Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

REGULAR ARTICLE

Are you prepared? Defining occupational health resource needs to prevent infectious disease transmission in the health care sector

by S. L. Pollock, A. Yassi, I. Connell, B. Gamage, and R. Copes

Sue L. Pollock, MSc, MD, is currently a fifth year community medicine resident in the School of Population and Public Health at UBC. She completed her Medical Degree at the University of Calgary in 2004 and her Master of Science degree in Epidemiology at the University of Toronto in 2000.

Annalee Yassi, MD, MSc, FRCPC, senior Canada Research Chair-holder at UBC, is an occupational medical specialist with over 25 years experience in the health care sector. She was Editor of the ILO Encyclodepia's chapter on Health care and Founding Executive
Director of the Occupational Health and Safety Agency for Health care in BC.

Ian Connell, MD, FCBOM, is a Fellow of the Canadian Board of Occupational Medicine. He has been practicing occupational medicine for over 20 years with a special interest in health care. He has been the Occupational Medical Consultant to the Fraser Health Authority since 1986 and to Vancouver Coastal Health since 2000.

Bruce Gamage, RN BSN BSc. (Micb.) CIC, studied Microbiology and Nursing at the University of British Columbia. He specialized in Oncology and Infection Control. Recently, he was the Infection Control Consultant at the BC Centre for Disease Control and now manages the BC Provincial Infection Control Network.

Ray Copes, MD, MSc, is Director of the Environmental Health Services Division at the BC Centre for Disease Control as well as Clinical Associate Professor in the Faculty of Medicine, and a Faculty Associate in the School of Occupational and Environmental Hygiene at UBC. He is also the Scientific Director for the National Collaborating Centre for Environmental Health.

Abstract

This article discusses the extent of resource allocation to Occupational Health (OH) to prevent infectious disease exposure and transmission in British Columbia (B.C.). It also characterizes the delineation of roles and responsibilities within OH services in B.C. health care settings and highlights areas where improvements to current OH programs could be made to prevent and control occupational infections. Given the breadth of OH responsibilities, resource allocation in many health care institutions for these services is inadequate and roles and responsibilities may not be clearly delineated.

Résumé

Le présent article traite de l'ampleur de l'affectation des ressources à la santé au travail afin de prévenir l'exposition aux maladies infectieuses et la transmission de ces maladies en Colombie-Britannique (C.-B.). Il caractérise également la délimitation des rôles et des responsabilités au sein des services de santé au travail dans les établissements de santé de la C.-B. et met en lumière les secteurs où il serait possible d'améliorer les programmes de santé au travail actuels pour prévenir et contrôler les infections professionnelles. Compte tenu de l'afflux des responsabilités en santé au travail, l'affectation des ressources est insuffisante dans de nombreux établissements de santé à l'égard de ces services, et les rôles et responsabilités ne sont peut-être pas clairement définis.

There is increasing focus on the importance of maintaining the health of Health Care Workers (HCWs), particularly in light of the aging population,[1] an aging health care workforce[2] and increasing difficulties in the recruitment and retention of HCWs.[3] Health care managers and policy-makers are therefore examining ways to effectively and efficiently maintain healthy working conditions and develop programs to improve and protect the health and safety of HCWs.[4] Protecting HCWs from exposure to infectious diseases, for example, also serves to protect the health of their patients, other HCWs and the general public.[5]

Maintaining HCW health has additional advantages for health care management. Prevention of infectious disease morbidity and mortality in HCWs can potentially benefit health care management through decreased absenteeism[6,7] and reduced workers' compensation costs.[8]

It is generally agreed that the primary purpose of an OH program is promotion of employee health and well-being.[9] OH services are delivered by health care professionals, including nurses and physicians, in all industries worldwide. Ironically, OH services in the health care sector, where the target population is HCWs, have tended to lag behind OH service provision in other

sectors.[10] This is problematic considering that many HCWs are at risk of exposure to infectious agents during work, and are known, for example, to have increased risk of acquiring diseases such as tuberculosis and influenza.[11,12] This potential was highlighted through the experience of Severe Acute Respiratory Syndrome (SARS) in 2003 in which high levels of both occupational transmission as well as nosocomial spread were noted in Canada[13] and elsewhere.[14,15] While standard and airborne infection control precautions were reportedly instituted in affected hospitals, they apparently were incomplete and/or intermittently applied, thereby resulting in occupational transmission.[16] The death of three Canadian HCWs from SARS highlighted the seriousness of occupational transmission, and focused attention on the care of HCWs. Not only was occupational acquisition of SARS well documented,[17] it was also demonstrated that caring for colleagues as patients was emotionally difficult.[18] In addition, OH professionals felt that their role was generally undervalued within health care.[19]

SARS is only one of many emerging pathogens that have appeared in recent years. Additional examples include HIV, Hantavirus pulmonary syndrome, monkey pox, and West Nile Virus.[20,21] It is estimated that some 30 novel pathogens have emerged in the past two decades, and the incidence may be increasing.[22] HCWs are at the frontline of our defense against emerging and existing infections. Therefore, proper occupational health measures to reduce their exposure to infectious diseases are essential.

OH professionals must be involved in a variety of other tasks, aside from the control of occupational infections in HCWs, including the primary, secondary and tertiary prevention of disability from musculoskeletal injury, stress, violence, as well as occupational chemical and physical exposures. Typically, OH professionals with responsibilities for preventing occupational infectious diseases must also address numerous other occupational concerns, making it harder to assess the exact number of OH professionals needed from the perspective of infection control per se. In 2002, the Public Health Agency of Canada published P*revention and Control of Occupational Infections in Health Care*, clinical guidelines to assist OH professionals, medical directors and others responsible for the prevention and management of infectious diseases in HCWs.[23] These guidelines reinforced the necessity for collaboration between OH departments and Infection Control (IC) programs in order to reduce occupational health hazards.

The B.C. Provincial Infection Control Network (PICNet) is an infection control knowledge collaborative established in 2005 by the B.C. Ministry of Health Services following lessons learned from the SARS outbreak. Encompassing both regional and provincial health organizations, PICNet advises on health care-associated infection practice across B.C.[24] PICNet conducted a needs assessment within the six Health Authorities (HAs) in B.C. to systematically gather information on OH department resources, polices and procedures related to the control of occupational infections and to identify priorities and make recommendations on pertinent issues such as resource allocation

The purpose of this study, conducted by PICNet as a component of the needs assessment, was three-fold:

1. to ascertain the extent of resource allocation to OH to prevent infectious disease exposure and transmission in British Columbia;

2. to characterize the delineation of roles and responsibilities within OH services in health care settings in B.C.; and

3. to highlight areas where improvements to current OH programs could be made with respect to the prevention and control of occupational infections.

Methods

An OH questionnaire was developed by the PICNet Needs Assessment Working Group, in accordance with the Public Health Agency of Canada's 2002 infection control guidelines.[23] The questionnaire was sent by e-mail to the OH directors of the six OH departments in the province to oversee its completion. These data were submitted to the PICNet management office for analysis by a consultant statistician. All data were entered in EpiData and analyzed in EpiInfo v.3.3. Examples of the data collected include: number of professional OH staff and employees served by the department, number of HCW immunizations, fit tests, and outbreak investigations completed in 2005, as well as descriptive data about the number and type of orientation and educational sessions conducted. The roles and responsibilities of the OH professional specific to occupational infections were divided into four categories: risk assessment, risk control, education, and evaluation.[23] Data were also collected about contract workers and medical staff working in the organization.

Results

All six HAs reported OH professional involvement in the prevention and management of occupational infections. However, there were no reports of OH professionals dedicated solely to activities related to occupational infections. Reasons for lack of dedicated professionals in this area included insufficient OH professionals and the generalist nature of the OH professional.

Resources and staffing

OH departments in B.C. were found to be under-resourced and understaffed in terms of resources related to the control of occupational infections, with two-thirds of HAs reporting OH position vacancies. Reasons for vacancies were reported to include a shortage of qualified professionals; however, none of the HAs reported active recruitment. Of the five HAs that reported total job time addressing issues related to the prevention and control of occupational infections, three reported that < 25% of work time was spent in this area.

None of the HAs felt that OH departments had adequate time or resources to perform all necessary tasks related to the

control of occupational infections. All cited limited staffing resources as a challenge. Geography was also a problem: five of six HAs reported that staff were required to travel between sites. One HA reported that travel accounted for 25-49% of total OH department time.

A ratio of OH nurses to employees was calculated based on available data from the six HAs. Per one OH nurse full-time equivalent, there was a range of 1,964-7,000 employees (median = 2,862). There was no ratio for OH physicians to employees calculated due to the very low usage of occupational physicians in health care across the province.

Duties and responsibilities

OH professionals in B.C. are expected to perform an extensive range of tasks and this may prevent them from fulfilling all of their job responsibilities, including tasks specific to the prevention and management of occupational infections. Infection Control Practitioners (ICPs) are frequently asked to perform "traditional" OH duties due to lack of OH staff: three HAs reported that ICPs conducted OH duties related to occupational infections. One HA reported having ICPs perform new employee orientations due to lack of OH resources.

Coverage of medical staff and contract workers

Medical staff (e.g., fee-for-service physicians) and contract workers were particularly poorly covered by OH departments, with none of the HAs conducting employee health assessments for medical staff. However, five of six HAs reported conducting immunizations and respiratory fit testing for medical staff, and all HAs reported including medical staff in exposure and outbreak investigations. Five HAs reported having contract workers within their organization, but three of the five did not know whether policies and procedures were the same for contract as for non-contact workers. In HAs where OH services were not offered to contract workers, issues not related to exposure/infection follow-up were left to the contract workers' employer.

Discussion

There is widespread agreement that the OH service plays a critical role in an effective infection control program.[25] Given the wide range of necessary OH service provision, both ICPs and public health professionals may feel the effects of an OH service that is under-resourced. For example, ICPs may be required to assist with OH duties regarding the control of occupational infections, in spite of already being under-resourced for their own duties. It is increasingly well documented that policy decisions in this area of infectious disease transmission, and the content of specific training programs, are best developed collaboratively,[26] and because of their overlapping responsibilities, OH professionals must interact regularly and effectively with ICPs.[27] For example, communication about employee safety within health care organizations, and especially between OH and IC, is important in creating safe workplaces,[19] and clearly defining roles is essential.[28] Coordination of OH services with other departments that support the IC objectives can promote improved surveillance for infection in HCWs, as well as assist with exposure investigation and implementation of preventive measures.[29]

New occupational infections do occur in HCWs, and it is probable that another life-threatening and possibly unknown occupational infectious disease will emerge in the future.[15] Because of the risk of population health impact from emerging pathogens, it is critical to integrate OH, IC and public health. It is also critical that an adequate number of OH professionals be trained and hired to play an effective role in this collaboration, including the integration of up-to-date OH policies and procedures into the organization's overall infection control program, consistent and timely coverage for all employees, including contract workers and medical staff, dedicated OH professionals to liaise with ICPs, and in the event of an emergent situation, OH professionals to take the lead in organizing and coordinating an employee response plan.

OH professional to employee ratios have been proposed in the literature, although there is no consistent standard. It has been suggested that one OH nurse is usually needed for >300 employees with one additional OH nurse for every 750 employees thereafter. Additionally, an on-site OH physician is generally agreed to be warranted part time when the workforce reaches 1,000 employees and full time when it exceeds 2,000.[27] In another source, appropriate OH nurse staffing levels for the delivery of OH services have been identified as one full-time OH nurse for every 200-450 employees.[30] While there are no objective studies on which to base authoritative statements on the appropriate number of occupational physicians and nurses for infection control, it is clear that in B.C, as elsewhere, more resources are needed to cover training and staffing of dedicated OH professionals to work in the clinical areas of exposure follow-up and management of outbreaks. All health care employers must maintain adequate staffing of occupational nurses and physicians to prevent and manage exposure of HCWs to communicable diseases, including follow-up,[31] without diverting funds from other OH needs.

This study asked about contract workers within the HAs. Three HAs reported that they did not know if policies and procedures related to occupational infections were the same for contract workers as for hospital employees. This response emphasizes the importance of ensuring that consistent occupational infection standards be implemented for all groups of HCWs, including hospital employees, contract workers and medical staff. According to the Centers for Disease Control and Prevention *Guidelines for Infection Control in Health Care Personnel*, contractual employees must receive appropriate OH services. One way to accomplish this is to ensure that contract employers have agreements with their contract employees for the provision of OH services consistent with the policies of the facility where the employees work.[32]

Providing an adequate resource base for health and safety in the workplace is the employer's responsibility. Management must allow for the necessary resources and time to be dedicated to the program, demonstrate its desire for employees to participate and be willing to accept suggestions from

employees. In addition, management must be able to assess the relative merits of various programs, determine priorities and delegate responsibility.[33] The resulting benefits for the health care manager extend beyond the critical goal of a healthy workforce. Additional advantages potentially include decreased absenteeism rates, in addition to cost savings and a reduction in liability risk.

Based on the results of this survey and a review of the existing world knowledge, we propose the following: developing standards for the roles and responsibilities of OH professionals in the area of infection control activities related to health care associated infections; developing strategies to encourage the recruitment and training of new OH professionals to meet those standards; proposing region-specific OH professional staffing ratios with consideration to the scope of service provision and the geographic separation between worksites; providing ongoing training for OH professionals in the prevention and management of occupational infections, recognizing the specific educational needs of OH staff working in health care and making this available on an ongoing basis through online avenues; and encouraging greater collaboration among all professionals dealing with infectious diseases (e.g., ICPs, OH and public health) including in-service training opportunities to increase awareness of each person's roles.

Conclusions

The prevention of occupational injuries and illnesses is the most important duty of an OH service in any industrial sector. In the health care sector, special attention must be placed on OH programs and services for the prevention of infectious disease.[25] Given the breadth of these responsibilities, resource allocation in many health care institutions for OH services is inadequate and roles and responsibilities may not be clearly delineated. Health care workers are the backbone of the health care system. Protecting them from acquiring and transmitting infectious diseases is paramount to providing safe and effective health care, and requires more attention and resources.

Acknowledgments

We gratefully acknowledge the invaluable contribution and collaboration of the Provincial Infection Control Network Needs Assessment Working Group. We thank Monali Varia for her help with the analyses for this paper. We also thank Karen Lockhart, Research Manager of the "Making Health Care a Healthier Place to Work" program for her assistance and the Canada Research Council of Canada for supporting Dr. Yassi's CRC Chair in this area of study.

References

1. Health Canada. Canada's aging population. Health Canada, Division of Aging and Seniors;2002.
2. Hart KA. The aging workforce: Implications for health care organizations. Nursing Economics 2007;25(2):101-102.
3. Lowe GS. High-quality healthcare workplaces: A vision and action plan. Hospital Quarterly 2002;5(4):49-56.
4. Shamian J, El-Jardali F. Healthy workplaces for health workers in Canada: Knowledge transfer and uptake in policy and practice. Healthcare Papers 2007;7:6-25.
5. Lundstrom T, Pugliese G, Bartely J, Cox J, Guither C. Organizational and environmental factors that affect worker health and safety and patient outcomes. American Journal of Infection Control 2002;30(2):93-106.
6. Wilde JA, McMillan JA, Serwint J, Butta J, O'Riordan MA, Steinhoff MC. Effectiveness of influenza vaccine in health care professionals: A randomized trial. Journal of the American Medical Association 1999;281(10):908-13.
7. Saxen H, Virtanen M. Randomized, placebo-controlled double blind study on the efficacy of influenza immunization on absenteeism of health care workers. Pediatric Infectious Disease Journal 1999;18(9):779-83.
8. Yassi A, Pawson D, Leary T, Sikorski J, Parent D, Gilbert M, et al. Trends in workplace injuries, illness, and policies in healthcare across Canada: Workers' compensation patterns and policy changes in healthcare organizations. Report for Health Canada; 2004.
9. Rantanen J. Occupational health services: An overview. Copenhagen: World Health Organization, Regional Office for Europe;1990.
10. Yassi A, Gidotti TL. Occupational health services for hospital workers: Who does it best? Healthcare Management FORUM 1990;3(3):20-2.
11. Menzies D, Fanning A, Yuan L, Fitzgerald M. Hospital ventilation and risk for tuberculous infection in Canadian health care workers. Annals of Internal Medicine 2003;133(10):779-789.
12. Schwartzman K, Loo V, Pasztor J, Menzies D. Tuberculosis infection among healthcare workers in Montreal. American Journal of Critical Care Medicine 1996;154:1006-12.
13. Varia M, Wilson S, Sarwal S, McGeer A, Gournis E, Galanis E, et al. Investigation of a nosocomial outbreak of severe acute respiratory syndrome (SARS) in Toronto, Canada. Canadian Medical Association Journal 2003;169(4):285-292.
14. Chen NH, Wang PC, Hsieh MJ, Huang CC, Kao KC, Chen YH, et al. Impact of severe acute respiratory syndrome care on the general health status of healthcare workers in Taiwan. Infectection Control and Hospital Epidemiology 2007;28(1):75-9.
15. Koh D. Emerging infections among health care workers: The severe acute respiratory syndrome (SARS) experience. GOHNET Newsletter No. 8 - Health Care Workers. World Health Organization: The Global Occupational Health Network [on-line];2005.
16. Minor breach, major problem: Toronto medical workers find SARS 'unforgiving': CDC sends team of investigators to Canada. Hospital Infection Control 2003;30(6):73-77.
17. Ofner-Agostini M, Gravel D, McDonald LC, Lem M, Sarwal S, McGeer A, et al. Cluster of cases of severe acute respiratory syndrome among Toronto healthcare workers after implementation of infection control precautions: A case series. Infection Control and Hospital Epidemiology 2006:27(5):473-8.
18. Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. Canadian Medical Association Journal 2003;168(10):1245-51.

19. Moore D, Gamage B, Bryce E, Copes R, Yassi A. Protecting health care workers from SARS and other respiratory pathogens: Organizational and individual factors that affect adherence to infection control guidelines. American Journal of Infection Control 2005;33(2):88-96.
20. Lederberg J, Shope RE, Oaks SC Jr., editors. Emerging infections: Microbial threats to health in the United States. Washington, DC: National Academy Press;1992.
21. Morse SS. Factors in the emergence of infectious diseases. Emerging Infectious Diseases 1995;1:7-15.
22. Smolinski MS, Hamburg MA, Lederberg J, editors. Microbial threats to health: Emergence, detection, and response. Washington, DC: National Academy Press;2003.
23. Public Health Agency of Canada. Prevention and control of occupational infections in health care. Ottawa, ON: Public Health Agency, Health Canada;2002.
24. Provincial Infection Control Network BC. PICNet website, About us. [Accessed September 8, 2008]. Available from: http://www.picnetbc.ca
25. Diekema DJ, Doebbeling BN. Employee health and infection control. Infection Control and Hospital Epidemiology 1995; 16(5):292-301.
26. Baka A, Fusco F, Puro V, Vetter N, Skinhoj P, Ott K, et al. A curriculum for training healthcare workers in the management of highly infectious diseases. Euro Surveillance 2007;12(6):E5-6.
27. Orford RR, editor. Organization and operation of a medical center occupational health service. Clinics in Occupational and Environmental Medicine 2001;1(2):217-236.
28. Ebaugh H. Defining the scope of occupational health services. Effective policy and procedure development. American Association of Occupational Health Nurses Journal 1998;46(11): 547-52; quiz 553-4.
29. Sebazco S. Occupational health. In: Carrico R, editor. APIC text of infection control and epidemiology (pp. 26-2). Washington, DC: Association of Professionals in Infection Control and Epidemiology, Inc;2005.
30. Rieth LK. The occupational health service. Staffing, facilities, and equipment. American Association of Occupational Health Nurses Journal 2000;48(8):395-403; quiz 404-5.
31. Beltrami EM, Panlilio AL. Occupational exposure. In: Carrico R, ed. APIC Text of Infection Control and Epidemiology. Washington DC; Association of Professionals in Infection Control and Epidemiology, Inc; 2005:26-16.
32. Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchman SD. Guideline for infection control in health care personnel. American Journal of Infection Control 1998;26(3):289-327.
33. World Health Organization. Occupational health: A manual for primary health care workers. Cairo, Egypt: World Health Organization, Regional Office for the Eastern Mediterranean;2001.