always result in non-differential misclassification towards the null[3]. Table 5 shows that, as the sensitivities and specificities decrease, the corrected relative risks of pneumonia for those ventilated versus those not ventilated greatly increase. The relative risk changes from 6.0 when we assume that the definition is 100% sensitive and specific, to 43.4 when we assume that the definition is 99.7% sensitive and specific. Because of the very low incidence of pneumonia, sensitivities and specificities 99.6% and below provide us with a method of classification that is worse than achieved by chance alone[3]. In order to have useful surveillance data, it is therefore crucial that surveillance efforts be targeted toward high prevalence infections.

Table 5: Uncorrected and corrected relative risks of pneumonia for those on ventilators versus those not on ventilators assuming the case definitions have various sensitivities and specificities (4).

Sensitivity	Specificity	Relative Risk
100%	100%	6.0
99.9%	99.9%	8.1
99.8%	99.8%	13.1
99.7%	99.7%	43.4

CONCLUSION

In a report issued in relation to this Caesarian section outbreak at Surrey Memorial Hospital, Dr. Doug Cochrane, Chair of BC's Patient Safety Task Force and VP of Medical Affairs, underscored the importance of surveillance when he recommended that the reporting of post-operative wound infections be mandatory, and that a surgical follow-up process be instituted to "ensure adequate recognition and tracking of surgical site infections"[15]. Unfortunately, decision-makers at all levels of the health care system are unaware of the random and systematic error that affects all health research[16]. This paper has shown that surveillance results are especially vulnerable to errors due to misclassification bias that may be statistically insignificant but remain clinically significant. This high propensity for misclassification bias is due to inter-rater variability, and because of the generally low incidence of infection in health care institutions. In addition, low levels of case definition clarity, sensitivity, specificity, and positive predictive value, can lead to misclassification bias that can account for large fluctuations in incidence rates and measures of risk. Misclassification bias may therefore render the results of surveillance virtually useless in detecting true changes in infection rates and in guiding practice[17]. One of the main epistemological issues in surveillance is therefore to validate the assumption that the random and systematic errors that stem from misclassification bias are negligible using the methods described. ●

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Award winners

Congratulations to everyone!

Early Bird Draw: Complimentary 2008 Conference registration: Kathleen Toth, Vernon, BC

Exhibit Passport Winners:
- Digital camera: Janis Kennedy, Winnipeg, Manitoba
- DVD player: Ivy Scobie, Regina, Saskatchewan
- iPod: Norma Cochrane, Sydney, Nova Scotia
- GPS: Patsy Rawding, Halifax, Nova Scotia
- "Northern Lights" print: Lynne Goodwin, Scotland

Strut Your Stuff! Breakfast: Complimentary 2008 Membership: Allyson Shephard, Ottawa, Ontario

2008 Conjoint Conference: Complimentary weekend stay at Hyatt Regency: Shelley Schmidt, Hamilton, Ontario

2007 Ecolab Poster Contest: Laurie Boyer, North Bay, Ontario; Esther Giesbrecht, Calgary, Alberta; Honourable Mention

3M Research Grant: Anne Bialachowski for her submission: *Long-Term Care Professionals Perceived Barriers and Facilitators to Implementing Infection Control Best Practice Guidelines*

3M Chapter Achievement Award: Southwestern Ontario Professionals in Infection Control (SOPIC)

CBIC Chapter Achievement Award: Toronto Professionals in Infection Control (TPIC)

2007 Best First-time Abstract Submission: Melody Cordoviz, Edmonton, Alberta, for her presentation: *Welcome To the Big Top: Piloting Infection Control Guidelines in a Mobile Triage Centre*

2007 Best Oral Presentation: JoAnne Burt, Oshawa, Ontario for her presentation: *The Development Of An Electronic Tool, Using Microsoft Excel, To Simplify Costing Of Clusters, Outbreaks And Other Applications For The Infection Control Practitioner (ICP) In Acute And Long Term Care*

2007 Best Poster Presentation: Kathryn Bush, Calgary, Alberta, for her presentation: *Educating Medical Students About Infection Control: There And Back Again*

CHICA Chapter Presidents

2007 Virox Scholarship winners

Denise Murphy (APIC), Joanne Laalo (CHICA), Clare Barry (honourary member, CHICA), Carol Goldman (IFIC), Sheila MacDonald (CBIC)

CHICA-Canada board of directors: Betty Ann Henderson, Dick Zoutman, Bonnie Henry, Karen Hope, Cynthia Plante-Jenkins, Joanne Laalo, Karen Clinker, Marion Yetman, Pearl Orenstein

2007 Scientific Program Committee: Marilyn Albers, Liz Werner, Ramona Rodrigues, Jim Gauthier, Donna Moralejo, Marion Yetman, Rick Wray, Betty Ann Henderson

Pearl Orenstein, CHICA-Canada membership director; Anne Bialachowski, winner 2007 3M research grant; Christian Blyth, 3M Canada; Anna Hunt, President, Southwestern Ontario Professionals in Infection Control, 2007 chapter achievement winners

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Clare Barry CHICA-Canada Honourary Member

The prestigious honourary membership in CHICA-Canada was presented to Clare Barry at the 2007 conference. A past president, Clare has distinguished herself as an educator, mentor, and advocate for the advancement of infection prevention and control in all settings. Currently she is the Senior Infection Prevention and Control Consultant, Strategic Planning and Implementation Branch, Ministry of Health and Long Term Care, Ontario. In this capacity she is working on the development of a hand hygiene audit training program and tool. She is the author of numerous articles and has presented on infection prevention and control issues at local, provincial, national, and international levels.

In accepting the honourary membership, Clare was typically humble and said that any success she has had over the years has been because of the teamwork she has experienced. She described how CHICA-Canada has grown through the years and is an invaluable instrument for the advancement of the profession and those who are part of it.

Clare has also been active in the world of sports with strong ties to the cycling community. Even here she takes the infection prevention message and has actively worked to help make sports a safe field for all of the participants. In her personal life, Clare displays this same passion in all her endeavours. Whether it is traveling to Belize on a retreat with her church group, cycling with her husband Mike, or spending time with her son Michael, his wife Dede and her grandson Liam she brings the same energy and commitment to everything she does. Clare's strong family ties keep her grounded and provide her support to pursue her goals. In all that she does Clare constantly strives for excellence and challenges all around her to do the same.

The following is an excerpt from Clare Barry's honourary membership acceptance speech at the 2007 CHICA-Canada Conference.

This honour is about being part of a successful professional network, CHICA-Canada. CHICA members have provided their talents to make this association a recognized national and international leader in infection prevention and control. Collaboration with other countries has made CHICA influential in improving practices.

Think of CHICA as a great connector and source of current professional information. If I needed an answer, CHICA could connect me to sources. I am proud of this association. It has the insight to partner/connect with many organizations to improve standards and outcomes, and has collaborated with APIC to provide us with professional standards and the CIC certification exams.

Some key things I have learned through the years:

Networking through our professional association is imperative to learn the best way to do things in our daily roles. It will make us all better at our jobs and improve our leadership skills. Teamwork makes a better product even though compromising is not always easy. We all contribute different viewpoints to enrich the product.

Having a passion for my role and loving to learn makes work become play – I continue to be in awe and a respectful student of the information and knowledge of areas related to:

- Microorganisms
- Human behaviour and what influences peoples' decisions
- Change processes to get effective and sustaining improvement in practice
- Human factors so we can assess and improve systems to support healthcare providers at infection preven-

tion (e.g. How can we expect compliance with hand hygiene and routine practices if we do not provide the tools in the right place and processes to support compliance? We need to address the enablers and barriers.) *In order to succeed at attaining the goal of consistent and improved use of infection prevention practices, it is essential that we assess and address the human factors/ processes that will support the change.*

- Effective communication methods in a variety of venues. How do we market a program to different audiences; communicate with decision-makers and front line providers?
- Leadership: what makes an effective leader in a given situation?
- Education models that improve practice. (We all educate but do we actually get a sustaining change in practice?) The message has to match four generations' learning styles. Does method of delivery connect with the "silent" generation, the boomers, the "X" and the "Y" generations?

Be strategic in planning and a future thinker. Reflect and watch what is happening around you and position the issue so other disciplines buy in. Put the pieces together.

Challenge all assumptions to verify that they are still correct or need changing. Never get in a rut as it only hurts you and others if it is not based on current evidence, experience and enlightenment. If something isn't working approach it from another angle. There is a reason why it is not working.

Aim for excellence while being practical. Be close to clients to apply the science in a practical method.

Use a philosophy of continuous quality improvement. Aim for zero tolerance for any preventable infection.

Know the history of the field so you do not make the same mistakes.

Always be willing to learn from mentors and then pass it on. Often students become teachers of the new challenges and ideas. Remember, you are the mentors of each other and future ICPs.

Value who you are and what you are doing no matter what stage of your career you are at. Working together we are all stronger. You are each important and do an important role. It is exciting to see and encourage the new talent emerging.

In the final analysis, the microorganisms will keep us honest and busy. There will always be stressors, some chaos, laughter, and tears. I, as each of you, have been privileged to work in a field that is continually evolving.

Thank you to all of you for your patience in teaching me many things and for collaborating on many projects over the years. What fun it has been and will continue to be! May we continue to have a passion for our daily professional work and inspire each other.

Run for IFIC

June 11, 2007 was a perfect morning for a walk or run through Edmonton's River Valley. Thirty-five dedicated runners and walkers gathered at the CHICA conference host table at 6:00 a.m. to participate in the second annual IFIC run (2.5 km walk/5 km run). The event started promptly at 6:30 with a send-off from Capital Health's Medical Officer of Health, Dr. Gerry Predy. The run was led by Edmonton's very own Ralph Ennis-Davis, who temporarily got lost on his own route. Special guest runners included Dr. Dick Zoutman from Ontario and Edmonton's Dr. Marcia Johnson. Judi Linden from Portage la Prairie emerged as the winner.

The run raised a total of $4,976 for IFIC including an $1,800 contribution from CHICA-Canada. In the true competitive Alberta spirit, the individuals who raised the most money were Gwyneth Myers from Calgary and Marilyn Albers from Edmonton. The IFIC run committee would like to express their gratitude to all the participants and contributors.

Carol Goldman

Thanks to CHICA-Canada Conference Sponsors

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CHICA Northern Alberta – Thank you

CHICA-Canada would like to thank the members of CHICA Northern Alberta whose enthusiasm and support helped make the 2007 conference such a success. From organization of the 2nd Annual Run for IFIC, to the great crafts table, and even better silent auction, they injected a lot of fun into the conference and made everyone feel welcome. The highlight of the week was the Fun and Farewell event held the last night. Starting with wine and cheese and then a bit of retail therapy, 178 attendees enjoyed the opportunity to visit both the Fantasyland Hotel and West Edmonton Mall. It was a great night – for the attendees and the retailers. Congratulations to the entire chapter for making this a memorable and fun conference.

2007 Ecolab Poster Contest Winner

Laurie Boyer of North Bay, Ontario has won the 2007 Ecolab Poster Contest with her submission themed "Infection Prevention and Control: Practice and Participate". The graphic depicts a team effort and the practices required to surmount infections in today's healthcare settings. Esther Giesbrecht of Calgary, Alberta was given an Honourable Mention for her worthy submission to the contest. The 2007 contest was hosted by CHICA Northern Alberta and sponsored by Ecolab Healthcare.

Kari Schmitz (Ecolab); Laurie Boyer, winner of 2007 Ecolab poster contest; Esther Giesbrecht, 2007 honourable mention; Karen Clinker, CHICA-Canada director of programs and projects

The 2007 poster (English and French) is available for downloading from www.chica.org.

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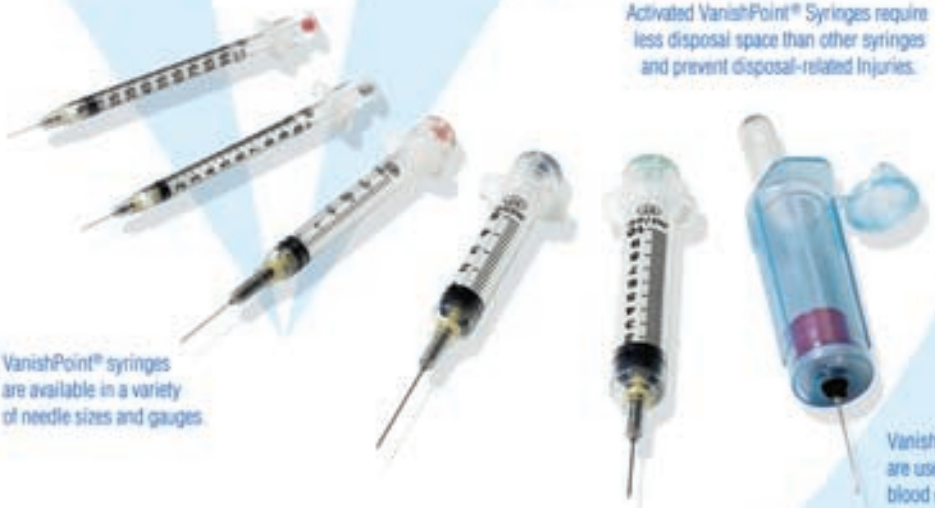

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In Canada, hospital infections kill between 8,000 and 12,000 Canadians annually, and it is estimated that 250,000 people become infected in hospital while being treated for something else. Worldwide, over 1.4 million people are suffering from infections acquired in hospitals.

Based on research endorsed by the World Health Organization (WHO), increased hand hygiene could reduce infections incurred in healthcare settings by up to 50 per cent. Even though proper handwashing may seem straightforward, the WHO has determined that compliance among healthcare providers is low worldwide. In Canada, on average 40 per cent of healthcare providers comply with the WHO hand hygiene guidelines on when and how to clean their hands. "Some of the barriers to compliance are systemic, such as limited availability of handwashing facilities and personnel shortages that lead to time pressures on the job," states Joanne Laalo, CHICA president. "But the reality is that handwashing is such a basic measure, we often take it for granted. Healthcare workers – the backbone of Canada's high quality healthcare system – have a critical role in stopping the spread of infection."

The Canadian Patient Safety Institute (CPSI), a non-profit national organization established by federal, provincial and territorial Ministers of Health, has launched Canada's hand hygiene campaign under the theme ***"STOP! Clean your hands".*** CPSI is working on this campaign with CHICA-Canada, Canadian Council for Health Services Accreditation, the Public Health Agency of Canada and members of national infection control working group. Together, they are seeking strategic sponsorships from public and private-sector organizations to help implement this initiative.

"While the campaign is primarily aimed at healthcare providers in a variety of healthcare settings, patients and visitors to healthcare facilities are also part of the solution," says Phil Hassen, CEO of CPSI. The campaign will include media activities and special events to raise awareness of the importance of proper hand hygiene among Canadians and to encourage the adoption of effective hand hygiene practices. "Experts agree that while hand hygiene improvement efforts are under way in various regions and provinces/territories, a national strategy with a disciplined approach is essential to ensure that consistent, reproducible and measurable improvements are achieved in each organization and across the country."

Canada's Hand Hygiene Campaign has been developed based on discussions with healthcare providers, unit managers, infection prevention and control professionals and senior healthcare leaders such as hospital CEOs and directors of healthcare facilities across Canada.

"A key element of the campaign is a series of toolkits that focus on education, training, communication, promotion and overall awareness of the issue and its solutions," says Hassen. "Each toolkit will include a nationally consistent audit tool to help determine baseline performance on hand hygiene compliance and monitor and report on improvements over time, both at the local healthcare facility level, as well as at the national, system-wide level."

The national campaign was launched during the 2007 CHICA conference, and will be tested with select national healthcare institutions during the summer of 2007. It will be officially launched during the Canadian Healthcare Safety Symposium (Halifax 7) in Ottawa, October 10-13.

For further information on the "***STOP! Clean your hands"***, hand hygiene campaign, visit *www.handhygiene.ca* or *www.lavagedesmains.ca*

Dick Zoutman, Phil Hassen (Canadian Patient Safety Institute), Joanne Laalo

CPSI Hand Hygieme patrol at Canada's Hand Hygiene Campaign launch (L-R) Back row: Philip Hassen, Chantal Backman, Pierrette Leonard, Paula Beard, Jonathan Robb, Jody White, Vanda Killeen, Carine Trazo, Robyn Bergen, Joe Gebran. Front row: Tracy Romano, Orvie Dingwall, Kelly Bowman, Erin Pollack, Debbie Barnard, Christa Davis

CIRCLE SESSION NUMBER

EDMONTON,AB
JUNE 10-14, 2007

CHICA-CANADA - CD ORDER FORM

Novice Practitioner Day

NP1 - The Role and Scope of Infection Control
NP2 - The Principles of Routine Practice and Their Application
NP3 - Surveillance
NP4 - Basics of Cleaning, Sterilization and Disinfection
NP5 - Microbiology / Significant Pathogens
NP6 - Outbreak Management
NP7 - Making Recommendations and Communications

Pre Conference Day

PC1 - Infection Prevention & Control Through a Patient Safety Lens
PC2 - Safer Healthcare Now - Infection Prevention & Control
PC3 - Infection Prevention & Control Meets Patient Safety in the ICU
PC4 - Focus Your Surveillance
PC5 - Maximize Data Collection
PC6 - Basic Data Handling
PC7 - Surveillance Results / Implement Change
PC8 - Keeping Up With Technology/Hybrid
PC9 - Incorporating IPC in Facility Design
PC10 - Infection Control During Construction
PC11 - Mold Health Effect Investigations
K1 - President's Address - Joanne Laalo / Opening Address - Philip Hassen

Plenary Sessions

P1 - Using Intervention to Improve Practice - Robert A. Weinstein
P2 - Zero Tolerance for Healthcare - Denise Murphy
P3 - Communities of Practice - John Parboosingh
P4 - Reaching Your Audience - Susan Crichton
P5 - Infection Prevention and Control Vignettes - Jim Gauthier / Diane Roscoe
P6 - Changing, Evolving, Improving - Panel
P7 - IPC Accreditation as a Stand-Alone Prgm. - Karen Hope/Jessica Peters
P8 - Partnering/Public Health Agency of Canada - Jennifer Kruse

Advanced Practitioner Day

AP1 - An Orientation Package for the Novice IPCP
AP2a,b - Mentoring
AP3 - Core Competencies for Infection Prevention and Control Professionals
AP4 - Defining and Developing Your Professional Persona
AP5a,b - Developing a Professional Development Plan
AP6 - Marketing Yourself

CONCURRENT SESSIONS

Clinical Dilemmas

C1 - No Rash Judgement: A Dermatologist's Approach to Rashes - Is It Productive? Approach to Sorting Out Coughs
C2 - Bring on the Cranberry Juice: Urinary Tract Infections in Long-Term Care

Community Dilemmas

C3 - Scope of the Problem / Implications For Acute Care
C4 - Implications For Community

Staff Dilemmas

C5/6a,b - Occupational Hygienist Paradigm of HCW Safety - Infection Control Paradigm of HCW Safety

Innovative Education

C7 - The Pedagogical Value of Stories
C8 - Edu-Tainment

Evidence-Based Practice

C9 - Implementing Evidence Based Practice
C10 - The Evidence Around Promoting Hand Hygiene

Ethical Dilemmas

C11 - Disclosure of Nosocomial Infection
C12 - Care Versus Isolation

Oral Presentations

O1 - Acute Care
O2 - Long-Term Care
O3 - Community and Occupational Health
O4 - Changing Trends in MDROs Pt. 1
O5 - Changing Trends in MDROs Pt. 2
O6 - Evolving Understanding of Respiratory Infection Pt. 1
O7 - Evolving Understanding of Respiratory Infection Pt. 2
O8 - Improving Practice: A Potpourri of Ideas Pt. 1
O9 - Improving Practice: A Potpourri of Ideas Pt. 2

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The International Infection Control Council (I2C2) is a partnership of CHICA-Canada, APIC and ICNA (UK). In 2002, it published the *Infection Control Toolkit: Strategies for Pandemics and Disasters*. With the advent of SARS and the H5N1 influenza virus, as well as other natural disasters and disease outbreaks since 2002, the I2C2 recognized the need to update and revise the previous toolkit. The content has been updated and reformatted into the newest version ***Infection Control Toolkit for Emergencies and Disasters***. The purpose of the toolkit is to assist IPCPs in the preparation and implementation of plans for emergencies and disasters.

The revised toolkit is now available at $120 CDN (member rate) plus shipping & handling and GST.

Future Conference

2008 Conference
May 29-June 5, 2008
Palais des Congrès, Montreal
Headquarter Hotel: Hyatt Regency

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Correction

This is how Primed Medical Products Inc.'s exhibitor listing should have appeared in the spring issue. We apologize for the error.

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Nominations are invited for the following positions:

- President Elect (one-year term)
- Secretary/Membership Director (three-year term)
- Director, Education (three-year term)

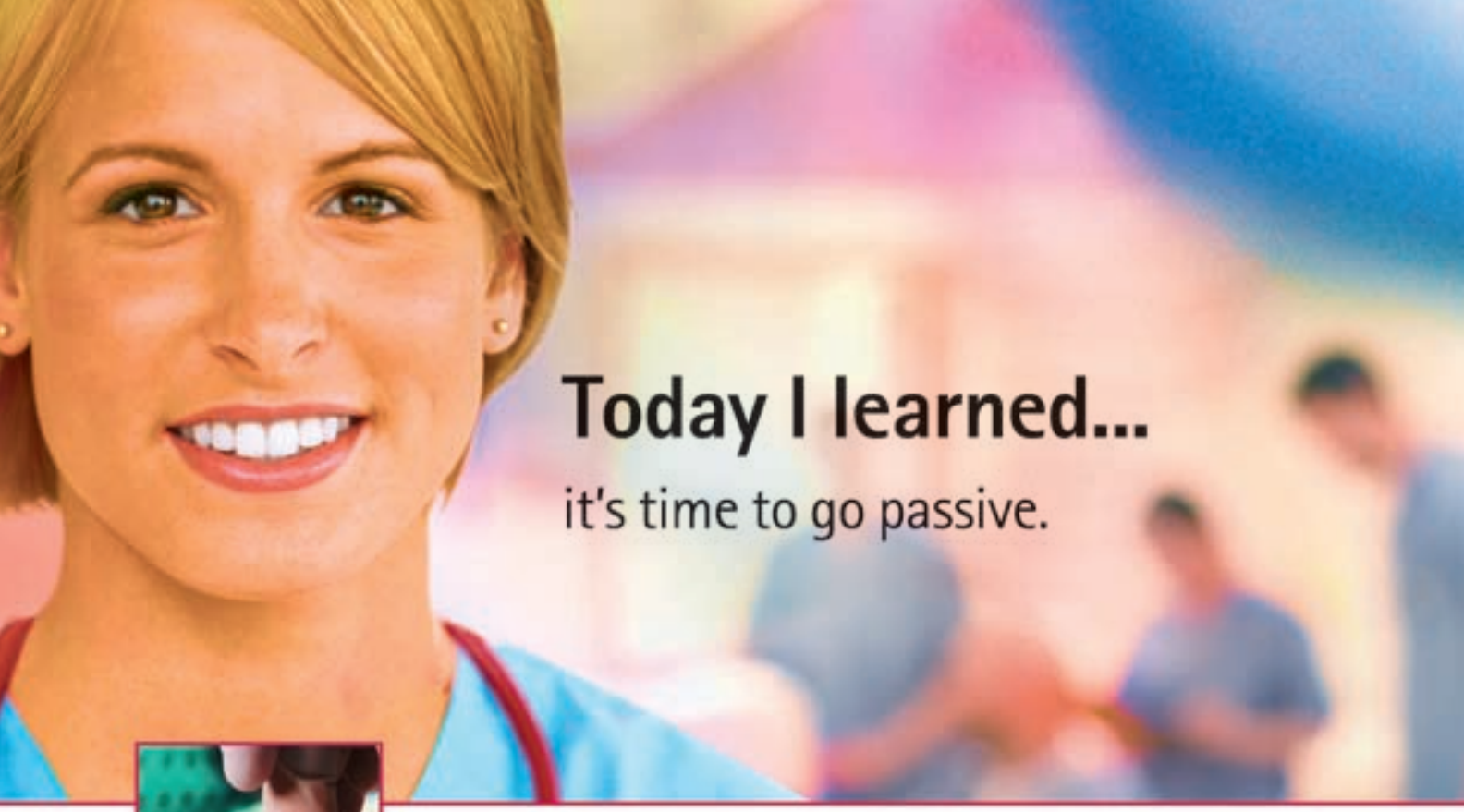
These terms commence January 1, 2008. Position descriptions and nomination forms are found in the CHICA-Canada Policy and Procedure Manual, or may be obtained from the Membership Service Office or downloaded from **www.chica.org** (Members login).

Signatures of two active members are required for each nomination. If you know someone who would be qualified and interested in one of the above positions, send a completed nomination form to:

Pearl Orenstein RN, BA, DIA, CIC
CHICA-Canada Secretary/
Membership Director
c/o Membership Service office
PO Box 46125 RPO Westdale
Winnipeg MB R3R 3S3

Or by courier to:
Pearl Orenstein RN, BA, DIA, CIC
CHICA-Canada Secretary
/Membership Director
c/o Membership Service office
67 Bergman Crescent
Winnipeg MB R3R 1Y9

Deadline for nominations: August 15, 2007.



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[1] Perry, Jane. International Healthcare Worker Safety Center. "Preventing Sharps Injuries: Where Do We Stand in 2007?" Presented at B. Braun Medical, Orlando, FL, Feb. 23, 2007. 2003 EPINet data: Of injuries from safety devices, 44% occurred after use and before disposal (potentially preventable if passive or if safety feature activated).

[2] Mendelson MH, Lin Chen BY, Finkelstein-Blond et al. Study of Introcan safety IV catheter (B. Braun Medical Inc.) for the prevention of percutaneous injuries in healthcare workers [abstract]. Presented at: 13th Annual Meeting of the Society for Healthcare Epidemiology of America (Arlington, VA), 2003.

[3] Inuma Y, Igawa J, Takeshita M, et al. Passive safety devices are more effective at reducing needlestick injuries [letter]. J Hosp Infect 2006 (Dec.); 61 (4): 360-1.

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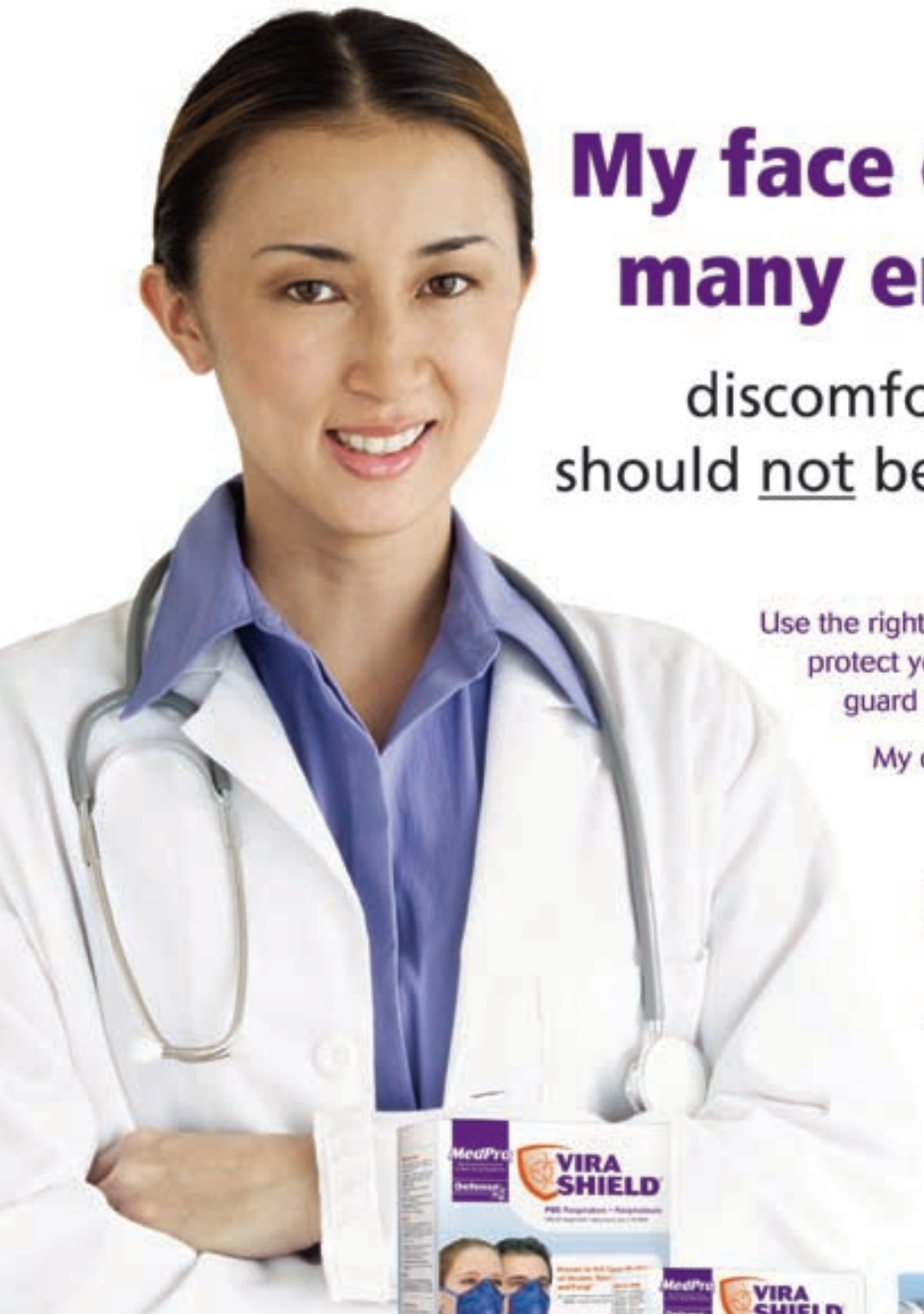

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