A systematic collection of glimpses related to future healthcare, reveals at least two trends. One trend embodies increased uses of nanotechnology, individualized drugs, cell-based computing and microchip-enhanced brains. The other one relates to emerging e-health care provision services, like telemedicine. Notwithstanding the previously mentioned prospects, both healthcare professionals and patients remain increasingly dissatisfied as a result of unclear expectations and fundamentally different views with respect to the content of quality in healthcare and the reliability of systems and services. On the other hand, quality and reliability are thought to be measurable at least in specific domains. Thus, our knowledge on the subject could be compared with a fleeting glance. New ways of thinking should evolve based on what we actually know and those we do not understand. The safest way to achieve it is related with the juxtaposition of criticism and the existing body of knowledge. Thus, unilateral approaches, for example dealing only with continuous quality improvement or reliability assurance, do not work. Instead, a comprehensive analysis of the e-health and quality interaction should be applied.

In this context, we should mention that there are essentially three cumulative levels of quality, which include conformance quality, requirements quality, and quality of kind. However, the meaning of quality is constantly evolving. As a result, there are definitions, which describe the dimensions of access, choice, information, satisfaction, health improvement and continuity of care. Notwithstanding the abundance of definitions, the most prominent ones were put forward by Avedis Donabedian and the Institute of Medicine (IOM). Donabedian defined quality as ‘the ability to achieve desirable objectives using legitimate means’, and quality of care as ‘that kind of care which is expected to maximize an inclusive measure of patient welfare, after one has taken account of the balance of expected gains and losses that attend the process of care in all its parts’. He also argued that we have to decide whether to enter monetary cost in the definition of quality, distinguishing between a ‘maximalist’ and an ‘optimalist’ statement of quality. The maximalist statement ignores monetary costs and defines the highest quality as the ‘degree that can be expected to reach the greatest improvement in health’. In contrast, the optimalist statement of quality recommends avoiding expensive interventions that do not achieve a substantial improvement in health.

The Institute of Medicine, defined quality as ‘the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge’. The definition covers the dimensions of safety, equity, respect, patient centeredness, continuity, effectiveness, efficiency and timeliness. It is crucial to note that the focus narrows to the goal of improving health outcomes focusing from patients to individuals and populations. It also adds ‘desired outcomes’ to the definition so as to highlight the need to assess the perspective of the recipients of services, and ‘consistent with current professional knowledge’, which implies that we have to define the standards of the service.
Patient safety is increasingly being seen as an absolute path to quality. As a consequence, the patient safety debate is parallel to the established quality of health care initiatives. It is, therefore, essential to reiterate patient safety as a quality dimension. Safety refers to the reduction of risk and forms a key component of quality. According to the IOM, patient safety is ‘freedom from accidental injury due to medical care, or medical errors’, with medical error being defined as ‘the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim…[including] problems in practice, products, procedures, and systems’.

At the same time, patients seek more information about their condition and require an active role in the healthcare process. It is also increasingly likely to express their dissatisfaction if the quality of service does not meet their expectations. Therefore, patient empowerment is increasingly being seen as a vital component of a modern patient-centered health system. A patient-centered approach is defined by the Picker Institute Europe as:

- informing and involving patients, eliciting and respecting their preferences
- responding quickly, effectively and safely to patients’ needs and wishes
- ensuring that patients are treated in a dignified and supportive manner
- delivering well coordinated and integrated care

There is evidence that patient-centered approaches increase patient and doctor satisfaction, reduce anxiety, and improve the quality of life. There also seems to be some evidence that patient-centered care is more efficient. Strengthening patient empowerment means that patients play a more active role in partnership with health professionals. This will help patients to benefit more from their healthcare and support professionals to better understand their patients.

Finally, systematic improvement of the quality of care is only possible when we educate physicians with the attitudes, knowledge and skills needed for continuous quality improvement. Unfortunately, we pay remarkably little attention to medical curricula and there are few exemplary teaching programs in this field.

On the other hand, there is a growing proportion of people aged 65 and over, and of people over 80 years old, which has dramatic consequences on health systems. Elderly people tend to use more health services as they are more prone to illness, and suffer from multiple conditions. As a result, we need new technologies, which improve disease prevention, shift healthcare from hospitals to primary care, and use electronic interactive tools for capturing and using patient feedback on the healthcare.

Unfortunately, the current strategy of many healthcare systems around the world is unsustainable. The efforts of healthcare professionals and the value of genomics, regenerative medicine, and information-based medicine cannot counteract the effect of globalization, consumerism, and demographic shifts. Therefore, health systems have to face a radical restructuring based on balancing different opinions of ‘good value’, consumer responsibility for personal health management, and an overall shift in the nature, mode, and means of care delivery.

E-health is an emerging field in the intersection of medical informatics, public health and business, referring to new electronic technologies, web-based transactions and advanced networks, and implies fundamental rethinking of healthcare processes based on electronic communication and computer based support. Currently, most e-health policies reflect technology driven decisions, focus on prescriptions, booking, diagnostic reports, and discharge summaries, while in the future will support clinical pathways, governance, and patient empowerment. E-health approach is mostly technology-centered, product-based
innovation and driven by the opportunities. Consequently, the health system is capable to cope with limited organizational problems.

There are two basic definitions of reliability in the literature. The first relates to the probability that the system performs its functions in a specified time limit while the second relates with the ‘reliability on demand’, that is, the probability that the system, when invoked, successfully completes its mission. We could also define it as the probability that the software does not produce any system failure. The procedure involves the application of statistical distributions, like the exponential, gamma, Weibull, binomial, Poisson, normal, log normal, Bayes, and Markov distributions, on the previous failure data in order to predict the intended behavior of a system. The application of the previously mentioned distributions to the data of system failure avails the fitting of processes, which are based on maximum likelihood or least squares estimates. The effectiveness of the model involves chi-square or goodness-of-fit measures. Finally, we understand software reliability through the introduction of the fault, error, and failure hypothesis. Fault is a false statement in the software, and error an unexpected state of the system. An error might occur when an internal variable assumes an unexpected value. Finally, a failure relates to an error, which circulates up to the system output. It occurs, for example, when an output variable assumes an unexpected value.

‘E-Health Systems Quality and Reliability: Models and Standards’ addresses the reason, principles and functionality of health and health care systems and presents a novel framework for revealing, understanding and implementing appropriate management interventions leading to qualitative improvement. It also provides evidence on the quality and reliability of telemedicine and reviews standards and guidelines for practicing medicine at a distance. Finally, it presents an evaluation framework for e-health communities, analyzes e-health applications in e3Health, and exemplifies patient safety, and education in e-health.

As a result, it supports students understand the effect of new technologies on health systems, helps healthcare professionals better understand their patients, acts as an assistant for patients to derive more benefits from their healthcare, and encourages e-health systems designers and managers to ground everyday practice on quality principles.

In chapter 1, Aleš Bourek addresses the logic, principles and functionality of health and health care systems to present a framework for revealing, understanding and implementing appropriate and adequate management interventions leading to qualitative improvement in the specified areas. Medicine (healthcare) was traditionally considered an ‘art’. However, it slowly, with the establishment of analytical methods of work, became ‘science’ and today it is usually classified as a ‘service’. Therefore, profound understanding of what medicine truly is (art or science or service or a combination of these) is crucial for all processes leading to the improvement of quality of health care. However, any discipline, function or process of healthcare and health domains that requires information handling currently unattainable via the ‘digital data flow’ lies for the moment outside of the e-health and e-healthcare scope.

In chapter 2, Jana Zvárová and Ing. Karel Zvára describe how the scheme proposed by J.H. van Bemmel in 1984 can be used for classification of e-health applications. Apart from the electronic component of e-health applications, they consider two other features connected with health economics and environmental health. An excellent example of such a robust model is the Health Level 7 Reference information model (RIM, ISO/HL7 21731:2006). Finally, they argue that using the latest medical knowledge creates two novel families of e-health decision-support applications.

In chapter 3, Paola Di Giacomo states that e-health is a priority of the European i2010 initiative. She concludes that the attention towards electromechanical systems means the realization of tools of small dimensions, which have considerable advantages and greater diagnostic-therapeutic effectiveness. Therefore, an economic analysis has to take into consideration the use of biomedical technology, the
study of alternatives, the choice of the economic evaluation method, and the identification and quantification of the costs and benefits.

In chapter 4, Susana Lorenzo, Gilberto Llinas, Jose J. Mira, and Emilio Ignacio probe into the impact of the Internet on some aspects of patient-centeredness. They write in support of the patient as a prudent actor who rationally decides where to go and what to do. However, they are prompt in stating that many patients are not familiar with the exact definition of e-health, and the terms associated with e-health. Nevertheless, patients might get a first opinion from the Internet. Therefore, websites should meet reliability and comprehensiveness requirements.

In chapter 5, Anastasius Moumtzoglou elucidates that people-centered health care represents a structural change in thinking, which encapsulates before anything else the consideration of the patient. The development of people-centered care might include a partnership approach based on equal footing, capacity-building and the expansion of organizational care. Its core values encompass empowerment, participation, family, community, and the elimination of any form of discrimination. As a result, they bestow people on shared decision-making not exclusively on issues of treatment but also for health care organization. On the other hand, a global e-health agreement is beginning to take shape on the involvement of stakeholders, the interoperability, and standards. Consequently, e-health can have a remarkable impact on people-centered care, despite the challenges of implementation and adoption.

In chapter 6, Stavros Archondakis, Aliki Stathopoulou, and Ioannis Sitaras analyze the guidelines concerning the use of laboratory information systems for medical records storage and retrieval. They affirm that post-examination procedures, such as authorization for release, reporting, and transmission of the results have a dramatic impact on laboratory quality improvement. Finally, they reveal their conclusion that cooperation between laboratory and hospital information system will be improved by the implementation of specific procedures concerning data replacement, recovery and updating.

In chapter 7, V.G. Stamatopoulos, G.E. Karagiannis, and B.R.M. Manning outline an approach which focuses on establishing and then using existing end-to-end care process pathways as early benchmarks against which to assess the effects of changes in clinical practice in response to new clinical knowledge inputs. The primary focus of this approach is to provide a practical means of validating improvement in best practice processes and performance standards as the basis of exemplary clinical governance. It also seeks to identify potential risks of adverse events and provide the basis for preventive measures. Finally, they argue that a pathway-linked knowledge service approach does not infringe on the professional autonomy.

In chapter 8, Ioannis Apostolakis, Periklis Valsamos, and Iraklis Varlamis clarify that evidence-based medicine (EBM) refers to the careful consideration of all the available evidence when making decisions about the care of the individual patient. Moreover, they recognize that EBM still remains a complex and delicate process which needs Quality Assurance (QA). Overall, they provide an introduction on the concepts of EBM, highlight the need for structured methodologies that will ensure the quality of the EBM process, and provide a critical overview of the existing methodologies in quality assurance of the evidence.

In chapter 9, Asen Atanasov provides a brief overview on some e-medicine resources and global definitions focused on the three main subjects of the healthcare quality – the patient, the costs and the evidence for quality. He also mentions sites that assist in the retrieval of information about methods for obtaining evidence along with the ways of measuring evidence validity. These sites provide information on implementing the ultimate evidence-based product – clinical guidelines for better medical practice and health service.
In chapter 10, Suzana Parente and Rui Loureiro provide some basic ideas on e-health safety and security, focusing on the provider perspective. They present one novel unpublished case and six cases from the Food and Drug Administration (FDA), Multi-Media Consumer Information, (FDA) Patient Safety News. Topics highlight fraud, impersonation of health care professionals, misuse of data and information, and backups.

In chapter 11, Solvejg Kristensen, Jan Mainz and Paul D. Bartels point out those patient safety initiatives, which have been launched in a number of countries, primarily focusing on problem identification, learning and improvement. However, so far there has been little emphasis on monitoring outcomes and surveillance of development of patient safety at the organizational and system level. They conclude that patient safety is a new field, which requires much more research-based documentation, and a comprehensive approach on a number of different measuring dimensions.

In chapter 12, Amar Gupta, Raymond Woosley, Igor Crk, and Surendra Sarnikar refer to an information technology architecture for enabling the monitoring of adverse drug events in an outpatient setting. The proposed system architecture enables the development of a web based drug effectiveness reporting and monitoring system that builds on previous studies, and demonstrates the feasibility of a system in which community pharmacists identify and report adverse drug events. They also specify the main technical requirements of such a monitoring and reporting system, identify the critical factors that affect the successful implementation and use of the system, and present information technology solutions that satisfy these requirements.

In chapter 13, Christopher L. Pate and Joyce E. Turner-Ferrier explore the concept of e-health as it relates to healthcare delivery, healthcare quality and education. They address these relationships by discussing and defining the concept of e-health, discussing fundamental linkages between e-health and quality-related healthcare outcomes, and highlighting key themes between health education, technology and quality.

In chapter 14, Shiu-chung Au and Amar Gupta illustrate a site, which is being developed for the field of Gastrointestinal Motility. The site augments the innovations of existing healthcare information sites with the intention of serving the diverse needs of lay people, medical students, and experts in the field. The site leverages the strengths of online textbooks, which have a high degree of organization, in conjunction with the strengths of online journal collections, which are more detailed and focused to build a knowledge base that can be easily updated but still provides reliable and high quality information to users. Gastrointestinal Motility Online uses automated methods to gather information from various heterogeneous data sources to create a coherent, cogent, and current knowledge base serving a diverse base of users.

In chapter 15, George Athanasiou, Nikos Maris, and Ioannis Apostolakis examine the structural transformation of the learning process, the paradigm shift of collaborative, and community learning, and the necessity of quality assurance of all learning assets. They provide a number of e-learning standards, a reference framework for the specification of quality approaches and an introduction on how the e-learning process can be founded on pedagogical standards. The novelty of their approach lies in the fact that it combines the merits of evaluation, self-support and collaboration for improving quality in learning, which makes it an appropriate solution for the highly volatile healthcare community.

In chapter 16, Åsa Smedberg asserts that e-health communities can assist in maintaining a healthier life-style through ongoing interactions between community members. However, whether these e-health communities actively promote learning depends on the ways they support community members reflect upon their habits, underlying reasons and motivational factors. Overall, she presents a framework to
evaluate e-health communities from a learning perspective, which covers different types of conversation topics, ways to respond and community awareness.

In chapter 17, Ferrer-Roca expects a new era for Telemedicine after the 2009 Prague Declaration. However, she argues that there are barriers, which include literacy, standard connectivity and quality control. Therefore, she addresses literacy regarding the type of standards in each topic of the Telemedicine Body of Knowledge.

In chapter 18, Elizabeth A. Krupinski, Nina Antoniotti, and Anne Burdick review the mission of the American Telemedicine Association Standards and Guidelines Committee, and the process by which standards and guidelines documents are produced. They also report on the committee’s progress in providing the telehealth community with standards and guidelines for the practicing medicine at a distance.

In chapter 19, Sisira Edirippulige, and Anthony C. Smith challenge the evidence on quality and reliability of telemedicine techniques. They describe the telepaediatric service in Queensland, Australia outlining some evidence for quality, reliability and sustainability.

In chapter 20, Anastasia Kastania reviews the reasons for the evaluation of e-health systems, the methods for designing an e-health evaluation and the main points that represent a successful evaluation procedure. She conducts an extensive literature search to encapsulate the dimensions of e-health quality assurance, and provide a conceptual framework for quality and reliability assessment.

In chapter 21, Anastasia Kastania and Sophia Kossida realize the potential of patient information management and medical decision support in an open and mobile medical environment. Therefore, they present an overview of personalized, mobile and Grid applications as well as evidence on quality issues of these fields. They conclude that the success of the information technology allows the biomedical researchers to capitalize in an eclectic selection of tools for resource allocation as well as ubiquitous and transparent distributed systems.

In chapter 22, Anastasius Moumtzoglou sketches a mental image of the future healthcare. He argues that the advancement of e-health in healthcare derives large quality and patient safety benefits. Moreover, advances in genomics, proteomics, and pharmaceuticals introduce new methods for unraveling the complex biochemical processes inside cells. Data mining detects patterns in data samples, and molecular imaging unites molecular biology and in vivo imaging. Finally, the field of microminiaturization enables biotechnologists to start packing their bulky sensing tools and medical simulation bridges the learning divide by representing certain key characteristics of a physical system.

Conclusively, ‘E-Health Systems Quality and Reliability: Models and Standards’ impacts both the field of quality and e-health contributing to the better understanding of their interaction. Specifically, the book opens new avenues for patient-centered medicine, enables the evidence-based patient choice, and cites examples to successful implementation. Moreover, it introduces novel approaches to improve the quality of health care, exemplifies the strategic evaluation of e-health systems, patient safety in e-health, people-centered care, personalized health, evidence-based medicine and reliability modeling.

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