Guidelines for Vulnerability Reduction in the Design of New Health Facilities

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Photos: PAHO/WHO
Page 5 photo of scale model courtesy of architect Micaela Baroni.

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Preface

Keeping hospitals in operation consumes nearly two thirds of total public health spending in Latin American and the Caribbean. Hospitals are an investment of major social significance, and funding for their construction often comes from international loans.

It is almost always the case that, when struck by large-scale natural disasters, hospital services are interrupted temporarily or permanently, mainly due to damage to their infrastructure. The operational loss of these facilities can mean the partial or complete loss of significant capital investments. Far more importantly, such catastrophic events often leave a severe and lasting scar on the welfare and the socioeconomic development of the population and the country.

In recent years, various PAHO/WHO member states have managed to reduce the vulnerability of their hospitals; several of them went on to withstand successfully the effects of subsequent disasters. Even countries with limited financial resources can serve their populations well by providing them with hospitals and other health facilities that are resistant to earthquakes, hurricanes, and other natural hazards.

For this to happen, however, a change of strategy must take place—one that ensures that new, remodeled or extended facilities enjoy greater safety from adverse natural events.

This handbook, produced in conjunction with the PAHO/WHO Collaborating Center for Disaster Mitigation in Health Facilities at the University of Chile, puts forward three potential levels of protection from adverse events, or performance objectives:

a) *Life safety* – ensuring that the building will not collapse before evacuation can take place, and that any injuries that occur will not put the life of patients and staff at risk.

b) *Investment protection* – significantly reducing structural and non-structural damage, even though the facilities may be rendered temporarily non-operational.

c) *Functional protection* – guaranteeing that the facilities will continue to operate and serve the community with a minimum of disruption.

PAHO/WHO recommends that essential areas and components of hospitals be built in keeping with the third and most demanding performance objective, and that any new health facility be built entirely so as to meet, at least, the first level of protection, namely life safety.

International experience has shown that applying this philosophy to the construction of a new hospital, even when meeting the third performance objective, only adds about 4 percent to the total cost of the project. This is the maximum amount that hospital authorities, project designers, builders and financial agents must weigh against the social, political and economic costs arising from the interruption or total loss of vital services at the very time that they are needed the most. By contrast, applying innovative approaches when designing and selecting the site of a new facility can improve its safety and efficiency without significantly increasing overall costs.

This handbook seeks to spread far this new vision of the conception and construction of public health infrastructure. It is to be hoped that health-sector managers, professionals, and technical consultants entrusted with managing, designing, building, and inspecting new health facilities may benefit from its reading and discussion.

Mirta Roses
Director
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PAHO/WHO

Introduction

The experience of several countries shows that it is possible to employ a methodology for the design and construction of new health facilities that is capable not only of ensuring the safety of human lives, as has been the case until now, but of guaranteeing the safety of the investment in the facility and its continued operation as well. Depending on the characteristics of the health network and the economic resources available, it is possible to build health facilities that enjoy a high level of functional and investment protection. While it may not be expected that such facilities will remain intact and fully functional during and immediately following any emergency, it is reasonable to expect them to recover in a short time, and at a reasonable cost. Finally, if resources are limited or natural or technical conditions do not allow it, health facilities can still be built that, confronted with severe natural phenomena, will suffer moderate or even considerable damage without imperiling the lives of their occupants.

In order to meet different protection objectives, it is necessary to establish new design and construction criteria—and engage in quality assurance from start to finish. Experience shows that the financial cost of applying these measures represents less than 4 percent of the total construction cost, and in some cases is practically zero, since it only implies choosing a different location or changing the underlying design philosophy. In any case, the amount is marginal when compared to the economic costs of retrofitting or rehabilitating a structure damaged by a natural disaster—not to mention the social, political, and economic impact of the temporary or permanent loss of a health facility.

The traditional stages in the project development cycle for the construction of new health facilities are outlined below.

Phase 1: Preinvestment

Stage I. Identification of the need for a new health facility. At this stage, consideration is made of variables such as the characteristics of the existing health care network, current development policies, the rate of utilization of existing services, expected demand, epidemiological and demographic profiles, health policies, and geographical characteristics of the area. Directly associated with Stage I is the search for financing for the development of the new facility.

Stage II. Assessment of options to meet this need. At this stage the various options for meeting the need for a new health facility are identified, assessed, and compared. The definitive location of the facility is an essential variable in this process.

Stage III. Medical/architectural program and preliminary plans. In this stage the services and spaces desired are defined and preliminary plans are drafted in order to determine the functional relations and basic characteristics of the new infrastructure.

Phase 2: Investment

Stage IV. Project design. In this stage the project plans, specifications, budget, and tender documents are drawn up.

Stage V. Construction. At this stage, the new infrastructure is built.

Phase 3: Operations

Stage VI. Operations and maintenance. While this stage is not part of the development of the new infrastructure, it is indispensable to define in advance how the facility will operate and remain functional.

The chief purpose of this handbook is to assist health sector administrators and professionals whose mission is the management, design, construction, and inspection of new hospitals, laboratories, and blood banks, with a view to protecting the infrastructure and operation of these facilities. With this in mind, improved criteria for the various project development stages will be described in the pages that follow, and the procedures for selecting the performance objective will be specified. We will also discuss how to assess the various siting, design, and construction options, as well as how to select the professional teams that will be involved in the project. While this handbook is not a design or building code, relevant basic concepts will be presented, and reference will be made to specific documents listing the appropriate technical recommendations needed to meet the performance objectives desired.

In preparing this handbook, only some natural hazards have been taken into account: seismic events, hurricanes and strong winds, landslides, floods, and volcanic eruptions. Other phenomena—such as drought, fire, or man-made hazards—have been excluded. It is important to acknowledge that different natural phenomena present different challenges to the development of a project. In the case of floods or volcanic activity, generally the only technically and financially feasible option is to select a site that offers the desired level of safety. If landslides, mudslides, or floods are the prevailing hazards, it is often possible to modify the variables that control the phenomenon—for instance, by planting trees, or building ditches and other water-diversion structures. When it comes to seismic events, hurricanes and strong winds,in addition to choosing the site correctly, it is necessary to design the structures so that they are resistant to such phenomena. In the specific case of earthquakes, it is necessary to provide safety to the entire infrastructure, both internal and external. In the case of strong winds, protection efforts should focus mainly on exposed external components.

In extreme situations, the only solution is to distribute the risk by building not one facility but several, distributed spatially, that can perform the desired health care functions. Locations in different sites should improve the odds of effective protection, since even if some of them are affected, functional damage will not be total. Being aware of these differences and options should facilitate appropriate and cost-effective risk management.