Five Policy Recommendations from Toronto's SARS Outbreak to Improve the Safety and Efficacy of Restrictions on Hospital Admissions to Manage Infectious Disease Outbreaks

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The Issue

Infectious diseases have been in the spotlight in Ontario as a result of newly announced government-led public reporting of hospital-based infectious diseases. These include *Clostridium difficile*, vancomycin-resistant *Enterococcus* and methicillin-resistant *Staphylococcus aureus*. The increased attention to hospital-based infectious diseases in Canada comes as a result of multiple factors, including the 2003 outbreak of severe acute respiratory syndrome (SARS) in Toronto, which disrupted the healthcare system and killed 44 people (Schull et al. 2007; Hwang et al. 2007); the revelation that hospital-based outbreaks of *Clostridium difficile* killed an estimated 117 patients in Quebec in 2003 (Loo et al. 2005); and ongoing concern over the possibility of an influenza pandemic (World Health Organization n.d.).

Control of such outbreaks may require the temporary closure of hospital wards or units or, occasionally, the entire hospital, and it may restrict new admissions to hospital (Hansen et al. 2007; New York State Department of Health 2006; Toronto Pandemic Influenza Planning Steering Committee 2005). In the case of hospital-based outbreaks, this may be done to control the outbreak and limit the potential contact of uninfected patients with the organism. One study found 194 separate documented instances of closures of part or all of a hospital due to outbreaks of 20 different organisms (Hansen et al. 2007). Closures lasted up to 56 days; entire hospitals were closed due to outbreaks of SARS, influenza, streptococcal pneumonia, norovirus, shigella and rotavirus (Hansen et al. 2007). In the case of a major community-based outbreak of an organism such as influenza, where large numbers of admissions to hospital are expected, hospitals may need to limit non-urgent admissions to provide "surge capacity" to deal with the influx of patients affected by the infection. Such a restriction on admissions is an integral part of plans to deal with an influenza pandemic (New York State Department of Health 2006; Toronto Pandemic Influenza Planning Steering Committee 2005).

Recently, we published a series of articles on the health effects of widespread restrictions on non-urgent hospital admissions imposed at all 32 hospitals in the Greater Toronto Area to control the 2003 SARS outbreak, the largest outbreak outside of Asia (Schull et al. 2006, 2007; Stukel et al. 2008). Our objective is to summarize key policy recommendations, suggested by our results, to improve the safety and efficacy of restrictions on hospital admissions to manage infectious disease outbreaks.

The 12% decline in the overall admission rate represented 3,654 fewer hospitalizations over eight weeks; however, models predict that the expected number of influenza hospitalizations would exceed that by 1,165 to 7,591.

Hospital Restrictions

To limit the spread of SARS, a provincial health emergency was declared, with widespread restrictions on the non-urgent use of hospital-based services at all 32 hospitals in the Greater Toronto Area. Ambulatory and in-patient medical and surgical activities were restricted to urgent cases, and respiratory isolation rooms were expanded. In addition, visitor access was severely restricted, and the use of personal protective equipment by staff in high-risk areas was mandated. Three community hospitals were closed for a few weeks to several months. A centralized system was created to screen all requests for inter-hospital patient transfers (Schull et al. 2007). These restrictions, however, lacked measures to mitigate the impact on potentially vulnerable patients, such as those with chronic diseases, elderly patients and low-income patients (Schull et al. 2007).

Impact of the Restrictions

The overall hospital admission rate decreased by 12% (95%

Table 1. Five recommendations to improve the safety and efficacy of restrictions on non-urgent hospital admissions to manage outbreaks or provide surge capacity

1. Non-urgent admissions may be safely restricted for reasonably brief periods of time. Restrictions on non-urgent hospital admissions were not associated with adverse effects on hospitalized patients or with excess mortality. Such a measure can be used by policy makers and hospital administrators without jeopardizing essential care.

2. Public information campaigns to inform patients to seek care when necessary should be implemented as part of the restrictions. Restrictions on non-urgent admissions were not associated with excess overall mortality in the community. However, they can create a public perception that hospitals are unsafe places, and patients may not present to hospital for care even when they have urgent problems. Patients cannot always be relied upon to accurately self-triage, and public information campaigns should reinforce the importance of seeking urgent medical care (in hospitals when appropriate or elsewhere if possible), especially among higher-risk patient groups (the elderly, those with chronic diseases characterized by exacerbations, etc.)

3. Develop urgent admission criteria for the most common surgical conditions. In the absence of standardized clinical urgency criteria, restrictions on non-urgent admissions had only a modest effect on reducing hospital admissions. It is possible that more admissions could have been averted if there had existed a clear clinical consensus on what constituted an "urgent" admission. The impact of restrictions could be greater and less variable if health authorities creating pandemic management plans engaged with clinical experts to develop criteria to define urgent admissions for the most common surgical conditions well before they are needed.

4. Recognize limited impact of restrictions on creating surge capacity. If restrictions are being imposed to "free up" hospital beds for other, more urgent admissions (e.g., in the setting of an influenza pandemic), policy makers should anticipate that the number of additional beds made available may be less than the number of beds required. This measure can be a safe part of an overall strategy to increase hospital capacity, but the limited number of beds made available should be anticipated. Additional measures, such as treating and admitting patients in locations not traditionally used for acute care hospitalizations, may be required.

5. Implement strategies that protect access to highly regionalized tertiary care programs. Restrictions on non-urgent hospital admissions can result in major disruptions of inter-hospital transfer programs. In the setting of restrictions, strategies that protect access to highly regionalized tertiary care programs (e.g., invasive cardiology, neurosurgery, oncology, trauma) should be prioritized.

confidence interval [CI] 9–15%); the elective non-cardiac surgery rate decreased by 22% (95% CI 18–26%), while that of elective cardiac surgery (where widely accepted clinical prioritization criteria exist) decreased by as much 66% (95% CI 57–73%) (Schull et al. 2007). Mortality, readmission and complication rates did not change for hospitalized patients during or after the SARS restrictions (Stukel et al. 2008), and population-based mortality rates were unchanged (Hwang et al. 2007). There were also some unintended consequences. High-acuity visits to emergency departments fell by 37% in the Greater Toronto Area, and inter-hospital patient transfers fell by 44%, disrupting some regional programs where specialized care is available only in high-volume or tertiary hospitals (Schull et al. 2007). These results may not be applicable to longer or more sustained outbreaks or ones occurring in regions without robust community-based primary care.

Implications and Recommendations

In the event of a major community-based influenza outbreak or pandemic where large numbers of admissions to hospital are required, hospitals may need to take further steps to severely limit non-urgent admissions to provide "surge capacity" to deal with the influx (New York State Department of Health 2006; Toronto Pandemic Influenza Planning Steering Committee 2005). Imposing the same restrictions as those implemented during the SARS outbreak would not provide sufficient surge capacity in the setting of pandemic influenza. The 12% decline in the overall admission rate represented 3,654 fewer hospitalizations over eight weeks; however, models predict that the expected number of influenza hospitalizations would exceed that by 1,165 to 7,591 over the same time period, depending on pandemic severity (Schull et al. 2006). Yet the ultimate demand for hospitalizations is difficult to predict since different pathogens produce outbreaks of different magnitudes, durations and transmission patterns.

Patients cannot always be relied upon to accurately self-triage, and public information campaigns should reinforce the importance of seeking urgent medical care.

Our findings suggest five key policy recommendations that decision-makers should consider when developing outbreak management plans that incorporate restrictions on access to, or the closure of, hospitals to manage outbreaks or provide surge capacity (Table 1).

Discussion

These recommendations may be helpful to policy makers and administrators as they develop plans to manage infectious disease outbreaks. Restricting access to hospitals appears to

be a safe measure to employ to control outbreaks or provide surge capacity, though it can be only one part of a comprehensive strategy. The development of uniform clinical urgency criteria for common conditions leading to admission, such as exist currently for cardiac procedures, and mechanisms for health system coordination for the deferral of such cases will be important to ensure safe surge capacity. Mitigating adverse effects requires maintaining some access to regionalized hospital programs and instituting pro-active campaigns to remind the public to seek care when necessary. HQ

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