

Engineering The System Of Healthcare Delivery

This book presents statistical processes for health care delivery and covers new ideas, methods and technologies used to improve health care organizations. It gathers the proceedings of the Third International Conference on Health Care Systems Engineering (HCSE 2017), which took place in Florence, Italy from May 29 to 31, 2017. The Conference provided a timely opportunity to address operations research and operations management issues in health care delivery systems. Scientists and practitioners discussed new ideas, methods and technologies for improving the operations of health care systems, developed in close collaborations with clinicians. The topics cover a broad spectrum of concrete problems that pose challenges for researchers and practitioners alike: hospital drug logistics, operating theatre management, home care services, modeling, simulation, and data mining in patient care and health care organizations.

An overview of engineering systems that describes the new challenges posed for twenty-first-century engineers by today's highly complex sociotechnical systems. Engineering, for much of the twentieth century, was mainly about artifacts and inventions. Now, it's increasingly about complex systems. As the airplane taxis to the gate, you access the Internet and check email with your PDA, linking the communication and transportation systems. At home, you recharge your plug-in hybrid vehicle, linking transportation to the electricity grid. Today's large-scale, highly complex sociotechnical systems converge, interact, and depend on each other in ways engineers of old could barely have imagined. As scale, scope, and complexity increase, engineers consider technical and social issues together in a highly integrated way as they design flexible, adaptable, robust systems that can be easily modified and reconfigured to satisfy changing requirements and new technological opportunities. Engineering Systems offers a comprehensive examination of such systems and the associated emerging field of study. Through scholarly discussion, concrete examples, and history, the authors consider the engineer's changing role, new ways to model and analyze these systems, the impacts on engineering education, and the future challenges of meeting human needs through the technologically enabled systems of today and tomorrow.

Racial and ethnic disparities in health care are known to reflect access to care and other issues that arise from differing socioeconomic conditions. There is, however, increasing evidence that even after such differences are accounted for, race and ethnicity remain significant predictors of the quality of health care received. In Unequal Treatment, a panel of experts documents this evidence and explores how patient-centered care may overcome the disparities. The book examines how disparities in treatment may arise in health care systems and looks at aspects of the clinical encounter that may contribute to such disparities. Patients' and providers' attitudes, expectations, and behavior are analyzed. How to intervene? Unequal Treatment offers recommendations for improvements in medical care financing, allocation of care, availability of language translation, community-based care, and other arenas. The committee highlights the potential of cross-cultural education to improve provider-patient communication and offers a detailed look at how to integrate cross-cultural learning within the health professions. The book concludes with recommendations for data collection and research initiatives. Unequal Treatment will be vitally important to health care policymakers, administrators, providers, educators, and students as well as advocates for people of color.

Second in a series of publications from the Institute of Medicine's Quality of Health Care in America project Today's health care providers have more research findings and more technology available to them than ever before. Yet recent reports have raised serious doubts about the quality of health care in America. Crossing the Quality Chasm makes an urgent call for fundamental change to close the quality gap. This book recommends a sweeping redesign of the American health care system and provides overarching principles for specific direction for policymakers, health care leaders, clinicians, regulators, purchasers, and others. In this comprehensive volume the committee offers: A set of performance expectations for the 21st century health care system. A set of 10 new rules to guide patient-clinician relationships. A suggested organizing framework to better align the incentives inherent in payment and accountability with improvements in quality. Key steps to promote evidence-based practice and strengthen clinical information systems. Analyzing health care organizations as complex systems. Crossing the Quality Chasm also documents the causes of the quality gap, identifies current practices that impede quality care, and explores how systems approaches can be used to implement change.

Increasing costs and higher utilization of resources make the role of process improvement more important than ever in the health care industry. Management Engineering: A Guide to Best Practices for Industrial Engineering in Health Care provides an overview of the practice of industrial engineering (management engineering) in the health care industry. Explaining how to maximize the unique skills of management engineers in a health care setting, the book provides guidance on tried and true techniques that can be implemented easily in most organizations. Filled with tools and documents to help readers communicate more effectively, it includes many examples and case studies that illustrate the proper application of these tools and techniques. Containing the contributions of accomplished healthcare process engineers and process improvement professionals, the book examines Lean, Six Sigma, and other process improvement methodologies utilized by management engineers. Illustrating the various roles an industrial engineer might take on in health care, it provides readers with the practical understanding required to make the most of time-tested performance improvement tools in the health care industry. Suitable for IE students and practicing industrial engineers considering a move into the health care industry, or current healthcare industrial engineers wishing to expand their practice, the text can be used as a reference to explore individual topics, as each of the chapters stands on its own. Also, senior healthcare executives will find that the book provides insights into how the practice of management engineering can result in sustainable improvements in their organizations. To get a good overview of how your organization can best benefit from the efforts of industrial engineers, this book is a must-read.

From Devices to Systems
Engineering a Safer World
Machine Learning and Analytics in Healthcare Systems

HCSE, Florence, Italy, May 2017

A New Health System for the 21st Century

This book introduces condition-based maintenance (CBM)/data-driven prognostics and health management (PHM) in detail, first explaining the PHM design approach from a systems engineering perspective, then summarizing and elaborating on the data-driven methodology for feature construction, as well as feature-based fault diagnosis and prognosis. The book includes a wealth of illustrations and tables to help explain the algorithms, as well as practical examples showing how to use this tool to solve situations for which analytic solutions are poorly suited. It equips readers to apply the concepts discussed in order to analyze and solve a variety of problems in PHM system design, feature construction, fault diagnosis and prognosis.

Experts estimate that as many as 98,000 people die in any given year from medical errors that occur in hospitals. That's more than die from motor vehicle accidents, breast cancer, or AIDS—three causes that receive far more public attention. Indeed, more people die annually from medication errors than from workplace injuries. Add the financial cost to the human tragedy, and medical error easily rises to the top ranks of urgent, widespread public problems. To Err Is Human breaks the silence that has surrounded medical errors and their consequence—but not by pointing fingers at caring health care professionals who make honest mistakes. After all, to err is human. Instead, this book sets forth a national agenda—with state and local implications—for reducing medical errors and improving patient safety through the design of a safer health system. This volume reveals the often startling statistics of medical error and the disparity between the incidence of error and public perception of it, given many patients' expectations that the medical profession always performs perfectly. A careful examination is made of how the surrounding forces of legislation, regulation, and market activity influence the quality of care provided by health care organizations and then looks at their handling of medical mistakes. Using a detailed case study, the book reviews the current understanding of why these mistakes happen. A key theme is that legitimate liability concerns discourage reporting of errors—which begs the question, "How can we learn from our mistakes?" "Balancing regulatory versus market-based initiatives and public versus private efforts, the Institute of Medicine presents wide-ranging recommendations for improving patient safety, in the areas of leadership, improved data collection and analysis, and development of effective systems at the level of direct patient care. To Err Is Human asserts that the problem is not bad people in health care—it is that good people are working in bad systems that need to be made safer.

Comprehensive and straightforward, this book offers a clear prescription for raising the level of patient safety in American health care. It also explains how patients themselves can influence the quality of care that they receive once they check into the hospital. This book will be vitally important to federal, state, and local health policy makers and regulators, health professional licensing officials, hospital administrators, medical educators and students, health caregivers, health journalists, patient advocates—as well as patients themselves. First in a series of publications from the Quality of Health Care in America, a project initiated by the Institute of Medicine

Know What to Expect When Managing Medical Equipment and Healthcare Technology in Your Organization As medical technology in clinical care becomes more complex, clinical professionals and support staff must know how to keep patients safe and equipment working in the clinical environment. Accessible to all healthcare professionals and managers, Medical Equipment Management presents an integrated approach to managing medical equipment in healthcare organizations. The book explains the underlying principles and requirements and raises awareness of what needs to be done and what questions to ask. It also provides practical advice and refers readers to appropriate legislation and guidelines. Starting from the medical equipment lifecycle, the book takes a risk-based approach to improving the way in which medical devices are acquired and managed in a clinical context. Drawing on their extensive managerial and teaching experiences, the authors explain how organizational structures and policies are set up, how funding is allocated, how people and equipment are supported, and what to do when things go wrong.

Getting the right diagnosis is a key aspect of health care - it provides an explanation of a patient's health problem and informs subsequent health care decisions. The diagnostic process is a complex, collaborative activity that involves clinical reasoning and information gathering to determine a patient's health problem. According to Improving Diagnosis in Health Care, diagnostic errors-inaccurate or delayed diagnoses-persist throughout all settings of care and continue to harm an unacceptable number of patients. It is likely that most people will experience at least one diagnostic error in their lifetime, sometimes with devastating consequences. Diagnostic errors may cause harm to patients by preventing or delaying appropriate treatment, providing unnecessary or harmful treatment, or resulting in psychological or financial repercussions. The committee concluded that improving the diagnostic process is not only possible, but also represents a moral, professional, and public health imperative. Improving Diagnosis in Health Care a continuation of the landmark Institute of Medicine reports To Err Is Human (2000) and Crossing the Quality Chasm (2001) finds that diagnosis-and, in particular, the occurrence of diagnostic errorsߞhas been largely unappreciated in efforts to improve the quality and safety of health care. Without a dedicated focus on improving diagnosis, diagnostic errors will likely worsen as the delivery of health care and the diagnostic process continue to increase in complexity. Just as the diagnostic process is a collaborative activity, improving diagnosis will require collaboration and a widespread commitment to change among health care professionals, health care organizations, patients and their families, researchers, and policy makers. The recommendations of Improving Diagnosis in Health Care contribute to the growing momentum for change in this crucial area of health care quality and safety.

Imagine: You are a hospital Chief Executive Officer, Chief Financial Officer, medical or nursing director, patient safety specialist, quality improvement professional, or a doctor or nurse on the front lines of patient care. Every day you're aware that patients and families should be more engaged in their care so they would fare better both in the hospital and after discharge; their care could be safer and more seamlessly coordinated; patients should be ready for discharge sooner and readmitted less often; your bottom line stronger; your staff more fulfilled. You enter into new payment models such as bundling with an uneasy awareness that your organization is at risk because you don't know what the care you deliver actually costs. Like most healthcare leaders, you are also still searching for a way to deliver care that will help you to achieve the Triple Aim: care that leads to improved clinical outcomes, better patient and family care experiences, and reduced costs. Sound familiar? If so, then it's time to read The Patient Centered Value System: Transforming Healthcare through Co-Design. This book explains how to introduce the Patient Centered Value System in your organization to go from the current state to the ideal. The Patient Centered Value System is a three-part approach to co-designing improvements in healthcare delivery—collaborating with patients, families, and frontline providers to design the ideal state of care after listening to their wants and needs. Central to the Patient Centered Value System is seeing every care experience through the eyes of patients and families. The Patient Centered Value System is a process and performance improvement technique that consists of 1) Shadowing, 2) the Patient and Family-Centered Care Methodology, and 3) Time-Driven Activity-Based Costing. Shadowing is the essential tool in the Patient Centered Value System that helps you to see every care experience from the point of view of patients and families and enables you to calculate the true costs of healthcare over the full cycle of broken and fixed. The Patient Centered Value System is the building of teams to take you from the current state of care delivery to the ideal. Healthcare transformation depends not on individual providers working to fix broken systems, but on teams of providers working together while breaking down silos. The results of using the Patient Centered Value System are patients and families who are actively engaged in their care, which also improves their outcomes; providers who see the care experience from the patient's and family's point of view and co-design care delivery as a result; the tight integration of clinical and financial performance; and the realization of the Triple Aim.

Management Engineering

Data Analytics in Biomedical Engineering and Healthcare

Healthcare Technology Management Systems

Moving Upstream to Improve the Nation's Health

Concepts and Precepts

Opportunities for the Health Care System

Lean Healthcare Systems Engineering for Clinical Environments

The rapid development of new technologies has created a lasting impact in the healthcare sector during the past decades. Due to this influence, potential clinical problems have decreased while the quality of healthcare delivery and overall user friendliness has increased and contributed to cost-effective healthcare systems. Biomedical and Clinical Engineering for Healthcare Advancement is an essential reference source that discusses growth in healthcare applications driven by the adoption of new technologies, as well as the expansion of machine learning algorithms for clinical decision making. It focuses on combining vision, motion, data acquisition, and automated control to accelerate the development of affordable and portable medical devices. Featuring research on topics such as artificial intelligence, drug delivery, and retinal imaging, this book is ideally designed for healthcare professionals, biomedical engineers, biomedical professionals, clinicians, hospital directors, physicians, medical students, and clinical researchers.

Advances in Medical and Surgical Engineering integrates the knowledge and experience of experts from academia and practicing surgeons working with patients. The cutting-edge progress in medical technology applications is making the traditional line between engineering and medical science ever thinner. This is an excellent resource for biomedical engineers working in industry and academia on developing medical technologies. It covers challenges in the application of technology in the clinic with views from an editorial team that is highly experienced in engineering, biomaterials, surgical practice, biomedical science and technology, and that has a proven track record of publishing applied biomedical science and technology. For medical practitioners, this book covers advances in technology in their domain.

For students, this book identifies the opportunities of research based on the reviews of utilization of current technologies. The content in this book can also be of interest to policymakers, research funding agencies, and libraries, that are contributing to development of medical technologies. Covers circulatory support, aortic valve implantation and microvascular antestomosis Explores arthroplasty of both the knee and the shoulder Includes tribology of materials, laser treatment and machining of biomaterial

It has been almost 20 years since the Institute of Medicine released the seminal report titled, Crossing the Quality Chasm. In it, the IoM identified six domains of care quality (safe, timely, effective, efficient, equitable, and patient-centric) and noted a huge gap between the current state and the desired state. Although this report received a great deal of attention, sadly there has been little progress in these areas. In the U.S., healthcare still has huge disparities, is inefficient, and is fragmented with delays in care that are often unsafe. Most U.S. citizens are expected to suffer from a diagnostic error sometime during their lifetime, not receive a large fraction of recommended care, and pay for one of the most expensive systems in the world. Much has been written about quality improvement over the years but many prominent quality and safety experts. Yet progress has been slow. Some have called on the healthcare professions to look outside of healthcare to other industries using examples in nuclear power and airlines for safety, the hotel and entertainment industry for a 'customer' focus, and the automotive industry, particularly Toyota for efficiency (Lean). This book by Dr. Oppenheim on lean healthcare systems engineering (LHSE) is a fresh approach that brings forth concepts that systems engineers have used in huge national defense projects. What's unique in this book is that these powerful system engineering tools are modified to be able to address smaller sized healthcare problems that still involve similar problems in fragmentation and poor communication and coordination. This book is an invaluable reference for a new powerful process named Lean Healthcare Systems Engineering (LHSE) for managing workflow and care improvement projects in all clinical environments. The book applies to ambulatory clinics and hospitals of all types including operating rooms, emergency departments, and ancillary departments, clinical and imaging laboratories, pharmacies, and population health. The book presents a generic rigorous but not mathematical step-by-step process of integrated healthcare, systems engineering and Lean.

The book also contains the first major product created with the LHSE process, namely tabularized summaries of representative projects in healthcare delivery applications, called Lean Enablers for Healthcare Projects. Each full-page enabler table lists the challenges and wastes, current, past, improved goals, and expected benefits, and some useful descriptions of the healthcare system of interest. The book provides user-friendly solutions to major problems in healthcare delivery operations in all clinical environments, addressing fragmentation, staff burnout, lives-at-risk and stove-piped management, lack of optimized processes, hierarchy gradient, lack of systems thinking, "blaming and shaming culture", burnout of providers and many others.

Introduction to Clinical Engineering focuses on the application of engineering practice within the healthcare delivery system, often defined as clinical engineering. Readers will explore the fundamental concepts integral to the support of healthcare technology to advance medical care. The primary mission of clinical engineers is the utilization of medical devices, software, and systems to deliver safe and effective patient care throughout technology's lifecycle. This unique and interdisciplinary workforce is part of the healthcare team and serves as the intersection between engineering and medicine. This book is aimed at practitioners, managers, students, and educators to serve as a resource that offers a broad perspective of the applications of engineering principles, regulatory compliance, lifecycle planning, systems thinking, risk analysis, and resource management in healthcare. This book is an invaluable tool for healthcare technology management (HTM) professionals and can serve as a guide for students to explore the profession in depth. Offers readers an in-depth look into the support and implementation of existing medical technology used for patient care in a clinical setting Provides insights into the clinical engineering profession, focusing on engineering principles as applied to the US healthcare system Explores healthcare technology, hospital and systems safety, information technology and interoperability with medical devices, clinical facilities management, as well as human resource management

Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health was released in September 2019, before the World Health Organization declared COVID-19 a global pandemic in March 2020. Improving social conditions remains critical to improving health outcomes, and integrating social care into health care delivery is more relevant than ever in the context of the pandemic and increased strains placed on the U.S. health care system. The report and its related products ultimately aim to help improve health and health equity, during COVID-19 and beyond. The consistent and compelling evidence on how social determinants shape health has led to a growing recognition throughout the health care sector that improving health and health equity is likely to depend Éc; at least in part Éd; on mitigating adverse social determinants. This recognition has been bolstered by a shift in the health care sector towards value-based payment, which incentivizes improved health outcomes for persons and populations rather than service delivery alone. The combined result of these changes has been a growing emphasis on health care systems addressing patients' social risk factors and social needs with the aim of improving health outcomes. This may involve health care systems linking individual patients with government and community social services, but important questions need to be answered about when and how health care systems should integrate social care into their practices and what kinds of infrastructure are required to facilitate such activities. Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health examines the potential for integrating services addressing social needs and the social determinants of health into the delivery of health care to achieve better health outcomes. This report assesses approaches to social care integration currently being taken by health care providers and systems, and new or emerging approaches and opportunities; current roles in such integration by different disciplines and organizations, and new or emerging roles and types of providers; and current and emerging efforts to design health care systems to improve the nation's health and reduce health inequities.

The Use of Operations Management Methodology for Quantitative Decision-Making in Healthcare Settings

A New Engineering/Health Care Partnership

Healthcare Systems Engineering

The Patient Centered Value System

Improving Health Care Worldwide

Engineering a Learning Healthcare System

Social Isolation and Loneliness in Older Adults

Healthcare Technology Management Systems provides a model for implementing an effective healthcare technology management (HTM) system in hospitals and healthcare provider settings, as well as promoting a new analysis of hospital organization for decision-making regarding technology. Despite healthcare complexity and challenges, current models of management and organization of technology in hospitals still has evolved over those decades ago. The book offers the real prospect of personalized health care, we will be confronted by an increasingly complex array of health care options and decisions. The Learning Healthcare System considers how health care is structured to develop and to apply evidence from health profession training and infrastructure development to advances in research methodology, patient engagement, payment schemes, and measurement and highlights opportunities for the creation of sustainable learning health care system that gets it right care to people when they need it and then captures the results for improvement. This book will be of primary interest to hospital and insurance industry administrators, health care providers, those who train and educate health workers, researchers, and policymakers. The Learning Healthcare System is the first in a series that will focus on issues important to improving the development and application of evidence in health care decision making. The Roundtable on Evidence-Based Medicine serves as a neutral venue for cooperative work among key stakeholders on several dimensions: to help transform the availability and use of the best evidence for the collaborative health care choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and, ultimately, to ensure innovation, quality, safety, and value in health care.

Handbook of Computational Intelligence in Biomedical Engineering and Healthcare helps readers analyze and conduct advanced research in specially healthcare applications surrounding oncology, genomics and genetic data, ontologies construction, bio-memetic systems, biomedical electronics, protein structure prediction, and biomedical data analysis. The book provides the reader with a comprehensive guide to advanced computational intelligence, spanning deep learning, fuzzy logic, connectionist systems, evolutionary computation, cellular automata, self-organizing systems, soft computing, and hybrid intelligent systems in biomedical and healthcare applications. Sections focus on important biomedical engineering applications, including biosensors, enzyme immobilization techniques, immuno-assays, and nanomaterials for biosensors and other biomedical techniques.

Other sections cover gene-based solutions and applications through computational intelligence techniques and the impact of nonlinear/structured data on experimental analysis. Presents a comprehensive handbook that covers an Introduction to Computational Intelligence in Biomedical Engineering and Healthcare, Computational Intelligence Techniques, and Advanced and Emerging Techniques in Computational Intelligence Helps readers analyze and do advanced research in specially healthcare applications Includes links to websites, videos, articles and other online content to expand and support primary learning objectives

Engineering Solutions to America's Healthcare Challenges covers the technologies, systems, and processes that are emerging in hospitals, clinics, community centers, universities, and the White House to help repair healthcare in the United States. Focusing on the importance of individuals being proactive about their own state of health, it presents a systems approach to changing the way healthcare professionals do business and take care of their patients. Written by a leading government and private sector consultant with more than a decade of experience as an industrial engineer, the book features interviews with leading industry experts, both domestic and international. Describing how industrial engineering practices are shaping healthcare, it explains why systems thinking must be the foundation for every aspect of healthcare. The book presents proven Lean and Six Sigma tools that can help any healthcare organization begin making operational improvements that result in a better quality of care for patients—all while reducing and even eliminating the waste of time, money, and human resources. These solutions include implementing Six Sigma in emergency rooms, SS in accounting for medical inventory, using Theory of Constraints to form a plan for shortening the length of stay in hospitals, how informatics are

being used currently in patient care, and also offers examples of the Institute of Medicine's six aims for healthcare: safety, effectiveness, efficiency, timeliness, family-centered focus, and equity.

A new approach to safety, based on systems thinking, that is more effective, less costly, and easier to use than current techniques. Engineering has experienced a technological revolution, but the basic engineering techniques applied in safety and reliability engineering, created in a simpler, analog world, have changed very little over the years. In this groundbreaking book, Nancy Leveson proposes a new approach to safety—more suited to today's complex, sociotechnical, software-intensive world—based on modern systems thinking and systems theory. Revisiting and updating ideas pioneered by 1950s aerospace engineers in their System Safety concept, and testing her new model extensively on real-world examples, Leveson has created a new approach to safety that is more effective, less expensive, and easier to use than current techniques. Arguing that traditional models of causality are inadequate, Leveson presents a new, extended model of causation (Systems-Theoretic Accident Model and Processes, or STAMP), then shows how the new model can be used to create techniques for system safety engineering, including accident analysis, hazard analysis, system design, safety in operations, and management of safety-critical systems. She explains the new techniques to real-world events including the friendly-fire loss of a U.S. Blackhawk helicopter in the first Gulf War; the Vioxx recall; the U.S. Navy SUBSAFE program; and the bacterial contamination of a public water supply in a Canadian town. Leveson's approach is relevant even beyond safety engineering, offering techniques for "reengineering" any large sociotechnical system to improve safety and manage risk.

Healthcare Management Engineering: What Does This Fancy Term Really Mean? A Guide to Best Practices for Industrial Engineering in Health Care Handbook of Computational Intelligence in Biomedical Engineering and Healthcare Engineering Solutions to America's Healthcare Challenges Principles and Applications Holistic Life Cycle Architecture Modeling and Design with Real-World Applications Systems Engineering

Healthcare Systems EngineeringHCSE, Florence, Italy, May 2017Springer

Clinical Systems Engineering: New Challenges for Future Healthcare covers the critical issues relating to the risk management and design of new technologies in the healthcare sector. It is a comprehensive summary of the advances in clinical engineering over the past 40 years, presenting guidance on compliance and safety for hospitals and engineering teams. This contributed book contains chapters from international experts, who provide their solutions, supported with case studies, and global perspectives is maintained throughout. This book is ideal for clinical engineers, biomedical engineers, hospital administrators and medical technology manufacturers. Presents clinical systems engineering in a way that will help users answer many questions relating to clinical systems engineering and its relationship to future healthcare needs. Explains how to assess new healthcare technologies and what are the most critical issues in their management Provides information on how to carry out risk analysis for new technological systems or medical software Contains cases on how to improve the quality and usability of medical devices.

As the United States continues to debate reform of its healthcare system, this book argues that providing health insurance for all without improving the delivery system will not improve the current problems of access, affordability, and quality. The US healthcare system has many excellent components: strong scientific input, extraordinary technology for diagnosis and treatment, dedicated staff and top-class facilities among them. But the system has evolved haphazardly over time and although it has not failed entirely, the authors argue that like any system where attention is, paid to individual components at the expense of the system as a whole, it can never hope to succeed. Above all, they point out that the US system does not provide high value healthcare; it has the highest costs in the world and yet many other countries have lower infant mortality rates and better life expectancy. Together with a team of highly regarded thought leaders, the authors of this publication advocate a complete re-thinking of healthcare from a systems perspective - an engineering approach to healthcare-and they then describe how to set about it. Covering a wide range of subjects including: health care costs and economics, barriers to change, integrated health systems, electronic records and computer-based patient support as well as patient safety and palliative and chronic care, this book will be of interest to all those involved in healthcare provision whose goal is affordable care to promote healthy, high quality lives.

An argument that understanding healthcare delivery as a complex adaptive system will help us design a system that yields better health outcomes. Breakthroughs in medical science, innovations in medical technologies, and improvements in clinical practices occur today at an increasingly rapid rate. Yet because of a fragmented healthcare delivery system, many Americans are unable to benefit from these developments. How can we design a system that can provide high-quality, affordable healthcare for everyone? In this book, William Rouse and Nicolaeta Serban introduce concepts, principles, models, and methods for understanding, and improving, healthcare delivery. Approaching the topic from the perspectives of engineering and statistics, they argue that understanding healthcare delivery as a complex adaptive system will help us design a system that is more efficient, effective, and equitable. The authors use multilevel simulation models as a quantitative tool for evaluating alternate ways of organizing healthcare delivery. They employ this approach, for example, in their discussions of affordability, a prevention and wellness program, chronic disease management, and primary care accessibility for children in the Medicaid program. They also consider possible benefits from a range of technologies, including electronic health records and established data mining with expert ease. Progress on the topics in a step-by-step manner and reinforces theory with a full-fledged pedagogy designed to enhance students' understanding and offer them a practical insight into the applications of it. Features chapters that introduce and cover novel ideas in healthcare engineering like Applied Microbots and Nanobots in Healthcare Practices, Intelligent Walker for Posture Monitoring, AI-Powered Robots and Hybrid Intelligent Systems for Medical Diagnosis and so on. Deepak Gupta is an Assistant Professor at the Maharaja Agrasen Institute of Technology, GGSIPU, Delhi, India. Moolchand Sharma is an Assistant Pr

Advances in Medical and Surgical Engineering Improving Diagnosis in Health Care Resilience Engineering Meeting Human Needs in a Complex Technological World To Err Is Human Systems Thinking Applied to Safety Unequal Treatment:

This book provides a guide for systems engineering modeling and design. It focuses on the design life cycle with tools and application-based examples of how to design a system, focusing on incorporating systems principles and tools to ensure system integration. It provides product-based and service system examples to understand the m system. The first section explains systems principles, models, and architecture for systems engineering, lifecycle models, and the systems architecture. Further sections explain systems design, development, and deployment life cycle with applications and tools and advanced systems engineering topics. Features: Focuses on model-based system design models. Uses real-world examples to corroborate different and disparate systems engineering activities. Describes and applies the Vee systems engineering design methodology, with cohesive examples and applications of designing systems. Discusses culture change and the skills people need to design and integrate systems. Shows throughout the systems engineering life cycle. This book is aimed at graduate students and researchers in systems engineering, modeling and simulation, any major engineering discipline, industrial engineering, and technology.

Apply engineering and design principles to revitalize the healthcare delivery system Healthcare Systems Engineering is the first engineering book to cover this emerging field, offering comprehensive coverage of the healthcare system, healthcare delivery, and healthcare systems modeling. Written by leading industrial engineering authorities, this book provides a well-rounded resource for readers of a variety of backgrounds. Examples, case studies, and thoughtful learning activities are used to thoroughly explain the concepts presented, including healthcare systems, delivery, quantification, and design. You'll learn how to approach the healthcare industry as a complex system, and to advance improvements. Written with an eye toward practicality, this book is designed to maximize your understanding and help you quickly apply toward solutions for a variety of healthcare challenges. Healthcare systems engineering is a new and complex interdisciplinary field that has emerged to address the myriad challenges facing t as both an Introduction and a reference, giving you the knowledge you need to move toward better healthcare delivery. Understand the healthcare delivery context Use appropriate statistical and quantitative models Improve existing systems and design new ones Apply systems engineering to a variety of healthcare contexts Healthcare sys

technologies in healthcare-based Internet of Things

Design Approach, Feature Construction, Fault Diagnosis, Prognosis, Fusion and Decisions

Crossing the Global Quality Chasm

Engineering and Technology for Healthcare

Confronting Racial and Ethnic Disparities in Health Care (with CD)

Biomedical and Clinical Engineering for Healthcare Advancement

Introduction to Clinical Engineering

Analysis of Medical Modalities for Improved Diagnosis in Modern Healthcare

This book constitutes the thoroughly refereed post-conference proceedings of the Third International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2010, held in Valencia, Spain, in January 2010. The 30 revised full papers presented together with 1 invited lecture were carefully reviewed and selected from in two rounds of reviewing and improvement. The papers cover a wide range of topics and are organized in four general topical sections on healthinf, biodevices, biosignals, and bioinformatics.

Data Analytics in Biomedical Engineering and Healthcare explores key applications using data analytics, machine learning, and deep learning in healthfiness and biomedical data. The book is useful for those working with big data analytics in biomedical research, medical industries, and medical research scientists. The book covers health an machine and deep learning applications for biomedical data, covering areas such as predictive health analysis, electronic health records, medical image analysis, computational drug discovery, and genome structure prediction using predictive modeling. Case studies demonstrate big data applications in healthcare using the MapReduce and Hadoop. Examines the development and application of data analytics applications in biomedical data Presents innovative classification and regression models for predicting various diseases Discusses genome structure prediction using predictive modeling Shows readers how to develop clinical decision support systems Shows researchers and specialists learning for better medical diagnosis, including case studies of healthcare applications using the MapReduce and Hadoop frameworks

This Brief's Series book illustrates in depth a concept of healthcare management engineering and its domain for hospital and clinic operations. Predictive and analytic decision-making power of management engineering methodology is systematically compared to traditional management reasoning by applying both side by side to analyze 26 c management problems adapted from hospital and clinic practice. The problem types include: clinic, bed and operating rooms capacity; patient flow; staffing and scheduling; resource allocation and optimization; forecasting of patient volumes and seasonal variability; business intelligence and data mining; and game theory application for allocation of cooperating providers. Detailed examples of applications are provided for quantitative methods such as discrete event simulation, queuing analytic theory, linear and probabilistic optimization, forecasting of a time series, principal component decomposition of a data set and cluster analysis, and the Shapley value for fair gain sharing between summary of some fundamental management engineering principles is provided. The goal of the book is to help to bridge the gap in mutual understanding and communication between management engineering professionals and hospital and clinic administrators. The book is intended primarily for hospital/clinic leadership who are in charge of decisions. This book can also serve as a compendium of introductory problems/projects for graduate students in Healthcare Management and Administration, as well as for MBA programs with an emphasis in Healthcare.

Properly performing health care systems require concepts and methods that match their complexity. Resilience engineering provides that capability. It focuses on a system's overall ability to sustain required operations under both expected and unexpected conditions rather than on individual features or qualities. This book contains contributions by experts in health care, organisational studies and patient safety, as well as resilience engineering. Whereas current safety approaches primarily aim to reduce the number of things that go wrong, Resilient Health Care aims to increase the number of things that go right.

New prospects for biomedical and healthcare engineering are being created by the rapid development of Robotic and Artificial Intelligence techniques. Innovative technologies such as Artificial Intelligence, Deep Learning, Robotics, and IoT are currently under huge influence in today's modern world. For instance, a micro-nano robot allows us to problems at a cellular scale owing to its precise positioning and manipulation ability; the medical robot paves a new way for the low-invasive and high-efficient clinical operation, and rehabilitation robotics is able to improve the rehabilitative efficacy of patients. This book aims at exhibiting the latest research achievements, findings, and ideas in biomedical and healthcare engineering, primarily focusing on the walking assistive robot, telerobotic surgery, upper/lower limb rehabilitation, and radiography. As a result, a wide range of robots are being developed to serve a variety of roles within the medical environment. Robots specializing in human treatment include surgical robots and of assistive and therapeutic robotic devices is also expanding rapidly. These include robots that help patients rehabilitate from severe conditions like strokes, empathic robots that assist in the care of older or physically/mentally challenged individuals, and industrial robots that take on a variety of routine tasks, such as sterilizing rooms and equipment, including medications. The objectives of the book are in terms of advancing the state-of-the-art of robotic techniques and addressing the challenging problems in biomedical and healthcare engineering. This book lays a good foundation for the core concepts and principles of robotics in biomedical and healthcare engineering, with established and new insights with expert ease. Progress on the topics in a step-by-step manner and reinforces theory with a full-fledged pedagogy designed to enhance students' understanding and offer them a practical insight into the applications of it. Features chapters that introduce and cover novel ideas in healthcare engineering like Applied Microbots and Nanobots in Healthcare Practices, Intelligent Walker for Posture Monitoring, AI-Powered Robots and Hybrid Intelligent Systems for Medical Diagnosis and so on. Deepak Gupta is an Assistant Professor at the Maharaja Agrasen Institute of Technology, GGSIPU, Delhi, India. Moolchand Sharma is an Assistant Pr

Advances in Medical and Surgical Engineering Improving Diagnosis in Health Care Resilience Engineering Meeting Human Needs in a Complex Technological World To Err Is Human Systems Thinking Applied to Safety Unequal Treatment:

This book provides a guide for systems engineering modeling and design. It focuses on the design life cycle with tools and application-based examples of how to design a system, focusing on incorporating systems principles and tools to ensure system integration. It provides product-based and service system examples to understand the m system. The first section explains systems principles, models, and architecture for systems engineering, lifecycle models, and the systems architecture. Further sections explain systems design, development, and deployment life cycle with applications and tools and advanced systems engineering topics. Features: Focuses on model-based system design models. Uses real-world examples to corroborate different and disparate systems engineering activities. Describes and applies the Vee systems engineering design methodology, with cohesive examples and applications of designing systems. Discusses culture change and the skills people need to design and integrate systems. Shows throughout the systems engineering life cycle. This book is aimed at graduate students and researchers in systems engineering, modeling and simulation, any major engineering discipline, industrial engineering, and technology.

Apply engineering and design principles to revitalize the healthcare delivery system Healthcare Systems Engineering is the first engineering book to cover this emerging field, offering comprehensive coverage of the healthcare system, healthcare delivery, and healthcare systems modeling. Written by leading industrial engineering authorities, this book provides a well-rounded resource for readers of a variety of backgrounds. Examples, case studies, and thoughtful learning activities are used to thoroughly explain the concepts presented, including healthcare systems, delivery, quantification, and design. You'll learn how to approach the healthcare industry as a complex system, and to advance improvements. Written with an eye toward practicality, this book is designed to maximize your understanding and help you quickly apply toward solutions for a variety of healthcare challenges. Healthcare systems engineering is a new and complex interdisciplinary field that has emerged to address the myriad challenges facing t as both an Introduction and a reference, giving you the knowledge you need to move toward better healthcare delivery. Understand the healthcare delivery context Use appropriate statistical and quantitative models Improve existing systems and design new ones Apply systems engineering to a variety of healthcare contexts Healthcare sys

research, and management science, uniting the principles and practices of these fields together in pursuit of optimal healthcare operations. Although collaboration is focused on practitioners, professionals in information technology, policy and administration, public health, and law all play crucial roles in revamping health care systems. Health reference for stakeholders in any field.

In 2015, building on the advances of the Millennium Development Goals, the United Nations adopted Sustainable Development Goals that include an explicit commitment to achieve universal health coverage by 2030. However, enormous gaps remain between what is achievable in human health and where global health stands today, and progress to meet this goal, a deliberate and comprehensive effort is needed to improve the quality of health care services globally. Crossing the Global Quality Chasm: Improving Health Care Worldwide focuses on one particular shortfall in health care affecting global populations: defects in the quality of care. This study reviews the available evidence and makes recommendations to improve health care quality globally while expanding access to preventive and therapeutic services, with a focus in low-resource areas. Crossing the Global Quality Chasm emphasizes the organization and delivery of safe and effective care at the patient/provider interface. This study explores issues of access to services and the impact of technology on health care delivery. Focusing on front line service delivery that can directly impact health outcomes for individuals and populations, this book will be an essential guide for key stakeholders, governments, donors, health systems, and others involved in health care.

Improving our nation's healthcare system is a challenge which, because of its scale and complexity, requires a creative approach and input from many different fields of expertise. Lessons from engineering have the potential to improve both the efficiency and quality of healthcare delivery. The fundamental notion of a high-performing health system is efficient, safer, and higher quality--is rooted in continuous improvement principles that medicine shares with engineering. As part of its Learning Health System series of workshops, the Institute of Medicine's Roundtable on Value and Science-Driven Health Care and the National Academy of Engineering, hosted a workshop on lessons from engineering for health care. Building on previous work done in this area the workshop convened leading engineering practitioners, health professionals, and scholars to explore how the field might learn from and apply systems engineering principles in the design of a learning healthcare system. Engineering a Learning Healthcare System: A Look at the Future of Health Care system challenges and what the field of engineering has to offer in the redesign of the system toward a learning healthcare system.

This book provides applications of machine learning in healthcare systems and seeks to close the gap between engineering and medicine. It will combine the design and problem-solving skills of engineering with health sciences, in order to advance healthcare treatment. The book will include areas such as diagnosis, monitoring, and therapy. The book also explores the application of machine learning to the design of healthcare systems, offers multiple perspectives on a variety of disciplines, while also letting the reader know how to avoid some of the consequences of old methods with data sharing. The book can be used as a reference for practitioners, researchers and for students at basic and intermediary levels in Computer Science, Engineering, and Health Care.

The Learning Healthcare System

Third International Joint Conference, BIOSTEC 2010, Valencia, Spain, January 20-23, 2010, Revised Selected Papers

Medical Equipment Management

Healthcare Paradigms in the Internet of Things Ecosystem

Clinical Engineering Handbook

Understanding and Managing the Complexity of Healthcare

Data-Driven Technology for Engineering Systems Health Management

Social isolation and loneliness are serious yet underappreciated public health risks that affect a significant portion of the older adult population. Approximately one-quarter of community-dwelling Americans aged 65 and older are considered to be socially isolated, and a significant proportion of adults in the United States report feeling lonely. People who are 50 years of age or older are more likely to experience many of the risk factors that can cause or exacerbate social isolation or loneliness, such as living alone, the loss of family or friends, chronic illness, and sensory impairments. Over a life course, social isolation and loneliness may be episodic or chronic, depending upon an individual's circumstances and perceptions. A substantial body of evidence demonstrates that social isolation presents a major risk for premature mortality, comparable to other risk factors such as high blood pressure, smoking, or obesity. As older adults are particularly high-volume and high-frequency users of the health care system, there is an opportunity for health care professionals to identify, prevent, and mitigate the adverse health impacts of social isolation and loneliness in older adults. Social Isolation and Loneliness in Older Adults summarizes the evidence base and explores how social isolation and loneliness affect health and quality of life in adults aged 50 and older, particularly among low income, underserved, and vulnerable populations. This report makes recommendations specifically for clinical settings of health care to identify those who suffer the resultant negative health impacts of social isolation and loneliness and target interventions to improve their social conditions. Social Isolation and Loneliness in Older Adults considers clinical tools and methodologies, better education and training for the health care workforce, and dissemination and implementation that will be important for translating research into practice, especially as the evidence base for effective interventions continues to flourish.

Clinical Engineering Handbook, Second Edition, covers modern clinical engineering topics, giving experienced professionals the necessary skills and knowledge for this fast-evolving field. Featuring insights from leading international experts, this book presents traditional practices, such as healthcare technology management, medical device service, and technology application. In addition, readers will find valuable information on the newest research and groundbreaking developments in clinical engineering, such as health technology assessment, disaster preparedness, decision support systems, mobile medicine, and prospects and guidelines on the future of clinical engineering. As the biomedical engineering field expands throughout the world, clinical engineers play an increasingly important role as translators between the medical, engineering and business professions. In addition, they influence procedures and policies at research facilities, universities, and in private and government agencies. This book explores their current and continuing reach and its importance. Presents a definitive, comprehensive, and up-to-date resource on clinical engineering Written by worldwide experts with ties to IMBE, IUPESM, Global CE Advisory Board, IEEE, ACCÉ, and more Includes coverage of new topics, such as Health Technology Assessment (HTA), Decision Support Systems (DSS), Mobile Apps, Success Stories in Clinical Engineering, and Human Factors Engineering

Innovation in healthcare is currently a "hot" topic. Innovation allows us to think differently, to take risks and to develop ideas that are far better than existing solutions. Currently, there is no single book that covers all topics related to microelectronics, sensors, data, system integration and healthcare technology assessment in one reference. This book aims to critically evaluate current state-of-the-art technologies and provide readers with insights into developing new solutions. With contributions from a fully international team of experts across electrical engineering and biomedical fields, the book discusses how advances in sensing technology, computer science, communications systems and proteomics/genomics are influencing healthcare technology today.

In a joint effort between the National Academy of Engineering and the Institute of Medicine, this books attempts to bridge the knowledge/awareness divide separating health care professionals from their potential partners in systems engineering and related disciplines. The goal of this partnership is to transform the U.S. health care sector from an underperforming conglomerate of independent entities (individual practitioners, small group practices, clinics, hospitals, pharmacies, community health centers et. al.) into a high performance "system" in which every participating unit recognizes its dependence and influence on every other unit. By providing both a framework and action plan for a systems approach to health care delivery based on a partnership between engineers and health care professionals, Building a Better Delivery System describes opportunities and challenges to harness the power of systems-engineering tools, information technologies and complementary knowledge in social sciences, cognitive sciences and business/management to advance the U.S. health care system.

In modern healthcare, various medical modalities play an important role in improving the diagnostic performance in healthcare systems for various applications, such as prosthesis design, surgical implant design, diagnosis and prognosis, and detection of abnormalities in the treatment of various diseases. Analysis of Medical Modalities for Improved Diagnosis in Modern Healthcare discusses the uses of analysis, modeling, and manipulation of modalities, such as EEG, ECG, EMG, PCG, EOG, MRI, and fMRI, for an automatic identification, classification, and diagnosis of different types of disorders and physiological states. The analysis and applications for post-processing and diagnosis are much-needed topics for researchers and faculty members all across the world in the field of automated and efficient diagnosis using medical modalities. To meet this need, this book emphasizes real-time challenges in medical modalities for a variety of applications for analysis, classification, identification, and diagnostic processes of healthcare systems. Each chapter starts with the introduction, need and motivation of the medical modality, and a number of applications for the identification and improvement of healthcare systems. The chapters can be read independently or consecutively by research scholars, graduate students, faculty members, and practicing scientists who wish to explore various disciplines of healthcare systems, such as computer sciences, medical sciences, and biomedical engineering. This book aims to improve the direction of future research and strengthen research efforts of healthcare systems through analysis of behavior, concepts, principles, and case studies. This book also aims to overcome the gap between usage of medical modalities and healthcare systems. Several novel applications of medical modalities have been unlocked in recent years, therefore new applications, challenges, and solutions for healthcare systems are the focus of this book.

Engineering the System of Healthcare Delivery

A Look at the Future: Workshop Summary

Robotic Technologies in Biomedical and Healthcare Engineering

Health Care Systems Engineering

A Step-By-Step Process for Managing Workflow and Care Improvement Projects

Towards a New Organizational Model for Health Services

Building a Safer Health System

For Resilience Engineering, 'failure' is the result of the adaptations necessary to cope with the complexity of the real world, rather than a breakdown or malfunction. The performance of individuals and organizations must continually adjust to current conditions and, because resources and time are finite, such adjustments are always approximate.

This definitive new book explores this groundbreaking new development in safety and risk management, where 'success' is based on the ability of organizations, groups and individuals to anticipate the changing shape of risk before failures and harm occur. Featuring contributions from many of the world's leading figures in the fields of human factors and safety, Resilience Engineering provides thought-provoking insights into system safety as an aggregate of its various components, subsystems, software, organizations, human behaviours, and the way in which they interact. The book provides an introduction to Resilience Engineering of systems, covering both the theoretical and practical aspects. It is written for those responsible for system safety on managerial or operational levels alike, including safety managers and engineers (line and maintenance), security experts, risk and safety consultants, human factors professionals and accident investigators.

Transforming Healthcare through Co-Design

Building a Better Delivery System

Clinical Engineering

Integrating Social Care into the Delivery of Health Care

Engineering Systems

Biomedical Engineering Systems and Technologies

Crossing the Quality Chasm