TORONTO STAFF REPORT

November 23, 2005

To: Board of Health

From: Dr. David McKeown, Medical Officer of Health

Subject: Preliminary Results of SARS-Related Public Health Research

Purpose:

To present some findings to date from SARS research under way at Toronto Public Health and outline the implications for pandemic influenza planning.

Financial Implications and Impact Statement:

There are no financial implications stemming from this report.

Recommendation:

It is recommended that the Board of Health receive this report for information.

Background:

Toronto Public Health, the Regions of York and Peel Public Health, and a number of academic researchers have been collaborating on research related to public health management of SARS. The purpose of this research is to investigate the risk of SARS to the general community, and evaluate the role of large-scale contact tracing and quarantine as public health measures in the 2003 SARS outbreak. While the highest risk group for SARS was hospital health care workers and in-patients, to date the risks to the general community have not been well defined.

The study group aims to publish the detailed research findings in the scientific literature to make them widely available to the medical/public health communities and the general public. This work was funded 100% by the Ontario Ministry of Health and Long-Term Care.

This report presents preliminary findings of the research and outlines the implications for pandemic influenza planning.

Comments:

The SARS Quarantine Evaluation and Community Transmission Study has three major components:

(1) A qualitative study of the quarantine experience;

(2) Documentation of the contact follow-up / quarantine protocols and procedures used in the three health units during the outbreak; and

(3) A quantitative analysis of:

- (i) exposure patterns in the community
- (ii) the risk of SARS among community contacts
- (iii) logistics and effectiveness of large scale contact tracing
- (iv) the effectiveness of quarantine during the outbreak

In addition, Toronto Public Health is involved in a study of household transmission of SARS and an ongoing study of the ethical issues related to quarantine.

Overview of Findings to Date:

Quarantine imposes a significant burden on individuals. The qualitative component of the study included interviews with 21 individuals who were quarantined during the SARS outbreak but did not become cases themselves. The intent was to investigate their experiences and inform future quarantine policy. Inconsistencies and changes in the factual information about SARS and in quarantine protocols, confusion about the purpose of quarantine, and logistical issues in contact follow-up were all identified as problems. However, interviewees expressed considerable support for compliance with quarantine, citing ethical, legal, and social imperatives as the reasons for their support. Analysis of the qualitative data showed that streamlined communication strategies, enhanced communicable disease training for all public health staff, and improved continuity of care should be part of any review of quarantine policies and procedures. Documentation of the detailed public health protocols developed during the outbreak has been compiled and will support any quarantine measures that may be implemented in the future.

The quantitative section of the study dealt with individual contacts who were exposed to SARS. The study examined contacts in households and extended family and/or friends, as well as in work, school, hospital visit, and outpatient health care settings. It excluded hospital workers and in-patients. This portion of the study involved a review of SARS case and contact records from the three participating health units who handled 90% of the reported cases and approximately 95% of the identified contacts during the Ontario SARS outbreak.

The household transmission study found that risk of transmission to other household members was associated with the length of time a SARS case was ill at home, and with infection control practices in the household.

Community Transmission Risk:

Almost 31,000 community contacts of SARS were identified in public health records for the three health units over the four months of the outbreak (approximately half in Toronto). Daily counts of those exposed ranged dramatically from none to as high as 3,000. Among general community members, household contacts of SARS cases were at highest risk of becoming infected. Hospital visitors were at relatively low risk. In high schools and large workplaces, a single case could potentially expose many others. Three SARS cases in high school/workplace settings resulted in almost 5,000 contacts being identified. Contacts in school and workplace settings appear to have been at extremely low risk of SARS. Among these contacts, only one case of transmission occurred in a very close workplace contact.

Control Measures:

The experience with SARS shows that the availability of concrete, detailed plans and the necessary infrastructure to implement them can improve outcomes during a large outbreak. By phase two of the SARS outbreak, enough had been learned about this new disease to allow the development of comprehensive infection control and follow-up policies and procedures. There was also an infrastructure in place to deliver them, both in hospitals and in the community. There were far fewer total cases in phase two (59 vs. 274) and a smaller proportion of these were community cases (31% vs. 50%).

Contact tracing and quarantine were the primary control measures used in the community during SARS. The purpose of contact tracing is to identify exposed individuals at specific risk of infection and to deliver targeted intervention to decrease the risk of illness and further transmission. Intervention may include measures such as immunization, prophylaxis and infection control advice. Once a case is diagnosed and reported, it takes time for public health staff to locate and speak with the ill person and/or family and friends, identify specific contacts at risk, and then locate and speak with each of these contacts in turn. SARS has a median incubation period of four days from exposure to onset of infectiousness. Based on the Ontario experience during the SARS outbreak, this is likely a bare minimum to reliably deliver an intervention to the highest risk contacts in the community. Large-scale contact tracing of exposed individuals should not be considered as a control strategy if an intervention must be delivered within one to three days of exposure. The time required for contact tracing is the key “bottleneck” to delivering the intervention in time.

Contact tracing and quarantine did not eliminate transmission of SARS. However, it was effective in reducing transmission by about 50% for the closest community contacts – mainly of household members. Early identification and hospital isolation of cases as they became ill and infectious likely also played a major role in successfully reducing transmission.

Where practically feasible, quarantine may have a legitimate role as an interim measure when dealing with unknown respiratory pathogens for which there is no available treatment, vaccine, or prophylaxis. However, its usefulness will be severely limited by disease characteristics. If a disease progresses quickly from exposure to onset of infectiousness (i.e. less than the four-day median period for SARS) it will not be feasible to get individual contacts into quarantine prior to them becoming infectious themselves. A quarantine approach is also unlikely to have much impact on airborne infections, and/or infections such as influenza, which are much more easily transmitted than SARS.

Implications for Pandemic Influenza:

While SARS affected a significant number of Toronto area residents as cases or contacts, pandemic influenza is likely to have a much larger impact, and require an extraordinary public health response. Many strategies to contain the outbreak and reduce its impact will be similar. For example, public health follow-up and medical management must be able to handle the full range of ages. In addition, some people needing hospitalization will have vulnerable dependents who must also be cared for. This will be even more of a challenge for pandemic influenza, since more families will be directly affected. The SARS experience highlighted the need for school and workplace policies to support ill people staying home. This will also be a critical issue for pandemic influenza.

There are, however, fundamental differences in both the epidemiology and control measures that flow directly from the differing characteristics of the two diseases. The most obvious is infectiousness. Pandemic influenza is more easily transmitted and will likely affect many more Toronto residents. SARS was primarily nosocomial (hospital-based) and therefore focused in very specific, identifiable risk groups. Despite initial uncertainty and concern, the general community was never at high risk. By contrast, influenza is a community-spread infection; we are all at risk. Unlike SARS, influenza cannot be contained in specific locations or among particular segments of the community. Rigorous infection control protocols in hospital, while important, will have little impact on transmission in the general population. Thus, hospitals will play a much smaller role in containment of the outbreak than they did during SARS. They will, however, be treating a much larger number of patients.

Individual contact tracing and quarantine were the main control measures used in the community during SARS. While this approach had some success (in conjunction with intensive surveillance and infection control in hospitals) it is extremely unlikely to be effective for influenza. People with influenza are infectious within one to two days following exposure. This is not sufficient time to identify and trace individual contacts before they become infectious themselves. The number of contacts at risk per case is also likely to be higher, and the risk group is more difficult to identify for influenza. Unlike in SARS, people with influenza are infectious prior to becoming ill. Isolation of cases as they become ill therefore cannot prevent transmission. If contact tracing and quarantine have any role in influenza control, it will be minimal and only in the very initial phases. Instead, control strategies for pandemic influenza will need to focus on interventions which can be applied community-wide. Clear risk communication and direction to the general public will be vital throughout.

Finally, the SARS experience shows that detailed protocols and delivery mechanisms can have a positive impact on large outbreaks. The influenza pandemic planning currently underway in health units, hospitals, and communities throughout Ontario is effort well spent.

Conclusions:

The public health research on the SARS outbreak in 2003 provides useful findings about the epidemiology of SARS and the effectiveness of public health response measures and offers valuable lessons for other large communicable disease outbreaks, including Pandemic Influenza. The research identified parameters for implementing contact tracing and quarantine pressures and indicated that while they were useful tools in SARS, they are unlikely to be effective in controlling Pandemic Influenza.

There is a need for substantial surveillance, data sharing and management and rapid epidemiological analysis to effectively manage any large scale communicable disease outbreak. The involvement of public health in applied research is crucial to ensure continuous improvement in outbreak response.

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