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The Canadian Journal of INFECTION CONTROL

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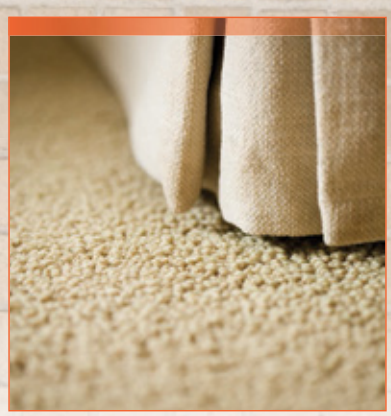

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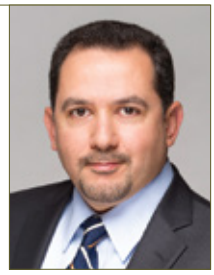
Moving forward: a roadmap for *CJIC* development



Chingiz Amirov, MPH, MSc QIPS, CIC
Editor-in-Chief, *Canadian Journal of Infection Control*

Dear Colleagues,

This is going to be my last Editor-in-Chief message published in the journal. Effective next issue, this section of the *CJIC* will be retired, as peer-reviewed periodicals traditionally do not carry such editorials. However, I'd like to use this last editorial to broadly outline my vision of a roadmap for the *CJIC* development.

As a scientific periodical, we are in the business of *knowledge transfer*. To effectively meet this mandate, publishing articles is not enough. These articles need to be found, read and cited by other peers. This can be best achieved by getting indexed in a bibliographic citation database. For a biomedical journal like *CJIC*, the target database is PubMed/MEDLINE supported by the U.S. National Library of Medicine (NLM).

Getting *CJIC* indexed in PubMed/MEDLINE will be our critical objective for the next few years. Competition for getting indexed in this leading database is stiff. According to NLM, rejection rate currently stands at around 80%. Although there is no exact recipe for getting indexed, we have a good idea of what needs to be done. Our earliest chance of re-applying for a review will be in the spring of 2016. Additional time may be taken to increase our chances of success. Certain critical elements will need to be in place prior to re-application. They can be summarized as increased quality and quantity of content, and improved quality of editorial work. Scientific merit of *CJIC*'s content will be the primary consideration during the review.

Significant progress with these critical elements has been done by my predecessor, Pat Piaskowski, and the Editorial Board. Each of these elements will be fleshed out in greater detail to inform a comprehensive roadmap for *CJIC* development that I am working on now. Ultimately, the roadmap will need support of the IPAC Canada's Board of Directors and the journal's Editorial Board. Importantly, transition to a new iteration of *CJIC* is going to be a delicate balancing act. While making progress towards the above critical elements, it will be equally important to keep the journal cost-effective through our continued work with the publisher and industry partners.

Remember that you, as a member of IPAC Canada, have an important role to play in this process. Ultimately, it is your high-quality manuscripts that will help us get indexed. I strongly encourage all of you to consider submitting your articles to *CJIC* and I am truly excited about possibility of developing *CJIC* into a robust scientific periodical that we all can be proud about.

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Barriers and bridges to infection prevention and control on a surgical unit at a Netherlands hospital and a Canadian hospital:
A comparative case study analysis

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ABSTRACT

Background
The overall aim of this research was to explore why some hospitals are more successful than others at reducing the acquisition rates of multidrug-resistant organisms (MDRO).

Method
Using a socio-ecological perspective on health systems adapted from works in ecological restoration, ecosystems management, and healthcare, a participatory comparative case study design was employed. The study was conducted on a surgical unit at a Netherlands hospital with very low rates of MDRO and a surgical unit in a Canadian hospital with higher rates of these pathogens. Research methods included a total of six unit observations, nine practitioner-led photo walkabouts of the units (n=13), six focus groups (n=26), and the review of relevant policies and procedures.

Results
When looking at the whole system for infection prevention and control in the context of particular environmental design constraints, and where hospital staff have reinforced norms of vigilance to prevent cross contamination, there were multiple conditions or activities at the Netherlands hospital that differed from the Canadian hospital which may have had an impact on the lower MDRO prevalence rates. These conditions or activities included differences in ratios of hospital beds per capita, bed occupancy rates, equipment cleaning processes in place, bed cleaning systems (centralized versus manual) and the presence of an active grassroots Hygiene in Practice group engaging practitioners in several ongoing activities to promote infection prevention and control.

Conclusion
Given these clear differences between the two study sites, it is important to try to generate further evidence-informed rationale for these and other interventions in order to guide health system leaders who need to decide where to allocate finite resources.

INTRODUCTION

Many studies and guidelines have been published in the last 10 years that support the implementation of interventions to prevent and control methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE) and other multidrug-resistant organisms (MDRO). Although published studies have shown successful reductions or elimination of MDRO, several factors limited the ability to draw general conclusions from these results, including differences in definitions of MDRO, study design, outcomes, confounding variables, and periods of follow-up (1). Additionally, the studies in questions were largely descriptive or quasi-experimental in nature (2) and had no explicit theory articulated about infection prevention and control (IP&C) as the basis for the research design.

The use of theory-driven research, which is largely lacking in the patient safety (3-5) and infection control literature (6,7) is beneficial to build theory which more accurately reflects the real world and can possibly, at some point, assist in predicting how intervening in one specific way will affect outcomes. Given the lack of

theoretically driven studies to date in the field, it has not been possible to determine which interventions or specific combinations of interventions are most effective in reducing the incidence of MDRO. In pursuit of contributing to the work of building theory about IP&C in complex health systems, a socio-ecological approach on health systems which draws on several fields (8-10) was used to inform this research design. A participatory research approach was employed to generate and share scientific and local knowledge about the places we inhabit within the larger context of understanding socio-ecological systems as a whole (10-13).

The core elements of the socio-ecological framework that guided this study, adapted from Stokols (14), Waldvogel (15), Struelens (16) and Marck et al. (17) are those of citizen science, place ethic, engaged practice, and adaptive learning and growth. The first element, citizen science, refers to the collaborative approach between researchers and participants to conduct and translate the research into policy and practice (10,12).

TABLE 1: Summary of Statistical Information

Elements	The Netherlands Hospital	Canadian Hospital
Country Level Organization for Economic Co-operation and Development (OECD)		
Total national health expenditure	9.8% Gross Domestic Product (GDP)	10.1% Gross Domestic Product (GDP)
Practicing physicians	3.93 per 1,000 population	2.18 per 1,000 population
Nurses	8.69 per 1,000 population	9.02 per 1,000 population
City Level		
Population	294,742	898,150
Total acute care beds (adult)	2,400	1,598
Hospital Level		
Operating budget	884 million euro = 1.23 billion Can$	$1.08 billion Can$
Number of beds	1,042 144 patient rooms with single beds (14%)	1,174 100 patient rooms with single beds (8.5%)
Admissions	31,420	46,426
Emergency Department visits	22,564	126,850
Outpatient visits	336,000	938,209
Average Length of Stay	7.7 days	7.9 days
Employees	10,668 staff 2,560 Registered Nurses	12,029 staff 3,489 Registered Nurses (RN) and 314 Registered Practical Nurses (RPN)
Infection control program staffing	1.32 FTEs per 250 beds	2.72 FTEs per 250 beds
Unit Level		
Number of beds	34 6 rooms with single beds (18%)	40 4 rooms with single beds (10%)

The second element, place ethic, refers to the need to understand and respect the history, culture, knowledge and rituals of communities (9,18), including what they see as key in providing the care for their patients and their environment. The third element, engaged practice, refers to the ongoing use of self monitoring and feedback to develop and incorporate evidence-informed IP&C practices (9,10) into the way that individuals, teams, and healthcare communities work. Finally, the fourth element, the notion of adaptive learning and growth, refers to the creation and use of strategies to share experiences and learnings with others in order to ensure sustainability (8-10,19,20).

The purpose of this research was to conduct a comparative case study analysis of two hospital units. The two case studies were conducted in order to develop a better understanding of what may be shaping the apparent differences in the prevention of MDRO between a hospital in the Netherlands and a Canadian hospital. The first case study was conducted on a surgical unit in an acute care hospital in the Netherlands, which reported rates of MDRO below 1% (21). The second case study was conducted on a surgical unit at a Canadian hospital, which reported higher rates of these pathogens (22).

METHODS

Case Selection

In order to better understand the nature of IP&C practices in two different countries, two hospitals were selected on the basis that they differed in their rates of MDRO infections, where in the Netherlands, the methicillin-resistant *Staphylococcus aureus* (MRSA) prevalence rate was reported as being less than 1% (23) whereas the overall incidence of MRSA in Canadian hospitals from 1995 to 2007, increased from 0.65 to 11.04 cases per 10,000 patient-days (24). Both these hospitals were also academic health sciences centres of similar size in publicly funded systems. These observations suggested that exploring hospital practices on these units in these two countries might reveal critical differences that might shed light on their different acquisition rates.

Although these two hospitals were similar in size, with comparable average length of stays, the number of patient rooms with single beds and the total number of acute care beds available per capita were much greater in the Netherlands. Furthermore, the city in the Netherlands was much closer to agricultural production, while the Canadian city was very urban. In addition, the volume of admissions, emergency department visits, and outpatient visits differed greatly. There were also differences in the composition of the healthcare workforce, with almost twice the proportion of practicing physicians per 1,000 population in the Netherlands as in Canada, but only half the proportion of designated infection control professionals in the Netherlands hospital as in the Canadian hospital. A summary of statistical information on the two case study contexts is available in **Table 1**.

The first case study was conducted on a 34-bed surgical unit at a Netherlands hospital consisting of orthopedic, cosmetic, urology, general surgery and no off-service patients. The second case study was conducted on a 40-bed unit at a Canadian hospital with a general surgery, otolaryngology and ophthalmology population as well as off-service patients due to overcapacity. These two units were selected for their similar patient populations.

Data Collection

This study involved two comparative case studies. Ethical approval was obtained by each hospital's Research Ethics Board. The data collection methods conducted by the lead author (CB) included six field observations of the clinical units, the collection of IP&C policies and procedures, nine practitioner-led photo walkabouts (n=13), six focus groups (n=26) to review and obtain further discussion about the narratives and photographs collected during the walkabouts, and the collection of MDRO rates.

Data Analysis

Following successive iterative analyses of the individual case studies, a cross-case synthesis technique [25,26] was used to compare and contrast perspectives and analyze themes found in the two case studies.

FIGURE 1A: The Netherlands hospital – 4-bed patient room (IC-24)

FIGURE 1B: Canadian hospital – 4-bed patient room (C-MG-60)

Results

The two case studies had the following similar themes:

1. Considerable IP&C challenges were inherent to the design of the clinical unit.
2. Nurses and other staff employed a wide variety of workarounds to try to adapt to the design of their care environment.
3. Participants viewed organizational and team cultures as integral to the way they enact IP&C practices in their workplaces.
4. In the face of numerous system constraints, participants viewed engaged leadership as important for IP&C.

Some key findings for each of these themes are compared below.

Considerable IP&C challenges were inherent to the design of the clinical unit.

At the Netherlands hospital, the 34-bed unit consisted of six single-bed patient rooms, 10 two-bed patient rooms, and two 4-bed patient rooms, with shared bathrooms in the two-bed and four-bed rooms. Similarly at the Canadian hospital, the 40-bed unit consisted of eight single-bed patient rooms, 12 two-bed patient rooms, and two four-bed patient rooms, also with shared bathrooms for the 2-bed and 4-bed rooms. Photographs of the four-bed patient rooms on the study unit at the Netherlands hospital (**Figure 1 (a)**) and at the Canadian hospital (**Figure 1 (b)**) are presented below.

Although the configurations of these rooms were quite different, both hospi-

FIGURE 2A: The Netherlands hospital - Equipment in hallway (MGMT-37)

FIGURE 2B: The Netherlands hospital - Linen storage closet (IC-66)

FIGURE 3A: Canadian hospital - Equipment in hallway (C-HK-01)

FIGURE 3B: Canadian hospital - Linen cart in hallway (C-NS-16)

FIGURE 4A: The Netherlands hospital - Dirty utility room (IC-43)

FIGURE 4B: Canadian hospital - Dirty hold (C-NS-08)

tals had four-bed patient rooms. In the Netherlands, the four-bed rooms were located in the corners of the unit, with the beds forming a L shape; in Canada, the four beds were facing each other with two bays on each wall. Nonetheless, shared bedrooms and bathrooms are a common IP&C problem in most hospitals across the globe (27,28).

Lack of storage space on the units was another environmental challenge for both case study sites. Both hospitals stored equipment in the hallway. At the Netherlands hospital, for example, the photograph in **Figure 2 (a)** shows the storage of a housekeeping cart, a wound dressing cart, a blood pressure machine, and a dirty linen cart in the hallway. Despite the presence of equipment in the hallway, though, the Netherlands hospital has many storage areas on the unit. For example, **Figure 2 (b)** displays a photograph of the linen closet. This storage limits the number of individuals who access the linens and thus reduces the chances of cross-contamination.

In the hallway of the Canadian hospital, **Figure 3 (a)** illustrates that there were several carts (e.g., isolation, linen) and blood pressure machine visible. Contrary to the Netherlands hospital, there were no storage area for linen supplies, and thus the cart is kept in the hallway where it is accessible to all the staff, patients, and visitors (**Figure 3 (b)**).

At the Netherlands hospital, there was one dirty utility room on the unit (**Figure 4 (a)**). By contrast, at the Canadian hospital, there were no dirty utility rooms on the unit. There was only a very small dirty hold outside of the patient rooms (**Figure 4 (b)**). During the focus group with the support staff, a participant explained that: "the dirty hold, at least that's accessible for [when] you have something dirty… And it is labelled. Yeah, it's labelled, it's clear. So even visitors, if they're looking around for something they know that it's a dirty area" (FG support staff, P8, 664).

At the Canadian hospital, the dirty utility room is located off the unit near the elevators. The housekeeping manager explained: "You have to leave the unit to go to the soiled utility room and I would like for your analysis to remark the distance that a worker has to travel no matter who it is, to bring something soiled and so that begs the question because it's not easy access, are people just dumping soiled equipment in the hallway" (PW housekeeping manager, P5, 1094).

In addition, in both hospitals, there was often very little space for nurses to set up their necessary supplies in order to provide care for the patient. For example, at the Netherlands hospital, the patient's bedside table contained many patient belongings. The nurse had set up two basins to bathe the patient (**Figure 5 (a)**).

Similarly, at the Canadian hospital, patient belongings and extra supplies were found on the windowsill and bedside table (**Figure 5 (b)**) thus making it challenging for nurses to set up their supplies in the room. It is evident by these photographs that nurses need more space to work as well as adequate, easily cleaned surfaces on which to place patient care equipment.

"It is evident by these photographs that nurses need more space to work as well as adequate, easily cleaned surfaces on which to place patient care equipment."

Nurses and other staff employed a wide variety of workarounds to try to adapt to the design of their care environment.

The environmental design of both hospitals creates many challenges to IP&C practices and lead staff to develop and adopt a variety of workarounds. An example was the equipment cleaning process at both hospitals. At the Netherlands hospital, the unit developed a process whereby they stored clean equipment in one hallway (**Figure 6 (a)**) and dirty equipment in another hallway to minimize the chances of someone taking dirty equipment for use with another patient. Furthermore, a checklist was developed at the Netherlands hospital to clearly identify who, when, and how each piece of equipment should be cleaned (**Figure 6 (b)**). This checklist was posted in the dirty utility room of the unit.

During the photo walkabout with a Netherlands nurse, she explained that the equipment in this hallway is clean and the equipment in the other hallway is dirty. The staff are aware of this process and when they need a patient table, for example, they know which side of the hallway to obtain a clean table (PW nurse, P9, 201).

At the Canadian hospital, some nurses held that the cleaning of equipment is the responsibility of the housekeeping staff. The nursing staff did not seem to be aware of any guidelines indicating who was responsible for cleaning equipment. However, the patient lift below had a sign indicating that housekeeping had cleaned it (**Figure 7**). Although the labeling is a clear mechanism for accountability at the Canadian case study site, a related critical step seems to be in doubt, which is that staff need to consistently remove the sign once they have used the equipment to ensure that it is not re-used on another patient until it is re-cleaned again. As a participant explained: "It's excellent; the only thing is that it's only as good as, as long as the nurse takes off the sign once it's been used, right. Because housekeeping's not going to go re-clean that until that sign's off. But someone has to, there's a human element; someone has to actually remove the sign to say I've used it. Ideally this should be stored

"The environmental design of both hospitals creates many challenges to IP&C practices and lead staff to develop and adopt a variety of workarounds."

FIGURE 5A: The Netherlands hospital - Patient's bedside table (MGMT-38)

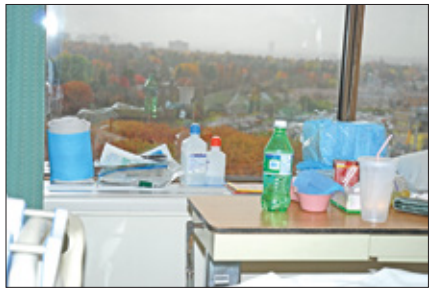


FIGURE 5B: Canadian hospital - Patient table (C-MG-34)

FIGURE 6A: ***(above)*** The Netherlands hospital - Clean equipment in this hallway (NURS-12)

FIGURE 6B: ***(right)*** The Netherlands hospital - Cleaning checklist (NURS-20)

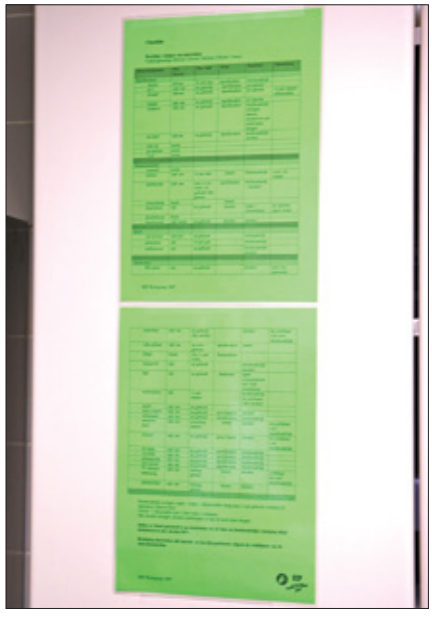
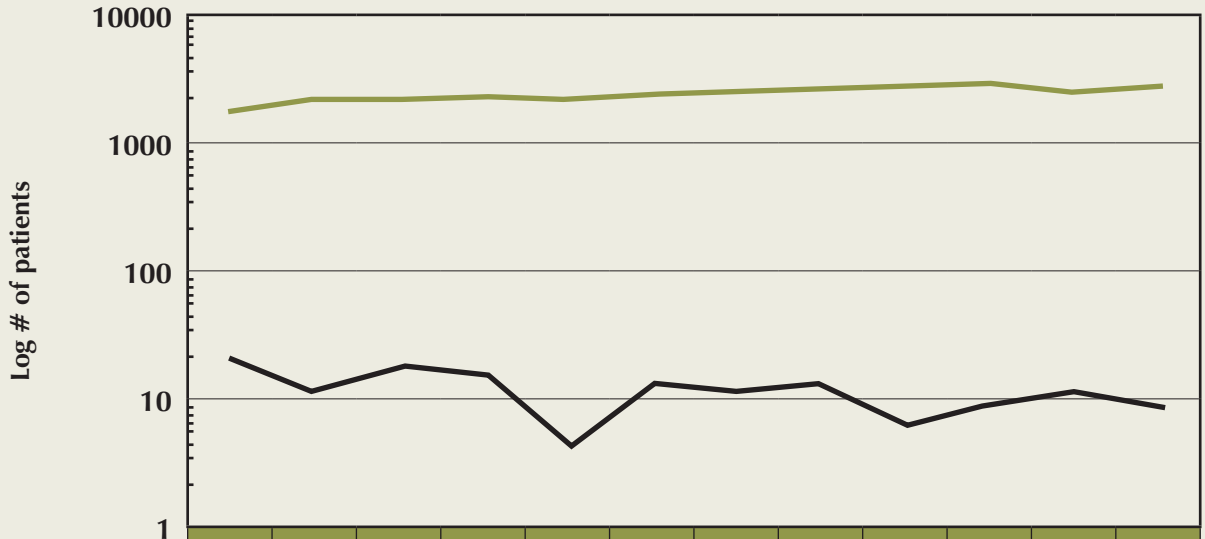


FIGURE 7: ***(below)*** Canadian hospital - Lift in hallway with clean sign (C-MG-52)

FIGURE 8: Cross-Case Comparison of the number of admitted patients screened for MRSA



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	21	12	20	16	6	12	11	12	7	9	11	9
CAN Hospital	1573	2113	2267	2422	2460	2367	2494	2501	2522	2620	2410	2593

in a clean hold somewhere, because obviously anyone coming by can touch it with soiled hands so that's the only thing" (FG management, P9, 495).

Furthermore, another Canadian participant explained that there is often: "no label to say whether [the equipment is] clean or dirty. And usually you get a bad surprise when you pull up the seat and you see, I guess [this commode] has not been cleaned. It's just the general principles of the clean should be put away somewhere as opposed to just out there [in the hallway]" (FG management, P9, 443).

According to a key informant, housekeeping is expected to put a "clean" label on the equipment and nursing is then supposed to remove it upon use. However, this process has not been audited to see how well this is being followed.

Participants viewed organizational and team cultures as integral to the way they enact IP&C practices in their workplaces.

Culture is reflected by the kinds of communication that occur within a team; effective communication is important in order to obtain optimal patient outcomes (29). At the Netherlands hospital, a clear communication strategy was the isolation card found posted underneath the room number. The card read "barrière-box" isolation with gloves and gowns symbols (Observations, P1, 19). A participant said that: "with the isolation room you have this card so everybody who enters the room knows that this is happening and what you have to wear" (PW housekeeping staff, P5, 95).

An example of effective communication at the Canadian hospital that promotes a culture of safety was demonstrated on the unit. When a patient is discharged, the isolation sign is left up until the housekeeper has cleaned the room. The housekeeping manager explained that: "On the bottom of each sign, it says that 'only housekeeping staff can remove the sign…and then when the housekeeper removes it and he does all his checklists, he hands this in as proof that it was done using the proper techniques" (PW housekeeping P5, 638).

However, examples of ineffective communication regarding IP&C were also discussed at both study sites. For instance, at the Netherlands hospital, a participant stated: "There's not enough information to the staff about infection control measures during a [patient] transport. They wear gowns and gloves when they're in the room but they don't tell the staff what to do during transport, so they're not informed" (FG Management, P12, 121).

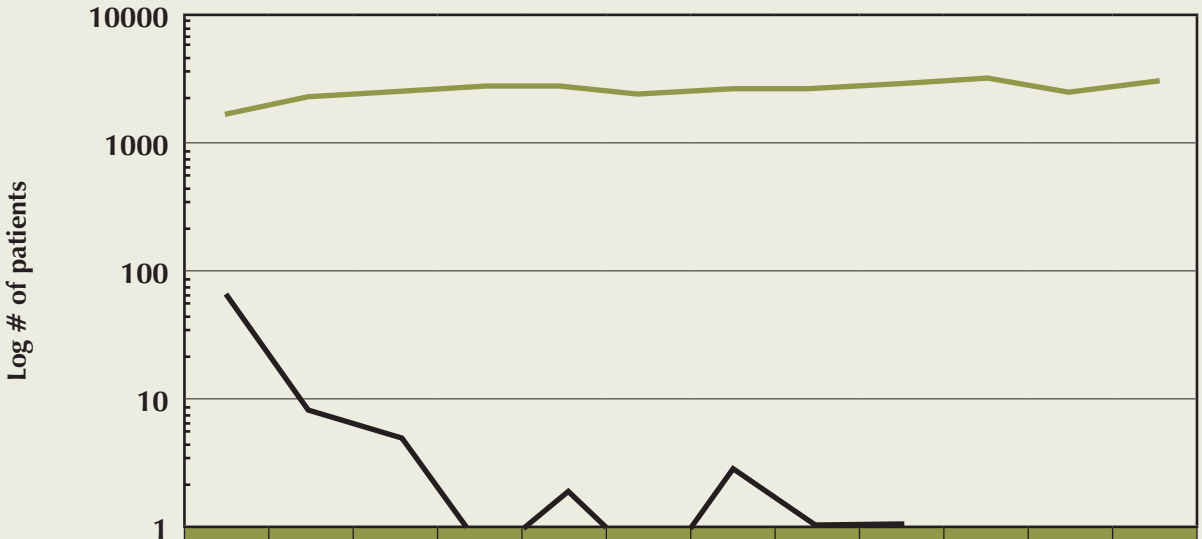
Similarly problematic communication was presented at the Canadian hospital by a participant who explained: "There's a specific code for an isolation patient in the patient tracking system that rarely gets used. I mean if it is used, when the porter picks up the call it says, patient on isolation so he knows right away that he needs to get his [personal protective equipment]. But I mean it's so very rarely used, the [porter] gets to the room and says: I didn't know, nobody told me...the patient wasn't [coded] in the system as an isolation patient" (FG support staff, P8, 947).

These examples indicate that sufficiently clear mechanisms to promote effective communication amongst staff are not always in place, a factor that can contribute to the occurrence of preventable adverse events (29).

In the face of numerous system constraints, participants viewed engaged leadership as important for IP&C.

As a critical component of organizational

FIGURE 9: Cross-Case Comparison of the number of admitted patients screened for VRE



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	59	9	5	0	2	0	3	1	1	0	0	1
CAN Hospital	1550	2080	2241	2396	2444	2338	2478	2477	2519	2595	2381	2560

governance, engaged leadership was identified in both study sites as important for supporting consistent IP&C practices within an organization. An example which requires engaged leadership and governance both within and external to individual healthcare organizations, was the management of the bed occupancy issues. Overcapacity can be a significant barrier to IP&C in hospitals. The city in the Netherlands had 8.0 acute care beds per 1,000 population; whereas the number of acute care beds was much lower (1.77 beds per 1,000 population) in the Canadian city.

The average bed occupancy rate reported, at the Netherlands hospital, was estimated at approximately 80% whereas at the Canadian hospital, the average rate was 98.5%. Although, these rates differed slightly in their calculations (e.g., the Netherlands hospital did not factor in bed closures); nonetheless, the Netherlands hospital did not appear to have the overcapacity issues that were present in the Canadian hospital during the study period. In order to minimize the impact of high bed occupancies, management had developed policies and procedures at the Canadian hospital. For example, bed management meetings were held daily. In attendance were the patient flow managers and the clinical managers. A clear policy and procedure was developed to ensure communication and a consistent approach to the issues.

Another activity that requires management support was antibiotic prescribing policies. Antimicrobial stewardship is a key process in the prevention and spread of MDRO. At the Netherlands hospital, a yearly antibiotic usage report was published and shared with the department heads. The antimicrobial Defined Daily Dose (DDD) was 62.2 per 100 patient-days. Comprehensive antimicrobial data was collected including the defined daily dose (DDD) but antimicrobial was not prospectively controlled. The Canadian hospital, on the other hand, did not collect DDD data but carried out retrospective reviews of appropriate use of selected drugs (e.g., vancomycin, meropenem, fluconazole). The designated antimicrobial pharmacy specialist reviewed these target antibiotics on a periodic basis and made a determination about the appropriateness of use. The information was presented to the Antimicrobial Subcommittee of the hospital and antibiotic house staff education sessions were provided as needed.

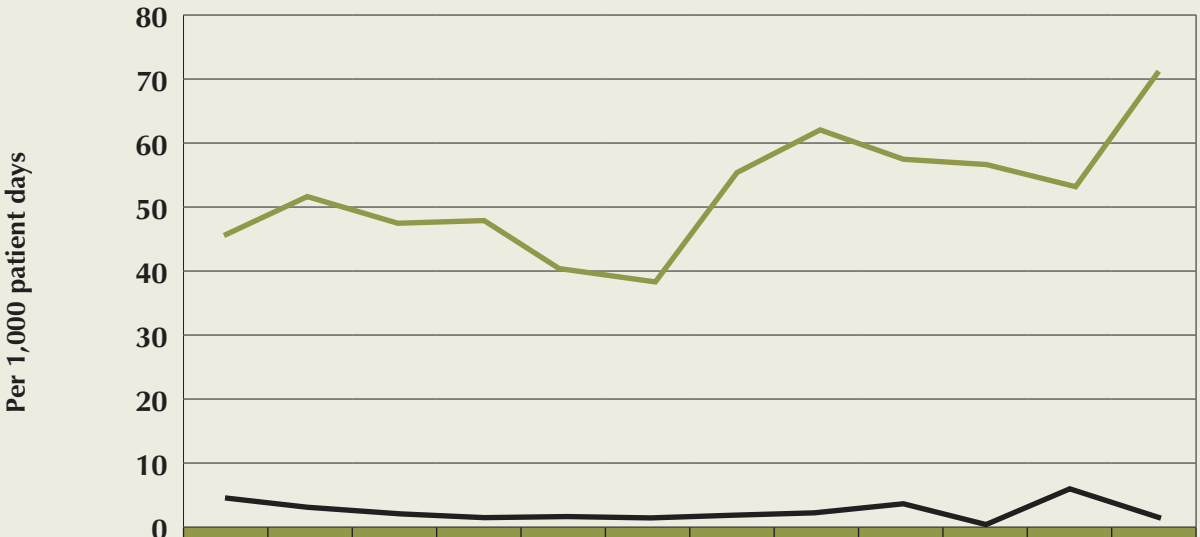
It is also evident that management in both study sites supported a variety of environmental cleaning processes, but with some possibly important differences. At the Netherlands hospital, a centralized hospital-wide bed cleaning system was in place. A physician participant pointed out: "a bed that's going off the unit to be cleaned... It's going to be washed... in this building; it's like a car wash" (PW physician, P8, 272).

As another Netherlands participant noted: "What a good system...beds are cleaned well at the central bed cleaning department" (FG health professionals, written comments, P26, 08).

This preferred method to manual cleaning provided consistent cleaning procedure with high temperatures (Dutch Working Party on Infection Prevention, 2007). However, at the Canadian hospital, beds were manually cleaned on the unit by the housekeeping staff when a patient was discharged.

Over 10 years ago, the search-and-destroy strategy for MRSA was implemented at the Netherlands hospital. The strategy consisted of the screening of high-risk patients which included mainly patients admitted from foreign hospitals and individuals who had come into close contact

FIGURE 10: Cross-Case Comparison of MRSA Prevalence Rates



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	5.01	3.25	1.69	1.66	1.77	1.66	1.74	1.94	3.6	0	6.69	1.67
CAN Hospital	46.51	51.29	48.85	48.97	40.53	38.71	55.94	62.71	58.86	57.95	53.62	71.05

with live pigs or calves. Screening cultures were taken when MRSA was suspected or to rule out MRSA contamination. The Canadian hospital implemented a universal MRSA screening strategy where all patients were swabbed for MRSA and VRE on admission. The number of admitted patients screened for MRSA and VRE is presented in **Figure 8** and **Figure 9**.

The prevalence rates for MRSA, VRE, CDI and extended spectrum beta-lactamases (ESBL) were compared in **Figures 10** to **13**. During the study, only high-risk patients at the Netherlands hospital were screened whereas at the Canadian hospital, all patients were screened on admission.

Furthermore, despite the overall common themes between the two individual case studies presented above, the following themes differed between the two cases:

1. Participants who engaged in communal practice activities tended to monitor and support the use of recommended IP&C practices (Case Study 1 only) (21).
2. The use of knowledge about IP&C supported adaptive learning and growth (Case Study 1 only [21]).
3. Common practices posed barriers to sound IP&C (Case Study 2 only) (22).

Participants who engaged in communal practice activities tended to monitor and support the use of recommended IP&C practices.

Findings for this theme were only evident in the Netherlands hospital case study. For example, there was presence of a group called Hygiene in Practice (HIP), consisting of clinical staff, to develop and implement sound IP&C practices on the clinical units across the hospital. This concept of a community of practice provided a forum for engaged practice where groups of professionals worked on initiatives to create, implement and evaluate evidence-informed care improvements. This type of community of practice, or any similar forms of communal IP&C practice groups, was not identified in the Canadian hospital.

The use of knowledge about IP&C supported adaptive learning and growth.

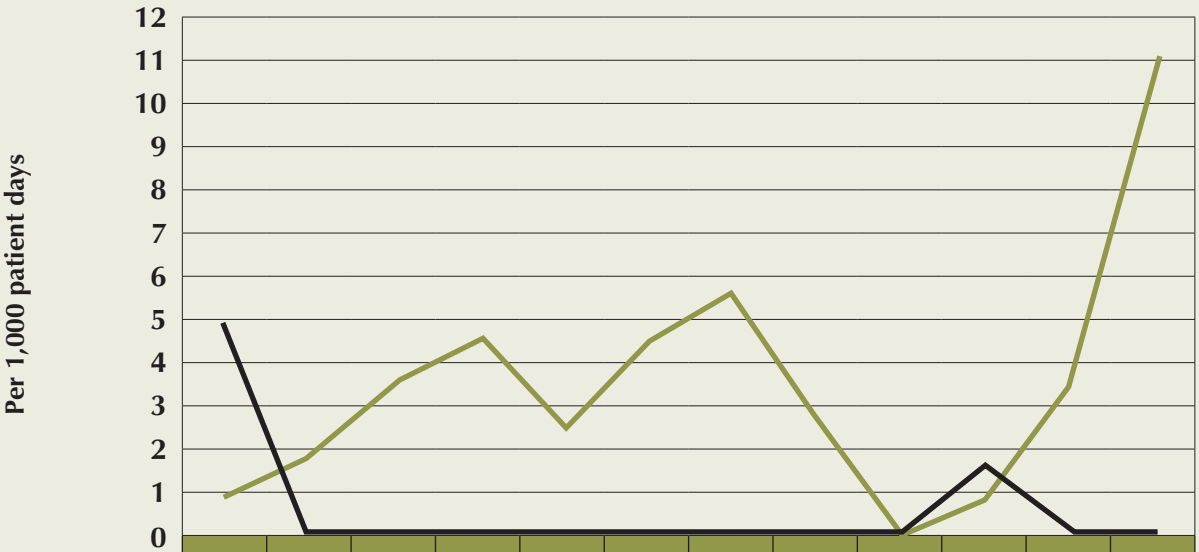
At the Netherlands hospital, the evidence-informed IP&C education provided by the grassroots HIP group built on the current staff knowledge and experience and was geared to address gaps in practice. This kind of coordinated educational initiative provided a strong example of adaptive learning and growth. At the Canadian hospital, there was not a consistent or standardized approach to IP&C education across the organization. IP&C education was provided at a program level to staff by their respective clinical educators. While there was no question that useful learning may be occurring with these non-standardized approaches, it was not possible to accurately assess what standardized learning was actually taking place.

Common practices posed barriers to sound IP&C.

At the Canadian hospital, participants were concerned with some common practices that did not support recommended infection control practices on the unit. For example, some participants were concerned that the patient equipment was not cleaned consistently before and after patient use. At the Netherlands hospital, mechanisms were put in place to ensure that all staff were aware of their responsibilities related to equipment cleaning.

Overall, it was difficult to confidently speculate why the themes discussed above were only present in one case study and not the other. Potential

FIGURE 11: Cross-Case Comparison of VRE Prevalence Rates



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	5	0	0	0	0	0	0	0	0	1.7	0	0
CAN Hospital	0.91	1.77	3.62	4.53	2.76	4.5	5.69	2.94	0	0.89	3.46	11.07

explanations may include the differences between the two sites in grassroots involvement in IP&C, in approaches to IP&C education, and in the methods in place to ensure sound IP&C practices.

Discussion

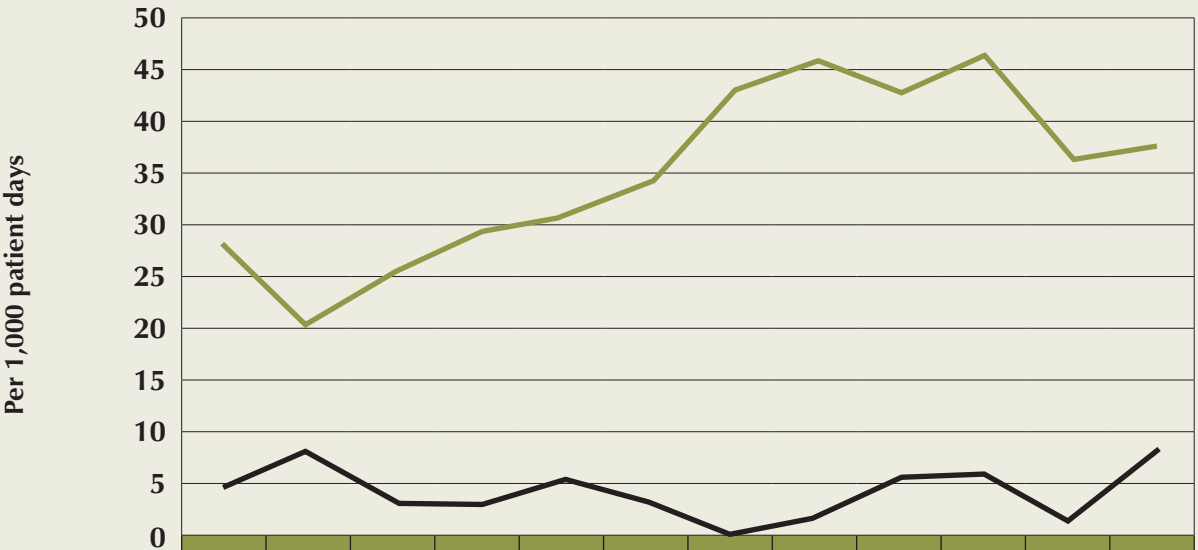
The key findings provided a starting point to better understanding the system for IP&C through the practitioners' experiences in these two organizations and demonstrated that there were several similar and different practices in place for IP&C in both hospitals, as well as a lack of comparable data between the two cases.

Common findings across both cases included the perceived importance of engaged leadership, a lack of antibiotic prescribing restrictions, the presence of environmental design issues and the frequent use of workarounds that may be problematic for IP&C. Emerging research suggests that engaged leadership and board involvement is associated with improved patient outcomes (30-32). Other experts (33-35) and organizations such as the Institute for Healthcare Improvement have also examined board engagement related to quality. In addition to these studies and reports, healthcare safety experts argue that senior leaders and boards need to engage with their healthcare organizations in ways that enable them to gain a better understanding of the quality issues that characterize their environments (33,36,37). This engagement includes working with practitioners and other stakeholders to help develop more effective means of monitoring and addressing the "ability to deliver safe, effective, high quality care within organizations with the right cultures, the best systems and the most highly skilled and motivated workforces" (36) (p. 8). Both hospitals had reporting structures that provide IP&C related information to the Board of Directors. What is less clear and warrants further study in future work is, as Ramsay et al. (32) suggest, the precise nature of the inter-relationships between internal governance, external governance, and incidence of HAI.

Furthermore, the appropriate use of antimicrobial agents (antimicrobial stewardship) was critical in reducing the emergence of antimicrobial-resistant organisms. Although the Netherlands hospital produced an antibiotic usage report on a yearly basis, and the Canadian hospital carried out retrospective reviews of the appropriate use of selected antibiotics, neither hospital had any mechanisms in place to restrict antibiotic use. As hospital pathogens become more resistant, stringent guidelines need to be implemented to support the judicial use of antibiotics (38).

Another common finding across both cases was the environmental design issues which often lead healthcare providers to use workarounds. According to Amalberti and colleagues (39), workarounds in complex healthcare systems may be conceptualized as the "adaptation of procedures by workers to deal with the demands of the work" (p. i67). Overall, the design of the unit can also have a strong influence on the risk of MDRO contamination. Joseph (27) and Ulrich (28) recommended single patient-bed rooms each with private washrooms as well as appropriate storage on the unit for all new construction. In addition, adequate access to ABHR or soap and water at point of care is necessary in order to reduce cross contamination in multiple patient rooms. According to the World Health Organization (40), the ABHR dispensers should be located at point of care. In addition, Creedon (41), Suresh et al. (42) and Harbarth et al.(43) supported the notion that ABHR

FIGURE 12: Cross-Case Comparison of CDI Prevalence Rates



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	5	8.13	3.37	3.32	5.31	3.32	0	1.94	5.4	5.12	1.67	8.33
CAN Hospital	28.27	20.34	25.32	29.02	31.32	34.21	43.62	46.05	43.46	46.36	36.33	37.83

dispensers should be located in many convenient locations around the unit.

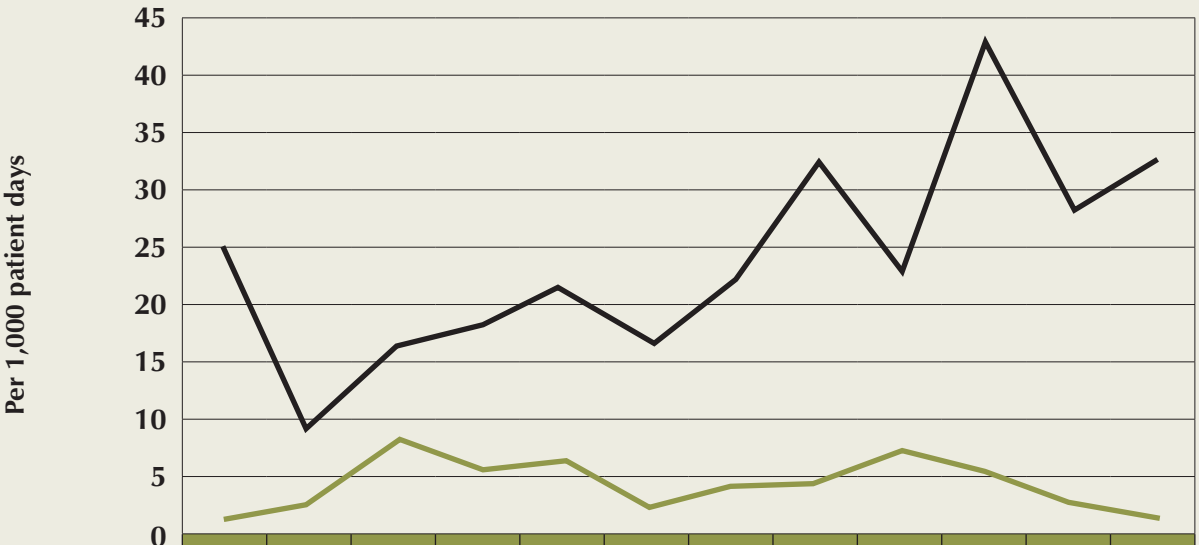
When looking at the whole system for IP&C in the context of particular environmental design constraints, and where hospital staff have reinforced norms of vigilance to prevent cross contamination, there were multiple conditions or activities at the Netherlands hospital that differed from the Canadian hospital which may have had an impact on the lower MDRO prevalence rates. These conditions or activities included differences in ratios of hospital beds per capita, bed occupancy rates, equipment cleaning processes in place, bed cleaning systems (centralized versus manual) and the presence of an active grassroots Hygiene in Practice group engaging practitioners in several ongoing activities to promote IP&C. Given these clear differences between the two study sites, it is important to try to generate further evidence-informed rationale for these and other interventions in order to guide health system leaders who need to decide where to allocate finite resources.

Research has shown that bed occupancy rates can have a significant impact on the rate of MDRO infections (44-47). Studies have shown that occupancy rates higher than 90% have higher MRSA infection rates than those with rates below 85% [48,49]. The bed occupancy rate was approximately 80% in the Netherlands hospital and 98.5% in the Canadian hospital. Occupancy rates were often near or above 100% at the Canadian hospital. Once bed capacity was reached, patients were admitted in the hallways or common areas and were at higher risk of infections due to "overworked staff who try to care for these patients in an environment that makes it difficult to follow best practices" (50) (p.20). This supports the idea that bed occupancy rates may provide a useful indicator of a hospital's ability to control or eradicate MDRO infections. At the health system level, one of the possible causes of overcapacity at the Canadian hospital study site may be the unusually low number of acute care beds available for the population served. Other contributors may include inadequate access to timely public health, primary healthcare, and home care services and inadequate access to appropriate assisted living and long term care facilities.

The findings also suggested that we need a better understanding of which kinds of environmental cleaning are most important for IP&C and in what contexts. Current evidence indicates that equipment should be cleaned and disinfected between each patient to avoid cross-contamination (51). Enhanced environmental cleaning has shown to decrease environmental contamination of MDRO (52) and decrease the likelihood of patients acquiring HAI (53-56). However, the centralized bed cleaning system at the Netherlands hospital is a process not common in North America. Further research on the effectiveness of this method in limiting MDRO transmission is needed. The different approaches (centralized versus manual) to bed cleaning practices warrant further investigation in regards to the effectiveness of these techniques at reducing hospital infections.

Unique to the Netherlands hospital case study is the Hygiene in Practice (HIP) group, a grassroots community of practice that oversaw, implemented and promoted evidenced-informed IP&C practices in the hospital. Healthcare workers who take ownership of the infection control issues on their unit can significantly improve MDRO rates (Plexus Institute, unpublished report, 2009). While we are well aware of the benefits of the support from IP&C experts, it is worth exploring which kinds of

FIGURE 13: Cross-Case Comparison of ESBL Prevalence Rates



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NETH Hospital	25	9.76	16.9	18.2	21.2	16.6	22.6	32.9	23.4	42.7	28.4	33.3
CAN Hospital	1.82	3.54	8.14	5.44	6.45	3.6	4.74	4.9	7.24	5.35	3.46	1.85

community of practice (e.g., unit-based practitioner-led or IP&C-led) have the most positive influence on IP&C practices in which contexts.

The research findings also revealed a lack of comparable findings between the two cases on the aspects of hand hygiene audit protocols (observations versus product measurement), surveillance and control strategies (high risk versus universal screening), reporting of acquisition rates (prevalence versus incidence rates), and the nature and extent of high risk populations for community-acquired methicillin-resistant *Staphylococcus aureus* (e.g., people in contact with pigs, veal calves or other livestock versus drug users, homeless people and prisoners) in the two hospitals' catchment areas. Hand hygiene adherence rates between the two hospitals were not comparable. The method used to monitor adherence to hand hygiene practices at the Netherlands hospital was measuring the unit-based consumption of alcohol-based hand rub (ABHR). In contrast, the Canadian hospital used direct observations. According to the World Health Organization, direct observation is the recommended method to monitor hand hygiene compliance. Monitoring product consumption does not determine if proper hand hygiene was performed. Furthermore, the amount of product consumed may not be accurate, as it could also include the quantity of product used by visitors and patients (40).

Many IP&C guidelines recommend either universal (all patients) or targeted (high risk patients) MRSA and VRE screening on admission (21,57,58). The significant differences in screening strategies for MRSA and VRE between the Netherlands hospital, which conducted high risk screening only, and the Canadian hospital, which conducted universal screening of all patients on admission, can have an impact on the differences in reported rates. At the Canadian hospital, we would expect to detect more cases because all patients were screened (universal screening), whereas in the Netherlands only the high-risk population was screened.

Another challenge was the difference in reporting of MRSA, VRE, CDI and ESBL rates between the two hospitals. At the Netherlands hospital, only prevalence rates of MRSA, VRE, CDI and ESBL were reported, whereas at the Canadian hospital, incidence rates of these pathogens were reported. In order to allow for some comparison between the two hospitals, prevalence rates were obtained from the Canadian hospital. It is not possible, however, to distinguish between hospital-acquired and community-acquired MRSA cases. The high-risk groups for community-acquired MRSA differed between these two countries. In the Netherlands, the high risk group was people in contact with pigs, veal calves or other livestock (Dutch Working Party on Infection Prevention, 2007) whereas in Canada, the high risk group included: injection drug users, homeless people, the incarcerated, and native aboriginals (First Nations people) (24).

In the Netherlands case study, the monthly MRSA prevalence rate ranged from 0 and 0.67% which was consistent with the rate of less than 1% (23) published in the literature. In the Canadian case study, the monthly MRSA prevalence rate was greater, ranging from 3.87 and 7.11%. The monthly VRE prevalence rate in the Netherlands case study ranged from 0-0.5% compared to 0-1.1% in the Canadian case study. Also, the CDI prevalence rate was lower, ranging from 0 and 0.8% in the Netherlands case study compared to 2.03-4.64% in the Canadian case study. However, the monthly ESBL prevalence rate was higher, 0.98%-4.27%.

"There were several limitations to the study. It was possible that staff on the study units may have altered their behavior during unit observations."

in the Netherlands case study compared to 0.18-0.81% in the Canadian case study. Although MRSA, VRE and CDI rates may be below 1% in the Netherlands case study, other pathogens such as ESBL did not appear to be as controlled. This increase was seen in all European countries, and it had been suggested that colonization of the food-producing animals (especially poultry), facilitated through antibiotic use, lead to the contamination of meat. It is unknown yet, if food contamination was the source of this high prevalence in European hospitals (59).

There were several limitations to the study. It was possible that staff on the study units may have altered their behavior during unit observations. The use of multiple methods of data collection was intended to minimize these potential sources of bias. It was difficult to compare some key empirical elements between the two cases because of the different IP&C data collection and reporting methods carried out by each hospital. As previously indicated, for instance, hand hygiene observations were performed in the Canadian study site and the consumption of the ABHR was calculated in the Netherlands site. Because the case study hospitals used different antibiotic resistant measures (total prevalence count of isolates for one case and nosocomial incidence rates for the other), all data were converted to prevalence rates to allow for comparison. This data collected by others, however, limited the possibility of determining the proportion of MDRO that were hospital-acquired versus imported or community-acquired. Organizations should aim at adopting standardized practices at the national and international level (i.e., World Health Organization, Organisation for Economic Co-operation and Development (OECD), etc.) in order to facilitate better comparison of data. Comparable data would provide better information to drive health policy changes. Furthermore, only one clinical unit at each hospital was studied in this research, which means that the findings, while qualitatively rich and analyzed with a whole systems perspective, need to be interpreted cautiously. It is possible that hospital-wide, regional, or even country-wide factors could account for some of the differences in rates.

CONCLUSION

There is ongoing urgency in the field of infection control to respond to outbreaks without strong levels of evidence. This clinical reality cannot be dismissed, but there are several common findings across both cases that merit further study in our ongoing efforts to develop and translate evidenced-informed IP&C programs into policy and practice. It is equally important in future research to further investigate the significance of health system and organizational practices where there were disparate findings between cases, such as the differences found between the Netherlands and Canadian study sites in ratios of hospital beds per capita, bed occupancy rates, staffing practices, equipment cleaning processes, and bed cleaning systems (centralized versus manual), as well as the presence or absence of unit-based IP&C communities of practice.

As future studies are designed, the findings and methodological challenges identified in this study suggest that case selection in future comparative IP&C case studies should be based on an expanded list of criteria. These criteria should include comparable audit, surveillance and reporting practices and comparable demographic and other relevant data, such as data on the agricultural practices within and demographic attributes of vulnerable populations within the hospital catchment areas.

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Why low pH does not necessarily mean skin irritancy

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KEY WORDS: Skin irritation, pH, pKa, hydrogen peroxide, disinfecting hand soap

ABSTRACT

It is a perception of most end-users of cosmetic and skin hygiene products that low or high pH, as opposed to "neutral," is related to skin irritation or, even worse, of skin breakdown. The marketing claims, in favor of neutral pH, used for advertising cosmetic products have a lot to do with this situation. From a toxicological point of view, low or high pH cannot be considered as a single factor for predicting the innocuousness of a cosmetic formulation.

Most end-users of skincare products focus on the pH. To them, a "good pH" is a "neutral pH" which is perceived as neutral to the skin but not necessarily as being the middle value (1) of the pH scale established from 0 to 14. Without describing all possible other factors that may truly be responsible for dermatitis, this paper should assist prescribers, infection control professionals (ICPs), and purchasers of microbicidal products in particular to understand this long-held notion on pH through a scientific examination of the effects of pH of microbicidal and cosmetic formulations on skin.

Method

Three foaming disinfecting hand soaps, with or without hydrogen peroxide and with or without perfume, were tested for skin irritation using an *in vivo* 48-hour patch-test on then healthy subjects (Laboratory Idea, France). The purpose of this experiment was to demonstrate their high level of skin tolerance despite the fact that their pH was about 2.

Results

All tested formulations were found to be non-irritating to the skin with Medium Irritation Index lower than 0.20.

Conclusion

In the experimental conditions of this study, it was demonstrated that properly formulated microbicidal products may be perfectly well tolerated by the skin even if they are acidic. The paper also demonstrates theoretically why pH should not be considered as the only predictive criterion in selecting skincare products.

INTRODUCTION

Many cosmetic and hygiene products have an acidic pH (deodorants, and alpha-hydroxy-acid based creams for instance) or an alkaline pH (soaps for example). Is this enough to consider them as potentially irritant to the skin? Or, is there another pH-related factor which is really the one to explore to predict skin irritations?

The circumstances surrounding the development of dermatitis are complex but do not involve any immunological mechanism (2). The level of skin irritation is generally linked to numerous factors such as the molecular weight, the partition coefficient and the chemical structure of components (acids, alkali, oxidizers, reducers, solvents, chelating agents, surfactants, etc.), their concentration, the contact time, the age, the skin area, the integrity of the skin, the environmental conditions (temperature, hygrometry) and so forth. The typical symptomatology is represented by the appearance of a local inflammatory reaction (vasodilation of micro-blood vessels with redness, edema, pain and itching), which might evolve, in extreme cases, towards skin necrosis (2).

This study was conducted in order to demonstrate experimentally that surfactant-based disinfecting foaming hand

lotions (with or without hydrogen peroxide and with or without perfume) with low pH (about 2) would not be irritating to the skin. This paper also demonstrates theoretically why an acidic or alkaline pH in itself does not necessarily mean that a given preparation will be irritating to the skin.

IN VIVO SKIN IRRITATION STUDY

MATERIALS AND METHODS

The pH of three foaming disinfecting hand lotions, with or without hydrogen peroxide, and with or without perfume, was adjusted to 2.05 +/- 0.05 using phosphoric acid (pK_{a1}: 2.15; pK_{a2}: 7.19; pK_{a3}: 12.37). The purpose of testing the variants of the same initial formulation (formulation 1) was to check the influence of the addition of hydrogen peroxide at 1% and perfume at 0.20% on the final skin irritation scores.

The qualitative compositions of the test-formulations are described in table I.

The epicutaneous tests (patch-test on volunteers) consisted of applying for 48 hours the test-product onto a defined skin area, situated on the internal face of the arm, using an occlusive patch "Finn Chamber Test" [3].

A dose of 0.02 ml of test-product, pre-diluted at 5% in distilled water, was applied on the skin of one arm and maintained in contact for 48 hours with a semi-occlusive plaster, in order to maximise the potential effects. Obtained diluted solutions of test-products had a pH of 2.00 +/- 0.05.

Ten healthy female and male subjects (with normal skin), aged 18 to 65, and not suffering from any dermatological disease, were involved.

The clinical score measurement, 30 minutes after the plaster removal, took into account the redness, edema and blistering. Depending on the intensity of the skin reaction, the score ranges from 0 to 4. The sum of the scores, divided by the number of subjects, defines the Medium Irritation Index (M.I.I.) (3), which allows us to classify the test-products according to table II.

RESULTS

In the experimental conditions of the three in vivo studies, the test results (Table III) showed that all M.I.I. of the test-formulations were all inferior to 0.20, which classifies them as non-irritant.

These results are consistent with a previous *in vivo* 48h single patch-test skin irritation study [4] which involved ten healthy subjects and five formulations of surfactant-based hand cleansing lotions whose pH had been adjusted to 3 or 10, using aqueous solutions of strong and weak acids (hydrochloric acid and lactic acid), as well as strong and weak bases (sodium hydroxide and sodium carbonate). All tested formulations herein at pH of 3 or 10 were found to be non-irritating.

The results of this study are also consistent with the theoretical toxicological approach below.

SKIN IRRITATION AND BREAKDOWN THEORY IN RELATION WITH LOW OR HIGH pH

For the skin to be damaged, a contact between the toxic substance and the organism is required. During the chemical reaction, corrosives and irritants exchange electrons with the skin components (lipids, sugars, amino acids, enzymes). This concept is called "donor-acceptor electron exchange" where the chemical and the skin components can alternatively play the role of electron donor or acceptor. This exchange involves six types of aggressive chemical reactions: acidic, alkaline, oxidation, reduction, chelation, and solvation. Ions for acidic-alkaline reactions, electrons for oxidation-reduction reactions, or parts of molecules (addition-substitution) are exchanged between the aggressive chemical and the skin components [5].

Therefore, predicting the skin irritating potential of cosmetic ingredients must be mainly based on their chemical structure, their physical and chemical properties, their mode of action and their concentration. Most soaps and detergents are alkaline and induce an increase in cutaneous pH, which affects the physiological protective "acid mantle" of the skin by decreasing the fat content. For instance, sodium lauryl sulphate (SLS), an anionic surfactant, is a reference irritant used in many skin irritation

"This paper also demonstrates theoretically why an acidic or alkaline pH in itself does not necessarily mean that a given preparation will be irritating to the skin."

TABLE 1: Test formulations

Ingredients	Formulation 1	Formulation 2	Formulation 3
Deionised Water	✓	✓	✓
Amphoteric Surfactant	✓	✓	✓
Non Ionic Surfactant	✓	✓	✓
Butylene Glycol	✓	✓	✓
Skin Conditioner	✓	✓	✓
Parfum			0.20% w/w
Hydrogene Peroxide		1.00% w/w	1.00% w/w
Preservative	✓	✓	✓
Organic Acid (to make up to pH 2.00 – 2.10)	✓	✓	✓
Final pH as neat	2.05	2.01	2.03

TABLE 2: Medium Irritation Index classification

M.I.I. ≤ 0.20	Non irritant
0.20 < M.I.I. ≤ 0.50	Slightly irritant
0.50 < M.I.I. ≤ 2.00	Moderately irritant
2.00 <M.I.I. ≤ 3.00	Very irritant
M.I.I. > 3.00	Extremely irritant

TABLE 3:
Summary of obtained irritation test results

TEST-PRODUCTS at pH 2.05 +/- 0.05	M.I.I.	RESULTS
Formulation 1 (without hydrogene peroxide and perfume)	< 0.20	Not irritant
Formulation 2 (with hydrogene peroxide but without perfume)	< 0.20	Not irritant
Formulation 3 (with hydrogene peroxide and with perfume)	< 0.20	Not irritant

studies. Its capacity for removing the skin protective lipids and for modifying the tertiary or secondary structure of the proteins (denaturation) is purely based on its surface tension properties, its amphiphilic chemical structure ($C_{12}H_{25}NaSO_4$), and its relatively small molecular weight (288.39). Comparatively, sodium lauryl ether-sulfate ($CH_3(CH_2)_{10}CH_2(OCH_2CH_2)_nNaSO_4$) is significantly much milder to the skin than SLS because of its greater molecular weight (about 420) and the presence of 2 or 3 moles of ethylene oxide (OCH_2CH_2) which modifies the distribution of electrons, making this molecule less reactive to the skin proteins.

The pH of cosmetic formulations is probably the least important factor contributing to the skin irritation process as several studies have demonstrated that there is no obvious correlation between the pH of skincare products and skin irritation [6]. Due to the presence of numerous acids such as lactic acid, pyrrolidone carboxylic acid, butyric acid, etc., the epidermis is slightly acidic, ranging from 4 to 6, and this is of high importance in permeability barrier homeostasis, pathogenic bacteria's growth inhibition, skin enzyme activity and immune function. Because all these characteristics are crucial for normal functioning, the skin has quite effective buffering capacity on acidic/alkaline pH [7].

The pH is also the most popular parameter and probably the least understood too. For most end-users the term "acidic" is synonym of "corrosive," simply because it is associated with known acids such as hydrochloric or sulphuric acid. To some extent, alkaline pH is also associated with skin irritation because end-users are educated by advertisements claiming that alkaline soaps are irritating to the skin. In consequence, a neutral pH is perceived as being physiologically neutral to the skin, and not as the middle value (2) of the pH scale (0 to 14).

The pH (expressed in $\log_{10}$) is the relative measure of the activity of hydrogen ions H^+ (proton). It is a function of the concentration in protons in a given solution: **$pH = -\log [H^+]$.**

For instance, pH 2 means that the concentration in H^+ ions is 10^{-2}.

Because the pH measures the total quantity of protons H^+ in a solution, but not their availability for chemical reactions, the pK, or dissociation constant, is a much more important criterion for predictive skin toxicity.

The pK represents the capacity of a chemical to dissociate in water to liberate H^+ ions, in the case of acids, or OH^- ions in the case of alkali. The higher this capacity, the stronger the acid or the base. Strong acids and strong alkali in solutions are totally dissociated and this means that all their H^+ or OH^- ions are released, and therefore available for chemical reactions (irritation or corrosion in the case of the skin and mucous membranes). On the contrary, weak acids and alkali release a small amount of H^+ or OH^- ions. This means that solutions of strong and weak acids may have the same pH but not the same corrosive or irritation potential.

For an acid, for which the dissociation constant is K_a, the reaction with water will be:

$$HA + H_2O \Rightarrow A^- + H_3O \Rightarrow K_a = \frac{[A^-].[H_3O^+]}{[AH]}$$

and $pK_a = -\log K_a$

As can be seen from the above equations, the stronger the acid, the lower the pK_a. It can also be demonstrated in the same way that the stronger the alkali, the higher the pK_b.

Strong acids have a pK_a inferior to 0 and strong alkali have a pK_b superior to 14 since they dissociate completely in water whilst weak acids and alkali are only partially dissociated.

The following figure 1 shows the possible reaction between acids and alkali [8].

FIGURE 1: Acid-alkali reactions

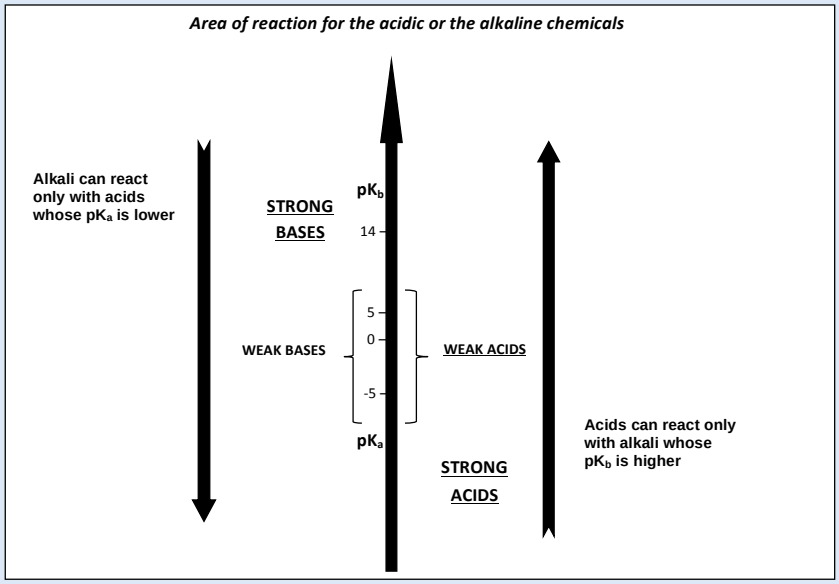
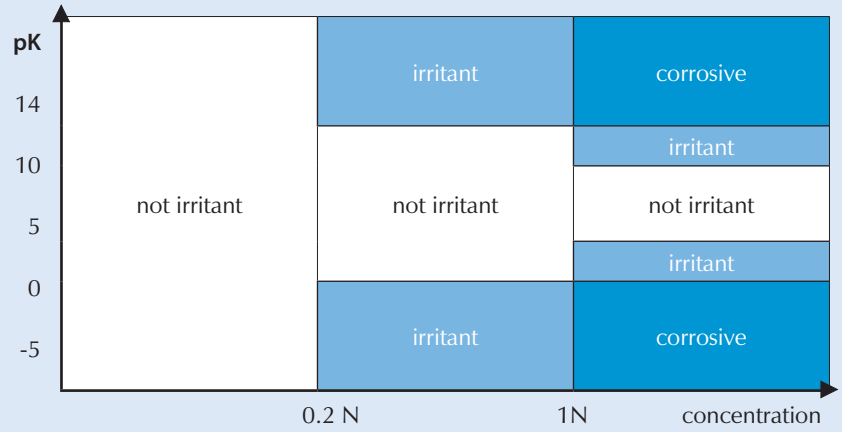


FIGURE 2: pK and concentration correlation with irritation and corrosion



Based on the above figure, it is easier to understand that a given acid AH is going to react with the base B, which has a higher energy value and, if it is sufficiently concentrated, it will also react with all alkali situated between B and A; A being the conjugate base of the acid AH. Of course this principle also applies to alkali.

The irritant or corrosive potential of an acidic or alkaline preparation may be predicatively evaluated by taking into account the pK and the concentration of the components responsible for the pH.

Studies on the eye proved that an acidic or an alkaline solution at a concentration inferior to 0.2N has absolutely no corrosive or even irritant action on the eyes [9].

The following figure 2 shows that an acidic solution with a $pK_a \leq 3$ or or a basic solution with a $pK_b > 10$, but at a low concentration (0.2 to 1N), will be irritant to the eyes only [10].

At concentration ≥ 1N, the solution will be corrosive for intermediate pK 4 to 5 or 9 to 10.

And, for pK 5 to 9 and whatever its concentration, the solution will have no effect on eyes.

Therefore, the concept of pK explains why the pH cannot be taken into consideration to evaluate the irritation or the corrosive potential of a preparation. At a given pH, the quantity of free H^+ or OH^- ions may be important (the preparation will be irritant or corrosive) or not (depending on the concentration and/or the contact time, the preparation might be slightly irritant or not at all) [1, 11].

To illustrate this notion even better, we should remember that certain foodstuffs, such as sodas, lemon juice and vinegar have a pH between 2 and 3. These foodstuffs are obviously in frequent contact with the mouth and mucous membranes.

CONCLUSION

The perception for product safety is that if the pH of a product is not neutral, it will be an irritant and/or corrosive. In an *in vivo* 48-hour patch-test skin irritation study involving ten healthy subjects, it was shown that three foaming disinfecting hand soaps, at pH of 2-2.1, with or without hydrogen peroxide and with or without perfume, were non-irritating to the skin. These results are consistent with the theory described in this paper and with a previous *in vivo* skin irritation study which also showed that surfactant-based formulations at pH 3 or 10 and involving weak acids and alkali, were not irritating either.

For weak acids and alkali, as well as for diluted strong acids and bases (< 0.2N), the quantity of H^+ or OH^- free ions, eventually in contact with the skin, is too low to react with the epidermal amino acids and provoke the production of inflammatory mediators (cytokines). Therefore, the pH alone is very poor criteria for predicting the potentially irritant character of a microbicidal or a cosmetic formulation; physical-chemical characteristics and the concentration of the ingredients, as well as the contact time do matter much more. Also, many ingredients (biocidal agents, surfactants, preservatives, perfumes) have an intrinsic irritating and/or sensitizing power independent of their pH that should be evaluated for selecting and purchasing such products.

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World Health Organization

Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola
August 2014

ICRA BEST PRACTICES IN HEALTH CARE CONSTRUCTION

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ipac pci NEWS

Inside:

ENVIRONMENTAL HYGIENE is a matter of patient safety!

HyGiene performance solutions

Cleaning Robots?

Magic-Bullet Solutions?

Miracle Surfaces?

WHICH IS MORE EFFECTIVE?

The stakes are rising for concerns about patient-safety and stronger "value- for-money" scrutiny on investments in environmental hygiene and infection prevention and control.

Infection Control Professionals are increasingly challenged to make sense of the explosion in new generation technologies, including: (self) disinfecting patient furniture and fabrics, (after clean) secondary disinfection devices (aka "the cleaning robots"), better performing cleaner-disinfectants, and new generation hygiene outcomes monitoring systems. The goal is an environment that is consistently safe, hospitable and ready to support care. The road blocks are the budget, limitations on staff capacity and capability, and the need to push the limit on clinical throughput.

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Ebola: a new perspective

Bruce Gamage, RN, BSN, CIC
President, IPAC Canada

Over the past few months I've read, with growing concern, the reports of the Ebola Virus Disease (EVD) epidemic in West Africa. This is the largest EVD outbreak ever identified and it has been spiraling out of control. The World Health Organization reports to date at least 3000 cases of EVD and over 1500 deaths. Those figures exceed all previous known Ebola cases and deaths combined.

There has been much concern raised both at the provincial and national level in Canada, that we may have potential for cases showing up in our hospitals. This is a real concern. Does it mean we should panic? No, but we need to be ready. Much work has been done; both federal and provincial public health agencies have dusted off and updated their hemorrhagic fever protocols. These plans are good and this work is necessary. We know a lot about this virus. It's been around since 1976.

The incubation period for EVD is two to 21 days. Patients are not infectious during the incubation period and prior to the onset of symptoms. Person-to-person transmission occurs primarily through direct contact with blood, body fluids, secretions and excretions of someone who is sick or through indirect contact with material contaminated with these substances. Ebola virus is not an airborne pathogen. Healthcare providers (HCP) need to understand this so that they can take proper precautions to protect themselves in the unlikely event that they will be required to provide care for a patient suspected of having EVD.

Some jurisdictional guidance calls for the use of airborne precautions at all times – based on the risk to an HCP from of an exposure to this virus being so high. Others suggest that the patients be housed in an airborne infection isolation room (AIIR) in order to avoid the need to move the patient if an aerosol generating medical procedure needs to be performed – but droplet and contact precaution should be applied. The key is that in every situation a point-of-care risk assessment needs to be done by every HCP to ensure that they are applying precautions that will ensure that neither they, their colleagues nor other patients are exposed to this virus.

All of these concerns are a luxury. In Canada we function in a healthcare system where we have the capacity to properly deal with potentially infectious patients. If we were to have a case, they would be provided excellent care and their chances of survival would be good. The likelihood that we will see an epidemic of EVD in Canada is about zero.

Our colleagues in West Africa are not so lucky. Each day they deal with a new tide of suspected EBV cases. They do not have AIIR rooms to isolate these patients – they don't even have enough beds to house these patients. They don't argue about what protective equipment needs to be worn, they don whatever they have and hope that they will be protected. Patients withhold information about their potential exposure to EVD in fear that they will be denied care or shunned by their community. My heart goes out to the HCP on the front lines of this outbreak. They are putting their lives on the line to do their best in a nearly impossible situation.

Dr. Joanne Liu, the international president of Medecins Sans Frontieres (MSF) has stated that, "To curb the epidemic, it is imperative that states immediately deploy civilian and military assets with expertise in biohazard containment." She told the UN, "I call upon you to dispatch your disaster response teams, backed by the full weight of your logistical capabilities. Without this deployment, we will never get the epidemic under control." Desperate times call for desperate measures. I will watch with interest to see how the various nations of the world respond.

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*Safer Healthcare Now! Campaign, Prevent Ventilator Associated Pneumonia: Getting Started Kit, p. 6, June 2012.

Bruce Gamage, RN, BSN, CIC
Président, IPAC Canada

Ebola : nouvelle perspective

Je m'inquiète de plus en plus des rapports publiés depuis quelques mois sur l'épidémie de maladie à virus Ebola en Afrique occidentale. C'est la plus vaste flambée recensée à ce jour, et elle échappe à tout contrôle. L'Organisation mondiale de la santé fait état d'au moins 3000 cas à ce jour et de plus de 1500 décès, des chiffres qui dépassent le total de tous les cas et décès connus antérieurement.

Les gouvernements fédéral et provinciaux se préoccupent beaucoup, à raison, du risque de voir un jour des cas surgir dans nos hôpitaux. Il n'y a pas de quoi paniquer, mais il faut être prêt. D'ailleurs, le travail de préparation accompli à ce jour est considérable. Les organismes fédéral et provinciaux de santé publique ont dépoussiéré leurs protocoles de lutte contre la fièvre hémorragique. C'est un travail nécessaire, et ce sont de bons plans.

Nous en savons beaucoup sur ce virus, qui a fait son apparition en 1976. La période d'incubation est de deux à vingt et un jours, au cours desquels les patients ne sont pas contagieux, pas plus d'ailleurs qu'avant l'apparition des symptômes. La transmission entre personnes résulte principalement du contact direct avec le sang, les fluides corporels, les sécrétions et les excrétions d'une personne malade ou du contact indirect avec des objets contaminés par ces substances. Le virus Ebola n'est pas un agent pathogène aéroporté. Les prestataires de soins de santé doivent bien le comprendre pour se protéger comme il se doit dans le cas peu probable où ils devraient traiter un patient soupçonné d'être atteint par le virus.

Certaines organisations prônent des précautions permanentes contre la transmission par voie aérienne, étant donné le risque énorme que pose aux prestataires l'exposition au virus. D'autres suggèrent de confiner les patients à une chambre d'isolement des infections aéroportées pour éviter de les déplacer s'il faut procéder à une intervention respiratoire produisant des aérosols. Mais il faut alors prendre des précautions contre la transmission par gouttelettes ou par contact. L'essentiel est que chaque prestataire de soins évalue les risques au cas par cas, sur les lieux de l'intervention, pour assurer l'application de toute les mesures nécessaires afin d'éviter que quiconque – collègues, autres patients et lui-même – soit exposé au virus.

Toutes ces précautions sont un luxe. Au Canada, les systèmes de santé nous permettent de composer avec des patients potentiellement contagieux. S'il nous arrivait un patient atteint de la maladie à virus Ebola, nous lui prodiguerions d'excellents soins et ses chances de survie seraient bonnes. La probabilité d'une épidémie au Canada est toutefois pratiquement nulle.

Nos collègues d'Afrique occidentale ont nettement moins de chance. Ils voient arriver chaque jour une nouvelle vague de cas présumés. Ils n'ont pas de chambres d'isolement des infections aéroportées. En fait, ils n'ont même pas assez de lits pour accueillir ces patients. Ils ne discutent pas des équipements de protection : ils endossent ce dont ils disposent et espèrent être protégés. Les patients ne parlent pas de leur exposition possible au virus par peur de ne pas être traités ou d'être chassés par leur entourage. J'ai une pensée admirative pour les prestataires de soins qui sont en première ligne devant cette flambée de contagion. Ils risquent leur vie pour les meilleurs soins possibles dans une situation quasi impossible.

Selon la docteure Joanne Liu, présidente internationale de Médecins sans frontières (MSF) : « L'épidémie ne sera pas contenue sans un déploiement massif de ressources civiles et militaires spécialisées dans le confinement des biorisques. » Elle a conjuré les délégués à l'ONU d'envoyer leurs équipes d'urgence et de les doter de tous les moyens possibles faute de quoi, dit-elle, il sera impossible d'endiguer l'épidémie. Des circonstances désespérées commandent des mesures désespérées. Je suis avec intérêt la réponse des diverses nations.

"J'ai une pensée admirative pour les prestataires de soins qui sont en première ligne devant cette flambée de contagion. Ils risquent leur vie pour les meilleurs soins possibles dans une situation quasi impossible."

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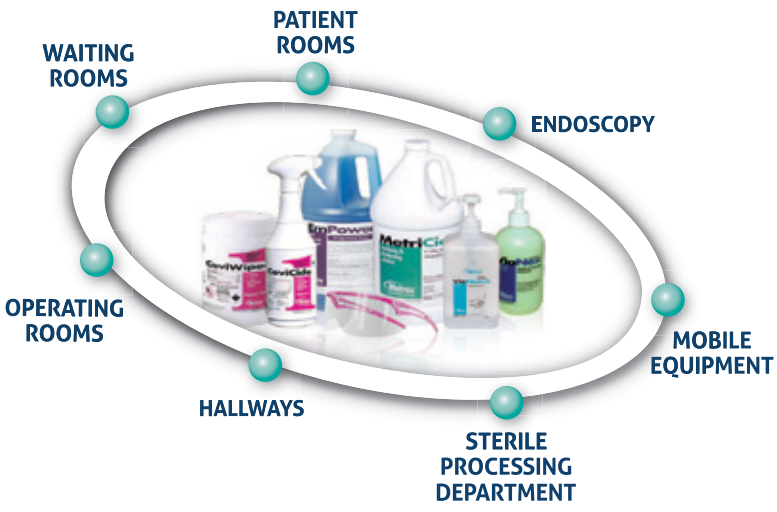

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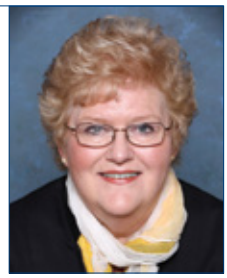

The Strategic Planning **Roadmap**

Gerry Hansen, BA
Executive Director, IPAC Canada

The current IPAC Canada Strategic Plan is effective for the period 2010-2015. It can be viewed online at *http://www.ipac-canada.org/Members/pdf/2015StrategicPlan.pdf*. The Strategic Plan for 2016-2018 will be developed prior to the 2015 Annual Meeting and will be presented to members for approval at that time.

The Strategic Plan charts the course to guide our organization. It is designed to engage members and association leaders in setting the future for the association and indeed their own profession. The absence of a process that involves environmental scanning, objective setting, strategy development and performance measurements offers no reference point for assessing how effectively resources are being allocated within the organization.[1]

Previously, a Strategic Plan included a number of Objectives and then Action items to complete those objectives. An update and gap analysis arising from the current Strategic Plan was published in the winter 2013 journal. The new Strategic Plan will likely have a different focus from the 2010-15 plan, reflecting the development of the organization and its governance structure. It will be less prescriptive, focusing on high level goals, outcomes and related metrics and allowing more latitude for implementation at the staff and committee level.[2] Additionally, the new Strategic Plan will be for a three-year period, not a five-year period, to better assess results and incorporate new strategies that will keep the plan meaningful.

The board has engaged David Sheridan, BC, MA, PhD to facilitate the 2016-2018 Strategic Plan process. In 2009, Dr. Sheridan facilitated the planning process leading to the association's current strategic plan and has worked with a range of national and provincial infection prevention and control organizations and networks. Dr. Sheridan notes that: "The proposed approach calls for a well-researched, inclusive and conceptually grounded process leading to a new strategic plan that is relevant, vital, realistic and supported by the association's internal and external stakeholders."

A four-stage work plan will include a project launch, environmental scan, strategy development phase and a final report with specific recommendations and provision for follow-up.

Project Launch: Dr. Sheridan will meet with the board in November 2014 to commence the process including review of key informant feedback and an investigation of the current strengths, weaknesses, opportunities and threats facing IPAC Canada (SWOT Analysis).

Environmental Scan: It is necessary that strategic choices are based on an intensive environmental scan and consideration of stakeholder opinions. The environmental scan will consist of an information review (fall 2014 and ongoing), approximately 25 confidential key informant telephone interviews (fall 2014), and an online member survey (early 2015).

Strategy Development: A two-day strategy development session with the IPAC Canada Board, Chapter Presidents, Executive Director and other designated stakeholders will be held as a pre-conference event at the National Education Conference in Victoria. The session will be held on Saturday, June 13 and Sunday, June 14, 2015.

Final Report and Follow-Up: Following the foregoing meeting, a draft strategic plan will be prepared capturing the findings from the environmental scan and the deliberations at the strategy development session. After review by the board, the final proposed 2016-2018 Strategic Plan will be presented to members at the 2015 Annual General Meeting.

IPAC Canada's new strategic plan will be a living document. The only stable part will be its mission, vision and values. The travel plan to get there will need to be adjusted regularly.[2]

We encourage all members to anticipate their input into the upcoming Strategic Plan, and actively participate in the process.

Resources:

1. Christopher LeClair, The Association Journal, Canadian Society of Association Executives.
2. David Sheridan, Shercon Associates Inc.

The winner of the 2014 Ecolab Poster Contest is David Ryding. On Page 130 of the Summer *CJIC*, we inadvertently misspelled David's last name as "Ryder." We sincerely apologize to David for this error.

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Moira Walker Memorial Award for International Service

About the International Service Award

This Award honors an individual or group that has demonstrated extraordinary efforts to bring about change or improvement related to infection prevention and control in parts of the world that are under developed or under resourced. The annual award is in honour of Moira Walker, RN, CIC, a Past President of IPAC Canada (formerly CHICA Canada) and Past Honourary Secretary of the International Federation of Infection Control. Moira's life was dedicated to enhancing the physical and spiritual health of her many friends and colleagues.

Nomination guidelines

- Who is eligible
  Preferred: Current IPAC Canada members in good standing. The award may be presented to individuals, prior nominees, or a group of individuals, but not past award recipients, who have demonstrated international cooperation in the field of Infection Prevention and Control or Public Health. Fundraising efforts alone will not be sufficient criteria for this award. Lifetime achievement in international service would be considered.
- Who may nominate
  Any member of IPAC Canada or a chapter of IPAC Canada may submit a nomination. The IPAC Canada Board of Directors (the Board) may also nominate candidates. The nomination form is available at *www.ipac-canada.org* (Opportunities).
- How to nominate
  A completed nomination form and covering letter outlining the nominee's projects that have resulted in this nomination must be forwarded to the Membership Services Office no later than March 31st of each year.
- Selection process
  The Board will select the recipient(s) through an evaluation process.

Award

Artwork with a First Nations and Inuit art theme. The accompanying engraved plate will announce the recipient's award. In addition, award winner(s) will be provided with a complete waived registration for the national education conference at which the award is presented. In the case of a group award, one representative of the group will be provided a complete waived registration.

DEADLINE:
The deadline for nominations is March 31, 2015.

Announcement and presentation

The award winner(s) will be advised by April 15th of each year. The award will be presented at the Opening Ceremonies of the IPAC Canada National Education Conference.

2015 ECOLAB® POSTER CONTEST

An annual poster contest is sponsored by Ecolab and supported by a chapter of IPAC Canada to give infection prevention and control professionals (ICPs) an opportunity to put their creative talents to work in developing a poster which visualizes the Infection Control Week theme.

YOU ARE INVITED to design a poster that will be used for Infection Control Week 2015 using the following theme:

Infection Prevention:

Prize: Waived registration to 2015 IPAC Canada National Education Conference or $500.

REMINDER: Posters should have meaning for patients and visitors as well as all levels of staff in acute care, long term care and community settings. The poster should be simple and uncluttered, with strong visual attraction and few if any additional words.

Judging will be on overall content. Artistic talent is helpful but not necessary. The winning entry will be submitted to a graphic designer for final production. Your entry will become the property of IPAC Canada.

HOST CHAPTER: IPAC CENTRAL SOUTH ONTARIO

Send submissions to:
Submissions will only be accepted by email.
Send submission to: *info@ipac-canada.org.*
Title email : 2015 Ecolab Poster Contest

DEADLINE: January 31, 2015

Submission format:
Electronic file in Word or PDF format only.
File size: must print out to 8.5"x11.0" paper
Name, address and telephone number must be included in the covering email. DO NOT include identifiers in the poster submission.

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A media release is provided to assist with any National Infection Control Week activities that may require a media release in your area. Add the local contact information at the bottom of the release. Available in both French and English.

NICW **media release**

Infection Prevention – Staying Ahead of the Game!
National Infection Control Week, October 20-24, 2014

Infection Prevention and Control programs are widely recognized as being both clinically effective and cost-effective in preventing and controlling the spread of infections in healthcare settings. Infection Prevention and Control programs protect clients/patients/residents and staff alike by preventing infections before they occur. Such prevention results in better clinical outcomes, fewer healthcare-acquired infections, reduced length of hospital stay, and less antimicrobial resistance, resulting in important cost saving for the health care system.

Ultimately, the most effective way to prevent the transmission of infection is through hand hygiene and effective environmental cleaning. Cleaning your hands is an ordinary procedure and does not take a lot of time and effort. You can use soap and water or alcohol based hand rub. It takes only 20-30 seconds of your time to clean your hands.

National Infection Control Week will provide Infection Prevention and Control Professionals within healthcare facilities and community settings the opportunity to promote the *Infection Prevention – Staying Ahead of the Game!* theme. Infection prevention and control professionals will be providing multi-modal education and collaborating with other organizations in order to deliver the message that infection prevention and control can be very simple and is most effective when everyone makes the effort.

Everyone can help prevent the spread of infections by being involved, providing input and initiating change in their own way. Keep in mind that National Infection Control Week is just the beginning. This invaluable lesson is one that must continue to be taught so that the impact of infections can be minimized.

About Infection Prevention and Control Canada

IPAC Canada, formerly CHICA-Canada, is a national, multi-disciplinary, voluntary association of infection prevention and control professionals (ICPs) with 21 chapters across the country dedicated to the health of Canadians by promoting excellence in the practice of infection prevention and control. Visit IPAC Canada's website (*ipac-canada.org*) for infection prevention and control information.

Contact the Infection Prevention and Control Professional in your hospital, long-term care facility or community for further information on activities planned for National Infection Control Week. Visit IPAC Canada's website for infection prevention and control information.

LOCAL CONTACT INFORMATION _____

It's time to make the switch.

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(of a bedpan washer)

Bedpan washers do not effectively kill C.difficile

- The standard washer disinfection stage is at a temperature of 80°C,[1] this temperature does not adequately eliminate C.difficile spores.[2]

Washers have high running costs

- The 5-7 minute, hot water cycle generates high utility costs.[1]
- Additional equipment may be required to effectively sterilize bedpans.[1]

The Pro's
(of a single-use, closed system)

Infection Control

- Single-use systems are proven to positively impact C.difficile outbreaks.

Efficient Cycle & 100% Recycled

- A cycle that runs on cold water for only 2 minutes, reducing utility costs to $0.08/cycle.
- Disposable products are 100% recycled and biodegradable

Auto Start Function

- A hands free operation that will begin automatically, after the lid is closed

Sources: [1] AETMIS. Comparative Analysis of Bedpan Processing Equipment. Technical note prepared by Christine Lobè. (AETMIS 09-04) Montréal, 2009. [2] AJIC Simulated-use testing of bedpan and urinal washer disinfectors: Evaluation of Clostrium difficult spore survival and cleaning efficacy - Alfa MJ, Olson N, Buelow-Smith L, Department of Medical Microbiology.

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2015 Champions of Infection Prevention and Control

In collaboration with 3M Canada, IPAC Canada has developed the prestigious Champions of Infection Prevention and Control Award. Applications are being accepted for the 2015 Champions of Infection Prevention and Control award. This award will acknowledge the extraordinary accomplishments of the front line Champions of Infection Prevention and Control. The award will recognize IPAC Canada members who work beyond what is expected as part of their employment, tirelessly, and creatively, to reduce infection, raise awareness, and improve the health of Canadians. Awards will be presented at the 2015 National Education Conference in Victoria. Award criteria and nomination form will be posted to *www.ipac-canada.org* by November 1, 2014. The deadline for 2015 nominations is March 1, 2015.

"This award will acknowledge the extraordinary accomplishments of the front line Champions of Infection Prevention and Control."

Sterillium® Rub Hand Antiseptic with 80% alcohol content is an effective broad spectrum antiseptic with excellent skin compatibility.

Sterillium® Rub's balanced emollient blend leaves hands feeling soft and smooth, never greasy or sticky. It dries quickly and leaves no buildup, allowing quicker, easier gloving.

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Bring in a **new member**

Win a complimentary 2015-2016 membership

Membership has its benefits. The IPAC Canada website (*www.ipac-canada.org*) has so much information on the benefits of being a member. The member resource guide for finding other IPAC Canada members, links to infection control sites, audit tools … the list is extensive. Tell another infection prevention and control professional (ICP), tell an ID physician, tell your Medical Laboratory Technologist, tell Environmental Services, tell EMS, tell your designate, and tell your director about the benefits of joining our national organization.

If that person joins IPAC by May 1, 2015, both you and the new IPAC Canada member will be eligible to win a complimentary 2015-2016 membership (value $202). You are eligible for the draw with every new IPAC Canada member that you get to sign up. Should the winning members have already paid their 2015-2016 membership, a refund will be made to the person or the institution which has paid the fee.

Send in this form no later than May 1, 2015. An announcement of the winners of this offer will be made at the 2014 conference. Membership applications can be found at *http://www.ipac-canada.org/about_join.php*.

New member name _____

Email address _____

Sponsoring member _____

Email address _____

Send this form by fax or email to:
IPAC Canada Membership Services Office | *info@ipac-canada.org* | Fax: 204-895-9595

2015 Diversey **Bursary**

IPAC Canada and SealedAir Diversey Inc. have collaborated on the establishment of the Diversey Education Bursary. The objective of the Bursary is to provide financial assistance to eligible IPAC Canada members to attend continuing professional education programs. With the need for increased funding for IPAC Canada members to attend or participate in educational events, the sponsorship of this bursary by Diversey Inc. enhances IPAC Canada's ability to support its members in attendance at the annual conference, at a chapter educational event, or as a student at one of the distance education courses supported or endorsed by IPAC Canada.

"We are pleased to partner with IPAC Canada to provide this education bursary which advances our joint objective – promoting best practice in infection prevention and control to improve patient and staff safety," said Carolyn Cooke, Vice President, North America Healthcare Sector. "We see continuing education and shared knowledge as cornerstones to improving patient outcomes and program quality, and we are proud to partner with IPAC Canada to be able to provide an opportunity for increased learning and knowledge sharing."

> "With the need for increased funding for IPAC Canada members to attend or participate in educational events, the sponsorship of this bursary by Diversey Inc. enhances IPAC Canada's ability to support its members."

The 2015 Diversey Education Bursary will be online in November 2014. The deadline date for applications is January 31, 2015.

2015 Virox Technologies **Scholarship**

Through the financial support of Virox Technologies, 16 IPAC Canada members were awarded scholarships to attend the 2014 CHICA National Education conference in Halifax. IPAC Canada and its members thank Virox Technologies for their initiative to make the national education conference accessible to those who may not have otherwise been able to attend.

In partnership with IPAC Canada, Virox Technologies will again provide scholarships to assist IPAC Canada members with attending the 2015 National Education conference in Victoria (June 14-17, 2015). The 2015 Virox Technologies Scholarship online application will be launched in November 2014. The deadline for applications is January 31, 2015.

> "IPAC Canada and its members thank Virox Technologies for their initiative to make the national education conference accessible to those who may not have otherwise been able to attend."

Distance education **graduates**

IPAC Canada congratulates the graduates of the 2013-2014 Distance Education Online Novice Infection Prevention and Control Course. The following group of graduates have successfully completed the course. This course also provides IPAC Canada members with the opportunity to share their expertise in the roles of coordinators, instructors and discussion facilitators. Many thanks go to the faculty of the course and to the families and colleagues of the students for making it all possible for students to strengthen their knowledge and skills. We know that they are ready and eager to apply them to practice.

Congratulations and best wishes to:

Abeer Ahmad, Toronto, ON
Adesegun Akintude, Saskatoon, SK
Kim Barnes, Kelowna, BC
Laurel Biluk, Gimli, MB
Sean Brown, Barrie, ON
Cristina Cabotaje (Ma), Mississauga, ON
Adele Coulter, Owen Sound, ON
Jerry Devries, Slate River, ON
Gladys Ens, Springstein, MB
Sherilyn Fenwick, Melville, SK
Krystal Fergus, Kelowna, BC
Kelly Fishleigh, Cambridge, ON
Danielle Gerick, Nanaimo, BC
Polly Griesbach, Oakville, ON
Delores Kennedy, Burns Lake, BC
Stanley Kolodziej, Edmonton, AB
Anne Mason, Dartmouth, NS
Elaine McDougall, Morris, MB
Sandra McKechnie, Penticton, BC
Christine Mochid, Morinville, AB
Lorel Morrison, Corbyville, ON
Hitesh Patel, Calgary, AB
Larysa Polinko, Mississauga, ON
Nisha Samuel, Markham, ON
Julie Servant, Sexsmith, AB
Linda Sonneveld, London, ON
Karen Webster, Aurora, ON
Annjanette Weddell, Edmonton, AB
Sarah Wells, Burnaby, BC
Lori Wilson, Thunder Bay, ON
Janelle Yakimishen, Dauphin, MB

The following students have graduated from the IPAC Canada Distance Education Course that was held in collaboration with Alberta Health Services:

Tamalee Andersen, Fort McMurray, AB
Remi Bolarinwa, Edmonton, AB
Judy Evans, St. Albert, AB
Yvette Gable, Edmonton, AB
Danielle Halaburda, AB
Kim Houde, Calgary, AB
Kathy Jarema, Edmonton, AB
Jenean Johnson, Red Deer, AB
Dione Kolodka, Calgary, AB
Sandra MacIssac, Lethbridge, AB
Emily Maclean, Lethbridge, AB
Blair Ranns, Peace River, AB
Gisele Saulnier, Edmonton, AB
Joy Scott, St. Albert, AB
Jian Sun, Edmonton, AB
Leeanne Van Rootselar, Calgary, AB
Ashley Van Ryn, Lethbridge, AB
Rauj Walia, Calgary, AB
Michelle Zwicker, Edmonton, AB

2013-2014 Faculty

Heather Candon, BSc, MSc, CIC, Course Coordinator

Jane Van Toen, MLT, BSc, CIC, Course Coordinator

Jill Richmond, BA, RN, BN, CIC, Practicum Coordinator

Kathy Bush, MSc, MLT, Instructor

Tara Leigh Donovan, BHSc, MSc, Instructor

Laura Fraser, RN, BScN, CIC, Instructor

Leila Kipke, MLT, Instructor

Sue Lafferty, RN, BScN, CIC, Instructor

Lesley McLeod, BSc, MSc, CIC, Instructor

Deb Paton, RN, BScN, CIC, Instructor

Sharon Wilson, RN, BScN, CIC, Instructor

Anne Augustin, MLT, CIC, Facilitator

Lori Jessome-Croteau, RN, BScN, MHS, CIC, Facilitator

Tina Stacey-Works, MLT, CIC, Facilitator

Jill Richmond, BA, RN, BN, CIC, Facilitator

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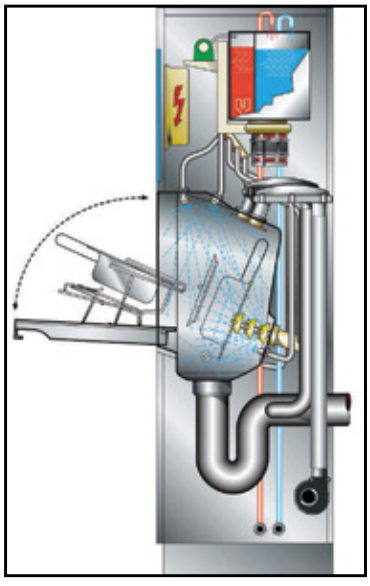

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