Attitudes to Living and Working in Pandemic Conditions among Emergency Prehospital Medical Care Personnel

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SARS = severe acute respiratory syndrome

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Abstract

Introduction: Little is known about the risk perceptions and attitudes of healthcare personnel, especially of emergency prehospital medical care personnel, regarding the possibility of an outbreak or epidemic event.

Problem: This study was designed to investigate pre-event knowledge and attitudes of a national sample of the emergency prehospital medical care providers in relation to a potential human influenza pandemic, and to determine predictors of these attitudes.

Methods: Surveys were distributed to a random, cross-sectional sample of 20% of the Australian emergency prehospital medical care workforce (n = 2,929), stratified by the nine services operating in Australia, as well as by gender and location. The surveys included: (1) demographic information; (2) knowledge of influenza; and (3) attitudes and perceptions related to working during influenza pandemic conditions. Multiple logistic regression models were constructed to identify predictors of pandemic-related risk perceptions.

Results: Among the 725 Australian emergency prehospital medical care personnel who responded, 89% were very anxious about working during pandemic conditions, and 85% perceived a high personal risk associated with working in such conditions. In general, respondents demonstrated poor knowledge in relation to avian influenza, influenza generally, and infection transmission methods. Less than 5% of respondents perceived that they had adequate education/training about avian influenza. Logistic regression analyses indicate that, in managing the attitudes and risk perceptions of emergency prehospital medical care staff, particular attention should be directed toward the paid, male workforce (as opposed to volunteers), and on personnel whose relationship partners do not work in the health industry.

Conclusions: These results highlight the potentially crucial role of education and training in pandemic preparedness. Organizations that provide emergency prehospital medical care must address this apparent lack of knowledge regarding infection transmission, and procedures for protection and decontamination. Careful management of the perceptions of emergency prehospital medical care personnel during a pandemic is likely to be critical in achieving an effective response to a widespread outbreak of infectious disease.

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Introduction

Emergency prehospital medical care providers are frontline health staff and in the event of a pandemic, will be among the first members of the community to face exposure to infection. Recent global events such as the severe acute respiratory syndrome (SARS) outbreak have confirmed that these personnel are among the first health workers to face exposure to infection during such events and to develop disease in highly contagious/epidemic conditions.

While there are many epidemiological differences between pandemic influenza and SARS, much of what was learned from dealing with the SARS

outbreak is applicable to pandemic influenza. During the SARS outbreak, approximately half of those infected were healthcare workers exposed to the virus while caring for patients with SARS, whether the infection was recognized.[1–4] Experience during the outbreak in Toronto and elsewhere in 2003 demonstrated the importance of a dedicated health surveillance and quarantine program in the emergency prehospital medical sector. Managing the exposure of personnel and containing the potential for this section of the health workforce to contribute to contagion is critical to effective control of epidemics characterized by human-to-human transmission.

Despite the fact that emergency prehospital medical care personnel are recognized as frontline health workers during emergencies, most of the research on attitudes and behaviors in relation to disasters and emergency responses have involved nurses or physicians, and/or hospital administration.[5–9] Few studies have included personnel from the emergency prehospital medical care sector.[10,11] Yet in Australia, this workforce (approximately 15,000 individuals) approaches the number of primary care medical practitioners (22,000),[12] and therefore, represents a significant portion of the healthcare sector.

Several studies have documented the psychological and psychiatric morbidity of healthcare workers as a consequence of the SARS epidemic.[13,14] However, little is known about the perceptions, attitudes, and likely behavioral responses of emergency prehospital medical care personnel facing the possibility of an outbreak or epidemic event. Studies that have examined attitudes and behaviors related to disasters and emergency responses have focused on SARS,[14–23] and usually have been restricted to one geographical region. The exception is research by DiMaggio *et al*,[24] which examined the attitudes and perceptions of a nationally representative sample of emergency services personnel in the US to a range of possible terrorist incidents.

Aims

This study was designed to investigate pre-event knowledge and attitudes of a national sample of emergency prehospital medical care personnel in relation to a potential human influenza pandemic, and to determine predictors of these attitudes.

Methods

Study Design

In Australia, emergency prehospital medical care providers perform acute medical care ranging from basic to advanced levels, within nine ambulance services. In May 2006, reply-paid surveys were distributed to a random sample of 20% of the national emergency prehospital medical care workforce (n = 2,929), including operational, administrative, and managerial staff. The sample was stratified according to ambulance service, gender, and location (metropolitan versus non-metropolitan). This stratification reflected an *a priori* hypothesis that perceptions and attitudes regarding a possible pandemic may vary along these dimensions.

Survey Items and Variables

A panel of experts, comprising epidemiologists, infectious disease experts, and psychologists assessed the face and content validity of successive drafts of the questionnaire, which was pilot-tested with small groups of potential respondents, and modified according to the feedback provided. The final survey, which required approximately 20 minutes to complete, comprised 115 items and was divided into four sections: (1) demographic information; (2) knowledge of influenza; (3) attitudes and perceptions; and (4) likely behavioral responses during pandemic conditions (not discussed in this paper).

Demographic Variables—Key variables included: (1) gender; (2) age; (3) work location (metropolitan versus non-metropolitan); (4) length of service in the ambulance system (≤5 years; >5 years); (5) current position (operational/non-operational); (6) volunteer status (volunteer/non-volunteer); (7) relationship status (living in permanent relationship/not); and (8) children (yes/no).

Knowledge of Influenza—The questionnaire comprised five domains of knowledge: (1) general knowledge of avian influenza; (2) general knowledge of pandemic human influenza; (3) knowledge of mechanisms of infection transmission; (4) protection; and (5) decontamination, with respect to influenza infection. For each of these domains, participants responded to a number of items, for which appropriate responses were predetermined by the expert panel. The number of correct responses was summed, and a total score exceeding a predefined limit was categorized as "adequate knowledge". Other scores were categorized as "inadequate knowledge".

Participants also responded (yes/no) to six statements about their perceptions of the adequacy of their education and training on aspects of pandemic human influenza, such as symptom recognition, correct reporting procedures, and effectiveness of antiviral medications. Positive scores were summed, and scores ≤5 were categorized as "perceived inadequate education/training". An additional item (yes/no) addressed perceived adequacy of education and training about infectious agents generally.

Attitudes and Perceptions—Attitudes and perceptions related to living and working in pandemic conditions were examined using five-point Likert scales. Factor analyses and internal reliability analyses were performed wherever appropriate. For composite variables, mean scale scores were computed, and scores then were categorized into similar sized groups, to allow inclusion in binary logistic regression. Three domains were investigated: (1) anxiety (eight items; Cronbach's alpha = 0.91; n = 714; high and low anxiety); (2) risk perception (10 items; Cronbach's alpha = 0.85; n = 725; high and low risk perception); and (3) overall concern (one item; low and high concern). Two additional items were used to assess the perceived level of concern among survey respondents' relationship partners with regard to pandemic influenza in general, and home quarantine during pandemic conditions.

Protocol

To protect confidentiality, selection of the study sample and distribution of survey packages occurred within each of the nine ambulance services, following protocols established by the Project Team. This allowed identifying information and

	Prehospital workforce (n = 14,451)		Sample (n = 725)	
	n	%	n	%
Male Metropolitan	5,112	35.4	261	36.0
Male Non-Metropolitan	3,867	26.7	195	26.9
Female Metropolitan	2,689	18.6	138	19.0
Female Non-Metropolitan	2,783	19.3	131	18.1
Total	14,451	100.0	725	5.0

Table 1—Australian emergency prehospital medical care workforce and sample, stratified by gender and location

contact details to be retained within each ambulance service. Potential participants received two survey packages—one for themselves and another for their relationship partner. Each survey package comprised: (1) a survey; (2) information sheet; (3) definition sheet; (4) consent form inviting respondents to participate in a focus group; (5) reply-paid envelope for return of the survey; and (6) a separate reply-paid envelope for the consent form. An independent mailbox was established for return of the surveys and consent forms. Returned surveys were kept in a locked filing cabinet. Electronic data were accessible to project staff only, and were password protected. Surveys were anonymous and carried only a numerical code to facilitate follow-up of non-responders. Data analyses occurred at a group-level only.

The relevant ambulance service sent each non-respondent a reminder letter and an additional copy of the survey package after four weeks. This direct communication was supported by general written and electronic reminders from each ambulance service to general staff encouraging participation in the survey. Personal letters of support for the project from Chief Executive Officers and the Chair of the Council of Ambulance Authorities, Web notices from the Australian College of Ambulance Professionals (the professional body in Australia), relevant unions, and memoranda posted on notice boards in ambulance stations were used as reminders and encouragements.

Ethics approval was obtained from the Behavioural and Social Sciences Ethical Review Committee of the University of Queensland, and complies with the provisions contained in the National Statement on Ethical Conduct on Research Involving Humans.

Statistical Processing

Using SPSS 11.5 (SPSS Inc., Cary, NC), crude odds ratios (ORs), and corresponding 95% confidence intervals (95%CI) were calculated to examine the relationships between predictor variables (demographics and knowledge) and reported attitudes/perceptions regarding pandemic influenza. All variables found to be statistically significantly associated (i.e., 95% CI not including 1.0, p <0.05) with attitude/perception measure in crude analyses were included in a logistic regression model for that attitude/perception. Any variables that no longer were statistically significantly related were removed from this model, one at a time, and the impact on the remaining variables was assessed. If no changes to the odds ratios of the other variables beyond 10% were observed, then the variable was not included in the final model.

Results

Although the response rate was relatively low (725/2,929 = 24.7%), the sample represented the Australian emergency prehospital medical care workforce in relation to the three stratification factors used to obtain the survey (Table 1).

Approximately two-thirds (64%) of respondents were male, the mean value for the ages of respondents was 43 ±0.44 years, and most participants (76%) were operational staff who had frequent contact with patients (Table 2). Approximately half (49%) of the respondents were paramedics, and therefore, able to perform advanced life support skills and administer mid-level prehospital drugs. One in seven possessed higher qualifications (i.e., able to perform endotracheal intubation; chest decompressions; and administer advanced cardiac and other drugs). Approximately 13% of respondents were student paramedics. Almost two-thirds of survey participants had been employed by an ambulance service for >5 years. The majority were employed in a full-time (n = 77.0%; n = 551), paid (85.4%; n = 551) capacity (vs. volunteers).

In general, respondents demonstrated poor knowledge in relation to avian influenza, influenza generally, and infection transmission mechanisms (Table 3). Only 5% of respondents across Australia perceived that their education/training on avian influenza was adequate. Many respondents reported high levels of anxiety about working during pandemic conditions, and perceived that there is a high level of risk associated with working in such conditions. Almost two-thirds of respondents perceived that their relationship partners were highly concerned about them working during a pandemic, and the majority of participants perceived that their partners were concerned about home quarantine in the event of a pandemic. Importantly, the majority of partners demonstrated poor knowledge of protection against infection.

Predictors of Attitudes to Working during a Pandemic

Independent predictors of attitudes toward working during a pandemic human influenza outbreak are listed in Table 4. Respondents who were volunteers (OR = 0.36; 95% CI = 0.2–0.6), or who demonstrated adequate knowledge of infection transmission mechanisms (OR = 0.63; 95% CI = 0.4–0.9)

Sample Characteristics		n	%
Gender (2 missing cases)	Male	462	63.9
	Female	261	36.1
Age	Mean = 43.1 ±0.44 years		
Position (36 missing cases)	Patient Transport Officer*	39	5.7
	Student	90	13.1
	Paramedic	340	49.3
	Intensive Care Paramedic*	94	13.6
	Manager/OIC	57	8.3
	Communications Officer	21	3.0
	Administration/Training/Research	48	7.0
Length of Service (3 missing cases)	<1year	57	7.9
	1–5 years	220	30.5
	>5 years	445	61.6
Volunteer Status (5 missing cases)	Volunteer	105	14.6
	Paid	615	85.4
Work Status (9 missing cases)	Full-time	551	77.0
	Part-time	165	23.0
Relationship Status (3 missing cases)	No partner	90	12.5
	Live with partner	578	80.1
	Long-term partner but not cohabitating	54	7.5
Has Children		517	71.3

Table 2—Sample characteristics (n = 725)
*Equivalent positions exist in different services (e.g., in Victoria, the equivalent to Intensive Care Paramedic is MICA

Variable	Low		High	
	n	%	n	%
Knowledge				
Perceived education/training (infectious agents)	384	53.0	341	47.0
Perceived education/training (avian influenza)	697	96.1	28	3.9
Knowledge (general influenza)	539	74.3	186	25.7
Knowledge (avian influenza)	688	94.9	37	5.1
Knowledge (infection transmission)	409	57.9	297	42.1
Knowledge (infection protection)	195	27.3	518	72.7
Knowledge (decontamination)	53	7.3	672	92.7
Attitudes				
Anxiety	79	10.9	645	89.1
Risk perception	106	14.6	619	85.4
Confidence in employer	425	62.8	252	37.2
Overall concern	401	55.4	323	44.6
Perceived relationship partner concern	242	34.5	460	65.5
Perceived relationship partner concern (home quarantine)	162	23.1	539	76.9

Table 3—Knowledge and attitudes of emergency prehospital medical care personnel (n = 725)

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		High Perceived Risk		High Anxiety		High Overall Concern	
		OR	95% CI	OR	95% CI	OR	95% CI
Demographics	Volunteer status (volunteer)	0.36	0.2–0.6				
	Gender (female)			0.56	0.3–0.9		
Knowledge	Infection transmission (adequate)	0.63	0.4–0.9				
	Avian influenza (generally)	1.86	1.1–3.2				
	Influenza protection (adequate)			0.32	0.2–0.6		
	Perceived education/training (infectious disease generally)					0.62	0.5–0.8

Table 4—Independent predictors of attitudes toward working during pandemic human influenza

were significantly less likely to perceive high risks related to working during a pandemic. Conversely, those who demonstrated adequate knowledge of avian influenza generally were more likely to perceive a high risk in relation to working during a pandemic (OR = 1.86; 95% CI = 1.1–3.2). Female participants were significantly less likely to be highly anxious about working during a pandemic (OR = 0.56; 95% CI = 0.3–0.9), as were respondents with adequate knowledge of infection protection methods (OR = 0.32; 95% CI = 0.2–0.6). The only variable that was significantly associated with overall concern about working during a human influenza pandemic was perceived education/training on infectious diseases generally. Respondents who perceived that they had adequate training in this area were significantly less concerned about working during a pandemic than were peers who perceived that their training was incomplete (OR = 0.62; 95% CI = 0.5–0.8).

Perceived Partner Concerns

Volunteer emergency prehospital medical care personnel were significantly less likely than were non-volunteers to perceive that their relationship partners were concerned about pandemic human influenza (OR = 0.60; 95% CI = 0.4–0.9), or about home quarantine during a pandemic (OR = 0.37; 95% CI = 0.2–0.6; Table 5). However, staff whose relationship partners did not work in the health sector were more likely to perceive that their partners were concerned about them working during a pandemic (OR = 1.65; 95% CI = 1.1–2.3), and about home quarantine (OR = 1.82; 95% CI = 1.2–2.8). Female respondents were less likely than males to perceive that their partners were concerned about a pandemic (OR = 0.67; 95% CI = 0.5–0.9). Importantly, while emergency prehospital medical care personnel with adequate knowledge of infection transmission mechanisms were less likely to perceive that their partners were concerned about home quarantine (OR = 0.57; 95% CI = 0.4–0.8), those with an adequate knowledge of avian influenza generally were more likely to perceive that their relationship partners were concerned about home quarantine (OR = 1.90; 95% CI = 1.1–3.1).

Potential Impact of Non-Response

Although the sample of eligible emergency prehospital medical care personnel was drawn carefully, the overall response fraction (24.7%) was modest. Some 90% (645/725) of participants in the survey were anxious about working during a pandemic.

Discussion

High levels of anxiety and risk perception in relation to working during pandemic conditions were observed among emergency prehospital medical care personnel. In general, respondents demonstrated poor knowledge of avian influenza, influenza in general, and infection transmission mechanisms. These findings have significant operational and organizational implications for the emergency prehospital medical care workforce, and pandemic preparedness.

Education/Training

About half of the emergency prehospital medical care personnel who responded to the survey perceived they had adequate education/training about infectious agents in general. This is similar to pervious studies of other healthcare workers.[17,25] These data demonstrate that personnel in the emergency prehospital medical care workforce who perceive they are well-informed about infectious disease generally are significantly less likely to be concerned about working in pandemic conditions. While adequate knowledge of infection transmission mechanisms was associated with lower perceived risk, only 42% of respondents demonstrated adequate knowledge of infection transmission. These data indicate that, at least at the time of the survey (2006), there was a clear lack of knowledge about mechanisms of infection transmission among the emergency prehospital medical care workforce in Australia, and a perception that education/training about infectious agents, and avian influenza specifically, was inadequate. These deficits are particularly important, given that the lack of knowledge was associated with increased stress of healthcare workers involved in treating patients with SARS.[26]

Simultaneously, data from the present study indicate that adequate knowledge of avian influenza is associated with a higher perceived risk related to working during pandemic conditions, perhaps reflecting an accurate appreciation of the high case fatality among humans infected with avian influenza. The extent to which these attitudes might translate into behaviors during pandemic conditions (e.g.,

		Perceived partner to have high degree of concern		Perceived partner to have high degree of concern re: home quarantine	
		OR	95% CI	OR	95% CI
Demographics	Volunteer status (volunteer)	0.60	0.4–0.9	0.37	0.2–0.6
	Gender (female)	0.67	0.5–0.9		
	Partner does not work in health industry	1.65	1.1–2.3	1.82	1.2–2.8
Knowledge	Infection transmission (adequate)			0.57	0.4–0.8
	Avian influenza (generally)			1.90	1.1–3.1

Table 5—Independent predictors of perceptions of relationship partners' attitudes toward working during pandemic human influenza

willingness to work, preparedness to wear personal protective equipment) and willingness to teach protective practices to family members and the public remains unknown.

The majority of respondents believed that their relationship partners were very concerned about a human influenza pandemic, and specifically about home quarantine of ambulance personnel during a pandemic. To date, there has been little attention directed to the concerns of relationship partners about the risks that a pandemic may bring to healthcare personnel. Thus, the extent of agreement between perceptions of partner concerns and actual partner concerns is unknown, as is their relative importance in terms of the attitudes and behavior of emergency prehospital medical care personnel facing pandemic conditions.[27] In the present study, an inverse relationship between knowledge of infection transmission mechanisms and perceived level of concern on the part of one's relationship partner about emergency work during a pandemic was observed. This highlights the importance of adequate training in infection control for the emergency prehospital medical care workforce. Even so, adequate knowledge about avian influenza was associated with a higher level of perceived concern among relationship partners about home quarantine. Ambulance services clearly face a delicate balancing act in providing factual information to their staff, assisting personnel and their families to arrive at a realistic assessment of the risks associated with avian influenza, and assuring that the consequent emotional and behavioral responses of both groups are congruent with those risks.

Attitudes and risk perceptions appear to have contributed substantially to psychological distress experienced by healthcare workers during the outbreak of SARS.[18] Addressing the perceived lack of pandemic-related knowledge and training may be crucial in managing the attitudes of the emergency prehospital medical care workforce, and therefore, pandemic preparedness. There is questionable wisdom in allocating valuable resources to educating emergency personnel on the specifics of virology, biochemistry, etc. There also is a challenge in providing sufficient information on the basic biology of influenza viruses to ensure that relevant procedures for prevention of transmission and protection and decontamination of ambulance staff and equipment are followed, while not raising inappropriate concerns to the point where provision of emergency prehospital medical care services would be compromised once the incidence of infection began to escalate.

These data indicate that particular attention should be directed toward the male, paid workforce (as opposed to volunteers), and to personnel whose relationship partners do not work in the health industry. However, highly sensitive training and communication strategies may compromise performance of ambulance services if staff outside the nominated target groups failed to follow best practice in infection control. Like protection against blood-borne viruses, optimal pandemic preparedness is likely to rely on universal safety precautions.

Strengths and Limitations

To date, the majority of studies examining attitudes and behaviors of healthcare personnel in relation to working in disaster conditions are limited by study design (many are based on convenience samples), and methodological weaknesses, such as failure to adjust for relevant confounders. Most have been restricted to descriptive analyses only, and few have included emergency prehospital medical staff. In contrast, the present study involved a large and representative sample of the national emergency prehospital medical care workforce in Australia. Knowledge of avian influenza and attitudes to working in pandemic conditions were assessed. Through the possibility of home quarantine of exposed staff, consideration of the outlook of relationship partners was a relevant and novel addition. While some of the measures were "soft" self-assessments of the adequacy of education and training, these were complemented by direct questions about transmission and prevention of infection. The authors believe that the apparent relationships between the accuracy of this knowledge and levels of anxiety and confidence have considerable face validity.

If it is assumed that only anxious individuals responded, the overall proportion of emergency prehospital medical care staff with significant anxiety about working in pandemic conditions is 22%. However, the assumption regarding selective response that underlies this figure is an extreme one, suggesting that the figure itself is conservative and that significant anxiety actually is more widespread. The alternative assumption, that anxiety is universal in this sample of the emergency prehospital medical care workforce, except for the 80 individuals who expressed no such

fears, yields a corrected estimate for the prevalence of significant concerns of 97%. As a consequence of the low response fraction, these sensitivity analyses lead to a wide range of estimates of the true prevalence of high anxiety about working during a pandemic. Nevertheless, given that the sample was nationally representative in terms of gender, locality, and specific ambulance service, a minimum prevalence of 22% remains significant managerially, and would impact on the national capacity to respond to a pandemic.

Conclusions

During pandemic conditions, when it is anticipated that part of the emergency prehospital medical care workforce will be unavailable due to illness and quarantine, absenteeism motivated by anxiety or concern over working could significantly impair the community's frontline medical response. The findings presented here highlight the potentially crucial role of effective education and training in maximizing pandemic preparedness. Further, these findings should facilitate development of systems for training and operational support of emergency prehospital medical care personnel facing such a situation. An understanding of the origins and likely responses of emergency services personnel to a major infectious disease outbreak is critical to maintaining response capacity during such an emergency.

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References

1. Centers for Disease Control and Prevention: Cluster of severe acute respiratory syndrome cases among protected health care workers—Toronto, Canada, April 2003. *MMWR* 2003;52:433–438.
2. Wenzel R, Edmond M: Lessons from severe acute respiratory syndrome (SARS): Implications for infection control. *Arch Med Res* 2005;36:610–616.
3. Chong M, Wang W, Hsieh W, Lee C, Chiu N, Yeh W, Huang T, Wen, J, Chen C: Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. *Br J Psychol* 2004;185:127–133.
4. Verbeek P, McClelland I, Silverman A, Burgess R: Loss of paramedic availability in an urban emergency medical services system during a severe acute respiratory syndrome outbreak. *Acad Emerg Med* 2004;11:973–978.
5. Gullion JS: School nurses as volunteers in a bioterrorism event. *Biosecur Bioterror* 2004;2:112–117.
6. Alexander GC, Wynia MK: Ready and willing? Physicians' sense of preparedness for bioterrorism. *Health Affairs* 2003;22:189–193.
7. Cowan A, Clark SJ, Kemper AR: Willingness of private physicians to be involved in smallpox preparedness and response activities. *Biosecur Bioterror* 2005;3:16–22.
8. Balicer RD, Omer SB, Barnett DJ, Everly Jr GS: Local public health workers' perceptions toward responding to an influenza pandemic. *BMC Public Health* 2006;6.
9. Ehrenstein B, Hanses F, Salzberger B: Influenza pandemic and professional duty: Family or patients first? A survey of hospital employees. *BMC Public Health* 2006;6.
10. Qureshi K, Gershon R, Sherman M, Straud T, Gebbie E, McCollum M, Erwin M, Morse S: Health care workers' ability and willingness to report to duty during catastrophic disasters. *Urban Health* 2005;82:378–388.
11. Syrett J, Benitez J, Livingston W, Davis A: Will emergency health care providers respond to mass casualty incidents? *Prehosp Emerg Care* 2007;11:49–54.
12. Australian Institute of Health and Welfare: Medical Labor Force 2004. National Health Labor Force Series no. 38. Canberra: AIHW, 2006. Available at http://www.aihw.gov.au/publications/hwl/mlf04/mlf04.pdf. Accessed 01 February 2010.
13. Chua S: Psychological effects of the SARS outbreak in Hong Kong on high-risk health care workers. *Can J Psychiatry* 2004;49:391–393.
14. Robertson E, Hershenfield K, Grace S, Stewart D: The psychological effects of being quarantined following exposure to SARS: A qualitative study of Toronto health care workers. *Can J Psychiatry* 2004;49:403–407.
15. Tzeng H: SARS infection control in Taiwan: Investigations of nurses' professional obligation. *Outcomes Manag* 2003;7:186–193.
16. Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, Sadavoy J, Verhaeghe L, Steinberg R, Mazzulli T: The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *Can Med Assoc J* 2003;168:1245–1251.
17. Moore D, Gilbert M, Saunders S, Bryce E, Yassi A: Occupational health and infection control practices related to severe acute respiratory syndrome. *American Association of Occupational Health Nurses* 2005;53:257–266.
18. Tam C, Pang, E, Lam L, Chiu H: Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. *Psychol Med* 2004;34:1197–1204.
19. Bai Y, Lin C, Lin C, Chen J, Chue C, Chou P: Survey of stress reactions among health care workers involved with the SARS outbreak. *Psychiatr Serv* 2004;55:1055–1057.
20. Koh D, Lim MK, Chia SE, Ko SM, Qian F, Ng V, Tan BH, Wong KS, Chew WM, Tang HK, Ng W, Mutlakin Z, Emmanuel S, Fong NP, Koh G, Kwa CT, Tan KB, Fones C: Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare workers in Singapore: What can we learn? *Medical Care* 2005;43:676–682.
21. Koh D, Takahashi K, Lim M, Imai T, Chia S, Qian F, Ng V, Fones C: SARS risk perception and preventative measures, Singapore and Japan. *Emerg Infect Dis* 2005;11:641–642.
22. Chan S, Leung G, Tirawi A, Salili F, Leung S, Wong D, Wong A, Lai, A, Lam T: The impact of work-related risk on nurses during the SARS outbreak in Hong Kong. *Fam Community Health* 2005;28:274–287.
23. Wong TW, Yau JK, Chan CL, Kwong RS, Ho SM, Lau CC, Law FL, Lit CH: The psychological impact of severe acute respiratory syndrome outbreak on healthcare workers in emergency departments and how they cope. *Eur J Emerg Med* 2005;12:13–18.
24. DiMaggio C, Markenson D, Loo GT, Redlener I: The willingness of US emergency medical technicians to respond to terrorist incidents. *Biosecur Bioterror* 2005;3:331–337.
25. Imai T, Takahashi K, Hoshuyama T, Hasegawa N, Lim M, Koh D: SARS risk perceptions in healthcare workers, Japan. *Emerg Infect Dis* 2005;11:404–410.
26. Maunder R, Lancee W, Rourke S, Hunter J, Goldbloom D, Balderson K, Petryshen P, Steinberg R, Wasylenki D, Koh D, Fones C: Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. *Psychosom Med* 2004;66:938–942.
27. Watt K, Tippett V, Raven S, Kelly H, Coory M, Jamrozik K, Archer F: Anticipated behaviors of emergency prehospital medical care providers during an influenza pandemic. *Prehosp Disaster Med* 2010;25(1):10–15.