



EERI Policy White Paper

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Promote Comprehensive, Safe, and Earthquake Resilient Health Care Systems

Adopted by the EERI Board of Directors: December 14, 2021

EERI Policy Position

EERI urges each earthquake prone community throughout the country to increase its earthquake safety and resilience through the planning and design of its health care systems. Facilities, networks, and systems providing for the health of the community need to care for those who were already sick or had health care needs pre-earthquake, as well as those injured as a result of the event. A holistic systems approach, linked to community resilience planning, is critical and should encompass buildings, site, equipment, infrastructure, staffing, and supply chains. Community resilience is improved when emergency health care and continuity of essential services are provided during the emergency period, and normal, pre-event health care services recover within a very short time.

Background

Health care systems in the United States are insufficiently prepared for moderate to severe earthquakes. The 1971 San Fernando earthquake in California was a testament to the vulnerability of hospitals to earthquake damage, where hospitals like the Olive View Medical Center and the Veterans Administration Hospital experienced significant damage and partial collapse. Even after its reconstruction, the 1994 Northridge, California earthquake caused nonstructural damage which rendered the Olive View Medical Center temporarily unusable.

After 1971, design and regulations for the functional recovery¹ of hospitals have improved, but implementation and planning challenges remain. One example is the 2019 Ridgecrest earthquake sequence that highlighted the need for broader capacity planning after nonstructural component damage required evacuation for which the hospital was ill-prepared to manage. Successful examples of improved hospital construction oversight and planning include California's Office of Statewide Health Planning and Development (OSPHD) and coastal hospital resilience planning as has been led by the Oregon Health Authority in partnership with Department of Geology and Mineral Studies (DOGAMI) for Oregon Coastal Hospitals preparing for the Cascadia earthquake. Similar state- and region-wide programs and organizations have yet to be developed in most other areas of the United States with moderate or high levels of earthquake risk. Moreover, health care system components other than hospitals that are also essential to the community have not received the same attention.

In addition, participation of health care organizations other than hospitals in federally funded Health Care Coalitions (HCCs) that coordinate activities among health care organizations, public health, emergency management, and emergency medical service agencies, have various levels of effectiveness throughout the country. Largely supported by the Department of Health and Human Services' Assistant Secretary for Preparedness and Response's (ASPR)² Hospital Preparedness Program (HPP)³, these coalitions are often under-funded and under-staffed to meaningfully engage the entire health care system in preparedness and response activities. In addition, HCCs are mostly centered on preparing for the emergency phase of the disaster cycle, therefore excluding risk mitigation planning as part of their efforts. Given the interdependencies of the health care system, failures of particular components will prove to have immense challenges in post-earthquake contexts with surges of health care demands. A holistic approach to the health care system's seismic resilience is necessary. **Therefore, better performance of health care facilities, regulation and funding by coordinating bodies, and inclusive regional earthquake preparedness planning are**

¹ Functional Recovery is a post-earthquake performance state in which the building is maintained, or restored, to safely and adequately support the basic intended functions associated with the pre-earthquake use or occupancy. See Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time (FEMA-NIST, 2021).

² U.S. Department of Health and Human Services (HHS), "Office of the Assistant Secretary for Preparedness and Response (ASPR)," accessed 15 April 2020, <https://www.phe.gov/about/aspr/Pages/default.aspx>.

³ U.S. Department of Health and Human Services (HHS), "Hospital Preparedness Program," accessed 15 April 2020, <https://www.phe.gov/Preparedness/planning/hpp/Pages/default.aspx>



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required for comprehensive, safe, and resilient health care systems.

Accreditation and Licensure Requirements for Health Care Systems

Current health care facility accreditation and licensure requirements do not sufficiently address building seismic safety, particularly for existing facilities. Requirements for post-disaster planning do not adequately consider potential post-earthquake conditions, which may leave facilities inadequately prepared. Hospitals in the United States require state licensure to operate and accreditation to obtain reimbursements from insurers. Accreditation can be earned by an entire health care organization, for example, hospitals, nursing homes, office-based surgery practices, behavioral health treatment facilities, doctor offices, home care providers, and laboratories, and are voluntarily pursued. Over 80% of health care facility and organization accreditation is managed and facilitated by The Joint Commission⁴ which provides standards (both physical and programmatic), oversight, and periodic evaluation of facilities. The Joint Commission standards require hospitals and other health care facilities to identify needs and develop an operational plan to be able to provide patient care for 96-hours following a disaster⁵, including functional back-up power, water, communications, and other utilities. However, lack of reliability for backup systems has been cited as a problem after past disasters.⁶ Furthermore, 96 hours is an unrealistically short time period to expect the restoration of critical infrastructure systems as experienced by hospitals in California which were not fully functional for 6 months.⁷ In Oregon, projections of estimated infrastructure downtime range from 6 to 18 months.⁸

State licensure requirements for healthcare organizations vary widely and include accreditation by independent organizations or in some cases by state or federal agencies. The Facility Guidelines Institute's (FGI)⁹ Guidelines for the Design and Construction of Hospitals, Outpatient Clinics, and Residential Health, Care and Support Facilities have been adopted by the majority of States and accrediting organizations. The FGI guidelines represent the additional requirements needed for healthcare facilities in addition to state and local codes and are updated every four years. Where there are no state or local seismic design requirements, FGI specifies compliance with ASCE 7.

The Hospital Preparedness Program (HPP) managed by the Assistant Secretary for Preparedness and Response (ASPR) establishes a foundation for national health care preparedness, and is the only continuously appropriated federal grant funding source since 2002 specifically for health care preparedness and response. ASPR provides **Health Care Preparedness and Response Capability¹⁰ guidelines that offer high-level objectives for the nation's health care delivery system. However, the guidelines have no enforceable language, no common minimum standards, no performance objectives for hospitals and other health care facilities. While the document includes a section on building integrity, there are no specific requirements for evaluation or retrofit of seismic deficiencies for existing**

⁴ The Joint Commission (TJC) is a private, non-profit group that acts as a national accrediting organization that evaluates health care organizations and is the oldest and largest standards-setting and accrediting body in health care in the United States. The standards focus on patient safety and quality of care, including emergencies preparation. Over 22,000 health care organizations and programs in the United States have been accredited by TJC. However, health care organizations, programs, and services pursue accreditation voluntarily. Health care organizations that achieve accreditation through a Joint Commission "deemed status" survey are determined to meet or exceed Medicare and Medicaid requirements to then obtain reimbursements. See The Joint Commission, 2018.

⁵ The Joint Commission, "Plans – Emergency Management 96 Hour Plan," accessed 1 July 2020,

<https://www.jointcommission.org/standards/standard-faqs/critical-access-hospital/emergency-management-em/000001216/>

⁶ Achour, Nebil, Masakatsu Miyajima, Federica Pascale, and Andrew DF Price. "Hospital resilience to natural hazards: classification and performance of utilities." *Disaster prevention and management* (2014).

⁷ Pickett, M. A., 2008. The ShakeOut Scenario Supplemental Study: Hospitals, SPA Risk LLC, Denver, CO.

⁸ The Oregon Resilience Plan: https://www.oregon.gov/gov/policy/orr/Documents/Oregon_Resilience_Plan_Final.pdf

⁹ Facilities Guidelines Institute, "Facilities Guidelines Institute," accessed November 25, 2020, <https://fgiguideines.org/>

¹⁰ Office of the Assistant Secretary for Preparedness and Response, *2017-2022 Health Care Preparedness and Response Capabilities*, 2016: <https://www.phe.gov/Preparedness/planning/hpp/reports/Documents/2017-2022-healthcare-pr-capabilities.pdf>



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hospitals; rather, the guidelines emphasize emergency response planning not on needed disaster risk mitigation and loss reduction or avoidance.

The Centers for Medicare and Medicaid Services (CMS) is a federal medical insurance agency administering Medicaid and Medicare funds. The agency requires 17 hospital and medical service provider types to meet conditions established in the Emergency Preparedness Rule¹¹ in order to be eligible for reimbursement for claims. The Emergency Preparedness Rule establishes emergency preparedness requirements for facilities and suppliers participating in Medicare and Medicaid to prepare for disasters and coordinate with federal, state, and local emergency preparedness. However, the CMS rule is an unfunded mandate that, while supporting preparedness, creates additional financial burdens on organizations. The rule requires emergency plans that are facility-based and community-directed but does not require an assessment of critical infrastructure interruptions to functionality of health care delivery following disasters.¹²

Hospital construction may be licensed by states or local governments, while ancillary facilities¹³ most commonly obtain their building permits and business licenses from cities and counties, meaning that the effort remains local in home ruled states. This affects the level of oversight, capacity, and funding between hospital buildings and essential ancillary facilities. These ancillary facilities can provide needed surge capacity with appropriate coordination and relieve hospitals of patient load especially in a post-earthquake context. Current model building codes emphasize the role of certain hospitals after disasters, even requiring that some new facilities be designed and constructed to **remain operational insofar as practical**¹⁴ immediately after a major earthquake. Existing facilities not meeting those requirements and those that serve the same functions, however, might be unable to recover as quickly if at all. Research of the International Building Code Risk Categories as assigned to the occupancy classes of the 17 provider types listed in the CMS Rule indicates that only 6 out of 17 provider types would be categorized as Risk Category IV.¹⁵¹⁶ ¹⁷ This is problematic as any of the 17 provider types must be considered as essential to be designed to remain operational following a disaster, however, many new buildings designed to the IBC will not meet this performance requirement. For existing hospital and non-hospital health care facilities¹⁸, neither The Joint Commission

¹¹ Centers for Medicare & Medicaid Services, Emergency Preparedness Rule (2016): <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertEmergPrep/Emergency-Prep-Rule>

¹² Toner, Eric. "Healthcare preparedness: Saving lives." *Health security* 15, no. 1 (2017): 8-11.

¹³ In this paper, ancillary facilities include but are not limited to: pharmacies (both stand-alone and in larger stores), doctor and dentist offices, offices that sell hearing aids and eyeglasses, dialysis centers, walk-in urgent care clinics, and long-term care facilities.

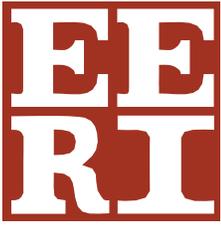
¹⁴ Structurally, hospitals are required to have a reasonable probability to have adequate strength and stiffness to limit deflections, drift and other deformations such that their behavior would not prevent functions. However, small probabilities of collapse of structural systems as well as anchorage failures of nonstructural systems in hospitals and corresponding losses of function are still anticipated in new construction experiencing severe earthquakes.

¹⁵ Research conducted by the Public Policy and Advocacy Committee.

¹⁶ Six Provider types in Risk Category IV: Hospitals, Ambulatory Surgical Centers (ASCs), Transplant Centers, Critical Access Hospitals (CAHs), Organ Procurement Organizations (OPOs), Rural Health Clinics (RHCs) and Federally Qualified Health Centers (FQHCs).

¹⁷ Risk Categories are a categorization of buildings and other structures for determination of flood, wind, snow, ice and earthquake loads based on the risk associated with unacceptable performance. Risk Category IV (Performance Group IV) is the highest design category and includes buildings and structures designated as essential facilities, and those for which failure could pose a substantial hazard to the community. Essential facilities are defined as those intended to remain operational in the event of extreme environmental loading from wind, snow, or earthquakes. See ASCE 7, FEMA P-424.

¹⁸ Non-hospital health care facilities are those that provide health care services ranging from acute to critical but are not considered hospital facilities. These can include: Religious Nonmedical Health Care Institutions, Ambulatory Surgical Centers (ASCs), Hospices, Psychiatric Residential Treatment Facilities (PRTFs), All-Inclusive Care for the Elderly (PACE), Transplant Centers, Long-Term Care (LTC) Facilities, Intermediate Care Facilities for Individuals with Intellectual Disabilities (ICF/IID), Home Health Agencies (HHAs), Comprehensive Outpatient Rehabilitation Facilities (CORFs), Clinics, Rehabilitation Agencies, and Public Health



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requirements nor the CMS Rule provide evaluation or regulation on unsafe building types. This is especially concerning when we learn of hospitals in buildings with unreinforced masonry in parts of Oregon and Washington state, along with other seismically active regions in the central United States.^{19 20}

Funding for Safe and Resilient Health Care Systems

Federal monies from the Hospital Preparedness Program support regional collaboration and health care preparedness and response by encouraging the development and sustainment of Health Care Coalitions (HCCs).

HCCs at the state and regional level serve as a network for planning, preparedness and response to incentivize often competitive health care organizations to collaborate in preparedness for many types of threats and emergencies.²¹ The HCC comprises individual health care and response organizations, including hospitals, emergency medical services (EMS) providers, emergency management organizations, and public health agencies, that collaboratively plan for disasters and emergencies. HCCs vary in scope and many do not have capacity to engage with all stakeholders influential in disaster risk reduction. Many HCCs are unable to reach their desired impacts on regional disaster preparedness due to a disconnect between the actual preparedness needs of the community and the stipulations within the ASPR grant requirements, along with staffing and funding limitations.²² Moreover, smaller health care providers, such as private practice physicians and dentists, often do not participate in the HCCs.

Regional Preparedness Planning for Health Care Systems

In some communities, major earthquakes can result in thousands of serious injuries and deaths. At the same time, our health care delivery system is undergoing major changes that render other acute care facilities as nearly essential facilities. This is evidenced by more procedures occurring in out-patient clinics and in medical offices. In addition, these facilities no longer have medical supplies for weeks stored on site. As with manufacturing, facilities are working under “just-in-time” supply strategies. Supplies are delivered from outside of metropolitan regions – or even the country – and are pre-ordered for normal operations, not for disaster situations. Suppliers and health care facilities rely on transportation networks that they assume will remain operational, but in cases of a large regional earthquake event cannot be reliably expected.

Infrastructure, medical suppliers, staff, and hospital and ancillary health care providers and facilities are interconnected, and all must be included in any regional- or community-level preparedness planning for health care systems. Regional plans have shown that a systems-perspective for health care delivery is not often considered when undertaking comprehensive planning and preparing for earthquake hazard consequences.²³ Furthermore in many regions, the public and relevant professional communities are often left out of resilience planning processes for health care systems that ultimately service their needs before, during, and after an earthquake event. Engagement of

Agencies as Providers of Outpatient Physical Therapy and Speech-Language Pathology Services, Community Mental Health Centers (CMHCs), Organ Procurement Organizations (OPOs), Rural Health Clinics (RHCs) and Federally Qualified Health Centers (FQHCs), and End-Stage Renal Disease (ESRD) Facilities.

¹⁹ Oregon Geology, Rapid Visual Screening, “Legacy Good Samaritan Hospital,” accessed October 11, 2021.

https://www.oregongeology.org/rvs/reports/Mult_hos08.pdf

²⁰ Washington State Department of Commerce, “Unreinforced Masonry Building Inventory,” accessed 15 July 2020,

<https://www.commerce.wa.gov/about-us/research-services/unreinforced-masonry-building-inventory/>

²¹ U.S. Department of Health and Human Services, “HPP Near You,” accessed 15 September 2020,

[https://www.phe.gov/Preparedness/planning/hpp/Pages/find-hc-](https://www.phe.gov/Preparedness/planning/hpp/Pages/find-hc-coalition.aspx#:~:text=Health%20care%20coalitions%20(HCCs)%20are,respond%20to%20disasters%20and%20emergencies.)

[coalition.aspx#:~:text=Health%20care%20coalitions%20\(HCCs\)%20are,respond%20to%20disasters%20and%20emergencies.](https://www.phe.gov/Preparedness/planning/hpp/Pages/find-hc-coalition.aspx#:~:text=Health%20care%20coalitions%20(HCCs)%20are,respond%20to%20disasters%20and%20emergencies.)

²² Walsh, Lauren, Hillary Craddock, Kelly Gulley, Kandra Strauss-Riggs, and Kenneth W. Schor. “Building health care system capacity to respond to disasters: successes and challenges of disaster preparedness health care coalitions.” *Prehospital and disaster medicine* 30, no. 2 (2015): 112.

²³ Ceferino, Luis, Judith Mitrani-Reiser, Anne Kiremidjian, Gregory Deierlein, and Celso Bambarén. “Effective plans for hospital system response to earthquake emergencies.” *Nature communications* 11, no. 1 (2020): 1-12.



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the earthquake engineering communities of practice with Health Care Coalitions may enhance awareness and prioritization of measures to reduce damage to buildings and on-site infrastructure in regional health care systems, along with preparedness activities.

Given the nature of hospital accreditation and licensure, the contingencies for federal funding of hospital preparedness, and the state of regional preparedness planning for resilient health care systems, it is clear that **we are insufficiently prepared to manage response and recovery of health care delivery following a major earthquake, due, in part, to an emphasis on hospitals rather than a comprehensive, systems view of all health care delivery services.**

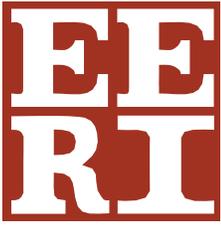
Needed Actions

EERI advocates a renewed focus on the accreditation requirements, licensing requirements, building code design requirements, funding, and community-engaged preparedness planning as they relate to the entire resilient health care system.

Accreditation, Licensing, and Building Code Design Requirements:

- Additional federal, state, and county dollars should be designated to seismic assessment and strengthening the resilience of healthcare suppliers and providers. EERI recognizes that seismic mitigation is expensive, and that introduction of new requirements for facilities can lead to financial insolvency with cascading impacts to healthcare access particularly for rural and underserved communities. Therefore, the introduction of essential seismic resilience requirements by any level of government, reimbursor, or accreditor must be coupled with sufficient federal, state, and county financial assistance, particularly for small, rural health care facilities. Private, foundation, and local sources of funding should be solicited when available and possible.²⁴
- Designated federal agencies should then ensure that existing requirements for healthcare suppliers and providers to obtain federal funding, tax incentives, and CMS reimbursement include appropriate seismic strengthening measures. In addition, essential facility building code and construction oversight requirements should consider not only hospital buildings, but also extend to ancillary facilities and other non-hospital health care facilities. Receipt of reimbursement by CMS should require adherence to the latest edition of the I-codes published by the International Code Council, at a minimum.
- Appropriate American Society of Civil Engineers (ASCE) 7 Risk Categories (Performance Groups) for all non-hospital health care facilities are needed to ensure surge capacity and operability following a disaster event. For new buildings, improved technical implementation and oversight is needed for hospitals and ancillary facilities. These categories need to be carried into the Facility Guideline Institute's guidelines. Existing buildings should have similar mechanisms for oversight through federal programs, guidelines, and initiatives to mitigate risk and develop resilience of our health care system.
- Efforts led by states to reduce earthquake damage to hospitals and other state-licensed facilities should be coordinated with cities and counties. While work on these actions is on-going, the efforts are often underfunded. States, cities, counties, health departments, and hospital operators should coordinate with each other to comply with state laws and codes that mandate essential facilities have appropriate structural performance, be safe to occupy, and have nonstructural systems (including HVAC, fire sprinklers, water and electricity) that are designed for functional recovery within an appropriate amount of time following disasters. In particular, coordination should include assessing any challenges to obtaining needed funding.
- Regions should consider emulating the above code seismic requirements that the Veterans Affairs Department provides for existing and new hospitals. These requirements include the expected performance

²⁴ See Oregon's seismic rehabilitation grant program for seismically unsafe hospitals as an example.
<https://www.homelandsecuritygrants.info/GrantDetails.aspx?gid=53561>



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of critical, essential, and ancillary buildings.²⁵

- Local authorities should pass seismic ordinances requiring the evaluation and replacement or retrofit of vulnerable building types or critical public infrastructure such as hospitals. Building owners can also conduct voluntary replacements or seismic retrofits to reduce seismic vulnerability of hospitals and non-hospital health care facilities that are in accordance with state and local hospital building standards.²⁶ Initiatives planned at the regional level should be coordinated with implementation at the local and state levels for increased effectiveness.

Funding for Safe and Resilient Health Care Systems:

- Federal funding sources essential for healthcare and public health emergency preparedness (e.g., ASPR's Hospital Preparedness Program, the CDC's Public Health Emergency Preparedness Cooperative Agreement) must be restored to or exceed peak 2004 levels. In addition, new federal funding streams focused on facility-level earthquake strengthening should be created, and should explicitly state minimum requirements for healthcare building integrity as contingencies to obtain funding.
- Federal and state agencies should consider incentive programs for hospitals and ancillary facility operators, including opportunities for increased funding or reimbursement, if they meet enhanced preparedness and seismic performance requirements. For example, regional earthquake risk assessments with earthquake consequences and losses could be a criterion for funding and will also support regional planning for systems-level outcomes.
- Critically located hospitals should have additional opportunities for preparedness planning through funding from private stakeholders and public-private partnerships, especially when expected earthquake consequences will impact transportation networks and supply provisions to hospitals serving large populations within a community.²⁷
- Ancillary facilities and non-hospital health service providers should have local, state, and federal funding opportunities for seismic strengthening, preparedness planning, and contingency planning for continued operations.
- Competitive grants to local HCCs should be offered funding through a combination of federal, state, private, and philanthropic sources. ASPR should pilot an initiative to designate disaster specialty hospitals and non-hospital health care facilities that can serve as centers of excellence in disaster care delivery and innovation.²⁸

Regional Preparedness Planning for Health Care Systems:

- Health Care Coalitions throughout the country should coordinate with many local and jurisdictional emergency preparedness planning agencies and government bodies to ensure coordination of infrastructural needs and requirements for continuity of hospital services. Local governments developing Local Hazard Mitigation Plans (LHMPs) should ensure coordination with Health Care Coalitions to develop recommendations for comprehensive health care resilience of their local area, inclusive of hospitals and ancillary health-related facilities. Local governments and organizations creating LHMPs should include local

²⁵ Office of Construction and Facilities Management, *Seismic Design Requirements*, U.S. Department of Veterans Affairs Seismic Design Requirements, 2019, <https://www.cfm.va.gov/til/etc/seismic.pdf>

²⁶ FEMA, *Fact Sheet, Seismic Building Code Provisions for New Buildings to Create Safer Communities*, 2020: https://www.fema.gov/sites/default/files/2020-10/fema_seismic-building-code-provisions-new-buildings-create-safer-communities_fact-sheet.pdf

²⁷ See Walsh et al., 2015.

²⁸ Toner, Eric. "Healthcare preparedness: Saving lives." *Health Security* 15, no. 1 (2017): 8-11.



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offices of emergency services, representatives of area hospitals and other providers, water and power utilities, and transportation providers in their area. In addition, while Local Hazard Mitigation Planning (LHMPs) guidance requires a proximate identification of hospitals, the federal guidance document should be expanded to recommend a more detailed approach.

- State and federal agencies, as well as health care facility operators, should ensure that hospitals and other major health care facilities have resilient infrastructure systems. Current policy requires that auxiliary water and power back-up sources last for a minimum of 96 hours. However, this time period is likely to be inadequate in some areas. This issue is particularly important for water supplies since the water network cannot be repaired to give priority to critical facilities (Achour et al., 2014). In addition, facilities located in areas that are subject to transportation system disruption should have adequate supplies onsite for immediate post-disaster use and should put in place operational or contingency plans to accommodate continuation of operations. Transportation disruptions can also impact the ability of key staff to get to their jobs, a problem that should be planned for with alternative staffing strategies.
- Ancillary health-related facilities should have auxiliary water and power sources to support post-earthquake operation. For example, dialysis centers should be built with back-up power systems that can support plugging in refrigerator trucks to expand capacity to address post-disaster surge demand. In addition, these ancillary health-related facilities located in areas that are subject to transportation system disruption should work with their HCC to develop plans for obtaining adequate supplies for immediate post-disaster use.
- Health care facility operators and building owners should explicitly identify and communicate their expectations from local infrastructure systems (water, energy, transportation, communications, etc.) and suppliers (medical gas, food, medical supplies) while engaging in community resilience planning.
- The community's needs and vision for resilient health care systems should be reflected in preparedness and mitigation planning. Community resilience planning at the state, regional, and local levels, should include workshops and tools such as the National Institute of Standards and Technology (NIST) community resilience planning guide.
- As part of its requirements, the CMS Emergency Preparedness Rule requires that facilities conduct a table-top exercise to plan for an emergency scenario. In areas of moderate-to-high earthquake hazard, these scenarios should consider both internal damage/disruption to facility operations and broader earthquake related consequences that may impact health care system operations (e.g., critical infrastructure system disruptions). Reports should be shared with regional preparedness planning organizations for development of complementary plans, policies, and procedures.
- Hospitals and healthcare coalitions should work with state and federal agencies to formalize arrangements with engineers and facility experts to report to the hospital, assess damage, and determine if the buildings can be reoccupied. The program should follow a model such as San Francisco's Building Occupancy Resumption Program (BORP) that permits owners of buildings to hire qualified structural engineers to create building-specific post-disaster inspection plans and allows these engineers to become automatically deputized as inspectors for these buildings in the event of an earthquake or other disaster.

Note: While this paper addresses topics directly associated with disaster planning, mitigation, and recovery specific to earthquakes, opportunities exist for policy makers and hospital stakeholders to leverage these concepts and recommendations for other significant regional or local hazards. Due to the complexity of the issues particular to earthquake hazards, other hazards are not covered explicitly herein. Future studies of health care system resilience to multiple hazards are encouraged. Additionally, this position is designed to cover a broad range of nationally applicable topics. Health care systems exist across diverse and disparate states, counties, and cities with extremely variable progress towards earthquake resilience. Thus, this paper may not capture all regional health care system resilience efforts, enforcement and implementation contexts, and best practices. It seeks broad action, but does not



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intend to disparage important local or regional progress. While the paper discusses the United States context, it may be used as a template to apply to other locations outside of the United States for health care system resilience.

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