电子健康档案评价

刘加林　主编

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Evaluation of Electronic Health Record

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刘加林 著
Jialin Liu

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作者提出了“医学随访学”和“耳鼻咽喉头颈外科信息学”的概念，并对临床随访及医学信息学进行了较深入的研究。命名了“会厌动脉”。以第一作者和通讯作者在国内外杂志发表论文60多篇，5次受邀到国际会议特邀大会发言，8次大会发言，6次壁报交流。4次受邀到国外知名大学讲学（讲座）。主编和参编专著6本。获7项国家实用新型专利。主持国家自然科学基金面上项目，省市科技项目6项，参与NIH（美国）、国家自然科学基金重点项目及省市科技项目10多项。

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About author

Jialin Liu M. D., is an associate professor and director of Department of Medical Informatics, West China Medical School of Sichuan University, an associate professor at Department of Otorhinolaryngology, West China Hospital, Sichuan University. Jia-lin serves as an associate editor of *Journal of Medical System*, a vice chairman of Electronic Medical Record/ Electronic Health Records Professional Committees in China Medical Informatics Association, a member of WHO Family of International Classifications (WHO-FIC) Education Committee, and an accreditation expert of Chinese Medical Informatics Association. Jia-lin is also a regular reviewer for CLINICAL ANATOMY and LARYNGOSCOPE, an accreditation expert of National Natural Science Foundation of China (NSFC), an accreditation expert of Sichuan Administration of Science and Technology, an accreditation expert of Chinese Science Paper Online. Jia-lin was a visiting scholar at Harvard Medical School (United States) from 2009 to 2010 and at Peter L. Reichertz Medical Informatics Institute (Germany) in 2014, respectively.

His research focuses on the use of information technology to measure and improve the quality of healthcare in the fields of patient safety, clinical decision support, improving patients satisfaction through EHR, improving quality of care and cost-effectiveness, and outcomes assessment. He established the Ph. D. degree program and master's degree program in Medical Informatics at West China Medical School of Sichuan University, which is the first program in Medical Informatics (100227) in China. He presented the concepts of "Medical Follow-up" and "Otorhinolaryngology-Head and Neck Surgery Informatics", and he is the first to name "Epiglottic Artery".

He served as the chief editor for 2 medical books (both in Chinese and English) and an editor for 4 other medical books. Dr. Liu published 62 papers as the first or correspondent author, of which, 14 papers had been selected into international congress plenary sessions. Dr. Liu holds 7 Patents (China). He has been awarded 17 grants from NSFC and Science Foundation of Sichuan Province as either PI or Co-Investigator.

前言

以电子健康档案（EHR）为核心的医疗卫生信息化建设一直是各国医疗卫生发展的方向和重点。电子健康档案是一项投资大、周期长、技术复杂的系统工程，需要进行科学的规划。为提高规划的科学性，需要对电子健康档案进行有效的评价。电子健康档案系统是一个社会技术系统，对电子健康档案的评价不仅仅是对一个信息系统的评价，还是一个复杂的社会过程。电子健康档案评价一直是医疗健康信息化研究领域最具挑战性的问题之一，也是一项十分艰巨、复杂的系统工程。

电子健康档案评价的复杂性还包括电子健康档案带来的组织架构和医疗服务流程的改变，以及由此带来的一系列医疗服务模式变化的评价。由于电子健康档案涉及医疗卫生的各个方面，以及健康信息的隐私保护、信息技术的有效使用等多个领域，需要具有不同背景的评价者共同参与，以得出一个比较全面和客观的评价。虽然电子健康档案在医疗健康领域的运用日趋广泛，但对其评价的研究仍然存在较大的分歧。电子健康档案评价的缺失和不恰当评价都是制约医疗健康领域信息技术发展的关键问题，将对电子健康档案为核心的医疗卫生信息技术的评价产生严重的负面影响。科学、客观的电子健康档案评价不仅能促进电子健康档案在医疗卫生领域中的应用，同时评价也是一种社会责任。

我们希望通过《电子健康档案评价》为读者实施和评价电子

健康档案提供参考和帮助。但是，本书不应作为电子健康档案评价的教条和“菜谱”。因为电子健康档案评价是一个十分复杂的过程，需要提出清晰的需求（目的），选择正确的评价方法、大量准确和精确的数据和信息，以及对数据科学的分析和正确的解释等。

本书不仅凝聚了作者十多年的心血，也是课题组所有成员长期努力成果的展示。本书得到了国家自然科学基金面上项目的支持，也是其成果之一。感谢项目组全体成员康德英、于中华、吴星涛、方进博、邹剑、刘思汝、张睿、黎勇、李孟娇、林丹、徐雯、付丹、杨翰、王慧锋、雷飞、鄂琪敏、王亚强、李云松、黄婷婷、代术成、谭玓、王晓东、黄青平、安玲玲、朱敏等对本书的反复修改，没有他们的支持和努力就没有本书。

由于电子健康档案的评价在理论和实践应用中都还充满争议，虽然作者参阅了大量国内外文献、资料和进行了长期准备。但是，由于知识和经验的局限，书中难免有错误、遗漏、不妥之处，恳请各位前辈、同道和广大读者批评指正。

刘加林

2016 年 3 月于成都

PREFACE

Electronic Health Record (EHR) is a core part in modern health informatics applications. Many countries have initiated programs for implementing the EHR as it is believed a cornerstone step in modernizing their public health infrastructure. However, EHR requires a large capital investment in new technology in addition to making changes to the existing healthcare systems and medical processes. It calls for synergy innovations in the information system, and its development time cycle is usually quite long. Throughout the entire development of an EHR system, well-informed decisions should be made at each critical node in order to properly evaluate, plan, and implement an EHR system, thus the evaluation of an EHR system is the first challenging step.

More complex an EHR system, more challenging it becomes to carry on the evaluation. As an EHR system becomes nowadays more and more embedded in our physical, social, and work environments, the evaluation of the EHR comes with multiple perspectives and cross-comparison among them by employing both qualitative and quantitative methods. Besides, the evaluation of an EHR system could be one of the most controversial aspects of health information technology. The widespread use of EHR is inevitable, but there is great difference in the EHR evaluation. If an EHR is inappropriately evaluated, problems can overweigh benefits, imposing harmful impact to the overall EHR environment. Evaluation is not only owing to responsibility, but to the understanding and improvement of an EHR.

The first goal of this book is to illustrate options of appropriate tools available in the literature to support accomplishing an assessment study. However, this book does not intend to offer a universal recipe. Evaluation of any specific electronic health record system involve significantly different scope of work, depending on the specific information in need (the questions to be answered by the e-

valuation study), the requirement for accuracy and precision, the project development methods (for constructive assessment), and on the existing healthcare materials, etc.

Another objective of the book is to provide broad-level understanding of various theories and frameworks of evaluation EHR rather than on the details of a particular method. This book represents more than ten years of efforts of the author in the field, and it also embodies the long-term efforts of all members in the author's research group. The study is supported by the National Natural ScienceFoundation of China, and the book includes research results from the project. I would like to thank the students who have made comments on the different versions of this book through the funded program. I would like to thank all the researchers who have contributed to the field of health informatics. This book is based on their research work. My colleagues and friends have provided invaluable feedback regarding the book's title, organization, topic coverage, typographical errors, and obscure parts and have helped in overall improvement of the materials. I thank all the reviewers for their valuable inputs. Many people have contributed to this book, either directly or indirectly. Without their support and inspiring criticism, this book would not have been completed.

The author hopes that the book would be useful in your work, research, and development, and readers would benefit from our work in the EHR field by using the book as a starting point before committing to pursuit EHR further. For readers who involve in making decisions about EHR implementation, this book will be particularly valuable.

Jialin Liu, M. D.
March 9, 2016

In nothing do men more nearly approach the gods than in giving health to men.

Cicero MT

We will make wider use of electronic records and other health information technology to help control costs and reduce dangerous medical errors.

President Bush GW. 2006

Our recovery plan will invest in electronic health records and new technology that will reduce errors, bring down costs, ensure privacy, and save lives.

President Obama B. 2009

Electronic health record as a vehicle for successful health care best practice.

Ghazisaeedi M. 2014

The promise of electronic health records being able to transform medical practice saving lives, money, and time has been around for some time, but the fulfillment of this promise in real-world applications has remained elusive due to many factors.

Schumacher RM, *etal*. 2009

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Evaluation can help in identifying where change may need fine tuning or major adjustment, thereby preventing harm and minimizing disruption. It can help in providing evidence for decision-making and extending knowledge.

Rigby M. 2001

Evaluating your electronic health record (EHR) implementation is a critical EHR implementation step. Conducting a post-implementation evaluation will enable your practice to continue improving workflows, achieve your goals and needs, and realize the benefits of EHRs.

HealthIT. gov. 2013

Evaluations must be viewed as an integral piece of every project, not as an afterthought.

AHRQ Publication No. 09 – 0083 – *EF.* 2009

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第一章　电子健康档案
Chapter 1　Electronic Health Record

By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care.

President Bush GW. 2004

Electronic health record (EHR) systems enable hospitals to store and retrieve detailed patient information to be used by health care providers, and sometimes patients, during a patient's hospitalization, over time, and across care settings. Embedded clinical decision support and other tools have the potential to help clinicians provide safer, more effective care than is possible by relying on memory and paper-based systems. In addition, EHRs can help hospitals monitor, improve, and report data on health care quality and safety.

Silow-Carroll S, etal. 2012

第一节　电子健康档案概述
1.1　Introduction of Electronic Health Record

An electronic health record is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. This record may include patient demographics (for example, age or sex), diagnoses, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and imaging reports.

Felt-Lisk S, etal. 2011

一、电子健康档案的定义

There is no universally accepted definition of the term electronic health record, but we use it to mean a digital, longitudinal record of a patient's health and health care that can be shared by differ-

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