

Towards Emergency Intelligence Support of Regional Emergency Networks: The Missing Dimension

by
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INTRODUCTION

(1) Emergency managers must be cognizant of, and prepared to deploy, new and promising knowledge technologies. Regional emergency management networks are emergency systems that efficiently and effectively integrate all of the key crisis and emergency service components. The goals of regional emergency management networks are: to reduce mortality and morbidity rates and risks from traumatic events; to promote emergency preparedness and crisis prevention; to assure effective provision and delivery of appropriate and timely emergency health services; and to effectively rationalize and coordinate emergency services on a regional level. Regional emergency management networks include a number of network levels, each supported by their own respective information systems.

(2) One of these key information technology developments is emergency intelligence systems, which have the potential to promote system efficiency and effectiveness in crisis and emergency management. These decision support systems address the specific strategic planning, analytical, communication and management information needs of emergency managers through advanced multimedia software and telecommunications. As the foundation for decision support of emergency activities, integrated crisis support systems monitor organizational effectiveness through pre-defined performance indicators, objectives, targets, and plans. They also facilitate systems' communications, by providing critical linkages to key external organizations, including all levels of government, emergency bodies, health facilities, police and fire services and social agencies, professional associations, emergency providers, institutional suppliers and service communities.

A TERRORISM SCENARIO

(3) It is one minute to noon on December 20, 2002. Thousands of employees from four government buildings and two adjacent high-tech companies are preparing to stream out of their offices to an adjoining shopping mall for a quick lunch and Christmas shopping. The shopping complex is connected via tunnels to all six office towers. Unbeknownst to all, a coalition of international terrorist groups has strategically planted twenty tanks of a chemical agent at each major building's connection to the shopping mall, where pedestrian traffic is heaviest. Sarin gas is released at precisely noon with devastating impact.

(4) Although each government department has a separate disaster plan, none of these plans have been coordinated, integrated, nor tested. Nor are the high-tech firms better prepared, as their disaster plans are limited to protecting their information systems, not people's lives. The 9-1-1 systems are immediately paralyzed with frantic calls and become unable to cope with the situation. Police, fire and ambulance services rush to the scene, unaware of the true nature and magnitude of the crisis. Moreover, the first responders are unaware of and ill-equipped for the imminent danger in which they find themselves. The sarin attack and its consequent devastation, the sheer insanity of such an event, are beyond human comprehension. As minutes tick by in an atmosphere of confusion, the mortality rates grow exponentially and will not level off nor decline until four hours later, when emergency managers of diverse agencies finally start to cooperate to cope with the situation. The lack of coordination between first responders and hospitals results in hundreds of casualties over the next six months. The economic losses to both the Federal Government and public sectors in Capital City are incalculable.

(5) After one year, public acceptance of the sarin attack replaces the incredulity of that fateful December day. Moreover, key emergency preparedness lessons of that day are still hard to comprehend. Every organization now simply updates their documented emergency plans and life continues as before. Pleas for better integration of information systems to prevent such catastrophes with their concomitant unacceptable levels of mortality and morbidity are ignored. The horror of that day recedes in the mind of the public, as does media attention. Institutional and public apathy become the order of the day, as the sarin attack becomes an interesting historical footnote. Meanwhile in the confines of yet another terrorist cell, preparations are being made outside of Capital City for a second wakeup call ...

EMERGENCY INTELLIGENCE SYSTEMS

(6) Emergency managers need more rapid access to crisis information systems with powerful query and analytical capabilities. Emergency intelligence systems are enabling information technologies that enhance emergency management effectiveness and efficiency in responding to critical traumatic events by integrating all the information systems at each level of the regional emergency management network. Integrated crisis support systems promote emergency management's ability to be creative and innovative by identifying, analyzing and presenting key relationships between data on an interactive basis. These interoperating systems serve as important strategic tools enabling emergency managers to react quickly and appropriately to changes in dynamic emergency environments. Such systems provide relevant clinical, resource, financial and operational management information that track critical organizational responses to crisis events, thus facilitating strategic decision-making. Emergency managers are more readily able to recognize and diagnose crisis management problems and to both develop and implement comprehensive solutions proactively. User friendliness and responsiveness characterize emergency information systems that allow emergency managers to access and interpret information quickly and independently.

(7) Operating within largely unstructured environments, emergency managers need to scan extensive databases for relevant information, delve into specific files for detail, be alerted to strategic issues and critical organizational problems, conduct profile and trend analyses of crises, and synthesize these into meaningful formats

that will promote decisive and effective decision-making. Integrated crisis support systems respond to all these critical management requirements by providing rapid access to relevant emergency operational and strategic information, forecasting and trend analysis, and information that supports analytical and intuitive decision-making at all levels of the regional emergency management network. Decentralized decision-making is facilitated, while strategic emergency management control is maintained.

(8) Emergency intelligence systems have the potential to improve emergency performance, enhance crisis communications, promote emergency service effectiveness and efficiency, and improve emergency planning and crisis management control. Such systems provide net benefits in the quality of information available, with greater timeliness, access to more concise and relevant internal and external information, and reduced paper and human resources costs. They allow rapid response to crisis demands, enhance service quality, streamline emergency management structures, improve monitoring of regional emergency network activities, and promote more effective communication with and between operational personnel. In effect, these systems support the goals and objectives of reducing mortality and morbidity rates and the negative impacts of crises on communities.

(9) Emergency intelligence systems respond to the cognitive world of emergency managers by supporting five key strategic functions, including:

... online analytical processing, which provides graphic information through the dynamic exploration and analysis of databases;

... data mining, which enables emergency managers to access detailed and analytical information on specific issues;

... strategic intelligence, which prompts the emergency managers to identify management issues by continuous scanning databases;

... critical forecasting, which enables emergency managers to perform trend and sensitivity analyses; and

... integrative reporting, which customizes variance and exception ad hoc queries to different management cognitive styles.

They are essentially business intelligence systems adapted to emergency environments.

THE MISSING DIMENSION

(10) Integrated crisis support systems capture critical trend information on key crisis management performance indicators of central importance to emergency managers. Emergency intelligence systems must provide essential, reliable and valid information that is acceptable and compatible to the cognitive styles of emergency managers in a timely and efficient way. Emergency managers must have the ability to access report summaries on an ad hoc basis and to explore network databases independently. Rigorous information validation processes ensure the highest levels of database integrity and enhance the overall reliability and credibility of integrated crisis support systems as a basis for sound strategic and operational decisions. Routine audits of system controls by qualified information system auditors and security specialists ensure that the highest levels of database effectiveness,

efficiency, data integrity and security are met and promulgated.

(11) Feedback on whether regional emergency networks are being managed effectively necessitates strategic control of the system. Effective strategic control requires that emergency and crisis system guidelines, standards and effectiveness indicators be supported through integrated crisis support systems. Guidelines, standards and crisis service quality indicators for regional emergency networks are essential to strategic control. The emergency service community and government organizations on all levels must collaborate to define regional system performance indicators and outcome standards and guidelines. Without such measures, there is no firm basis to assess the extent to which emergency and crisis services are being effectively delivered. These standards focus and target emergency management interventions into the system to reduce mortality and morbidity risks and rates cost effectively.

(12) The vital fuel in the regional emergency management networks is quality management information. This emergency information must be relevant, valid, reliable, available, and accessible. These networks should provide only the most relevant information to support key emergency management decisions that will ultimately improve the quality of crisis response within a given region. Crisis management controls depend on integrated telecommunication systems that provide valid and reliable information within a critical time span to support regional emergency management needs. Strategic information technology plans that promote the development and the implementation of integrated emergency information systems, using well-managed telecommunications architectures, are the basis for truly integrated regional emergency management networks.

(13) Municipal, state, provincial, and national agencies are ultimately accountable for the effective provision and delivery of regional emergency services to community populations. It is incumbent on them as part of their respective responsibilities to assure that integrated crisis support systems are in place to facilitate the identification and effective resolution of regional crisis management issues and problems. In concert with emergency service providers, governments at all levels need to establish crisis system guidelines, standards and effectiveness indicators, as a basis for effective regional emergency management networks. In essence, the implementation of effective integrated crisis support systems requires proactive emergency system management leadership and accountability from government organizations with the authority and responsibility to create regional emergency management networks.

(14) Government management and leadership are instrumental in facilitating the interoperability and integration of regional emergency management networks. In effect, the infrastructure of the regional emergency management networks needs to be reengineered to benefit fully from current information technology capabilities. Government agencies need to assume more proactive leadership roles in directing, funding and managing the information technology that will support more responsive and cost-effective regional emergency management networks.

(15) Strategic control and management are essential components of effective emergency systems delivery in Canada and the United States. Management control increases the likelihood that human and operational emergency resources and services will be managed economically, efficiently, and effectively throughout the network. Strategic control of regional emergency management networks assures

that appropriate crisis resources and services are managed effectively throughout the regional emergency management network and that mortality and morbidity risks and rates associated with traumatic events are controlled in a cost effective way.

(16) Strategic control of regional emergency management networks requires integrated regional information on the effectiveness of each network level and their mutual interfaces for the benefit of the service community. Emergency intelligence systems enable and facilitate the implementation of such a regional integrated perspective. Emergency strategic control is an important management process that is instrumental in improving the crisis system's effectiveness, by reducing mortality and morbidity rates, as well as overall emergency system costs.

(17) Emergency intelligence systems have the potential to provide tangible benefits to emergency managers in radically changing crisis environments. Emergency managers must have accurate, complete, reliable, and valid information that focus on volatile emergency environments. Integrated crisis support system technologies make this plausible for effective management decision-making. Integrated crisis support systems are instrumental in discerning environmental trends, increasing emergency service response efficiency, and promoting quality health through improved service monitoring and more effective strategic control.

(18) Stable financial support from government and non-government sources for integrated crisis support system initiatives is essential. Government sponsorship and proactive encouragement of regional emergency management networks with integrated clinical, financial, and management databases are vital. However, in the face of burgeoning demands to adequately finance other public service needs and with diminished public finances, governments often place a low priority on information technology development and emergency management. In the absence of public sponsorship, and in the face of other pressing government priorities, emergency managers will continue to rely on disparate and inefficient external information sources and informal heuristics as their primary management modus operandi. As a further consequence, the potential for integrated crisis support system technologies to better assist in making sounder resource allocation decisions for the benefit of traumatized patients and service communities in crisis is not fully exploited.

(19) Integrated crisis support systems in emergency management have one critical success factor, that of information technology management leadership. Effective systems require proactive and consistent emergency management involvement in all phases of emergency intelligence system development. The lack of adequate management participation compromises the ability of emergency intelligence systems to best serve management goals and objectives. Active support must translate into actual participation and visible strategic commitment, tangible actions, and stable financing of incident crisis support system endeavors. This represents a serious challenge for emergency managers, given the myriad of other management priorities that often supersede and limit the time available for involvement in emergency intelligence system development.

(20) Management information needs and requirements must drive the development and implementation of emergency intelligence systems. Successful development and implementation of integrated crisis support systems requires sound information technology architectures and capabilities throughout the regional emergency management network. Effective integrated crisis support system planning with clear

goals and objectives, well-defined designation of information technology management responsibility and accountability, and stable financing are a sine qua non. Proactive strategic planning assures an optimal fit between crisis information requirements and the hardware, software, and telecommunication capabilities that provide the technological foundation upon which effective integrated crisis support systems rest.

(21) Prudent assessments that examine integrated crisis support system economic, operational, and technical feasibility within a region must be integral parts of strategic planning of information technology. Of fundamental importance are the leadership responsibilities of Chief Emergency Information Officers, who ensure that all information resources and systems are effectively and efficiently managed. This senior emergency management executive must coordinate information technology resources, projects, planning endeavors and steering committee activities, which oversee the development and implementation of integrated crisis support systems and other technologies. The Chief Emergency Information Officer must ensure that information technology support and financing is in place to drive the development of integrated crisis support systems, which will substantially reduce emergency management costs and make regional emergency management networks more efficient, effective, and responsive to community needs.

THE TERRORISM SCENARIO - REVISITED

(22) It is one minute before noon on December 20, 2002. Dr. Francisco, the Regional Emergency Operations Center manager, has a functional emergency intelligence system at his disposal. The Center's computers are integrated with Capital City's regional trauma network. Multimedia workstations throughout the network interoperate with video-feeds to television and satellite systems, allowing emergency managers to monitor channels and broadcast full screen crisis information to other workstations. With the availability of immediate information and intelligent agents, Dr. Francisco is able to analyze that he is dealing with a sarin gas attack and immediately alerts the first respondents, many of who would have not been properly prepared for the scene and would have perished in their attempts to save others. When the alert sounds of a sarin attack in the Capital City Center, instantaneous reports on the numbers of casualties, injuries, and resource profiles are generated and immediately distributed throughout the regional emergency network workstations. The system had been routinely tested and the institutions and facilities in Capital City's regional emergency network have had many disaster simulations. Shock, panic, and anarchy are minimal.

(23) Regional emergency managers on high alert calmly absorb the information on the location and distribution of all emergency vehicles and personnel and the number and types of casualties and injuries. Information as to where emergency victims will be taken, the numbers of emergency staff at each facility, and those on call throughout the region is available and current, as is information on current health facility bed occupancy and vacancy rates. Backup facilities and resources are on full alert and ready to assist.

(24) In effect, the integrated crisis support systems allow Dr. Francisco to efficiently allocate critical care resources to effectively respond to the sarin attack crisis. This saves lives and minimizes the numbers of injuries. His operational staff quickly receives critical regional information.

(25) Once the immediate crisis is over, the fallout from the impact of the sarin gas attack continues for many months. Dr. Francisco is still concerned with the treatment of attack victims at the trauma hospitals and in recovery stages at chronic care institutions and home care throughout the region. The full impact on the business operations of the affected government departments and high-tech firms has to be investigated, as does the impact on the fire, police and ambulance resources and services. Most importantly, critical lessons for future emergency preparedness are quickly drawn and appropriate changes made quickly for governments, business organizations and the regional emergency networks in the likely event of yet another sarin gas attack. An emergency intelligence system makes this possible within one week – something that could not have been done in one year of investigation time at the cost of millions of public dollars. Proactive crisis preparedness, enabled through emergency intelligence systems technology, not institutional apathy, is the order of the day.

TOWARDS EMERGENCY INTELLIGENCE AND LEADERSHIP

(26) Ideally, an executive vision of comprehensive strategic emergency systems that supports more effective financial, human resource, operational, and quality management should drive integrated crisis support systems development.

Integrated crisis support systems enable and facilitate the realization and implementation of this vision. Strategic partnerships and efforts between emergency organizations, health facilities, and all levels of government form the basis of such systems. Nevertheless, emergency managers are the prime and ultimate drivers of incident crisis support system technologies. It is incumbent on them to exercise management leadership and act as catalysts for the development and implementation of promising new knowledge technologies.

(27) As enabling technologies, incident crisis support systems have the potential to transform regional emergency management networks and, ultimately, allow emergency managers to achieve greater effectiveness and efficiency within their respective service communities. As effective management enablers, integrated crisis support system technologies are the basis for more appropriate resource allocation and higher levels of quality emergency health services, all to the ultimate advantage of public and service communities. The final arbitrator of these potent knowledge technologies rests with emergency managers. It is the proactive vision and strategic leadership of emergency managers, which will determine the transformational power of these technologies in emergency management in Canada and the United States.

(28) Strategic control of regional emergency management networks requires a clearly identifiable emergency system with well-defined goals, objectives and accountability structures. Regional emergency management networks in both the United States and Canada are striving for the coordination and strategic control to achieve more effective emergency services. In Canada, provincial government legislation and guidelines for emergency services exist, but the ultimate accountability for providing emergency services still remains largely at the health facility level, with regional bodies exerting important coordinating roles with limited authority.

(29) The lack of integrated and interoperating emergency information systems on a regional basis poses significant challenges to strategic control of regional emergency management networks. Strategic control requires integrated information system platforms. Although trauma registries have been of significant value across North

America, the lack of data standardization have resulted in the production of voluminous quantities of data that is poorly integrated and of limited relevance and use for effective regional crisis management. From the perspective of crisis management, there continues to be a data surplus, but an informational vacuum.

(30) Regional emergency management networks must strive for further system integration through the implementation of crisis and emergency network guidelines, standards, and effectiveness performance indicators, supported by integrated crisis support systems on a regional level. Integrated crisis support systems are technological facilitators and conduits through which effective emergency management can be transformed, reengineered, and ultimately improved. For the system to take full advantage of existing knowledge technology, effective emergency management and proactive leadership on governmental levels must be exercised.

(31) Strategic control requires integrated crisis support systems that provide the information necessary to ensure that the regional emergency management network is effective. Once in place, regional emergency managers and providers would be in a better position to effect positive changes to the benefit of service communities. Several important and interrelated issues and problems must be addressed in order to improve regional information systems to support strategic control of regional emergency management networks. Appropriate crisis system guidelines, standards, and indicators still need to be developed and implemented.

(32) Governments need to take a proactive leadership stance to coalesce all network levels involved in the delivery of crisis care services regionally to better integrate their information technology planning endeavors. The establishment of emergency intelligence system steering committees would be a positive step to foster positive dialogues between emergency managers and providers in the direction of further integrating regional emergency management networks. More synergistic interactions between emergency providers are essential, if regional emergency management networks are to be integrated effectively and become more responsive to wider public and community service concerns and needs. If regional emergency management networks are to minimize mortality and morbidity risks and rates cost effectively and better prepare their communities for crisis and emergency situations, proactive leadership becomes critical. Do not the service communities adversely affected by the multiple scourges of crises in both the United States and Canada deserve the very best?

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