



CORE

Public Health Functions for BC

Evidence Review:
**Health Emergency
Management**

**Population Health and Wellness
BC Ministry of Health**

April 2006

This is a review of evidence and best practice that should be seen as a guide to understanding the scientific and community-based research, rather than as a formula for achieving success. This review does not necessarily represent ministry policy, and may include practices that are not currently implemented throughout the public health system in BC. This is to be expected as the purpose of the Core Public Health Functions process—consistent with the quality improvement approach widely adopted in private and public sector organizations across Canada—is to put in place a performance improvement process to move the public health system in BC towards evidence-based best practice. Health authorities will develop public performance improvement plans with feasible performance targets and will develop and implement performance improvement strategies that move them towards best practice in the program component areas identified in the Model Program Paper. These strategies, while informed by the evidence in this review, will be tailored to local context.

This Evidence Review should be read in conjunction with the accompanying Model Core Program Paper.

Evidence Review prepared by:

Leah Siebold, Hollander Analytical

Evidence Review accepted by:

Population Health and Wellness, Ministry of Health (April 2006)

Core Functions Steering Committee (April 2006)

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EXECUTIVE SUMMARY

This document was prepared to support the development of the evidence-based core program in health emergency management by health authorities in BC. Health emergency management is one component of the BC Core Functions in Public Health initiative.

An overview is presented, of exemplary health emergency management practices recommended by professional experts in the field, as well as research evidence documenting effective measures and “lessons learned” in responding to a range of actual disasters and emergencies. An extensive literature search was conducted to identify evidence of effective program strategies.

Exemplary practices and related research evidence, where available, are described using a conceptual framework encompassing the following stages and steps in preparing for, and responding to, an emergency:

- Strategic planning approach, focusing on development of a five-year plan prepared in collaboration with other sectors and with all levels of government.
- Hazard, risk and vulnerability assessment, involving the identification of all potential hazards and an assessment of the relative levels of risk for each hazard.
- Mitigation/prevention measures to reduce the level of risk where possible.
- Preparedness, with a focus on establishing an emergency response plan.
- Initial response.
- Incident management systems to facilitate coordinated interagency approaches.
- Consequence management and recovery.
- Consistent quality improvement.

A number of reference documents are consistent in their recommendations supporting the above framework, and the research evidence supports and supplements a number of these measures. However, it also is clear that the majority of evaluation studies focus on “lessons learned”, rather than on strategies that resulted in unequivocal success. It appears that the process of developing effective health emergency management requires more work. As an emerging field it is understandable that effective strategies are not yet established, and that the evidence is somewhat limited.

The scale of a disaster appears to be a major factor in predicting effective responses, with larger disasters often overwhelming response capacity. As well, it is evident that the range and types of emergencies can vary greatly, and that organizations have difficulty in planning for all potential challenges. However, there are some common elements that appear to be critical in supporting effective responses; in particular, the development of comprehensive emergency response plans, and well-articulated incident management systems. Collaboration, coordination and open communication among community agencies and all levels of government, are consistently cited as important, as are education and training initiatives.

1.0 OVERVIEW/SETTING THE CONTEXT

In 2005, the British Columbia Ministry of Health released a policy framework to support the delivery of effective public health services. The *Framework for Core Functions in Public Health* identifies health emergency management as one of the 21 core programs that a health authority provides in a renewed and comprehensive public health system.

The process for developing performance improvement plans for each core program involves completion of an evidence review used to inform the development of a model core program paper. These resources are then utilized by the health authority in their performance improvement planning processes.

This evidence review was developed to identify the current state of the evidence based on the research literature and accepted standards that have proven to be effective, especially at the health authority level. In addition, the evidence review identifies best practices and benchmarks where this information is available.

2.0 METHODOLOGY

2.1 Online Literature Review

An extensive literature review was undertaken on health emergency management. The search strategy was conducted on OVID, an online search system, and searched the following databases:

- All evidence-based medicine reviews – Cochrane Database of Systematic Reviews (DSR), ACP Journal Club (ACP), Database of Abstracts of Reviews of Effects (DARE) and Cochrane Central Register of Controlled Trials (CCT).
- Cumulative Index of Nursing & Allied Health Literature (CINAHL), 1982 to December (Week 2), 2005.
- Excerpta Medica Database (EMBASE), 1980 to 2005 (Week 50).
- Ovid MEDLINE, in-process and other non-indexed citations.
- Ovid MEDLINE, 1966 to November (Week 3) 2005.

The search obtained articles containing at least one MeSH term (Medical Subject Heading) or keyword from each of the following three components: nature of the emergency, response to the emergency and evaluation. Table A in Appendix 1 provides the complete list of search terms. The search was limited to articles dating from 1996 – 2005 inclusive, in the English language. The detailed search strategy is presented in Table B in Appendix 1.

Once duplicates were removed, 155 citations were found. These were printed out and the citations and abstracts for all relevant results were reviewed. From this review, copies of the most relevant studies (34 articles) were obtained and used to provide a substantial evidentiary foundation for this paper.

2.2 Reference Documents

A number of other documents describing exemplary health emergency management practices are also referenced in this paper, including:

- *Report on Health Emergency Management, Ministry of Health (BC Report)*, prepared by the Ministry of Finance, Internal Audit and Advisory Services, Office of the Comptroller General, in June 2005 (based on extensive consultation with officials in the Ministry of health and provincial health authorities).
- *National Framework for Health Emergency Management: Guideline for Program Development (National Framework)*, prepared by the Federal/Provincial/Territorial Network on Emergency Preparedness in December 2005, for the Conference of F/P/T Ministers of Health (the Council of Chief Medical Health Officers also provided input into the Framework).
- *NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs (NFPA Standard)*, by the National Fire Protection Association (2004). The *NFPA Standard* encompasses the processes for both public and private sector disaster/emergency planning, and is used extensively in the US. The Canadian Standards Association has been developing a new Canadian National Emergency Management and Business Continuity Standard, harmonized with the *NFPA Standard*, to provide a base for private sector emergency management and business continuity in Canada.

3.0 BACKGROUND

The Government of British Columbia has established the British Columbia Emergency Response Management System (BCERMS), with related legislation covering the responsibilities of ministries, provincial agencies, local authorities and citizens in the province, with respect to disaster response. The Ministry of Public Safety and Solicitor General manages BCERMS through the Provincial Emergency Program (PEP) and a central, coordinating group of officials. Accordingly, health emergency management processes in British Columbia need to be developed and provided within the context of BCERMS.

The Provincial Emergency Program maintains a Provincial Emergency Coordinating Centre (PEEC) with a 24-hour capability. Ministries and agencies are expected to establish their own central Emergency Operations Centre (EOC) to coordinate operations with the PEEC, when an emergency response function, for which they are responsible, is creating significant demand. They are also expected to establish regional EOCs, which coordinate with provincial field response centres, under similar conditions. Appendix 2 provides further details on BCERMS and the PEP.

The Emergency Health Services Commission of the provincial Ministry of Health has the broad responsibility of overall emergency medical service provision, regulation and direction in BC. The British Columbia Ambulance Service (BCAS) operates under the authority of the Commission, and its services should be considered as one element in the coordinated emergency management plans developed by health authorities.

4.0 HEALTH EMERGENCY MANAGEMENT

4.1 Program Principles

The *National Framework* suggests the following emergency management principles:

- Comprehensive emergency management.
- Strategic approaches in program development.
- An “all hazards/common consequences” approach, ensuring analysis of the full range of threats, implications and consequences.
- Sustainability.
- Resiliency.
- Pan-Canadian, trans-jurisdictional systems.

As well, a number of key factors have been noted in the *National Framework* to support and guide the implementation of health emergency management programs. These are: systematic risk management; continuity of services; evaluation and quality improvement; cooperation and coordination; professionalism and expertise; effective communications; management systems; volunteer participation; and resource management (FPT Framework 2005).

4.2 Program Framework

The *National Framework*, the *BC Report*, and the *NFPA Standard* all recommend the following program components as important in a comprehensive approach to health emergency management:

Before an emergency	<ul style="list-style-type: none">• Strategic planning approach.• Hazard, risk and vulnerability assessment.• Mitigation/prevention.• Preparedness.
During and after an emergency	<ul style="list-style-type: none">• Initial response.• Incident management systems.• Consequence management.• Recovery.
Throughout the process	<ul style="list-style-type: none">• Quality improvement.

Each of the above components is described in more detail in the following sections of this document, along with accepted program practices and relevant evidence. Where there is little evidence, the *National Framework*, *BC Report* and the *NSPA Standard* are referenced, as well as opinions of professional experts and academics in the field.

5.0 STRATEGIC PLANNING APPROACH

The first component of a successful health emergency management program, according to the *National Framework* and the *BC Report*, is “to have an overall plan on how to develop, resource and implement the program in conjunction with the relevant emergency management strategies of other ... sectors and agencies.” (*BC Report*) A strategic approach is needed to ensure a comprehensive and consistent management approach through an integrated framework.

Cooperation and coordination with other agencies and jurisdictions is essential before, during and after an emergency. There are often specific jurisdictional issues or responsibilities that need to be respected at the national, provincial and municipal levels, as well as different sectoral responsibilities held by a wide range of government agencies, non-government organizations, the private sector and the public. Each level of government and key sector agencies needs to develop emergency management plans that are consistent and sustainable, with well-coordinated linkages.

The *BC Report* (Ministry of Finance 2005) describes a best practice in this area as “development of an overall strategic plan which documents where an organization intends to be in respect to health emergency management in five years.” It recommends identification of the activities and resources required to achieve the goals, and a framework for measuring progress and successes in working toward these goals.¹

An additional initiative, which the *National Framework* (FPT Framework 2005) stresses as essential to health emergency management, is the process of “contributing to, empowering, and supporting emergency management planning at the community level.” It suggests that these activities extend to participating on community planning committees.

It is further suggested (*National Framework*) that the requirements for management skills in planning, budgeting, training, leadership and evaluation “can best be met efficiently by integrating emergency management within an organization and using the existing talents of staff members.”

The *NFPA Standard* (2004) also supports the development of a strategic plan, noting it should define the vision, mission, goals and objectives of the program.

¹ As of June 2005, one health authority had drafted a five-year plan and two others had adopted one-year, short-term plans.

6.0 HAZARD, RISK AND VULNERABILITY ASSESSMENT

According to the *National Framework*, overall best practices with respect to hazard, risk and vulnerability assessment include:

- Conducting ongoing hazard, risk and vulnerability assessments.
- Contributing information on the determinants of health and hazards to other sectors, organizations and agencies.
- Implementing a risk management process to support emergency management decision-making (this process includes risk estimation, risk evaluation, and risk control).
- Contributing to the risk management activities of other sectors, organizations and agencies.

6.1 Hazard and Vulnerability Identification

It is stressed in the *National Framework*, *BC Report*, and *NFPA Standard* that it is necessary to apply a comprehensive approach to collecting information about the three factors that combine to create a hazard, e.g.:

- The events that can impact on a community.
- The vulnerability of the population to such impacts.
- The resources the community can apply to cope with the impacts.

The *National Framework* (FPT Framework 2005) notes that every aspect of health emergency management depends on accurate information about the hazards. It proposes that, for efficiency purposes, it is important to examine all potential hazards at the same time, or within the same planning process, to ensure that the full range of threats are considered in a balanced way. Even though many of the hazards are different, they can result in the same consequences. For example, loss of power, loss of water and disruptions in communications, could all result from a severe storm, an earthquake, a volcanic eruption, a wildfire and so on. Identifying potential consequences in this manner will allow for greater efficiency in identifying solutions.

Furthermore, it is suggested that the following information be gathered and considered during this process:

- Up-to-date information sources that are accessible on an ongoing basis.
- Information on the capabilities and capacity of resources on a community level, including health facilities, health services, emergency social services, the trained voluntary sector, transportation, accommodation, catering, utilities, emergency services and trades and professions.
- Specific information on vulnerable groups of people, such as minority language groups, the elderly and persons with disabilities. Other factors that increase vulnerability should

also be considered, including the determinants of health. Lindsay (2003) notes that disaster vulnerability can be linked to the determinants of health, in particular, income, social status, social supports, and personal health.

- An appropriate level of detail. For example, national statistics on the number of people with mobility impairments may be useful for general purposes but will not aid in planning specific response action where names and addresses are needed.
- Information on communities' infrastructure and economy.

The *NFPA Standard* (2004) recommends that information on the following hazards be considered during the hazard identification process:

- Natural Hazards:
 - Geological (e.g., earthquakes, tsunamis, volcanoes, landslides, mudslides, glaciers and icebergs).
 - Meteorological (e.g., floods and tidal surges, droughts, fires such as forest, range and urban fires, snow, ice, sleet, avalanches, windstorm, hurricanes, tornados, dust/sand storms, extreme temperatures, lightning and famine).
 - Biological (e.g., diseases that impact humans and animals such as plague, smallpox, anthrax, West Nile virus, foot and mouth disease and animal or insect infestation).
- Human-caused Events:
 - Accidental (e.g., hazardous material spills, explosions/fires, transportation accidents, building/structure collapse, energy/power/utility failure, fuel/resource shortages, air/water pollution and contamination, water control structure/dam failures, financial issues such as economic depression and financial systems collapse, and communication systems interruptions).
 - Intentional (e.g., terrorism including conventional, chemical, radiological, biological and cyber terrorism, sabotage, civil disturbances including public unrest, mass hysteria and riots, enemy attack/war, insurrection, strikes, misinformation, crimes, arson and electromagnetic pulses).

6.1.1 Research on Hazard/Vulnerability Identification

Morrow (1999) proposes that effective disaster management should aggressively involve neighbourhoods and community groups in preparing a “community vulnerability inventory”. The inventory would identify where at-risk groups are located, including: residents of group living facilities; elderly people, especially the frail elderly; physically and mentally disabled people; poor households; single mothers; households; ethnic minorities (by language); recent residents/immigrants/migrants; large households; large concentrations of children/youth; the homeless; tourists; and transients.

An analysis of hazardous events in BC over the past century conducted by Pearce and Pearce (2005) identifies events which caused the most deaths: 4,400 estimated deaths as a result of the 1918/1919 flu pandemic; 643 deaths from the 1953 polio outbreak; 500 deaths from the heat waves in 1936; 343 deaths when a passenger ship sunk in 1918; 97 deaths from floods and rain storms; and 83 deaths from landslides. Overall, floods, forest fires and water contamination were the most frequently listed hazards in this history.

6.2 Risk Assessment

The *National Framework* (FPT Framework 2005) notes that “risk management ensures decisions about how to deal with hazards, through mitigation and/or preparedness activities, are evidence-based rather than subjective. It is the process that transforms qualitative information collected about the extreme events, the vulnerability of the community and its resources into quantitative risks that can be measured and compared”.

BC Report (Ministry of Finance 2005) recommends that the government-wide, comprehensive risk management model that has been adopted by the government of BC, be used for health emergency management. This model is consistent with the approach discussed in the *National Framework*. It outlines a comprehensive risk management process (including mitigation), which would include all of the following:

- Identify the risks that could challenge achievement of the strategic objectives pertinent to health emergency management.
- For each risk, identify what the organization has done to mitigate (reduce the consequences or likelihood of) and prepare for an occurrence.
- For each risk, evaluate the treatment alternatives available, including their costs and impacts on the consequences and likelihood of an occurrence.
- Decide whether to accept each risk or take specific action to mitigate or prepare for an occurrence.
- For all risks, gather the specific actions into a risk treatment plan. This plan would feed into the health emergency management strategic plan and the health emergency management business plans and budgets for the current and upcoming years; those plans in turn would feed into the corporate strategic plans, business plans and budgets.
- A process for monitoring, reviewing and continuously improving the effectiveness of the risk management process within the organization’s context.

Similarly, the *NFPA Standard* (2004) recommends “impact analysis” of all potential hazards to assess their level of risk. It further suggests that risk assessment of the hazards and vulnerabilities involve analysis of the potential for detrimental impacts of the hazards or conditions, including: the health and safety of people in the area; health and safety of personnel; delivery of services; property, facilities and infrastructure; the environment; economic and financial conditions; regulatory and contractual obligations; and confidence in the organization.

6.2.1 Research on Risk Assessment

Arnold (2005) suggests that the risk assessment roles with the greatest relevance to health emergency management include: the probability that a health hazard exists or will occur; the probability that the hazard will become an event; the probability that the event will lead to health damage; and the probability that the health damage will lead to a health disaster. The overall risk would be the product of these four probabilities. He also raises the importance of assembling a range of experts to participate in this assessment, and adoption of an evidence-based approach to using information.

An April 2005 consultant report provided the BC health authorities with an assessment of the geographic hazards to which each region is most vulnerable. Although it did not rate the relative risks of each hazard, it did provide a first step.

Other useful resources to assist in a comprehensive risk assessment process are:

- *An Assessment of Natural Hazards and Disaster in Canada: A Report for Decision-Makers and Practitioners*, prepared for The Canadian Natural Hazards Assessment Project (Etkin et al. 2004).
- The Canadian Standards Association *Guideline for Non-Structural Seismic Risk Assessment* (addresses the risk level of buildings and their contents).
- *Catastrophe Modeling: A New Approach to Managing Risk* (2005), published by Springer+Business Media (provides tools for analyzing hazards, inventory, vulnerability and loss).

7.0 MITIGATION/PREVENTION

Mitigation is defined by the *National Framework* as a process to reduce risk to programs, staff and clients based on the results of its risk management decision-making process. Risk management leads to four general options for dealing with a risk: elimination, reduction, transfer or acceptance. The goal is to avoid or limit the possibility that an extreme event will occur at all, and if it does, that the vulnerability of the community is minimized.

The health sector has two significant functions in the process, according to the *National Framework*:

- First, directly reducing the risk to their facilities and programs. Mitigation measures are particularly important for facilities providing emergency health services.
- Second, advocating for risk reduction measures within communities. The health sector has a vested interest in the plans and ability of communities to limit the harmful effects of emergencies on its population, as these are often felt primarily in terms of health.

Communities play an important role in minimizing potential impact. The negative effects of a disaster can extend to the economic and physical environments within a community and these, indirectly, can have a detrimental effect on the population's health. For example, home care patients tend to be more vulnerable to specific hazard impacts, so the health sector needs to play a role in addressing this vulnerability in conjunction with their clients, and with the community.

The *National Framework* explains that mitigation can be achieved through structural activities that depend on physical measures to eliminate or reduce a risk, or non-structural, social measures that reduce vulnerabilities and risks. For example, wildfires offers an example of a hazard that can be addressed through a variety of structural and non-structural mitigation measures, including: reforestation with less flammable species; forest management plans to reduce fuel loads; fire breaks to prevent fires from spreading; building codes specifying fire resistant materials; land-use plans for high risk areas; fire permit systems; spark suppression regulations for forest users; and limiting forest access during high danger periods.

The *BC Report* recommends a best practice would be the incorporation of mitigation measures into an organization's normal budgeting and planning process. It argues that integration of a formal risk management process into the strategic plan would strengthen a program's ability to achieve long-term success. This document would then provide written, reasoned priorities to guide resource allocation and risk mitigation decisions, and thereby avoid ad hoc, short-term decision-making.

The *NFPA Standard* states that the mitigation strategy should be based on the results of hazard identification and risk assessment, impact analysis, program assessment, operational experience and cost-benefit analysis.

7.1 Research on Mitigation

Mileti (1999) suggests the following six principles to help make mitigation more effective and more sustainable:

- Maintain and, if possible, enhance environmental quality.
- Maintain and, if possible, enhance people's quality of life.
- Foster local resiliency and responsibility for disasters.
- Recognize that sustainable, vital local economies are essential.
- Identify and ensure intra- and intergenerational equity.
- Adopt a consensus-building approach, starting at the local level.

As well, there are a number of resources that can provide helpful information in developing specific measures for the mitigation of risks:

- *The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation* (2000) by the H. John Heinz III Centre for Science, Economic and the Environment, Island Press.
- Stephenson and DuFrane (2005) discuss a range of methods for identifying the complex mix of competing costs, benefits and interventions associated with any restructuring of investment priorities to accomplish disaster mitigation.

A cautionary note is expressed by Cohen et al. (2004) about the substantial harm that can result from mitigation measures to reduce risks to bioterrorism. They point out that death and serious illness has resulted from smallpox vaccination programs, as well as an increased possibility of accidental or purposeful release of dangerous pathogens from biodefense laboratories.

8.0 PREPAREDNESS

Preparedness is the process of developing and readying response and recovery actions to increase the community's ability to respond to future disasters and emergencies. The *National Framework* suggests best practices for emergency preparedness are:

- Developing and implementing, at the corporate level down to the site level, an all-hazards emergency response plan, which addresses all potential risks, as well as all major business continuity issues (e.g., key personnel, alternate sites, communications, information technology, supplies and vital records).
- Communicating the emergency response plan to staff members and all health emergency management partners.

8.1 Planning

BCERMS advises that in the interest of speed and simplicity, response management should be carried out at the lowest possible level of government organization, with a minimum of reorganization once an event has occurred. Coordination of existing, highly decentralized arrangements is preferable to the implementation of new structures and procedures. However, it is recognized that when resources are extremely scarce, there may be no choice but to control their employment centrally in order to use them where they are needed most. Furthermore, an influx of additional resources in support of the provincial response effort needs to be centrally managed in the disaster operational area.

The *BC Report* discusses the challenges involved at the site level in customizing the emergency response plans including: the logistical issues of bringing people together, inconsistencies between plans at different sites and a lack of buy-in at the site level. To overcome these problems, two health authorities have provided one-day workshops for communities, either on-site, by teleconference or online, to assist them in developing site plans together.

The *BC Report* recommends that, on completion of the emergency response plans by health authorities, that they “communicate the plans to staff, health emergency management partners and the public.” It suggests that sharing copies at the corporate, regional and local levels is important, and if feasible, posting the plans on an Intranet or Internet site for open access by staff, community partners and the public, will facilitate accessibility and monitoring.

It should be noted that most health authorities have developed a template for a written all-hazards plan, based on the models proposed by the *National Framework* and on the BCERMS, to ensure consistency among organizations. The plan templates have, for the most part, been rolled out to community-level sites by health authorities, for customization with local information. The process at local sites was in the developmental stage in 2005.

In most cases, health authority corporate emergency managers drive the development and implementation of the plans at the regional and site levels. As well, some of the health authorities either have developed or are developing some hazard-specific plans intended to address such threats as pandemic influenza and spills of hazardous material.

8.1.1 Research on Preparedness

The literature cited in this section describes the results of a number of evaluations and studies that were conducted on health emergency management responses. They point to key issues and considerations that can contribute to the development of an effective emergency response plan. Some of the key issues repeatedly mentioned are:

- The primary importance of collaboration, coordination and communication among all relevant sectors, organizations and agencies on a community level, and among all levels of government.
- The need for skilled triage both in the field and within health facilities.
- The value of training and exercising in preparing staff members to respond effectively to emergencies.
- The need for communications strategies for those affected by the disaster/emergency and their family members (these information needs can place enormous demands on the response system).
- Efficient transportation and distribution systems.
- Immediate accessibility to ancillary supplies and resources.

A study on the overall effectiveness of health emergency preparedness was conducted by Bissell et al. (2004). The extent of fatalities and survival data was compared from four earthquakes (of relatively similar size) in countries with different levels of disaster response preparedness. An earthquake in Armenia, which had the lowest rating of preparedness, resulted in 167 deaths per 100 injuries; an earthquake in Japan, a country with a mixed preparedness rating, resulted in 31 deaths per 100 injuries; and two earthquakes in California, which had a high level of preparedness, resulted in 1 death per 100 injuries.

Booth and Stewart (2005) discuss the critical care response to the outbreak of Severe Acute Respiratory Syndrome (SARS) in Toronto in 2003. The primary challenge was absence of a coordinated leadership and communication infrastructure, as well as: closure of intensive care unit beds and loss of staff through quarantine and illness; implementation of novel infection control protocols; education of staff; research to learn about SARS; system planning; and maintenance of staff morale.

An evaluation by Kort, Stuart, and Bontovics (2005) of Ontario's response to SARS also revealed critical gaps in the emergency response capacity, and "identified, in the starkest terms possible, the need for improved emergency response planning." The key findings noted that future planning must:

- Ensure a broad and inclusive development process.
- Ensure the pandemic plan identifies: clear roles and responsibilities of federal, provincial/territorial and municipal levels of government; the approach to occupational health and safety issues, and ethical decision-making; a communications strategy linking all affected sectors and levels of government and the health sector; any commitments to

antiviral stockpiling; vaccine and antiviral allocation and use, and an approach for drug delivery from provincial stockpiles to local public health units; health human resource management and supplementation; and key programs/services to be scaled back to maximize surge capacity;

- Address best practices (e.g., involve all sectors of the health care system at the outset, acquire strategic expertise, and coordinate/advocate with broader emergency response systems).
- Outline future stages that include strengthening the delivery of clinical care to influenza cases, clarifying the role of primary care practitioners during a pandemic and leveraging Ontario's significant e-health investments.

Feeny et al (2005) reviewed hospital responses to the September 11, 2001 World Trade Center attack in New York. The hospital closest to the disaster experienced: overall chaos, loss of power, loss of communications and data (due to jammed phone lines and downed electrical lines), loss of water pressure, crippled hospital security, and many people who bypassed EMS triage and went directly to the emergency department. A number of lessons were learned and emergency plans revised to ensure:

- Availability of low-technology communications systems (i.e., messengers, hard-wired intercoms, walkie-talkies, FM radios).
- Planned responses for other potential terrorist activities including nuclear, biological and chemical attacks.
- Improved plans for basic supplies including potable water, cots, certain pharmaceuticals and so on.
- Integration of minimally acceptable care principles in the event of a high volume of patients during a crisis.
- Expansion of disaster drills and the inclusion of an element of chaos to build the flexibility and creativity of the response team.
- Clearer triage arrangements and transfer protocols with other hospitals.
- Enhanced provisions for families and others looking for missing or injured loved ones.

A unique and growing area of concern in many locations is emergency preparedness in response to the danger of bioterrorism. Chan, Yeung and Tang (2002) discuss the challenges of hospital preparedness in response to a potential mass exposure to toxic biological or chemical substances. They propose that the following steps be used in planning a response: initial assessment of the hazardous material; protection of staff and facilities; determination of the levels of protection; personal protective equipment; agent identification; decontamination of casualties and facilities; structure of the hospital decontamination team; and the training of emergency personnel.

Batho, Russell, and Williams (1999) describe the aftermath of the bombing of the Manchester City Centre in 1996. They note that the major constraint to an effective emergency response was the scale of the disaster. The emergency plan had not envisaged the extent of physical damage, or

the response of those most affected (5,000-10,000 people arrived at the town hall, and 15,000 telephone calls were received in the first week). However, there were also strengths identified in their response capability, as follows:

- Strong collaboration among city council, key organizations and agencies; working partnerships were crucial to the immediate response and subsequent recovery.
- Pre-determined strategies were in place for dealing with dangerous buildings.
- Previous training for police and city officials gave them the confidence to act without waiting for directions.
- Clear communication, coordination and liaison measures were in place.

An evaluation of a Rhode Island response to a nightclub fire noted the strengths of their emergency response plan, including: frequent disaster drills; an experienced trauma surgeon overseeing patient triage; quick formation of trauma teams; the presence of an attending surgeon in key hospital locations; and a strong hospital commitment. Weaknesses identified included: poor communication with the disaster scene, and the lack of specific instructions in the disaster plan for patient relocation/movement (Mahoney 2005).

Hoey and Schwab (2004) describe the importance of triage assessment tools and scoring systems to facilitate an effective triage process and to potentially reduce the morbidity and mortality associated with mass casualty events. Similarly, Eckstein et al. (1999) found on-scene medical control and early identification of the index case instrumental in effective out-of-hospital care interventions, as this facilitated immediate patient triage, field treatment, and hospital transportation when required.

Lee et al. (2002) noted that a mass casualty incident (MCI) plan was not effective during a response to an airliner crash. There was poor compliance with the plan on the part of the airport authority and ineffective coordination among multiple hospital-based staff at the site. The authors identified the most important factors for successful emergency response to any MCI as a practically designed MCI plan, good compliance among responders, and a strong support system of responding agencies.

Yi-Szu et al. (2000) noted that inadequate resuscitation after an earthquake in Taiwan was due a disaster plan which had insufficient manpower in field hospitals and long transportation times to back-up hospitals. To overcome these problems, they recommended that future evacuations of an overwhelming number of casualties, and needed support for medical resources, be handled by helicopter.

Weddle and Prado-Monje (1999) note that a lack of clear communication between military and civilian managers, and confusion among those requesting health resources, may remain obstacles to rapid response. They suggest that preplanning recognize these difficulties, and overcome them by defining request and validation pathways, and ensuring that communications through these channels are evident to those directing the disaster response. As well, early knowledge of the assets and capabilities of military units can avoid confusion in the early stages of response.

8.2 Resource Management

The *National Framework* notes that the efficient and effective management of resources is essential in times of disasters. By their definition, disasters are situations when resources are overwhelmed. The availability and condition of physical resources is as essential to the response as the plan and staff.

The *NFPA Standard* notes that resources for emergency program administration as well as disaster/emergency operations should be specifically identified. It also suggests that mutual aid agreements be used as a means of obtaining necessary resources. It recommends that a full range of resources be identified, including:

- The locations, quantities, accessibility, operability and maintenance of equipment.
- Supplies such as medical, personal hygiene, consumable products, administrative needs, ice and so on.
- Sources of energy including electrical and fuel resources.
- Emergency power production (generators).
- Communications systems.
- Food and water.
- Technical information.
- Clothing.
- Shelter.
- Specialized personnel (e.g., medical, religious, volunteer organizations, disaster/emergency management staff, utility workers, morticians and private contractors).
- Specialized volunteer groups (e.g., Red Cross, amateur radio, religious relief organizations, charitable agencies, Community Response Teams and so on).
- External federal, state, provincial, tribal, territorial and local agencies.

The *BC Report* suggests the following as best practices:

- A resource needs analysis to determine resource requirements.
- A plan in place for obtaining additional emergency resources on short notice.
- The use of an ongoing process to ensure that existing equipment and supplies are operational, including ongoing maintenance and systematic replacement and upgrades of equipment and supplies.

8.2.1 Research on Resource Management

Banner (2004) describes a Rhode Island exercise to test the State Medical Emergency Distribution System (MEDS), by supplying a large volume of emergency medical supplies in response to a simulated mass casualty incident. The MEDS communication plan did not work well and would not have worked in a real medical emergency because it was too slow and cumbersome. The problems were: too many elements involving communication; central management of supplies; and an analytical process for identifying needs and assets. The lessons learned resulted in improved practices, as follows:

- Simplification of the plan to reduce the number of decisions needed during an emergency. Predetermined population figures were integrated into the plan to establish prior need, and a list of priority sites (i.e., hospitals) was established.
- 100 distribution sites were established, instead of the central warehouse approach, with each site responsible for dedicated transportation to their surrounding areas.

Peters (1995) describes the problem of sudden and prolonged water loss in six area hospitals in Des Moines, Iowa during extensive flooding. He notes that rarely do disaster drills concentrate on the kind of calamities that can interfere with the functioning of all hospitals in one area. Over a 19-day period, the hospitals' surgical services, emergency departments, renal dialysis, dietary services, sanitation, laundry, cooling systems and fire protection systems were all jeopardized. Emergency preparedness planning had identified some alternative resources for obtaining potable water, but the response plans focused only on short-term utility loss and were overwhelmed by the magnitude of the disaster. Emergency managers were required to improvise solutions and they used a variety of innovative measures to obtain water.

8.3 Education, Training and Exercising

Education and training is a key to minimizing the impact of disasters and to ensuring a robust and resilient response, according to the *National Framework*. There is a need to train groups who will work together during a disaster, both within the organization and in external systems. Plans must identify these training needs. Every emergency response involves a balance between improvisation and preparedness. Training helps responders know when a situation can be dealt with using established methods or when an innovative solution is needed.

Training options include: in-house training that is specific to an organization's plans, equipment and responsibilities; interagency joint training with other organizations; and academic training. In BC, the Justice Institute has established a Certificate Program in Emergency Management, and PEP had developed online courses including: An Introduction to Emergency Management and Incident Command Systems.

Exercising is a term used to describe the use of emergency scenarios to allow participants to apply and practice their skills and roles in responding to a disaster. These can be effective in evaluating the state of response preparedness, although it is recognized that it is often difficult to fully simulate the conditions of a real emergency.

The *National Framework*, the *BC Report* and the *NPFA Standard* all recommend the use of exercises to test the Emergency Response Plan, and to provide training, coordination and consistency among partner organizations. The *National Framework* notes three types of exercises:

- *Basic exercises*, often called paper or tabletop exercises, which are conducted with participants gathered around one table. The goal is to increase the participants' familiarity with the emergency response plan and each other, as well as to provide an opportunity for problem-solving.
- *Intermediate exercises* are designed to test specific plan components in response to a scenario that is only described, not simulated. Participants may be in different locations, using their actual procedures and staff complements.
- *Major exercises* involving real-time deployment of actual resources to handle mock emergency situations. Practical or field exercises simulate emergency impacts.

The *BC Report* recommends, as best practice, the following components of a successful training and exercising program:

- An overall, written training and exercising plan to ensure that all personnel who may be involved in emergency activities are trained in BCERMS to their expected assignment levels or job functions.
- Coordination with other health authorities, BCAS and other emergency response agencies.
- Up-to-date training manuals and materials available to all staff at all sites.
- An appropriate mix of paper, tabletop and physical simulation.
- Programs tailored to cover all individual facilities, specialized tools or equipment and specific roles, jurisdictions and contingency plans.

8.3.1 Research on Education, Training and Exercising

There is extensive literature on various training methods and training courses. The studies often highlight the importance and value of training as an integral component to emergency preparedness.

Hsu et al. (2004) reviewed multiple studies on hospital training methods and found that disaster drills are effective in allowing hospital employees to become familiar with disaster procedures, identify problems in different components or responses (e.g., incident command, communications, triage, patient flow, materials and resources and security), and provide the opportunity to apply lessons learned to disaster response. The authors found the strength of other training methods to be uncertain.

Werner et al. (2005) found joint training among emergency first responders and public health staff in St. Louis to be successful in achieving common training objectives among law enforcement, public health, hospital staff and public and private agencies. It clarified response

roles and responsibilities and strengthened personal connections and understanding among response partners.

Kincaid, Donovan, and Pettitt (2003) found persuasive evidence that training effectiveness is substantially improved by the use of simulation as compared with traditional field exercises, based on seven years experience by the Institute for Simulation and Training, University of Central Florida. Two skill areas were addressed: emergency management incident command and emergency medical care performed in the field. Simulators converted from a United States Army war games exercise and a combat trauma patient simulator, are used to model emergency situations. The authors note that simulator training offers several advantages over other forms of training, including cost, safety and instructional effectiveness.

Doxtator, Gardner, and Medves (2004) assessed, through the use of a tabletop exercise, the ability of a rural health unit in Ontario to manage an influenza pandemic. Participants were community stakeholders including representatives from public health, hospitals, long-term care, social services, first responders, morticians, local government and the media. The exercise provided an opportunity to familiarize participants with the emergency response plan, to practice working collaboratively, and to identify areas for further planning. All participants and observers rated the exercise as successful.

Henning et al. (2004) evaluated a hospital-based tabletop bioterrorism exercise in a large, multi-institutional urban health system. They found that participants were able to identify a number of weaknesses in the emergency response plan as a result of the exercise, and over 94 per cent ranked the exercise as extremely or very useful. They concluded that tabletop bioterrorism exercises are a feasible, well-accepted modality for hospital preparedness training.

9.0 DISASTER RESPONSE MANAGEMENT

9.1 Initial Response

The initial response to a large emergency or disaster is a critical stage in its successful management. This can involve first responders going to the scene of an emergency, as is common with site-specific incidents such as the 2003 Kelowna fires. Alternatively, emergencies can involve the victims and the problems coming to a variety of first contact points. For example, people suffering a communicable disease outbreak or exposure to a hazardous substance would present themselves to clinics and emergency departments.

In both types of event, notes the *National Framework*, there must be coordination at each stage of response; for example, the initial assessment of the incident, the development of short and long-term actions plans, the assignment of resources to priority needs, and the provision of urgent care and support to the community. The health and emergency social services sectors must work closely with other public safety agencies (e.g., police, fire and emergency management offices), as well as other community partners (e.g., utility companies, non-government agencies and private sector companies).

It is necessary to have a system in place to simplify interagency management and interaction. Incident management systems, discussed in the following section, facilitate this coordination.

9.2 Incident Management Systems

Incident management systems are becoming an important, accepted organizational tool for emergency management. The *National Framework* states that the main points of a successful incident management system are “the ability to have personnel and resources operating in a pre-arranged, coordinated manner and to allow agencies from different sectors to function together with a common management structure.”

The *NFPA Standard* also recommends an incident management system and defines it as “a system that defines the roles and responsibilities to be assumed by personnel and the operating procedures to be used in the management and direction of emergency incidents.” The New Zealand Coordinated Incident Management System (1997) is described as “a concept for coordinating responses to emergency incidents by two or more emergency services. It provides a process for agencies with different legal, geographic and functional responsibilities to work together effectively in any situation through the use of common terminology and structure.”

An incident management system provides a flexible management structure that can be quickly tailored to the unique problems posed by an emergency, while retaining a common form that staff can be trained to use. Horizontal and vertical interagency coordination is improved when each has adopted an incident management system. This can include cooperation and joint operations between: departments within a hospital; facilities within a region; regional and provincial departments; or local, regional and provincial responders from different sectors (e.g., fire, police and utilities staff).

The common components of an incident management system are:

- Incident commander and command staff functions.
- Planning functions.
- Operations functions.
- Finance/administration functions.
- Logistics functions.

An incident management system should (*National Framework*):

- Ensure effective emergency response and help to ensure continuity of care.
- Use consistent, common terminology.
- Be modular and adaptable to any situation regardless of size or type, (including non-emergency events).
- Be adapted to meet the needs of the jurisdiction through development that involves all stakeholders.
- Be integrated with other agencies (vertical and horizontal integration).
- Be suitable for use by all components of the health and emergency social services sectors.
- Allow for unified command/management.
- Be defined and documented in writing (including a glossary of terms).
- Have clearly defined roles and responsibilities that are consistent with normal roles and, as much as possible, should keep people in normal roles and functions (e.g., logistics staff should take on logistics functions).
- Have clearly defined implementation, escalation, de-escalation and termination procedures.

The Incident Command System (ICS) is the most commonly used incident management system, and is referred to in the *BC Report* as a best practice. The BCERMS approach, adopted by the government of BC, is based on ICS, and all of the health authorities are committed to an ICS-based system as their model for initial response. The health authorities are generally at an early stage of planning and training with respect to ICS. Exercising and training of all staff is noted as a key component to ensuring that the ICS operates effectively. The *BC Report* also recommends that the Ministry of Health work with the health authorities to ensure there is sufficient training in the ICS.

9.2.1 Research on Incident Management Systems

Various forms of incident management systems have been developed to suit different operating contexts. Two incident management systems intended specifically for the health and emergency social services sectors are the “Hospital Emergency Incident Command System” (HEICS), and “Medical and Health Incident Management” (MaHIM). HEICS applies the principles of the

Incident Command System to the hospital setting. The MaHIM was developed as a result of the lessons from the 2001 Anthrax incidents in Washington, DC, when the separation of public health and facility-based health services was recognized as an obstacle to coordination. It provides an “overarching system for organizing and managing the many diverse medical and public health entities involved in mass casualty response” (Barbera and Macintyre 2002).

Burkle and Hayden (2001) note that the management of large-scale disasters is impeded by inadequately designed organizational infrastructure. They believe that the vertical organizational structures of most agencies responding to disasters contribute to poorly integrated response especially where collaboration, information sharing and coordination are required. Horizontal, or lateral, organizations have assisted traditionally vertical civilian and military agencies by enhancing their capacity to operate successfully in complex human emergencies and large-scale natural disasters. Because of the multi-agency and highly technical multi-disciplinary requirements for decision-making during a disaster, they suggest that horizontal management options be adopted for managing large-scale disasters.

9.3 Consequence Management and Recovery

All emergencies have a degree of impact on facets of individual health. Recognizing the interconnected nature of the health and emergency social services sectors is important when managing health consequences. For example, there may be immediate trauma, home care issues or a pressing need to supply clean water or emergency shelter.

Emergencies, especially those that overwhelm a community, have a complex set of causes and consequences that are impossible to plan for ahead of the event in accurate detail. Consequently, it is important that the health sector have a high level of preparedness and flexibility to respond effectively to each event.

The recovery phase of a disaster can take considerable time and in some cases, last for years. Challenges may include: physical injuries which require long-term treatment and therapy; public health issues such as mould or water contamination that may arise after the primary hazard has receded; psychosocial trauma which may become more evident with time or be exacerbated by the pain and frustrations of dealing with loss; and damaged infrastructure, displaced staff or other disruptions to health services which could hamper a return to normal business (*National Framework*).

It is as important for the health sector to manage these consequences during the recovery period, as it is for them to prepare for the immediate responses. These must be managed in a way that maintains the needed level of service while assisting in the transition of the community back to ‘normal’ systems and services (*National Framework*).

9.3.1 Research on Consequence Management and Recovery

Avery (2003) describes the difficult recovery from a volcano eruption in the West Indies, noting that the initial adverse effects on respiratory health were not long lasting, but there were far more devastating effects from the social and economic disruption and their adverse effects on family

life, including interpersonal violence, mental health, diet and nutrition. He notes it will take many years for a full recovery.

Batho et al. (1999) describe the transformation of the emergency response from dealing with the immediate crisis following the bombing of the Manchester City centre, to a stage of controlled recovery. They note that their emergency response plan lacked an outline for recovery but a range of short and long-term recovery initiatives were developed quickly after the devastation occurred. Working partnerships were crucial to the immediate response and subsequent recovery. Specific instruments were established to control the site, to assess the safety of buildings, to phase-in public access and to plan a major renewal of the city centre.

Becker (2001) and Norwood, Holloway, and Ursano (2001) note that within the United States preparedness community, there is a growing recognition of the importance of psychosocial issues in weapons of mass destruction incidents, and whereas social and behavioral issues were only infrequently considered just a few years ago, they are now coming to be seen as central to consequence management and recovery efforts.

Similarly, Norris et al. (2005) notes that there was a high need for both crisis counseling and continuing clinical care in the aftermath of the Oklahoma City bombing. They stress the need for preparedness, training and education, local control, interagency cooperation and psychosocial support for providers, as a way to overcome the problems that arose in providing mental health services following the disaster (i.e., conflicts among providers about credentials, referrals and the quality of services and the appropriateness of basing services solely on a crisis counseling model).

10.0 QUALITY IMPROVEMENT

The *National Framework*, the *BC Report* and the *NFPA Standard* all point to the importance of developing a continuous improvement process and a culture of communicating and acting on opportunities for quality improvement. The *BC Report* suggests the following three best practices to support this goal:

- A process for periodically monitoring changes in all relevant internal and external factors such as hazards, risks, the environment, communities' coping resources, other emergency response agencies' activities, vulnerable populations and elements of preparedness such as trained personnel.
- Evaluation included as a component of all training, exercising and post-incident activities.
- A continuous quality improvement cycle to feed the results of the above two components into the planning cycles of the program and the organization.

Similarly, the *NFPA Standard* suggests that the emergency response plan be reviewed annually and updated as necessary. It should be re-evaluated when any of the following occur:

- Regulatory changes.
- New hazards are identified or existing hazards change.
- Resources or organizational structures change.
- After tests, drills or exercises.
- After disaster/emergency responses.
- Infrastructure, economic and geopolitical changes.
- Funding or budget-level changes.

10.1 Research on Quality Improvement

A literature review on health emergency management by Info-Link Consulting (2005) discusses an evidence-based approach in public health, noting the importance of reliable, quantitative information. It suggests that knowledge generation, knowledge synthesis and knowledge transfer, including knowledge transfer to the community level, are key factors in effective evidence-based quality improvement.

11.0 CONCLUSION

The *National Framework*, *BC Report* and the *NFPA Standard* provide a solid conceptual overview of the key components for a health emergency management system. The research evidence supports and supplements a number of the approaches recommended by these documents.

However, it also is clear that the majority of evaluation studies focus on “lessons learned”, rather than on strategies that resulted in unequivocal success. In the studies of large-scale disasters, the emergency response capacity was overwhelmed for the most part. For smaller scale disasters, varying degrees of success were demonstrated. It appears that the process of developing effective health emergency management requires more work.

The scale of a disaster appears to be a major factor in predicting effectiveness. As well, it is evident that the range and types of emergencies can vary so greatly, that organizations have difficulty in planning for all potential challenges. However, there are some common elements that appear to be critical in supporting effective responses; in particular, the development of comprehensive emergency response plans, and well-articulated incident management systems. Collaboration, coordination and open communication among community agencies and all levels of government are consistently cited as important, as are education and training initiatives. Other “lessons learned” from the literature are also expected to contribute valuable information to assist health authorities in developing their emergency management programs.

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APPENDIX 1: ONLINE LITERATURE SEARCH

SEARCH STRATEGY FOR THE LITERATURE REVIEW ON HEALTH EMERGENCY MANAGEMENT

The literature search for the project on Health Emergency Management was conducted using OVID, an online search system, and searched the following databases:

1. All Evidence Based Medicine Reviews – Cochrane Database of Systematic Reviews (DSR), ACP Journal Club (ACP), Database of Abstracts of Reviews of Effects (DARE) and Cochrane Central Register of Controlled Trials (CCTR).
2. [CINAHL - Cumulative Index to Nursing & Allied Health Literature](#) 1982 to Dec. Week 2 2005.
3. Excerpta Medica Database ([EMBASE](#)) 1980 to 2005 Week 50.
4. Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations.
5. [Ovid MEDLINE\(R\)](#) 1966 to November Week 3 2005.

The search requested articles containing at least one term (Medical Subject Heading or keyword) from each of the following three components: nature of the emergency, response to the emergency, and evaluation. Table 1 provides the complete list of search terms. The search was limited to English language articles dating from 1996 to 2005, inclusive. As a result, 155 citations were found once duplicates were removed. Table 2 provides the detailed search strategy. We have printed out the citations and abstracts for all the relevant results and have reviewed them. Table 3 presents the number of citations selected.

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Table A: Components, MeSH Terms and Keywords

Component	MeSh Term	Keyword
Nature of the Emergency	Disasters Natural disasters Emergencies Fires Starvation Disease Outbreak Plague Hazardous substances Explosions Food contamination Terrorism Volcanic eruption Riots Civil disorders SARS virus Severe acute respiratory syndrome Bioterrorism	Business continuity Crisis Crises Earthquake Terrorism Landslide Flood Drought Avalanche Plague Infestation Power failure Sabotage Insurrection Catastrophe Hurricane Tornado Blizzard Ice storm Dangerous goods Epidemic Pandemic Wildfire Labour disruption Mass casualty Meteorite
Response to the Emergency	Risk management Disaster planning	Response to emergency Preparedness Mitigation Risk control Command system Emergency management
Evaluation	Cost-benefit analysis Program evaluation “Outcome assessment (health care)”	“outcome assessment (health care)”

Table B: Detailed Search Strategy

#	Search History	Results
	Nature of Emergency	
1	Disasters/	9947
2	Natural Disasters/	9724
3	Emergencies/	32871
4	Fires/	8376
5	Starvation/	12122
6	Disease Outbreak/	59568
7	Plague/	3817
8	Hazardous Substances/	5886
9	Explosions/	3208
10	Food contamination/	27632
11	Terrorism/	7142
12	Volcanic eruption/	1173
13	Riots/	436
14	Civil disorders/	668
15	SARS virus/	2665
16	Severe acute respiratory syndrome/	6136
17	Bioterrorism/	6171
18	Business continuity.mp	17
19	Crisis.mp	45238
20	Crises.mp	9256
21	Earthquake:.mp	3014
22	Landslide:.mp	7142
23	Flood:.mp	7729
24	Drought:.mp	3276
25	Avalanche:.mp	851
26	Plague:.mp	9343
27	Infestation:.mp	16814
28	Power failure:.mp	287
29	Sabotage.mp	295
30	Insurrection.mp	57
31	Catastrophe:.mp	3761
32	Hurricane:.mp	1125
33	Tornado:.mp	308
34	Blizzard:.mp	181
35	Ice storm:.mp	84
36	Dangerous goods.mp	2295
37	Epidemic:.mp	68452
38	Pandemic:.mp	5053
39	Wildfire:.mp	288
40	Labour Disruption:.mp	2
41	Mass casualt:.mp	992
42	Meteorite:.mp	810

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#	Search History	Results
	Nature of Emergency Cont'd	
43	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42	309272
	Response to Emergency	
44	Risk management/	20006
45	Disaster planning/	9047
46	Response to emergency.mp	196
47	Preparedness.mp	4182
48	Mitigation.mp	2408
49	Risk control.mp	3906
50	Command System.mp	139
51	Emergency management.mp	2752
52	44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51	40265
	Evaluation	
53	Cost-benefit analysis/	65136
54	Program evaluation/	68707
55	“Outcome assessment (health care)”/	259709
56	“Outcome assessment (health care)”.mp	25139
57	53 OR 54 OR 55 OR 56	386211
	Nature of Emergency AND Response to Emergency AND Evaluation	
58	43 AND 52 AND 57	195
59	Remove duplicates from 58	181
60	Limit 59 to English	174
61	Limit 60 to yr="1996-2005"	155

Table C: Selected Citations

Search	Number of Articles Identified	Number of Articles Selected
Nature of Emergency AND Response to Emergency AND Evaluation	155	35

APPENDIX 2: PROVINCIAL EMERGENCY RESPONSE MANAGEMENT

1. GENERAL

a. Orientation

The Government of British Columbia recognizes the fundamental obligation to provide for the safety and security of all British Columbians. Accordingly, it has legislated the responsibilities of ministries and other provincial agencies, local authorities, and citizens in relation to emergency and disaster response. It clearly has the authority to plan for the overall response expected; and extraordinarily during response, it may direct those actions which are routinely delegated to subordinate levels of government.

b. Provincial Response Management Strategy

The Inter-Agency Emergency Preparedness Council has developed the document *Provincial Government Emergency Response Management: A Strategy for Response*.

In the interest of speed and simplicity, response management should be carried out at the lowest possible level of government organization, with a minimum of reorganization once an event has occurred. Coordination of existing, highly decentralized arrangements is preferable to the implementation of new structures and procedures. However, when resources are extremely scarce, there may be no choice but to control their employment centrally in order to use them where they are needed most. Furthermore, an influx of additional resources in support of the provincial response effort needs to be centrally managed in the disaster operational area.

All provincial government ministries and agencies have agreed to conduct operations using the *British Columbia Emergency Response Management System (BCERMS)*, which exists within the Response Management Strategy. BCERMS is under development as this plan is written, and it acknowledges as a fundamental principle that there are four levels of response:

- Site (incident/multiple incidents)
- Site Support (by local authority, ministry, etc.)
- Provincial Regional Coordination
- Provincial Central Coordination

2. PROVINCIAL MANAGEMENT REQUIREMENTS

Ministry of Attorney General will provide the personnel to fill the appointments required by the emergency management structure as follows:

- Minister Responsible- Attorney General
- Deputy Minister Responsible- Deputy Attorney General

(The Emergency Committees of Cabinet and Deputy Ministers will likely reflect the composition of the Central Coordination Group.)

- Central Coordination Group (CCG)

Chair- Director, Provincial Emergency Program

(Ministry representatives should be from those ministries which [will] have an active role in response, as called by the Chair.)

- Provincial Emergency Coordination Centre (PECC)- Based on the Provincial Emergency Program Emergency Coordination Centre (PEP ECC), Victoria. The PEP ECC maintains a 24-hour operations capability, and Director PEP can activate the nucleus of a provincial coordination staff from within Provincial Emergency Program headquarters.
- Provincial Field Response Centre(s) (PFRC)- Based on the manager of each Provincial Emergency Program region, augmented by other provincial ministries' staff.

Ministries and Agencies are expected to establish their own central Emergency Operations Centre (EOC) to coordinate operations with the PECC, when the emergency response functions for which they are responsible are resulting in significant activity. They should also establish regional EOCs which coordinate with PFRCs, under similar conditions.

3. ESCALATION OF RESPONSE

a. Local Emergency

Should a local government be capable of response to an emergency with its own resources, augmented through direct assistance from other sources, the provincial government management requirement is one of coordination only. During a local government response, the Provincial Emergency Program may activate the Victoria Provincial Emergency Coordination Centre. A liaison officer may be attached to the local authority Emergency Operations Centre in order that the provincial government can be informed of the situation. A Provincial Field Response Centre (PFRC) with minimal staff and capabilities may also be activated.

b. Major Emergency/Disaster

A major emergency may overwhelm local authority response, and require an enhanced provincial response management structure because:

- resources are in demand over a wide area, and mutual aid agreements break down;
- the demands for provincial level resources exceed the existing capabilities of pre-arrangements to provide;
- the uncertainties associated with damage assessment over a wide area require provincial government action to produce an accurate total situation analysis; or
- the provincial government may choose to be represented in the disaster operational area to express its concern, to provide a wider scope to public information, and to perform provincial government functions in a manner which is clearly seen to be directed at the response effort.

Under these conditions a PFRC will almost certainly be activated in or close to the operational area, and the PECC will be in operation in Victoria. The PFRC can:

- establish communications within the operational area with all local governments likely to be affected by the disaster, and with those local governments not affected but who are able to provide assistance;
- establish and maintain communication from the operational area to the Provincial Emergency Coordination Centre in Victoria;
- gather damage assessments from local authorities in the area, define the operational area, and produce a summary report which will form the basis of future provincial government actions;
- receive, collate and forward requests for assistance from local authorities in the operational area;
- provide on-the-spot coordination on behalf of the provincial government, where possible; and
- plan for, and be the nucleus of expansion to a PFRC with greatly enhanced capabilities and responsibilities should that be directed by government.

4. PROVINCIAL FIELD RESPONSE CENTRE (PFRC)

To meet an unknown requirement with a structure capable of a flexible response to a possibly escalating scenario is a challenge. In the discussion of PFRC tasks below, the orientation is towards a major event. The actual configuration of a PFRC during a response operation will be the result of on-the-scene adaptation to actual conditions. The manual, *PFRC Guidance and Procedures*, includes more details.

a. **Tasks - Immediate Phase**

The immediate phase response is centred on operations which are the responsibility of local governments, and life-saving and life-preserving operations of the British Columbia Ambulance Service. However, during this phase significant requests for provincial assistance are possible. Inadequacies of local government response capabilities may also become evident and require provincial government action. The staff available for establishment of the PFRC must be capable of these tasks:

- communicating by telephone, radio or personal liaison with all local governments in the area to determine the extent of the damage and thus the size of the expected operational area. This will be a progressively demanding task, but the initial assessment must be rapid and accurate enough to permit selection of a site for the PFRC and to allow provincial government action to commence an expanded management role.
- communicating with the Provincial Emergency Program Headquarters/Provincial Emergency Coordination Centre in Victoria to provide the initial analysis of the situation and to recommend further provincial government action.
- functioning as a central collection point for requests for assistance from local governments, providing immediate coordination where necessary, and if

authorized by the Director, Provincial Emergency Program, managing the total response in the operational area as needed.

b. **Tasks - Sustained Phase**

For sustained phase operations full coordination capabilities are needed in the PFRC to manage the overall response as resources become available and response actions in the disaster area become more methodical. The thrust of the activity swings from immediate life-saving requirements to the prevention of further loss of life and other forms of suffering, detailed damage assessment, and the prevention of further damage to property. The sustained phase tasks imply a high level of resource allocation to local governments for some functions, and a need for centralized control of resources for other functions.

The PFRC tasks include:

- maintaining operational direction or coordination of the provincial response effort until responsibility is released to "normal arrangements" on a function-by-function basis.
- self-administration, and coordination of unforeseen self-administration needs of other provincial ministries involved in the response effort.
- planning for future operations, including commencement of recovery activities as these become feasible.
- financial management of the provincial government response effort, including administration of any disaster financial assistance programs that could become available.
- operating a public information centre in the operational area.
- arranging for the receipt, stockpiling, and dispatch of resources.
- coordinating disaster response communications requirements.

5. PROVINCIAL EMERGENCY COORDINATION CENTRE (PECC)

The Provincial Emergency Coordination Centre is activated only when necessitated by the magnitude of the provincial response, as a means of coordination of more than one Provincial Field Response Centre, and to serve as a staff channel between the Central Coordination Group and the PFRC(s).

The Provincial Emergency Coordination Centre is the location designated for liaison with the Federal Coordination Officer (normally the Regional Director of Emergency Preparedness Canada).