QUESTIONAIRE-BASED QUANTIFICATION OF SEISMIC RESILIENCE IN IRANIAN HOSPITALS

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Hospitals constitute an important part of the health care system. During a disaster, their role is even more critical; therefore, it is vital to provide timely and good quality treatment to injured patients in order to minimise fatalities. Hospital performance estimates (before and during an extreme event) can assist disaster mitigation efforts to provide timely treatment to the injured and ill, so it is essential to provide a performance measure that will eventually be used by policy makers (Cimellaro, 2010).

According to the terminology of the Multidisciplinary Center for Earthquake Engineering Research (MCEER), the performance of a hospital (or system) during a disaster is measured using a unique decision variable (DV), defined as resilience, which combines other variables (economic losses, casualties, recovery time, etc.) that are usually employed to judge performance during extreme events. As described by Bruneau et al. (2003), resilience has been defined the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009).

Providing a model for evaluating the promotion of resilience as a widespread concept that has many subsets, one of the most important parts of vital arteries, as well as therapeutic facilities such as hospitals in Iran, has always been considered.

The quantification of seismic resilience at the physical level proceeds through a probabilistic framework because of the considerable uncertainties in the field of earthquake and extreme-event engineering in both demand and capacity. The system diagram in Figure 1 identifies the key steps of the framework to quantify resilience, highlighting the uncertain variables inside the framework (intensity parameters (I), response parameters (R), performance measures (PM), etc.).

To achieve this goal, a model for quantitative assessment of the probabilistic probability index of seismic resilience of hospitals was presented. In this repair, all structural and non-structural components of the hospital were evaluated based on the HSI checklist structure. Then, through the questionnaire of experts related to the time and cost of repairs or replacement with the new system, depending on the need after possible earthquake it is calculated using the existing fragility curves and the proposed model. The index of the resilience of each of them is calculated for damage levels and different earthquake return periods. The results are ranked below and the components with the lowest probability resilience index are identified in their subset.

The results show that the probability index of non-structural components in the event of an earthquake after which the structure of the hospital is still possible to serve, but the non-structural components of the hospital are obstructed or damaged by lateral movements, including systems such as how can mechanical and electrical installations, internal walls and partitions, therapeutic equipment and elevators be promoted, and a proposal to allocate funds to enhance their resilience and, in general, enhance the overall resilience of the hospital system as a result of decision makers from it presented.

It can also be calculated by calculating the weight of the probability index of the whole hospital and comparing it to a macro level with other hospitals in a region. In other words, it is possible to assess the probabilistic probity of a network of health centers in one area to provide a more comprehensive form of management decision-making.

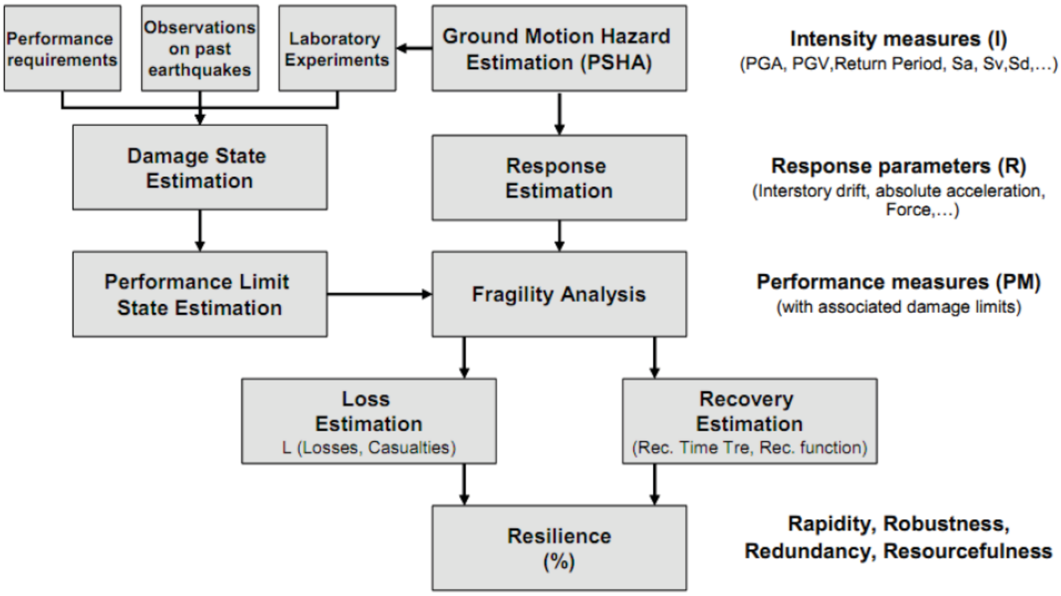

Figure 1. Resilience framework (Cimellaro, 2010).

The model has been applied to a network of hospitals. The resilience framework can be used as a decision support tool to increase the resilience index of systems, such as health care facilities, and reduce disaster vulnerability and consequences.

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