

# An Internet-Based Simulation System for Training and Development of Regional-Healthcare-Centers Managers

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**Abstract.** RHCMS (Regional Healthcare Center Management System) is an Internet-based simulation training system for Regional Healthcare-Centers (RHCs) managers. The system is based on an integrative model, designed and developed by an interdisciplinary team of experts, for the purpose of training and developing RHCs' managers. This model involves the study of the following fields: healthcare management, business administration, organizational behavior, health economics, management science, and information technologies. The simulation system enables the operation of a management decision-making game. In the game, teams of trainees, playing management teams of RHCs, within one specific community, compete among themselves. The simulation focuses on managerial performance, based on periodic team-decisions, within the internal and external environmental context. The simulation game has a major potential contribution in enabling management trainees to transfer theoretical knowledge into managerial practical tools, capabilities and skills.

**Keywords.** simulation, health informatics, eLearning, management games

## 1. Introduction

Management of a Regional Healthcare Center (RHC) is an interdisciplinary role, which integrates a variety of managerial tasks and the utilization of know-how, regarding quality of medical care, as well as finance, commerce, accounting and marketing. Health systems are complex and dynamic by nature. Appropriate training is, therefore, important for enabling managers to excel in their tasks. A quest for a specific training device for RHC managers has lately increased, following legislating transformations, shifts in political and economic priorities, alongside worldwide trends to transform RHCs into economically independent centers. This paper introduces a training tool for RHC managers, based on a new integrative model.

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## 2. Simulation Tools and Techniques

Following the rapid development of computer systems since the 1950s, simulation languages and software tools have been used for designing and analyzing models, which describe complex systems and processes. The use of simulation techniques is especially relevant in complex situations, where mathematical models or operations research techniques are not capable of finding optimal solutions, given a set of constraints. Simulation models imitate the behavior of systems, and can dynamically predict the development of situations over time. Simulation methods are commonly used to support managerial and other professional decision-making processes [1, 2].

**Management simulation games** are widely used for training management teams and students. In these games, virtual marketplaces simulate real worlds. Using simulation games, as a tool for practicing new management patterns in health systems, offers the following advantages:

- It allows for the learning of complex internal interactions between various components of a health system, and its environmental context.
- It offers experience and deeper understanding of expected developments and changes.
- It deepens the understanding of the system's characteristics, throughout the design phase.
- It enables assessing the relative importance and interdependency of various factors and components.
- It allows for examination of a system's reaction to new policies, standards, and institutional changes.

**Simulation within healthcare.** Simulation techniques are commonly used as a tool for practicing and assessing medical expertise. Most simulations in the field of medicine focus on clinical issues, medical education, nursing, and medical decision making [3–5]. Nowadays, there is a tendency to apply simulation techniques in healthcare management and administration, in order to improve quality of service and patient safety, particularly as analysis and design tools. Simulation games are used for training decision makers, mainly in hospitals. These games generally focus on finance and resource allocation. Within hospitals, a vast use of simulation tools is applied in the management of emergency and disaster situations [6]. The emphasis, in these cases, is on decision-making under pressure, and appropriate resource allocation, to assure best possible care, while avoiding bottlenecks in patient flow, through different diagnostic and treatment stations.

## 3. The Simulation System

Healthcare-related managerial simulation planning requires comprehensive knowledge and diversified skills. An interdisciplinary team of experts got together to initiate and develop the simulation system. Concept formation involved the study of the following fields: healthcare management, business administration, organizational behavior, health economics, management science, and information technologies. Modeling the system necessitated profound understanding of real-world, ongoing managerial processes, structures and performance measures. In order to acquire this knowledge, team members collected data, engaging in a series of in-depth interviews with RHC

managers, district executives, and headquarter executives from Israel's four Health Service Providers (HSPs). The findings revealed that the major objective of RHCs is to provide equal and qualitative health services to its clients, subject to monetary responsibility and regulatory constraints. In order to materialize this objective, the term "quality" was defined along two dimensions:

- Clinical quality measures: Quality of treatment, prevention programs, case management, diversity of health services, etc. It offers experience and deeper understanding of expected developments and changes.
- Service quality measures: Quality of equipment (modernization level and maintenance), overall waiting-in-queue time, ongoing operations management (purchasing, medications, maintenance, outsourcing usage), etc.

The simulation design was based on an interdisciplinary business simulation-game course, which is taught at the school of Business in the College of Management Academic Studies, during the final year of post-graduate studies [7]. Teams submit their decisions on a periodic basis through a web-based interface that is accessible anytime, and from any location. Decisions are filled in, using common form elements including text boxes, selection lists, check boxes, etc. The system interface allows trainees to view both current and accumulated information, concerning their decisions and outcomes, and see related industry and competitor data. Based on the information displayed, students can revise their strategy and make operational decisions for the upcoming quarter. Each team of trainees simulates an RHC management team belonging to a different HSP. All teams compete within one particular community. Decisions are made on a periodic basis and uploaded online. Each period reflects one quarter of a year in the real world. The simulation system generates outcomes for each RHC management team, based on their decisions, on environmental changes, and on dynamic model parameters.

**Decision domains.** Periodic decisions address five characteristics of healthcare management:

- Operations management
- Prevention programs and clinical quality assurance
- Human resources (HR) management and development
- Marketing
- Financial management

**Initial and periodic data.** Initial and periodic data, presented to the simulation teams, regarding their RHC and the regional environment, includes the following:

- Regional population figures, broken down by age, socioeconomic condition, education level, chronic diseases, social and cultural attributes, and other health characteristics.
- Number of RHC customers, broken down by age, socioeconomic condition, education level, chronic diseases, social and cultural attributes, and other health characteristics.
- RHC workforce size and breakdown (physicians, nurses, paramedical staff, and administrative staff).
- RHC financial resources: Initial budget, expenditure rates, and categories (rentals, salaries, hospital admissions, medicine, maintenance, etc.).
- Additional resources: equipment, fixed assets, etc.
- List of services provided by the clinic: Primary and secondary health services.

**Trainee objectives and budgetary considerations.** The objectives of the decision makers are as follows: Providing constantly enhanced quality of care assurance to RHC customers; developing health promotion programs; maintaining a reasonably balanced financial situation; increasing customer satisfaction; obtaining a relatively high market share by holding on to current customers and attracting new ones. The financial performance of each RHC is examined using standard financial statements: Income Statement and budget utilization reports. RHC income is derived from the following: Total number of clients (capitation), customers' age groups breakdown, rate of severely ill patients, extended insurance policies, profitable extra-health services and donations. RHC expenses including hospitalizations, fees and salaries, equipment purchase, medications, maintenance, etc., are affected by decisions made in each period, and by the simulation parameters.

**The performance evaluation tool.** The Health Value Added (HVA) tool is used for evaluating RHC team performance. HVA is a managerial strategic model that was developed by “Maccabi Healthcare Services”, Israel’s second largest HSP.

The model defines health indicators and translates them into specific performance measures that integrate quality of care, member satisfaction, and costs [8].

Based on Economic Value Added (EVA) concepts [9] and focusing on HSP member health, HVA measures parameters relating to resources and processes, with the aim of the following major goals:

- Providing high quality of care.
- Maintaining a high level of member satisfaction.
- Achieving the above within a given budget.

Figure 1 presents the HVA performance output screen, on which the participants receive the periodic data regarding their RHC’s results.

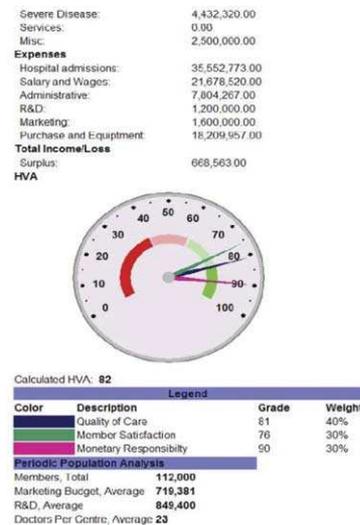


Figure 1. Performance output screen

#### 4. Evaluation of the Simulation

The simulation time-span was adapted to the thirteen-week semester practiced in Israel. The game itself lasted for 8 weeks, representing a two-year period in the life of an RHC (one quarter per week). The simulation is, however, flexible, allowing for different settings and time frames. The simulation enables trainees with totally different backgrounds and experience to go through the training together. It provides for the opportunity to easily and rapidly arrive at a common starting point. It encourages mutual learning and widening of horizons by knowledge-sharing and ongoing communication. Experienced managers of various healthcare functions can thus expand their understanding of potential hazards and problems, while, at the same time, inexperienced administrating, medical or nursing staff, as well as students, can benefit from their colleagues’ perspectives; when participating in the simulation within the

same team. This simulation turned out to be a great success with students (who experienced it throughout a “Management of a Regional Health Center” seminar, which took place in the department of Health-care Systems’ Management, in the Yezreel Valley College). Participants were asked to evaluate their experience throughout and following the simulation game. Responses were extremely favorable, indicating the potential academic value of this simulation, as well as its possible contribution as an effective training device for management candidates in healthcare organizations.

Utilizing this simulation provides RHC managers with the following benefits:

- Acquiring new managerial skills and implementing new ideas and theories.
- Understanding factors, mechanisms, and interrelationships within health systems.
- Understanding system and mechanism analysis, and balancing between quality of service and budgetary constraints, while coping with the clinical, administrative and overall managerial aspects.
- Enhancing effective decision-making processes, learning to take informative decisions, after scrutinizing various management models, and testing different functional models.
- Internalizing critical thinking patterns.
- On the individual level, developing one's own behavior patterns in management situations.
- Assimilating abilities concerning teamwork and intersectorial cooperation.

The simulation model has shown significant practical and theoretic value.

On the practical level, the model may contribute in training of healthcare managers, providing them with practical know-how as to the effective handling of new realities, in which economical and quality of care considerations meet. On the theoretic level, it contributes to the growing knowledge domain that deals with developing new training approaches, to bridge the gap between theory and practice, by integrating “Know-What” and “Know-How”.

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