Quality Management Case Studies in Health Service Emergencies: SARS and Wildland-Urban Interface Fires

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The province of British Columbia, Canada, experienced 2 major health emergency situations during 2003: severe acute respiratory syndrome (SARS) in early 2003 and wildland-urban interface fires during the summer of 2003. The interface fires occurred within the boundaries of the Interior Health Authority, 1 of 5 health authorities responsible for the delivery of health services in their respective areas of the province. The British Columbia Center for Disease Control (BCCDC) managed the SARS crisis in the province. Both organizations subsequently conducted quality management reviews of their handling of these emergency situations. This article reports on the quality management review of health services delivery during the interface fires and explores the role of physicians during regional emergencies. A similar report was published in the Spring 2004 edition of Quality Management in Health Care *on the way SARS was managed at the BCCDC. This article also compares managing a foreseeable emergency situation, such as a wildland-urban interface fire, with managing the unknown, which describes the situation during the initial stages of SARS. The realities confronting the unknown, and the need to manage the situation such that learning and discovery environments are allowed to come into being and evolve rapidly, are discussed.*

Key words: *consequence management, crisis management, emergency management, knowledge vacuum, learning environment, risk management*

The province of British Columbia (BC), Canada, experienced 2 major emergency situations during 2003 that affected the health system. The appearance of severe acute respiratory syndrome (SARS) in early 2003 caused a major disruption in business generally and tourism specifically, with health services delivery in Vancouver being particularly affected.[1] The wildland fires that occurred in the interior of the province during the summer of 2003 and engulfed large rural areas of the province also affected developed urban communities. Although wildland fires are not principally a health concern, communities affected by the crisis are.[3]

HEALTH SERVICES ORGANIZATION IN BC

In Canada, provincial governments are constitutionally responsible for the delivery of health services within their jurisdictions. All 10 provinces and 3 territories that make up the Canadian federation are required to provide Canadian citizens and landed immigrants resident in, or visiting, their jurisdiction access to medical care and inpatient hospital care at the time of need. Providing such access is a

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condition of the Canada Health Act through which the provinces receive funding from the Government of Canada to augment their health budget. All provincial programs cover the cost of most prescription medicines and other outpatient services for persons older than 65 years and residents receiving social assistance. Canadians also purchase supplemental insurance from private insurance companies, with the majority receiving such coverage through their employer. The way provincial health services are administered, however, differs among provinces, reflecting their geopolitical, historical, and societal differences.

In BC, health services are governed through a regional structure of 5 health authorities that are accountable to the province's Minister of Health for the organization and funding of all health services within their regions. The Ministry of Health reimburses physician services and prescription medicines. In addition, a Provincial Health Services Authority oversees the management of provincial programs such as communicable diseases reduction, cancer research and treatment, and transplantation. The interface fires occurred within the geographic boundaries of the Interior Health Authority (IHA), 1 of the 5 regional health authorities that oversee the management of heath services in BC.

The British Columbia Center for Disease Control (BCCDC) provided leadership and direction required during the SARS crisis. BCCDC is affiliated with the University of British Columbia and has a research and teaching mission, as well as is responsible for oversight of management of communicable disease control in the province.

The administrations of IHA and BCCDC subscribe to a quality management (QM) philosophy of operation that is an ongoing process of revision, adjustment, and improvement, and both are committed to demonstrating to clients, customers, and all other stakeholders that their organization is being administered as an institution that is continuously learning and growing.[4,5] Recognizing that QM is a continuous learning process, both entities conducted independent QM reviews of their respective emergency situations as opportunities to learn how to prepare for the next emergency situation.[6,7]

An account of the QM practices adopted by BCCDC in the management of SARS was recently published in the *Quality Management of Health Care*.[7] Following a review of the QM lessons learnt by IHA during the fires, this article compares and contrasts management challenges in addressing foreseeable emergencies, like wildland-urban interface fires, with the situations arising when there is a knowledge vacuum, such as one that occurred with the advent of SARS.

The Interior Health Authority

The IHA serves a population of approximately 690,000 people in the southeast part of BC, bordering the neighboring Canadian province of Alberta and the US states of Washington, Idaho, and Montana (see Fig 1). As shown in Figure 1, the IHA is organized into 4 health service areas (HSAs), each functioning as a separate business unit with responsibilities for a continuum of care—acute, residential, home and community, and mental health and addictions—in its geographic area. Most physicians providing medical services within the HSAs function as independent practitioners reimbursed under the province's Medical Services Plan. Generally, resident physicians have privileges that are granted by the IHA Board to work in local hospitals and other IHA facilities. The 4 HSAs are served by a health authority–wide corporate structure that oversees the operation of 36 acute care sites and 62 residential facilities. There are 56 communities within the boundaries of the IHA, and 10 regional districts. The IHA also serves 55 First Nations communities. In fiscal 2003/2004, IHA was responsible for managing a budget of a little more than $1.1 billion (Canadian dollars).

A QM review of IHA emergency management practices during the interface fires focused on the period mid-July to mid-September 2003. During this time, interface fires in the northern and eastern regions consumed private homes and began to threaten rural communities, including acute, long-term and residential care facilities and the homes of vulnerable persons living in the communities who needed care. As these initial fires grew, other interface fires also started around the large urban center of Kelowna where fires consumed many private homes and
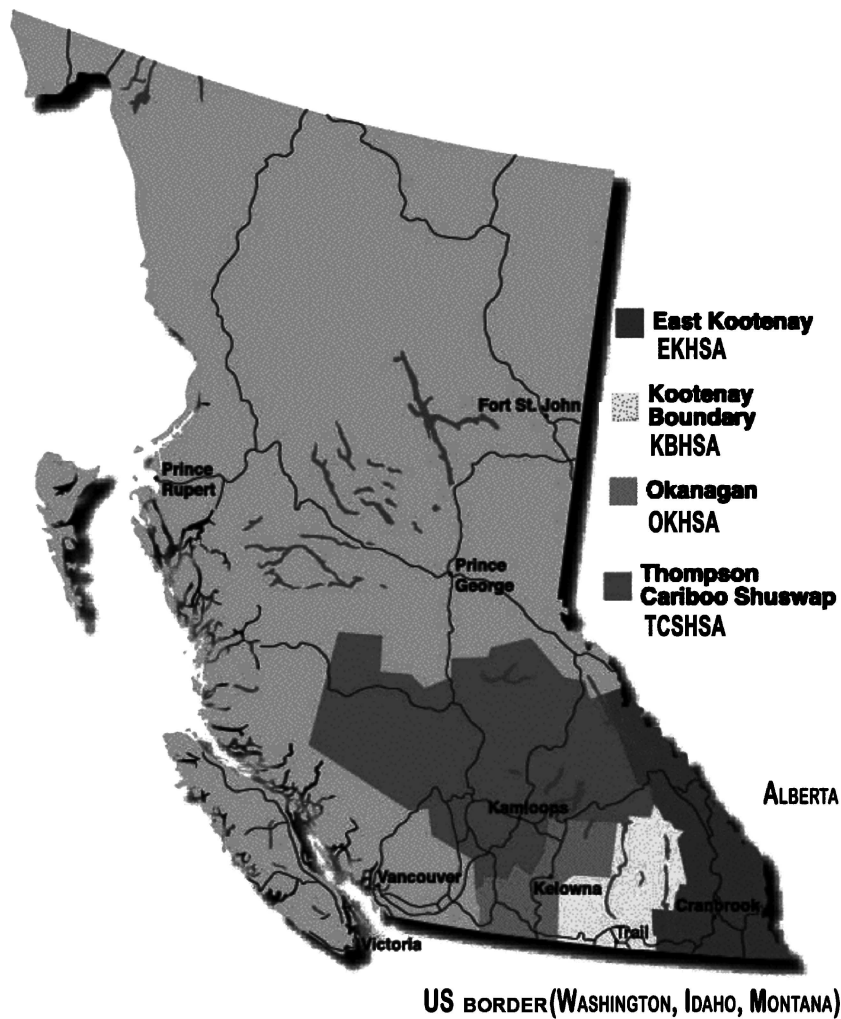
Figure 1. Area of province where all publicly funded health services administration are under the Interior Health Authority.

where the IHA's major referral hospital, the Kelowna General Hospital, is located.

EMERGENCY MANAGEMENT IN BC

Emergency management is different from the management of an emergency. The former includes prevention/mitigation, preparedness, response, and recovery, the latter involves crisis and consequence management. Changing from emergency management to managing an emergency is a well-defined process, the response phase of which is centered on the establishment of an organizational entity, known as Emergency Operations Center* (EOC) (See references 8 and 9). Figure 2 illustrates the organizational chart of an EOC. The British Columbia Emergency Management System requires all provincial government organizations and municipalities in BC to understand

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*For further information on constituting an EOC, see the US Federal Emergency Management Agency (FEMA) Web sites: www.fema.gov/preparedness/stat_local_prepare_guide.shtm//eoc and www.fema.gov/preparedness/eoc_grants.shtm.
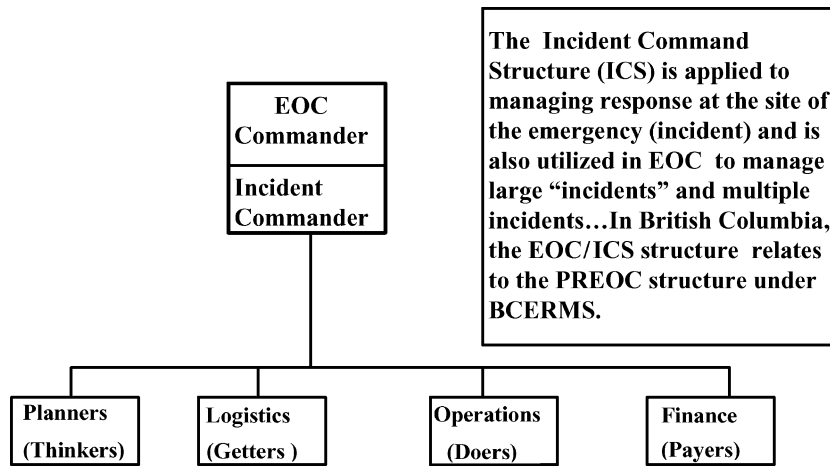
Figure 2. Organizational chart of an Emergency Operations Center (EOC). PREOC indicates Provincial Regional Emergency Operations Center; BCERMS, British Columbia Emergency Management System.

how to constitute an EOC and how their EOC relates to the provincial emergency management structure. There are 5 Provincial Regional Emergency Operations Centers (PREOCs) that serve different regions of BC. The PREOCs report to the Provincial Emergency Center, colocated with the Provincial Emergency Program (PEP) headquarters in the provincial capital, Victoria.

The organizational chart portrayed in Figure 2 presents a command and control military style of culture inherent in the Incident Command System. Emphasis on the "incident" presents a realization of the immediate and "commander" stresses the presence of an authority for giving orders. The degree of success of such a culture in an emergency situation will depend largely on the context of the event. The Incident Commander position serves as the governing structure that makes all decisions during the emergency situation, including the direction of staff and allocation of resources. Noting that the declaration of a state of emergency is an Executive Act, management personnel within an organization who are assigned such roles are expected to have some familiarity with the responsibilities involved in managing an emergency event. In the absence of such familiarity, it becomes critical for management to improvise and learn rapidly during stressful times. This management model will be discussed later in the context

of managing a knowledge vacuum as had occurred during the SARS crisis.

At the time when the 2003 wildland fires appeared as a major threat to the constituencies served by the IHA, there was a process in place for hiring an emergency management consultant. With the realization that the fires were wide spread across all HSAs, the IHA CEO constituted an EOC, retaining its emergency management consultant in an advisory leadership role as the IOC coordinator.

QM assessment of an emergency situation

The model used in assessing the management of both emergency situations is illustrated in Figure 3. The routine state of emergency preparedness is recognized as Q1. Going to an emergency state, Q2, is described as requiring a charge of energy that, presumably, is planned for on such an occasion. The physics analogy of a "quantum leap" is used to illustrate the instantaneous nature of such a change along the vertical arrow.[10] The rapidity with which transition can be made from Q1 to Q2 is largely dependent on the resources committed to anticipating the possibility of such an event occurring and the competency of the staff responsible for managing the situation.[11]

To illustrate how resource allocation can influence response time, a comparison is made of the relative degrees of gradient involved in travelling from Q1 to
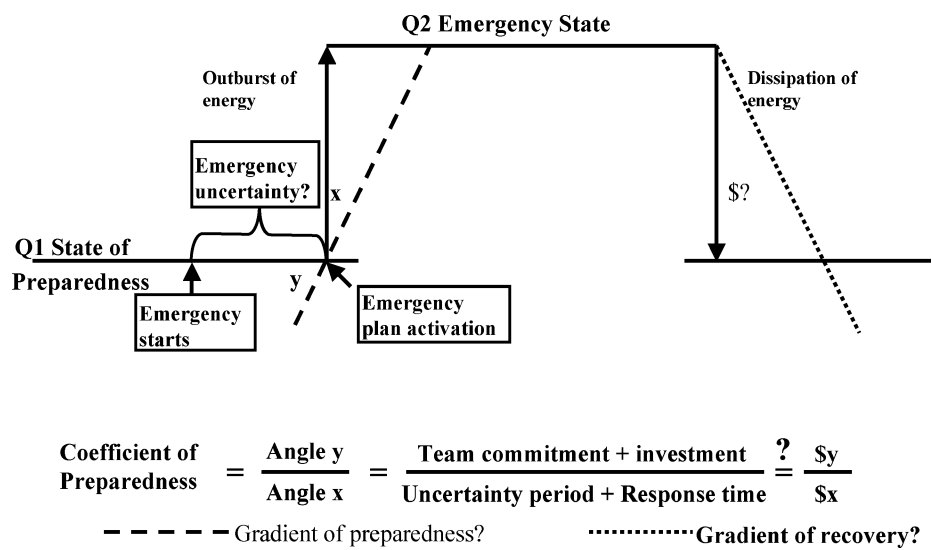
$$\text{Coefficient of Preparedness} = \frac{\text{Angle y}}{\text{Angle x}} = \frac{\text{Team commitment} + \text{investment}}{\text{Uncertainty period} + \text{Response time}} \stackrel{?}{=} \frac{\$y}{\$x}$$

– – – – – Gradient of preparedness?   ·············Gradient of recovery?

Figure 3. Classic emergency preparedness management—Making a quantum leap.

Q2. In the perfect case, the line would be perpendicular. The change would be instantaneous. Airports generally strive to achieve these conditions. In more conventional situations, it takes time and effort to travel from Q1 to Q2. This time line is represented by the broken line and angles y and x. Both angles have an inverse proportional relationship—as one increases, the other decreases. Correspondingly, the amount of resources committed toward maintaining a state of preparedness is likely to have an inverse relationship to the response time—the more the resources, the shorter the response time.

The extent to which an organization should commit resources to emergency preparedness can be measured through the discipline of risk management. This process involves identifying possible exposures that the organization may encounter within the context of its life and purpose and providing some indication of the risk associated with not preparing. In this context, Figure 3 proposes a measure of "risk preparedness" called the "Coefficient of Preparedness." This hypothetical calculation aims to define the risk in terms of the cost of not being prepared and is an area for further study.

The model illustrated in Figure 3 assumes that an emergency plan does exist to deal with the situation and this plan can be activated upon suspicion/confirmation that an emergency situation is present, or is imminent. The actual process of confirmation of an emergency state can be complex and in some situations may involve many stakeholders. Conventional organizational hierarchies do not apply in an emergency. In the absence of any training, the challenge begins with identifying who is in charge during the emergency and getting staff to convert to the new responsibility/reporting paradigm. As will be discussed later, these decisions become more complex when physicians are involved.

In addition to managing the response to an emergency event, Figure 3 also suggests that consideration needs to be given to the management of the return to normality. Reentry into a state of normality can be as traumatic as the onset of an emergency situation for persons involved across the emergency spectrum and needs to be managed accordingly.

AN ASSESSMENT OF QM PRACTICES AT IHA DURING THE INTERFACE FIRES

Figure 4 illustrates different parts of the QM process supporting a continuous learning cycle that was identified at the IHA. Identifying monitoring
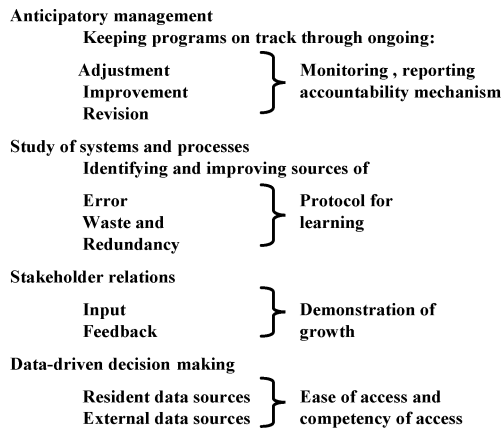
Anticipatory management
          Keeping programs on track through ongoing:

          Adjustment   Monitoring , reporting
          Improvement   accountability mechanism
          Revision

Study of systems and processes
          Identifying and improving sources of

          Error   Protocol for
          Waste and   learning
          Redundancy

Stakeholder relations

          Input   Demonstration of
          Feedback   growth

Data-driven decision making

          Resident data sources   Ease of access and
          External data sources   competency of access

Figure 4. Quality management audit cycle template—every situation is different.

and reporting accountability mechanisms enabled to assess anticipatory management. Systems and processes were assessed as a basis for learning and discovery. Growth of an organization was defined as valuing feedback and input received from stakeholders. Decision making was seen as a complementary relationship between the inherent knowledge base that resided among those staffing the organization and their ability and expertise in accessing and using data appropriately to make decisions in real time.

With reference to the QM Assessment Matrix (Fig 5), all interviewees were asked to identify their role on the vertical axis. They were then asked to answer the questions listed on the horizontal axis. In several instances, people explained that they tended to serve in a multitasking role across 2 or 3 functions described on the vertical column. Most of the figures presented in this article were developed through sequential brain-storming exercises with the persons being interviewed. Forty-six persons were interviewed mostly on a one-on-one basis, with interviews averaging 40 minutes, and all interviews were digitally recorded.

The following is a synopsis of responses provided to the questions asked.

Were you in an anticipatory mode for such a crisis?

The consensus was that nobody was in an "anticipatory mode" for the situation that unfolded. The

management of IHA went from a period of observation/monitoring to realization that they were going to be professionally involved. This process was frequently described as "coming to terms with the unthinkable." Presence of mind was repeatedly identified as being critical in establishing an incident command capability. With its ability to constitute an EOC quickly, IHA was able to activate a regional approach in its management of the emergency situation.

What did you do to ensure programs were optimally maintained?

There was a need to differentiate between programs in place that serve the mission of the organization and which must be maintained, and programs that arose as a consequence of the emergency situation. This required management to identify programs that appeared to be threatened and to decide about who should be assigned to handle the situation. The priority was always the safety and the well-being of the client or patient needing assistance. Serving individuals in their homes was a major challenge, particularly when it was not clear what options were available for evacuating them, if necessary. During the climax of the situation, the priority revolved around whether to evacuate or not. It was frequently mentioned that staff were also being affected personally by the situation. The culture of the organization under such circumstances was not around delegation as much as was around sharing of responsibilities. More often, when a job was identified staff assumed the responsibility for covering off and serving the need, regardless of rank.

Have you done revisions or adjustments to your program or job function?

The major challenge in addressing the learning opportunities arising from the experience was said to be a question of finding the time. Concern was expressed that with the passing of time, people will get relaxed and will not be motivated to participate in emergency preparedness training. A major challenge recognized repeatedly was the need for senior executives to become acquainted with all aspects of emergency management. Most persons interviewed had attended one

	Were you in an anticipatory mode for such a crisis?	What did you do to ensure programs were optimally maintained?	Have you done revisions or adjustments to your program or job function?	Can you identify sources of error, waste, and redundancy that occurred?	Was input received from all stakeholders in clarifying problems?	Do you have examples of decisions made in accordance with data interpretation?
Incident command (management)						
Operations (Doers)						
Planning (Thinkers)						
Logistics (Getters)						
Finance (Payers)						

Figure 5. Quality management assessment matrix.

or more debriefing sessions that were organized soon after the crisis. At the time this review was being conducted, the contract emergency planner was doing what he was originally hired to do—train all staff in what to expect when an emergency situation occurs. It was recognised that the recent experience made the ongoing learning process more real and relevant. This QM review was identified as adding insight and understanding to the situation.

Can you identify sources of error, waste, and redundancy that occurred?

While it was recognized that errors might have been made, everyone suggested that in the circumstances most decisions were based on best judgment at the time. Most people commenting on waste said that lit-

tle thought was given to cost implications during the emergency. The emphasis was on serving clients and patients both in the community and hospital settings. The nature of emergency management requires some built-in redundancy—there must always be a Plan B just in case Plan A does not work.

Was input received from all stakeholders in clarifying problems?

In exploring stakeholder relationships with persons being interviewed, Figure 6 evolved as portraying the kinds of affiliations that supported the role of the IHA in its management of the emergencies arising from the 2003 fires. Each of the entities portrayed in Figure 6 would have a similar view of the events unfolding around them during the 2003 fires. This

Figure 6. Interior health management and backup capabilities for the 2003 fires. QM review focuses on management practices within the dotted line.

review focused on the interrelationships between the Ministry of Health, IHA Executive, IHA EOC, HSAs, and BC Ambulance Services (enclosed in the dotted-line square box shown in Fig 6) during the emergency. The overlapping appearance of the relationships portrayed in Figure 6 stresses that such relationships were defined as providing "backup" at a time of an identified need and upon request during the situation. The HSAs were seen as being on the front line in dealing with the situation. Their actions and decisions were seen as being supported by the other components listed.

Do you have examples of decisions made in accordance with data interpretation?

An initial impediment in assessing the situation was the lack of appropriately scaled maps. Maps were required to provide a picture of where in the commu-nity IHA clients lived; where facilities were located relative to the fire notices, evacuation alerts, and orders; and who may be in need of support as a consequence of interface fires. A major concern was patients in the community, where they were located, and what backup support they may need. These data were not readily available initially. Interpretation of air quality measure became an issue. The differences between the air quality levels recorded by the tourism industry and the values acceptable in public health needed to be clarified. A spreadsheet template was created that recorded and monitored residential and chronic bed availability around the province. In BC, acute care bed status is available in real time through BC Bedline. The creation of the spreadsheet was an example of creative data compilation, analysis, and interpretation in support of critical decision making "under fire."

The QM emergency management matrix provided a systematic approach in analyzing the interplay among all job functions during the emergency. It highlighted the need to appreciate the complementary relationship between components rather than considering the strengths and weaknesses of any one in isolation. It also demonstrated the interdependencies of anticipatory management, systems and processes, stakeholder input, and data analysis in the ongoing assessment process.

PHYSICIAN INVOLVEMENT DURING REGIONAL EMERGENCIES

British Columbia hospitals are required to have emergency plans in place, both as part of their accreditation requirements as well as serving emergency legislation. In the Command Center structure in an acute care facility's emergency response plan, the chief of staff or her or his delegate will work with direct patient care staff to make decisions regarding patient evacuation/relocation. During the 2003 fires, IHA hospitals and their medical staffs were largely in a state of standby for possible surges of patients. Notwithstanding the reality that several hospital physicians were witnessing the burning of their homes, Code Orange protocol was in place so that any member of a medical staff could be contacted and asked to return to the hospital at a moment's notice.

The situation that arose during the 2003 fires was one of possible evacuation and relocation of hospital patients to other parts of the province requiring a Code Green protocol. In their disaster planning, all hospitals had considered the possibility of having to evacuate patients from the hospital building and moving them to nearby facilities and possibly the hospital car parks. Little, if any, consideration had previously been given to relocating hospital patients to other care facilities across the province or possibly out of the province. The QM review could not find any plan in Canada for handling the evacuation of a community the size of the Central Okanagan Regional District, which includes Kelowna with a combined population of 150,000. Had the wind not changed when it did, the situation could have been more critical. In fact, 2 evacuations were carried out involving residential facilities, one of 53 clients a distance of 23 km and the other of 97 clients a distance of 55 km. In discussing physician involvement in management of such emergencies, the relative roles of physicians at both evacuation and receiving sites were seen as needing to be coordinated with the rest of the emergency management process.[12]

Figure 7, developed through brain-storming interview sessions, illustrates a health systems response by linking Code Green and Code Orange as an extension of the emergency management infrastructure. The apex of Figure 7 offers a definition of "preparedness" as a continuous process of improvement with a plan for constituting an EOC, with Code Green and Code Orange being linked to the rest of the emergency management process.

The decision to involve physicians in the management of an emergency situation was identified as critical in the process of managing an emergency. As discussed, in relation to Figure 3 the activation of an emergency plan involves transcending from a state of preparedness (Q1) to an emergency response state (Q2). This is an administrative function and is referred to as a "quantum leap" in terms of stressing the immediacy with which it is expected to occur. Recognition that physicians are not really needed until clinical judgment is required gave rise to the notion of a "quantum leap within a quantum leap," as illustrated in Figure 8.

This model of physician involvement in the management of an emergency suggests that physician involvement can be seen as raising the emergency management bar to a Q3 level. Both processes would occur simultaneously with the implementation of the hospital's disaster plan in accordance with accreditation standards and legal requirements. The possible involvement of physicians in a regional emergency was not clearly defined and was seen as necessitating a second level of activation. Discussing Figure 8 in relation to physician involvement in emergency management, Dr Jennifer Rice, Medical Director,
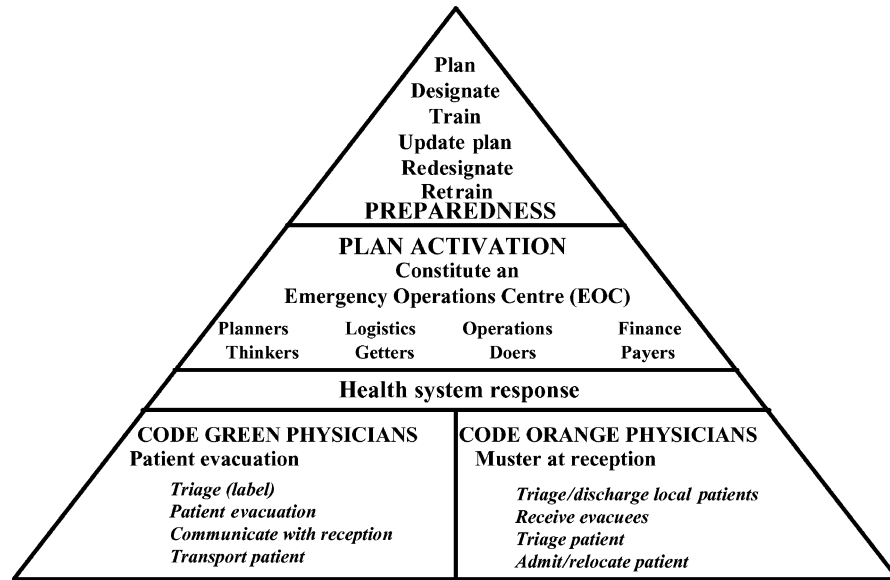
Figure 7. Physician involvement in an emergency situation.

Okanagan Health Service Area, said:

> "You don't call physicians to be on standby. They get bored very quickly. Call them when you need them. They will come."

This acceptance that physicians will always serve at times of an emergency was said to be part of the Ethical Code all physicians are required to adhere to. The experience of too many physicians responding to an emergency call was said to have its problems. Consideration of the management of emergencies requiring medical expertise at the regional level suggests that rather than having the regional emergency preparedness manager rely on the physicians' ethical code in planning for their involvement in emergency
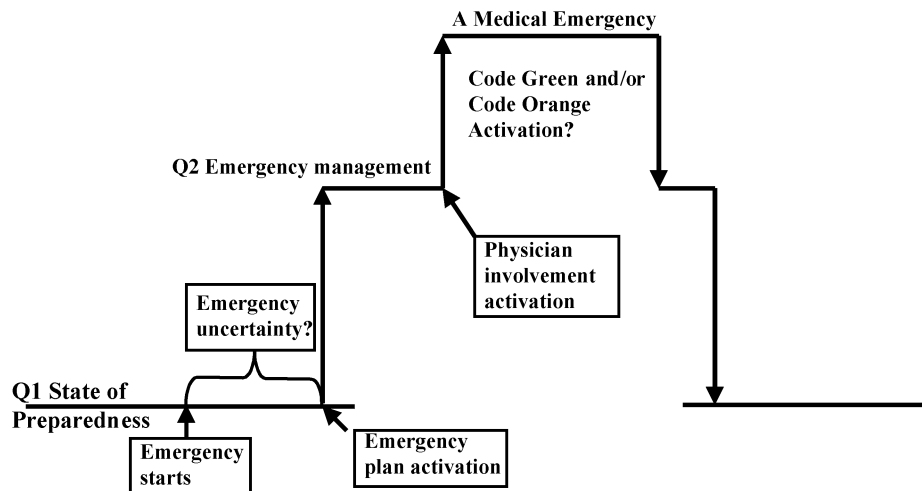
Figure 8. Physician involvement in emergency management—Making a quantum leap within a quantum leap.

management at the regional level, there is a need for a qualified physician leader to take charge of all clinical management at the regional level during an emergency.

DIFFERENCE BETWEEN MANAGEMENT OF SARS AND INTERFACE FOREST FIRE HEALTH RESPONSE

The success in managing the impact of the 2003 interface fires on health services was because of the rapid formation of a command structure in the form of an EOC. The IHA's ability to rapidly constitute the EOC ensured all aspects of effective management in responding to the situation. Such an organized approach toward the management of an emergency situation did not occur during the initial stages when SARS appeared in Vancouver. However, as noted earlier, the events unfolding during the appearance of an unknown disease evolved from a management culture that facilitated rapid learning and discovery. The creation of such an environment in the face of a knowledge vacuum was critical in the successful management of the SARS emergency.

Management differences between the interface fires and SARS are compared in Figure 9, which illustrates how "risk management" and "crisis manage-

	Structured Environment — wildland urban interface fires	Learning Environment — a new communicable disease entity
Risk Management (Emergency preparedness?)	- Routine activity - Incident reporting - Monitoring - Line responsibilities - Departmental/functional	- Routine activity - Surveillance - Discovery/learning - Peer review - Interdisciplinary
Crisis Management (Emergency response)	- Preparedness - Response/structure - Command/control - Definitive leadership - Paramilitary	- Ad hoc - Creative thought - Collegial relationship - Organic leadership - Chaos theory

Figure 9. Structured/learning approach toward risk and crisis management.

ment" differ in structured (corporate) environments and discovery (educational) environments. The interface fire situation was more of a corporate accountability or business continuity type of an environment. The environment at BCCDC during the SARS emergency was one of research, learning, and discovery. Comparing the periods of peak activity between the 2 emergency situations, the paramilitary style of management evident during the interface fires contrasts sharply with a "chaos theory" management philosophy that evolved with the recognition that there was a knowledge gap during the SARS emergency.[13]

As SARS became more of a reality in both the province and the country early in 2003, the role played by BCCDC was initially an ad hoc arrangement of meetings, telephone conference calls, e-mails, etc among scientists on the front line of decision making. Describing the culture during the SARS situation, Dr Mel Krajden, Associate Director of Laboratory Services at BCCDC, said:

"Within BCCDC we have a laboratory component and an epidemiological component. You could never crystallize the value of the academic piece, the value of the administration, the value of the epidemiology, the value of the lab piece coming together until SARS because it showed the benefits of having a structure to foster divisional needs and allow them to coalesce when necessary. It was the defining moment I think for BCCDC about the need to synthesize local, provincial, and national with international information to respond to a new entity.

What the SARS experience did was compress/evolve, in 6 to 8 weeks, from an ad hoc process of discovery and convert it into a sustainable structured process, that is, is SARS here to stay? What you realize is that you need enough structure and enough 'ad hocness' to allow you to respond to events that you can't predict."

The situation described by Dr Krajden was one of managing a knowledge vacuum in a learning environment. Initially, no one knew what SARS was. The
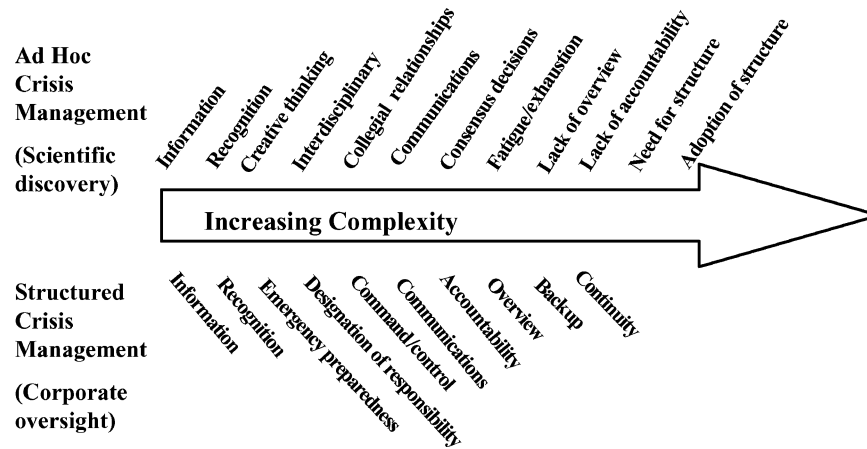
Figure 10. Ad hoc versus structured emergency management.

ability to rapidly confirm, through DNA sequencing, that SARS was a natural virus, and not a bioterrorism initiative, was a milestone in management of the unknown.

The scientists on the front line of this battle were highly specialized and one of a kind with little opportunity for substitution and backup. Figure 10 illustrates differences that need to be identified in managing a corporate environment compared to a learning environment during an emergency. In the absence of suitable support mechanisms, the learning environment eventually realizes and accepts the need for structure and backup to ensure continuity of the process.

Questioning the degree of "ad hocness" in the initial period of managing SARS, Dr David Patrick, Director, Epidemiology Services at BCCDC, who served as the Incident Commander in the BCCDC EOC that was eventually established for managing SARS and who is also a Jazz musician, said:

> "I don't know if I would call it totally 'ad hoc.' Certainly there is a lot of improvisation but there is improvisation on a form. It is a little like playing the Blues. You know you got a chord progression and everything else and you are not exactly sure what the other guy is going to play and you are different but there is a pattern to it. So what I say is that there is an improvisation over

a known template of outbreak response, which is generic."

According to Dr Patrick, the initial management of SARS in BC was similar to playing the Blues.

Emergency situations such as interpretation of a mysterious communicable disease have to be handled differently from managing the health response to a more conventional emergency. Clearly, the purpose must be the understanding of the problem and discovery and application of a solution. These activities necessitate the rapid creation of learning environments that can support a multidisciplinary team that is focussed on a specific agenda of discovery. The conventional learning paradigm is illustrated in Figure 11. Following a series of experiments, represented by the vertical spikes, Figure 11 identifies one set of results that permits the realization of a new level of understanding. This process is repeated over subsequent years or possibly decades, resulting in a new level of discovery (the "eureka" factor) each time.

Figure 12 illustrates the "compression/evolve" situation described by Dr Krajden that occurred around BCCDC during the initial phase of the SARS situation. The BCCDC played a pivotal role in defining SARS in an intense 4-month period. One of the driving features that made BCCDC a success was repeatedly recognized as being the collegial relationship that existed among scientists both all around
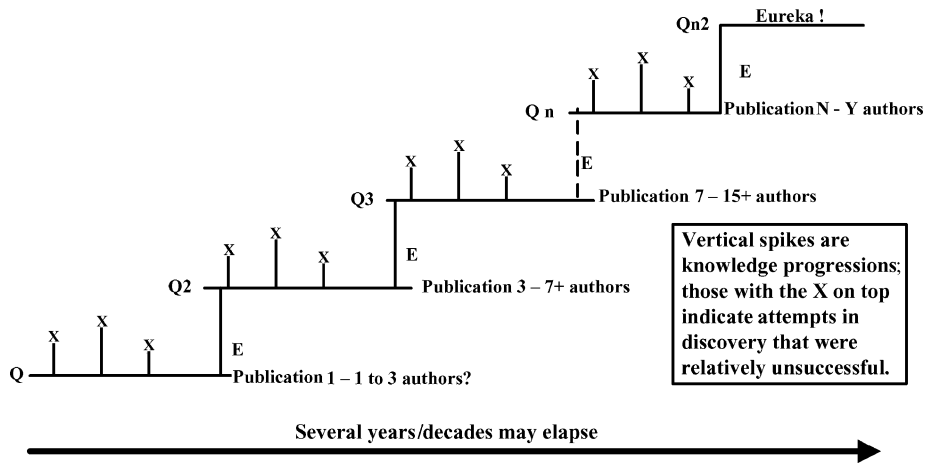
Figure 11. Managing a learning environment in normal times. University/College Administration Model.

Canada and internationally. The resident leadership at BCCDC encouraged an open systems approach independent of any management directive. There was no claim to proprietary ownership of the knowledge being created and processed in finding a solution. It was stressed that in a learning environment, no single entity can satisfactorily perform in isolation in such a short time. As noted in Figure 12, these circumstances give rise to other problems that need to

be addressed if successful learning environments are to be created when the need arises.[14]

Managing an emergency situation is generally envisioned as uniformed first responders, such as firefighters, ambulance personnel, police, and possibly the military, taking charge. Such a scenario surrenders the situation to a paramilitary style of management where trained professionals assume authority and give orders. Establishing an incident command
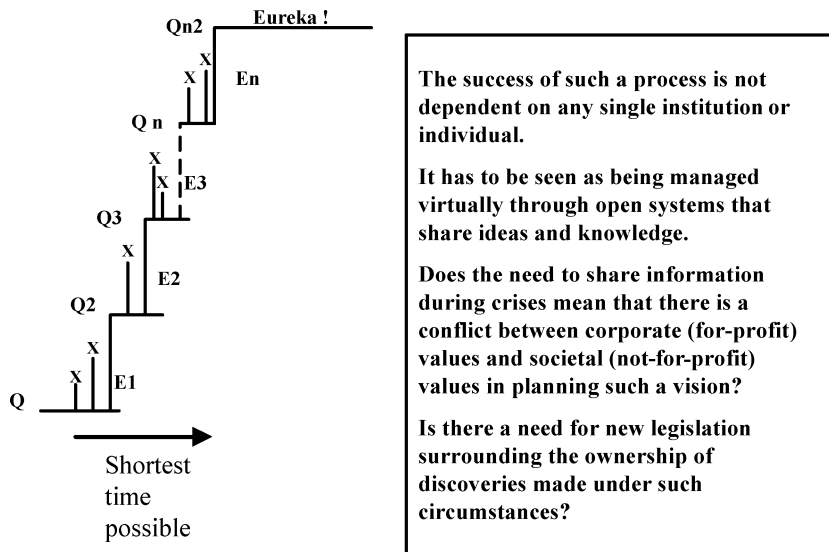

Figure 12. Managing a learning environment in times of emergency. Facilitating a paradigm shift?

structure in the form of an EOC is paramount in managing the situation. Being able to muster such resources quickly when an emergency situation exists serves as a societal safety net when the emergency threatens many communities. Having such a cadre of trained first responders and emergency managers is critical, particularly in community disaster situations involving interface fires, floods, power failure, an airplane crash, or earth movement. The QM review of the health response to the 2003 wildland-urban interface fires in BC demonstrated that having a local healthcare authority structure to initiate and quickly organize an EOC was critical in the successful management of an emergency situation threatening health services delivery.

Public health authorities are available to manage hazards that threaten community health, such as environmental contamination, communicable diseases, and food poisoning. Public health textbooks describe standard ways of managing such outbreaks, with the understanding that the health threat is recognized in terms of its ability to spread among the community through the air, in the food chain, transfusion blood services, sexual contact, and water supply. Managing such emergency situations that can be predicted and trained for is different from managing the unknown, such as terrorists using anthrax or some man-made biohazardous material.

Facing a knowledge gap in one's discipline that impedes the solution to an emergency situation leads to an intellectual sense of fear that is no less than the fear experienced when witnessing interface fires, floods, or earth movements. Recognizing that this fear can only be shared with close colleagues who understand and can grasp the magnitude of the problem adds further to the anxiety in determining how to address the situation. The organization of the multidisciplinary team that is usually envisioned as being required to manage such a situation can be daunting in the absence of any plan.

The leaf-like pattern in Figure 10 compares the different kinds of disciplines needed in managing a conventional emergency and one where there is a high degree of uncertainty.[15] The unstructured approach adopted in the learning environment con-

trasts sharply with the structured environment in its relation to conventional risk management and crisis management. As was demonstrated in the management of SARS in Vancouver during the spring of 2003, the management of the unknown is dependent on establishing effective learning environments as quickly as possible. This necessitates converting the situation described in Figure 11 to something resembling Figure 12.

The situation portrayed in Figure 12 describes what happened within the community surrounding BC-CDC in Vancouver during the early part of 2003. During this period, BCCDC served as a focal point to a "virtual" learning network of highly specialized scientists across Canada and the United States as well as other countries that came together to address the SARS phenomenon. The effortlessness with which these channels of communication opened in Vancouver at the time of SARS was attributed to personal relations between BCCDC scientists and their colleagues in distant regions who were readily available for consultation and collaboration.

Once a learning environment exists to address an emergency situation, little actual management in the conventional sense appears to be required. The inherent professional synergies among individuals within the network will carry it forward. This philosophy of operation appears to be acceptable, up to a point. As was evident in Vancouver during the SARS crisis (see Fig 10), scientists will recognize that there is a limit to the time and effort a single human being can commit toward solving a problem. Critical to this process is the inclusion of an organized communications function between the knowledge workers and the media. In Vancouver, scientists were required to leave their laboratories and go before the TV cameras during international media conferences to explain the situation to the public.

CONCLUSIONS

Facing a potential emergency situation is an uncertain period in the management of any organization. Is it really an emergency? What is expected? Do we

have an emergency management plan? Where is it? Will it work in this situation? Who is in charge during an emergency? These are some of the questions managers have to consider when their organization is being threatened, assuming they are given the time to think about such questions. The initial management decisions made at the advent of an emergency situation are critical to the business continuity of the enterprise.

The more traditional disasters, for example, hurricanes, earthquakes, wildland-urban interface fires, plane crashes, are relatively easy to plan for. As a consequence of 9/11, both "God-made disasters" and "man-made disasters" are all initially suspect.[16] This reality was evident during the SARS situation, when there was the suspicion of it being some form of bioterrorism. The eastern seaboard blackout that occurred during the summer of 2003 was also initially suspected of being a terrorist attack.[17] Every time a plane crashes terrorism is suspected. The new reality is a need to learn how to manage the unknown very quickly.

This article has provided a comparison and contrast analysis of managing 2 different kinds of emergency situations. While there are set protocols for managing understandable emergencies, such as wildland-urban interface fires, managing situations where the threat is not immediately recognized, such as one that occurred with SARS, requires a different type of management culture. The more conventional emergencies are managed by instituting a formal state of "preparedness" that is part of an organization. Being prepared for an emergency necessitates having in place resources that can respond to a set of circumstances. As was evident in other parts of the world, there was no state of preparedness for managing the SARS situation that arose in Vancouver during early part of 2003. The successful establishment of a multidisciplinary, virtual team of highly specialized scientists in different locations occurred more by default than design. In large part, it evolved from personal and professional relationships as well as a common realization of the potential gravity of the situation.

Preparing for emergency situations like SARS requires further research in how to plan for a virtual learning environment and how to activate such plans when there is a knowledge vacuum, such as the emergence of a new disease. Emergencies are everybody's concern. Knowledge workers cannot work in isolation from one another or from society. Professional emergency responders need to understand and realize the implications of the situation quickly so that they can be prepared to act accordingly. Besides the general public wanting to be informed about the situations, government intelligence authorities will be visible during undefinable emergencies, as was the case during the SARS situation in Vancouver. The relationship of these officials with key emergency management decision makers needs further clarification. Defining "preparedness" and activating a plan for managing the unknown are necessary to sensitize all stakeholders to better understand their role and responsibilities when such an emergency occurs, be they professional (uniformed) first responders or knowledge workers.

REFERENCES

1. Learning from SARS: renewal of public health in Canada. October 2003. Available at: www.hc-sc.gc.ca/english/pdf/sars/sars-e.pdf.
2. *2003 Wildland–Urban Interface Fires Post-incident Analysis Report.* Victoria, British Columbia, Canada: British Columbia Office of the Fire Commissioner; 2004. SD 421.34 C26 A193 2004. Available at: www.mcaws.gov.bc.ca/firecom/interface_fires/interface_fires_report.pdf.
3. Christian K. *BC Burns 2003.* White Rock, British Columbia, Canada: Canadian Institute of Public Health Inspectors; 2003.
4. Quality framework: "Quality in all we do." Quality Council, Interior Health Authority Board; November 21, 2002.
5. BC Centre for Disease Control. *2002/2003 Performance Plan, Promoting and Protection Public Health.* Vancouver, British Columbia, Canada: BC Centre for Disease Control.
6. *BC 2003 Forest Fires: A Test of Quality Management in Health Services Delivery.* Report commissioned by BC Ministry of Health Services, Victoria, and Interior Health, Kelowna. Vancouver, British Columbia, Canada: Info-Lynk Consulting Services Inc; January 30, 2004. Available at: www.interiorhealth.ca.
7. Zapp R, Krajden M, Lynch T. SARS: a quality management test of our public health safety net. *Qual Manage Health Care.* 2004;13(2):120–129.
8. www.fema.gov/preparednes/stat_local_prepare_guide.shtm#eoc.
9. www.fema.gov/preparedness/eoc_grants.shtm.

10. Margaret J. *Wheatley, Leadership and the New Science.* San Francisco, Calif: Berrett-Koehler Publishers Inc; 1994.

11. Lynch T, Cox P. Emergency management of SARS: a quantum leap or a paradigm shift? *Risk Manage Can Health Care.* 2003;5(6).

12. *British Columbia Operational Guidelines for Evacuations, 2003.* Victoria, British Columbia, Canada: Ministry of Public Safety and Solicitor General, Provincial Emergency Program; Justice Institute of British Columbia, Emergency Management Division; 2003. HV 555 C26 B756 2003. Available at: www.pep.bc.ca/management/Evacuation_Operational_Guidelines_2003–08.pdf.

13. James Gleick. *Chaos: Making a New Science.* Toronto, Canada: Penguin; 1987:213, 273.

14. Ford RC, Randolph WA. Cross-functional structures: a review of the integration of matrix organization and project management. *J Manage.* 1992;18:267–294.

15. Philip H, Randall W. *Relax, Its Only Uncertainty.* Prentice-Hall; 2001.

16. Lynch T. American/Canadian relations post September 11th: accommodation or surrender? *Int Travel Insur J.* 2002. Available at: www.infolynk.ca/health_care/relationspost9_11.html.

17. *Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations.* Washington, DC, and Ottawa, Ontario, Canada: US-Canada Power System Outage Task Force; 2004. TK 3091 U173 2004. Available at: www.pi.energy.gov/powertaskforce.html.