



Informatics for a healthier world

**QUARANTINE MANAGEMENT AND
COMPLIANCE MONITORING SOLUTIONS
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Summary

Well-publicized situations involving SARS and Influenza have resulted in several countries utilizing mass quarantine as a public health intervention for the first time in many generations. Quarantine separates persons who have been potentially exposed to an infectious agent (and thus at risk for disease) from the general community for the purposes of limiting potential transmission events. The widespread use of quarantine presents a number of planning and implementation challenges for national/regional governments. These include the location where the quarantine period would be spent, how the health status and the compliance of those in quarantine would be monitored, how their basic needs would be met, and whether those in quarantine would suffer economic consequences or social discrimination.

In a well-informed and cooperative population, voluntary compliance with quarantine requirements can be effective. Fighting boredom and other psychological stresses of quarantine, muting the forces of stigma against those in quarantine, and crafting and delivering effective and believable communications to a population of mixed cultures and languages are critical. The need for officials to develop consistent quarantine policies, procedures, and public messages across jurisdictional boundaries is very important. Several studies have shown that the threat of enforcement has less effect on compliance than does the credibility of compliance-monitoring.

Technological approaches to compliance monitoring are possible. A growing home health monitoring industry may provide some solid examples of tools that can be used for symptom assessment, location verification, and provision of health information. Global Village Consulting is well versed at adapting technological and information management solutions in public health systems to ensure client needs are met.

About Gevity

Gevity Consulting Inc. is a **health and social services focused** consulting company headquartered in Vancouver, Canada with growing branches in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and the Atlantic provinces. It is the flagship member of the Gevity Group of companies, which also includes Global Village Consulting Asia Pacific, based in the Philippines, Gevity Consulting SG Pte. Ltd. in Singapore, Gevity Consulting Middle East, based in Dubai in the United Arab Emirates, Gordon Point Informatics Ltd., and SPR Consult in Quebec.

We offer recognized experts with industry-leading expertise in:

- Public Health Strategy Assessment, Development and Implementation
- Population Health and Wellness Situation Awareness and Surveillance including literature reviews
- Cross Sector Facilitation and Stakeholder engagement specializing in First Nations engagements

- Electronic Health Records;
- Various health domains including but not limited to public health, primary care, laboratory, and medication management;
- Business intelligence and analytics; and
- Standards and terminology including specialized expertise in all major national and international health terminologies

Gevity focuses on providing the domain specific advice and direction required to ensure project success. We help our clients understand their needs, manage the change required, and deliver on right-sized solutions either directly, or as the vendor management team.

Quarantine Background Information

Severe acute respiratory syndrome (SARS) was contained globally by widespread quarantine measures, measures that had not been invoked to contain an infectious disease in North America for >50 years.¹⁻⁷ Although quarantine has periodically been used for centuries to contain and control the spread of infectious diseases such as cholera and the plague with some success,^{1-5,7-9} the history of invoking quarantine measures is tarnished by threats, generalized fear, lack of understanding, discrimination, economic hardships, and rebellion.^{1,4,5,7-9}

Quarantine separates persons who have been potentially exposed to an infectious agent (and thus at risk for disease) from the general community. For the greater public good, quarantine may create heavy psychological, emotional, and financial problems for some persons. To be effective, quarantine demands not only that at-risk persons be isolated but also that they follow appropriate infection control measures within their place of quarantine. Reporting on SARS quarantine has focused on ways in which quarantine was implemented and compliance was achieved.^{2-5,7-9}

As many as 50% of respondents in one study¹ felt that they had not received adequate information regarding at least one aspect of home infection control/quarantine, and not all of the respondents adhered to recommendations. A combination of lack of knowledge, an incomplete understanding of the rationale for these measures, and a lack of reinforcement from an overwhelmed public health system were likely contributors to this problem. Adherence to quarantine and infection control measures has been associated with higher levels of distress. Regardless of the cause, this distress may have been lessened with enhanced education and continued reinforcement of the rationale for these measures and outreach efforts to optimize coping with the stressful event.

Acceptance of public health interventions implemented has varied by location and disease in recent years. Studies relating to behavior during or around SARS outbreaks in Hong Kong indicated that during SARS more than 90% of Hong Kong residents frequently wore face masks.^{10,11,12} Following SARS it was reported that 71% would wear face masks if there was a resurgence of SARS.¹² However, research in Singapore during SARS found that only 4% of respondents in a representative population sample had worn a face mask in the preceding three days.¹³ SARS-related research from Toronto, Canada focused on compulsory quarantine and voluntary quarantine/isolation, mostly in health care workers rather than in the general population.^{14,15} Compliance with compulsory quarantine was reported as high.¹⁵ In population research fear of job/income loss was one of the most common reasons for noncompliance or for not self-quarantining.¹⁴ In addition, the importance of good social support (friends and family) was identified, due to high reliance on others for groceries and routine supplies; a need which the government was unable to meet.

Addressing individual behaviors, and in addition to the factors associated with high willingness to comply noted above, those with children and those with higher incomes were likely to report high willingness to receive vaccination. Factors associated with lower levels of willingness to isolate oneself were speaking a language other than English at home and being younger and having never been married. These findings are potentially important for those involved in disease or emergency response, and this may suggest a need for tailored communication or support strategies. It is possible that these groups rely more on social contact outside of the household and, hence, would be less willing to forfeit this in the event of a pandemic. Indications in some Australian and Canadian studies show that immigrants and those who speak a language other than English at home may be less willing to isolate themselves. It is not clear if these factors are particular to people of Asian descent in general.

The widespread use of quarantine presents a number of planning and implementation challenges.¹⁶ These include: where the quarantine period would be spent, how the health status and the compliance of those in quarantine would be monitored, how their basic needs would be met, and whether those in quarantine would suffer economic consequences or social discrimination. Historically, case studies have shown that quarantine compliance in major epidemics is lower when the public does not support its use.¹⁶ Employing methods to address these challenges before quarantine is used could ease the public's anxieties and increase compliance. This could include mass education campaigns as part of pandemic planning that include knowledge transfer of the tools available to public health agencies as well as information designed to encourage members of the public to consider what is good for the community as a whole.

In studies done in Hong Kong, Taiwan, Singapore and America, most respondents supported monitoring quarantined people through periodic telephone calls. Citizens in Hong Kong were significantly less likely than those in the other three countries to support this measure; however, a majority in Hong Kong still favored it. Periodic video screening was seen as a much less favorable option in all four regions. Approximately half of those in Singapore and Taiwan supported this method of monitoring compliance, while only 31% of both U.S. and Hong Kong respondents supported it. Public health officials proposed periodic checking of compliance by using a video technique that would be similar to using teleconferencing technology. Respondents might have believed that public health officials could use the video technology to view them without their knowledge. Majorities in Hong Kong, Singapore, and Taiwan favored using electronic bracelets to monitor quarantined people, compared with 40% in the United States. Similarly, at least half of respondents living in Hong Kong, Singapore, and Taiwan favored stationing guards outside the place where people were quarantined. Forty-three percent of U.S. respondents favored this option.¹⁶

Issues of quarantine legitimacy, criteria for quarantine, and the need to allow some quarantined healthcare workers to leave their homes to go to work were identified in some studies.¹⁷ Also important was the need to answer questions from people entering quarantine about the continuation of their wages, salaries, and other forms of income while they were not working, and about the means by which they would be supplied with groceries and other services necessary for daily living. The threat of enforcement had less effect on compliance than did the credibility of compliance-monitoring. Fighting boredom and other psychological stresses of quarantine, muting the forces of stigma against those in quarantine, and crafting and delivering effective and believable communications to a population of mixed cultures and languages were critical. The need for officials to develop consistent quarantine policies, procedures, and public messages across jurisdictional boundaries was paramount.

Quarantine Management Solutions

Government strategies for dealing with large-scale quarantine situations must necessarily be comprehensive and robust. Ensuring that factors reflected in the research are characterized in the policies and procedures developed and implemented as part of pandemic planning is critical.

These key factors include:

- Credible public health agencies
- Understandable health messages
- Community oriented thinking
- Support for people placed in quarantine (moral, financial, and daily needs)
- Well-resourced public health systems
- Use of technology in support and compliance monitoring

Quarantine Management as described earlier must support several aspects including:

- Client Identification
- Client Location Verification
- Health Assessment – temperature, symptom assessment
- Provision of health information
- Updates on community situation
- Entertainment
- Personal communication channels
- Provision of services – groceries, health services, financial services

Advances in fields such as artificial intelligence, wireless sensing, imaging diagnostics, lab-on-a-chip, and molecular biology will enable more flexibility in when, where, and how individuals receive care and follow up activities such as quarantine compliance monitoring, thus making public health interventions more convenient, affordable, and accessible. Metrics for public health could include such elements as blood pressure, respiratory rate, and body temperature. Ultimately, these tools will collect large volumes of data from ongoing measurement of health states through a combination of wireless sensors, imaging technologies, and portable, non-invasive laboratory replacements. Devices incorporating these technologies are becoming more commonplace and accepted. Smart phone devices in particular may provide a relatively low cost, well-accepted and efficient tool to assist with quarantine compliance monitoring and reporting.

An opportunity also presents to integrate the mobile monitoring and support technology with a full-featured disease notification, management and surveillance system. Information management in a mass quarantine situation becomes problematic very quickly. When several hundred contacts per case need to be monitored the daily impact on public health resources can be massive. Having information management tools that allow for efficient association between cases and contacts is critical. Having the ability to manage the disposition of contacts requiring daily compliance monitoring, symptom assessment

and ensuring their daily needs are met will lend credibility to the compliance monitoring system as a whole.

Canada and Saudi Arabia have both independently deployed state of the art public health systems recently that will ensure their future abilities to respond to pandemic situations. The system provides a complete intervention management tool that allows for documentation and monitoring of those in quarantine. This includes client identification, exposure setting, relationship to source case, contact disposition, symptom assessment, prophylaxis administration, and detailed reporting tools.

The *IBM Public Health Solution* application has been designed by health professionals to meet these specific needs. (Note that in Canada, the official name of this solution is Panorama and in Saudi Arabia it is called the Health Electronic Surveillance Network or HESN). Initially designed and developed for implementation and use by provincial and territorial jurisdictions across Canada, the IBM Public Health SDSM application is available globally. It provides public health professionals with integrated tools that assist in monitoring, managing, and reporting on public health. Both front-line service providers and public health decision makers have access to critical information through a centralized data repository. This improves client and population health outcomes - resulting in cost-savings.

Key features include:

- Powerful case management capabilities including communicating with laboratory systems
- Full contact management capabilities including quarantine management and other public health interventions
- Integration capabilities with mobile devices for compliance monitoring, symptom assessment, client support (education, entertainment and communication)
- Ability to capture basic assessment measurements such as Body Temperature, Respiratory Rate, Pules, and Blood pressure.
- Sophisticated filtering and analytical tools, full data export abilities
- Outbreak management tools to detect, manage, and analyze incidence of a particular disease beyond what is expected for a particular time and place
- Strong immunization management (Prophylactic and Routine) capabilities for immunization recording, scheduling, reporting of adverse events and reminder recalls
- Extensive supply chain management capabilities for drugs, vaccines and related materials
- Family health management component summarizes all non-disease related health activity including primary care and planning management
- Solution can be deployed as a suite or by individual module
- Multi-language support
- Predefined ad hoc reporting capabilities to enable extraction and analysis of data
- Designed to be highly interoperable and to integrate with other health systems (such as client and provider registries, lab systems, EMR etc.)
- Follows latest industry standards such as HL7 messaging and SNOMED
- Multi-platform support

For further information regarding Gevity's capabilities with regard to Quarantine Management and Compliance Monitoring Solutions please contact:

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References

1. SARS Control and Psychological Effects of Quarantine, Toronto, Canada
Laura Hawryluck, Wayne L. Gold, [...], and Rima Styra *Emerg Infect Dis.* 2004 July; 10(7): 1206–1212.
doi: [10.3201/eid1007.030703](https://doi.org/10.3201/eid1007.030703)
2. Risse GB "A long pull, a strong pull and all together": San Francisco and bubonic plague, 1907–1908.
Bull Hist Med. 1992;66:260–86. [[PubMed](#)]
3. Twu SJ, Chen TJ, Chen CJ, Olsen SJ, Lee LT, Fisk T, et al. Control measures for severe acute respiratory syndrome (SARS) in Taiwan. *Emerg Infect Dis.* 2003;9:718–20. [[PMC free article](#)] [[PubMed](#)]
4. Centers for Disease Control and Prevention Update: use of quarantine to prevent transmission of severe acute respiratory syndrome—Taiwan 2003. *MMWR Morb Mortal Wkly Rep.* 2003;52:680–3. [[PubMed](#)]
5. Mandavilli A SARS epidemic unmasks age-old quarantine conundrum. *Nat Med.* 2003;9:487.10.1038/nm0503-487 [[PubMed](#)] [[Cross Ref](#)]
6. Toronto Public Health Severe acute respiratory syndrome (SARS), 2003. May 29 [cited 2003 Aug 30]. Available from: <http://www.toronto.ca/health>.
7. Barbera J, Macintyre A, Gostin L, Inglesby T, O'Toole T, DeAtley C, et al. Large-scale quarantine following biological terrorism in the United States: scientific examination, logistic and legal limits, and possible consequences. *JAMA.* 2001;286:2711–7.10.1001/jama.286.21.2711 [[PubMed](#)] [[Cross Ref](#)]
8. Markel H Knocking out the cholera: cholera, class and quarantines in New York City, 1892. *Bull Hist Med.* 1995;69:420–57. [[PubMed](#)]
9. Markel H Cholera, quarantines and immigration restriction: the view from John Hopkins, 1892. *Bull Hist Med.* 1993;67:691–5. [[PubMed](#)]
10. Public health measures during an anticipated influenza pandemic: Factors influencing willingness to comply *Risk Manag Healthc Policy.* 2009; 2: 9–20.
Published online 2009 January 29. PMID: PMC3270909
[Melanie Taylor](#), [Beverley Raphael](#),¹ [Margo Barr](#),² [Kingsley Agho](#),¹ [Garry Stevens](#), and [Louisa Jorm](#)
11. Sim K, Chua HC. The psychological impact of SARS: A matter of heart and mind. *CMAJ.* 2004;170:811–812. [[PMC free article](#)] [[PubMed](#)]
12. Lau JTF, Yang X, Pang E, Tsui HY, Wong E, Wing YK. SARS-related perceptions in Hong Kong. *Emerg Infect Dis.* 2005;11:417–424. [[PMC free article](#)] [[PubMed](#)]
13. Quah SR, Hin-Peng L. Crisis prevention and management during SARS outbreak, Singapore. *Emerg Infect Dis.* 2004;10:364–368. [[PMC free article](#)] [[PubMed](#)]
14. DiGiovanni C, Conley J, Chiu D, Zaborski J. Factors influencing compliance with quarantine in Toronto during the 2003 SARS outbreak. *Biosecur Bioterror.* 2004;2:265–272. [[PubMed](#)]
15. Cava MA, Fay KE, Beanlands HJ, McCay EA, Wignall R. Risk perception and compliance with quarantine during the SARS outbreak. *J Nurs Scholarsh.* 2005;37:343–347. [[PubMed](#)]
16. Attitudes Toward The Use Of Quarantine In A Public Health Emergency In Four Countries [Robert J. Blendon](#), [Catherine M. DesRoches](#), [Martin S. Cetron](#), [John M. Benson](#), [Theodore Meinhardt](#) and [William Pollard](#) Published online before print January 2006, doi: 10.1377/hlthaff.25.w15 *Health Aff March 2006* vol. 25 no. 2 w15-w25
17. Factors Influencing Compliance with Quarantine in Toronto During the 2003 SARS Outbreak Clete DiGiovanni, Jerome Conley, Daniel Chiu, and Jason Zaborski. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science.* 2004, 2(4): 265-272. doi:10.1089/bsp.2004.2.265.

