



TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS
INFORMATION GATEWAY

Virtual Medical Care
Topic Collection
3/17/2016

Topic Collection: Virtual Medical Care

The recent increase in the use of virtual medical care (also referred to as telemedicine – though care may be provided via telephone, web, or other means) has led many in the emergency medical community to begin implementing call centers and web- or telephone-based triage and treatment systems in anticipation of and during public health emergencies. Additionally, health systems are using virtual platforms to coordinate care and provide remote access to specialty care and assessment (e.g., trauma, stroke, and psychiatric) which can be leveraged during disasters to broaden access to specialty consultation (e.g., for burn injuries or pediatric patients). These resources highlight lessons learned from recent events and strategies for implementing virtual medical care during a disaster.

Each resource in this Topic Collection is placed into one or more of the following categories (click on the category name to be taken directly to that set of resources). Resources marked with an asterisk (*) appear in more than one category.

[Must Reads](#)

[Applications for Telemedicine](#)

[Call Centers and Triage Lines](#)

[Event-Specific Lessons Learned](#)

[General Information](#)

[Plans, Tools, and Templates](#)

[Agencies and Organizations](#)

Must Reads

Association of State and Territorial Health Officials and National Association of County and City Health Officials. (2012). [Preliminary Report on the Role of Flu Information and Triage Lines in Reducing Surge in Healthcare Facilities and Increasing Access to Antiviral Medication During the 2009 H1N1 Pandemic](#).

This report summarizes the experience of jurisdictions across the country using hotlines and call centers to support the response to the 2009 H1N1 influenza pandemic. Algorithms for antiviral distribution; legal opinions on the use of hotlines; risk communication documents; and standing orders are included in the appendices.

Bogdan, G., Scherger, D., Seroka, A., et al. (2007). [Adapting Community Call Centers for Crisis Support: A Model for Home-Based Care and Monitoring](#). U.S. Department of Health and Human Services.

The authors explain the development, testing, and implementation of a model to enable community health call centers (e.g., poison control centers, nurse advice lines) to support home-management and shelter-in-place approaches in certain mass casualty or health

emergency events. The report includes a matrix with possible call center capabilities aligned with National Planning Scenarios and other guidance that can be tailored by call centers.

Case, T., Morrison, C., and Vuylsteke, A. (2012). [The Clinical Application of Mobile Technology to Disaster Medicine](#). *Prehospital and Disaster Medicine*. 27(5):473-80. (Abstract only.)

The authors conducted a literature review covering 2007-2012 to identify mobile health care technology solutions to aid in disaster management. They found five types of applications: disaster scene management; remote monitoring of casualties; medical image transmission (teleradiology); decision support applications; and field hospital information technology (IT) systems, most of which were still under development at the time of their review.

National Association of County and City Health Officials. (2014). [Nurse Triage Line Project – Webinar Discussion with Public Health Law Workgroups](#).

This is a summary of a webinar focused on the Nurse Triage Line Project (including lessons learned from H1N1) and included representation from the public health law workgroups of the National Association of County and City Health Officials (NACCHO), the Association of State and Territorial Health Officials (ASTHO), and the Council of State and Territorial Epidemiologists (CSTE). Participants discussed how a coordinated network of telephone triage lines may be useful during a severe pandemic or other public health emergency; legal issues and concerns that may be associated with using such a network; and possible solutions for resolving issues and concerns.

Oak Ridge Institute for Science and Education. (2009). [Coordinating Call Centers for Responding to Pandemic Influenza and Other Public Health Emergencies: A Workbook for State and Local Planners](#). Centers for Disease Control and Prevention.

This workbook guides planners through the process of determining the need for a call center, as well as how to operationalize a call center for use during public health emergencies.

Spaulding, A.B., Radi, D., Macleod H., et al. (2013). [Satisfaction and Public Health Cost of a Statewide Influenza Nurse Triage Line in Response to Pandemic H1N1 Influenza](#). *Plos One*. 8(1):e50492.

The authors describe the successful use of a telephone nurse triage line (NTL) set up by the Minnesota Department of Health for evaluating individuals with influenza-like illness. The NTL diverted callers from acute care visits at low cost and had a high rate of satisfaction among callers.

Vo, A.H., Brooks, G.B., Bourdeau, M., et al. (2010). [University of Texas Medical Branch Telemedicine Disaster Response and Recovery: Lessons Learned from Hurricane Ike](#). *Telemedicine and E Health*. 16(5): 627-633.

Authors from the University of Texas Medical Branch (UTMB) describe how UTMB was able to get its telemedicine services up and running within a week following Hurricane Ike due in part to the flexibility of its data network and plasticity of its telemedicine program. They offer lessons learned from the UTMB experience for future disasters.

Applications for Telemedicine

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Parvizi, D., Giretzlehner, M., Dirnberger, J., et al. (2014). [The Use of Telemedicine in Burn Care: Development of a Mobile System for TBSA Documentation and Remote Assessment](#). *Annals of Burns and Fire Disasters*. 27(2):94-100.

The authors describe a mobile application that uses digital images of patients' burns superimposed on a patient-specific 3D model. The application was found to more accurately estimate burn size than burn experts when tested at two separate international burn meetings.

Yperzeele, L., Van Hooff, R.J., De Smedt, A., et al. (2014). [Feasibility of Ambulance-Based Telemedicine \(FACT\) Study: Safety, Feasibility and Reliability of Third Generation in-Ambulance Telemedicine](#). *PLoS One*. 9(10):e110043.

The authors tested an in-ambulance telemedicine system and found that pre-hospital diagnoses were in agreement with final diagnoses 90% of the time; pre-notification of the hospital via text message was successful 90% of the time; and transmission of a pre-hospital report was completed 95% of the time. Challenges experienced were related primarily to limited connectivity, but also to hardware, software, or human error.

Call Centers and Triage Lines

*Association of State and Territorial Health Officials and National Association of County and City Health Officials. (2012). [Preliminary Report on the Role of Flu Information and Triage Lines in Reducing Surge in Healthcare Facilities and Increasing Access to Antiviral Medication During the 2009 H1N1 Pandemic.](#)

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Center for Infectious Disease Research and Policy (CIDRAP) at the University of Minnesota. (2016). [Using Hotlines in Disaster Preparedness and Response.](#)

This webpage summarizes examples of the way that hotlines have and are being used to support disaster preparedness and response.

Fernandez, J.B., Glotzer, D.L., Triola, M.M., and Psoter, W.J. (2008). [A Unique Role for Dental School Faculty: Telephone Triage Training and Integration into a Health Departments' Emergency Response Planning.](#) American Journal of Disaster Medicine. 3(3):141-6.

The authors describe a pilot program in which dental school faculty members received training in outbreak investigation and telephone triage to assist the New York City Department of Health and Mental Hygiene in preparing to respond to pandemic influenza. They propose the use of dental professionals and/or other "nontraditional healthcare personnel" in support of call centers and telephone triage lines.

Koonin, L. and Hanfling, D. (2013). [Broadening Access to Medical Care During a Severe Influenza Pandemic: The CDC Nurse Triage Line Project.](#) Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science. 11(1): 75-80.

The authors describe the Centers for Disease Control and Prevention's Nurse Triage Line Project and its goals of using a coordinated network of nurse triage telephone lines during

a pandemic to assess the health status of callers, help callers determine the most appropriate site for care, disseminate information, provide clinical advice, and provide access to antiviral medications for ill people, if appropriate.

- *National Association of County and City Health Officials. (2014). [Nurse Triage Line Project – Webinar Discussion with Public Health Law Workgroups](#).

This is a summary of a webinar focused on the Nurse Triage Line Project (including lessons learned from H1N1) and included representation from the public health law workgroups of the National Association of County and City Health Officials (NACCHO), the Association of State and Territorial Health Officials (ASTHO), and the Council of State and Territorial Epidemiologists (CSTE). Participants discussed how a coordinated network of telephone triage lines may be useful during a severe pandemic or other public health emergency; legal issues and concerns that may be associated with using such a network; and possible solutions for resolving issues and concerns.

- *National Council of State Boards of Nursing. (2012). [Nurse Triage Lines: Improving Access, Informing the Public](#).

This presentation discusses how Nurse Triage Lines (NTLs) may be used during disasters and includes an assessment of laws and regulations that impact the ability to set up NTLs in each state. Minnesota's experience during H1N1, and the CDC's Nurse Triage Line Project, are also discussed.

- *Oak Ridge Institute for Science and Education. (2009). [Coordinating Call Centers for Responding to Pandemic Influenza and Other Public Health Emergencies: A Workbook for State and Local Planners](#). Centers for Disease Control and Prevention.

This workbook guides planners through the process of determining the need for a call center, as well as how to operationalize a call center for use during public health emergencies.

- Spaulding, A., Radi, D., Macleod, H., et al. (2012). [Design and Implementation of a Statewide Influenza Nurse Triage Line in Response to Pandemic H1N1 Influenza](#). Public Health Reports. 127(5): 532–540.

The authors present the rationale behind the Minnesota Flu Line, and describe its implementation during the 2009 H1N1 influenza pandemic.

- *Spaulding, A.B., Radi, D., Macleod H., et al. (2013). [Satisfaction and Public Health Cost of a Statewide Influenza Nurse Triage Line in Response to Pandemic H1N1 Influenza](#). Plos One. 8(1):e50492.

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illness. The NTL diverted callers from acute care visits at low cost and had a high rate of satisfaction among callers.

The University of New Mexico School of Medicine. (2016). [Project ECHO](#).

The Extension for Community Health Outcomes (known as Project ECHO) was created to help healthcare providers in rural and underserved areas with information they need to treat conditions such as Hepatitis C, chronic pain, and behavioral health disorders. In the event of a disaster, one or more of ECHO's "hubs" could assist with virtual healthcare delivery.

*Yeager, V. (2009). [Emergency Response, Public Health and Poison Control: Logical Linkages for Successful Risk Communication and Improved Disaster and Mass Incident Response](#). Homeland Security Affairs. 5:Article 2.

The author proposes bringing together the expertise of emergency response organizations, public health agencies, and poison control centers to institute call centers and/or triage lines to disseminate information to the public during emergencies, and answer questions and concerns to keep concerned individuals from flooding local emergency rooms. Real-world examples of successful collaborations from Canada, Great Britain, and the U.S. are included.

Event-Specific Lessons Learned

Kim, T.J., Arrieta, M.I., Eastburn S.L., et al. (2013). [Post-disaster Gulf Coast Recovery Using Telehealth](#). Telemedicine Journal and E-Health. 19(3):200-10.

The authors conducted semi structured interviews with both regional key informants and national organizations with Gulf Coast recovery interests and determined seven factors for telehealth success: funding, regulatory, workflow, attitudes, personnel, technology, and evaluation.

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Piza, F., Steinman, M., Baldisserotto, S., et al. (2014). [Is There a Role for Telemedicine in Disaster Medicine? Critical Care.](#) 18(6): 646.

The authors describe the successful use of a telemedicine videoconferencing system to treat patients following a 2013 nightclub fire in Brazil.

*Spaulding, A.B., Radi, D., Macleod H., et al. (2013). [Satisfaction and Public Health Cost of a Statewide Influenza Nurse Triage Line in Response to Pandemic H1N1 Influenza.](#) Plos One. 8(1):e50492.

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Yu, J.N., Brock, T.K., Mecozzi, D.M., et al. (2010). [Future Connectivity for Disaster and Emergency Point of Care](#). *Point of Care*. 9(4):185-192.

Using experience from the 2010 Haiti earthquake, the authors discuss the need to ensure that networks are properly constructed and wireless connectivity is robust to optimize health care delivery, medical documentation, logistics, response coordination, communication, and telemedicine during disasters.

General Information

Alverson, D., Edison, K., Flournoy, L., et al. (2010). [Telehealth Tools for Public Health, Emergency, or Disaster Preparedness and Response: A Summary Report](#). *Telemedicine and E Health*. 16(1):112-4. (Abstract only.)

Participants in a conference breakout session were asked to respond to a series of questions about current and future use of telemedicine for public health disasters.

Atiyeh, B., Dibo, S.A., and Janom, H.H. (2014). [Telemedicine and Burns: An Overview](#). *Annals of Burns and Fire Disasters*. 27(2):87-93.

The authors discuss the use of telemedicine to bring the specialized expertise of burn centers to more patients. They also describe its challenges, including technical difficulties, legal uncertainties, limited financial support, reimbursement issues, and the need for more evidence of its value and efficiency.

D'Alessandro, M.P., D'Alessandro, D.M., Bakalar, R.S., et al. (2005). [The Virtual Naval Hospital: The Digital Library as Knowledge Management Tool for Nomadic Patrons](#). *Journal of the Medical Library Association*. 93(1); 16-20.

The authors describe the Virtual Naval Hospital, a digital library set up in 1997 to "make the Internet a useful medical reference tool for naval primary care providers at the point of care, by helping them take better care of patients, and, as a health promotion tool for sailors and marines, to help personnel live healthier lives."

Evisit. (2016). [Telemedicine Guide](#).

This vendor's guide provides overviews of 19 categories under telemedicine (e.g., pros and cons, telemedicine and clinical guidelines, telemedicine and Medicaid, and HIPAA and telemedicine).

Latifi, R. (2010). *Telemedicine for Trauma, Emergencies, and Disaster Management*. (Book available for purchase.)

This book discusses the use of telemedicine in the management of trauma, disaster, and emergency situations. Critical discussions on the practicality, logistics, and safety of telemedicine from recognized experts in the field are included.

Latifi, R. and Tilley, E. H. (2014). [Telemedicine for Disaster Management: Can it Transform Chaos into an Organized, Structured Care From the Distance?](#) American Journal of Disaster Medicine, 9(1): 25-37. (Abstract only.)

The authors conducted a literature review covering 1980-2013 to identify when telemedicine or telepresence was reported for disaster management, both in real life and in mock and simulation situations. They conclude that it is critical to establish telemedicine infrastructure and protocols in areas prone to disasters prior to an event occurring to avoid having to establish a telemedicine program in a chaotic environment.

Simmons, S., Alverson, D., Poropatich, R., et al. (2008). [Applying Telehealth in Natural and Anthropogenic Disasters](#). Telemedicine Journal and E-Health. 14(9):968-71. (Abstract only.)

The authors discuss how telehealth provides surge capacity by providing medical and public health expertise at a distance, limiting safety and logistical concerns. They note several applications for telehealth in disaster response, and propose ways to expand its use more broadly in future.

Turnock, M., Mastouri, N., and Jivraj, A. (2008). [Pre-hospital Application of Telemedicine in Acute-Onset Disaster Situations](#). United Nations.

This paper describes the use of telemedicine in the pre-hospital setting for disaster response. The authors discuss telemedicine disaster applications and technology, as well as implementation barriers and legal and ethical issues.

U.S. Department of Health and Human Services. (2009). [Pandemic and All-Hazards Preparedness Act \(Public Law 109-417\) Telehealth Report to Congress](#).

This report to Congress discusses telehealth and its potential uses during public health emergencies and disaster medical responses. Payment and reimbursement considerations, as well as pertinent legal issues, are included.

Xiong, W., Bair, A., and Sandrock, C. (2010). [Implementing Telemedicine in Medical Emergency Response: Concept of Operation for a Regional Telemedicine Hub](#). Journal of Medical Systems. 36(3): 1651-1660.

The authors developed and measured a model application in order to quantitatively analyze the potential health benefits of telemedicine in disaster response. They found that the model can support disaster response activities and enhance surge capacity; enhance

the speed and effectiveness of medical response; and improve resource and operations planning, as well as internal and external situational awareness.

Plans, Tools, and Templates

*Association of State and Territorial Health Officials and National Association of County and City Health Officials. (2012). [Preliminary Report on the Role of Flu Information and Triage Lines in Reducing Surge in Healthcare Facilities and Increasing Access to Antiviral Medication During the 2009 H1N1 Pandemic.](#)

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This workbook guides planners through the process of determining the need for a call center, as well as how to operationalize a call center for use during public health emergencies.

Agencies and Organizations

Note: The agencies and organizations listed in this section have a page, program, or specific research dedicated to this topic area.

[American Telemedicine Association.](#)

[Missouri Telehealth Network.](#)

[The UTMB Center for Telehealth Research and Policy.](#)

[UNM Center for Telehealth.](#)

U.S. Department of Health and Human Services, Health Resources and Services Administration.
[Telehealth Programs.](#)

[VA Telehealth Services.](#)

*This ASPR TRACIE Topic Collection was comprehensively reviewed in March 2016 by the following subject matter experts (listed in alphabetical order): **Dale C. Alverson, MD** Professor Emeritus and Medical Director, University of New Mexico Center for Telehealth Chairman, New Mexico Telehealth Alliance, CMIO, New Mexico Health Information Exchange Chairman, American Telemedicine Association Interstate Telehealth Discussion Group; **Timothy E. Davis, MD, MPH**, Branch Chief, NDMS Operational Medicine, HHS ASPR; and **John Hick, MD**, HHS ASPR and Hennepin County Medical Center.*