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Strategic Integration of Complex Networks and Systems for Advancing Biomedical Research

CATÓLICA BIOMEDICAL RESEARCH CENTRE

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Healthcare Systems Engineering and Operations Management

Essentials for Better Healthcare Delivery Systems

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Abstract. Due to the ongoing transformation of the healthcare industry from a fee-for-service (volume-based) to a pay-for-performance (value-based) model, the healthcare sector is constantly evolving every day. Moreover, with the advances in today's technology, many hospital systems are transitioning into digital modes of operation. Therefore, there is an increased need, more than ever before, to make the healthcare system safe, effective, patient-centered, timely, efficient, and equitable. While systems engineering tools have been widely used in a variety of applications to achieve major improvements, the healthcare sector has been slow in embracing them. The strategic use of these tools, such as lean six-sigma, applied operations research, supply chain management, modeling and simulation, human factors engineering/ergonomics, and data science/analytics can be readily used to measure, characterize, and optimize performance at various levels in a healthcare system. However, building a better delivery system requires effective partnerships that can harness the power of engineering, health and healthcare sciences, information technology, management, social sciences, and data science. Such partnerships are essential to transforming our under-performing healthcare system into high performance environments that produce premier quality care and better patient outcomes at lower cost. The integration of such expertise can establish next-generation policies and approaches in healthcare management, systems engineering, and outcomes research, and ultimately transform our healthcare system to one that embraces patient-centered care, optimized operations, efficacy, safety, and equity.

Therefore, the purpose of this workshop is to introduce healthcare systems engineering, operations management, and data science/analytics. To do so, the fundamentals and the current state of health systems in terms of performance and quality will be covered to illustrate the need for a systems engineering based approach. Then, various systems engineering and operations management tools will be introduced and discussed. In addition, various real-life case studies will be reviewed throughout this workshop. Those case studies have been conducted by faculty and students affiliated with the Watson Institute for Systems Excellence (WISE), an institute for advanced studies at Binghamton University. This institute has been working (in a collaborative mode) with several U.S. and international hospitals to demonstrate the impact of healthcare systems engineering, operations management, and data science/analytics. Therefore, this workshop will introduce the broad spectrum of applied research projects in the Healthcare Systems Engineering Center (HSEC), an organized research center under the umbrella of WISE. Those research activities include, but are not limited to: (a) workflow and process re-design, (b) productivity assessment and capacity planning, (c) strategic planning and future-state analysis, (d) lean six-sigma and operational excellence, (e) integrated clinical environment modeling, (f) healthcare data science and analytics, and (g) digital human modeling for ergonomic assessment. After describing the unique working model of his Healthcare Systems Engineering Center and its partner hospitals, several case studies will be presented and discussed.