

ABSTRACT

Arboleda, Carlos A. Ph.D., Purdue University, August 2006. Vulnerability Assessment of the Operation of Health Care Facilities During Disaster Events. Major Professor: Dulcy M. Abraham.

Health care systems are classified as essential infrastructure systems in disaster response plans. Physical damage to health care facilities or disruption of their operations or supply chains could prevent a full, effective response to a disaster and exacerbate the outcome of an emergency situation. Even if a hospital or public health facility were not directly affected by the disaster event, these facilities are required to operate efficiently during these emergencies.

In this study, three models (normal operations, response to a disruption, and restoration) are used to assess the level of interdependencies between the health care facility and the primary infrastructure systems linked to the facility. These models use optimization techniques to determine the unsatisfied demand in the major infrastructure systems and the impact of this shortage of resources on the operation of the hospital. A system dynamics simulation model is used as a tool to represent the operation of a health care facility, including the interaction between the different service areas (emergency room, intensive care unit, wards, operation room), the flow of patients within the facility, and the condition of the infrastructure systems that supply resources (i.e., water, power, medical supplies) to maintain the operation of the facility.

The framework and modeling used in this research can assist in determining cost-effective operational strategies in a health care facility in order to respond to a

disaster event by considering the interdependencies between the infrastructure systems and taking into account different restoration strategies that can be used to improve response capabilities. A similar methodology could be used to assess the vulnerability of other facilities, such as federal buildings, emergency response systems, and public agencies, involved in the response to disaster events.