So What? A Tribute to Dr. Reed M. Gardner, PhD, FACMI

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Background

Dr. Reed M. Gardner, PhD, FACMI, a pioneer and noted international leader in the field of Medical Informatics passed away on November 27, 2020. Dr. Gardner earned a Bachelor of Science in electrical engineering in 1960 and a PhD in Biophysics and Bioengineering in 1968 from the University of Utah, United States. He was one of the first graduate students of Dr. Homer Warner and after graduation continued to work with Dr. Warner at LDS Hospital in Salt Lake City, Utah. He later served as co-director of the Medical Informatics department at LDS Hospital in the late 1980s and early 1990s while Dr. Warner continued as chair of the Department of Medical Informatics at the University of Utah. After Dr. Warner retired, Dr. Gardner became the Chair of the Department of Medical Informatics at the University of Utah from 1996 to 2005. After retiring in 2005, Dr. Gardner continued to participate in projects, reviewed submitted publications for various peer reviewed journals, and was a valued contributor to books.

Personal Contributions

Dr. Gardner was one of the principal developers and evaluators of one of the first electronic medical records known as the HELP System (Health Evaluation through Logical Processing).[1] Early in his career, he independently developed an innovative new arterial line pressure sensor but did not pursue the patent.[2,3] He also helped standardize pulmonary function testing,[3,4] monitoring cardiac output and spirometry in intensive care units (ICUs),[5,6] use of clinical decision support in the ICU,[7] helped move from hard copy radiology film to a picture archiving and communication system (PACS),[8] computer alerts for laboratory data,[9] computerized blood ordering[10] and helped develop the early Medical Information Bus used in ICUs to pull data from patient monitors and other medical equipment into the EMR.[11,12] Dr. Gardner was active in public policy, helped build the nation's electronic health record interoperability policies, and was active in standards development. He supported security for patient data in the EMR and helped implement early password protection. After a visit to Kenya, he also became interested in the evolution and necessity of EMR use in third-world countries using OpenMRS.[13]

International and National Contribution to the Field

During his career, Dr. Gardner was a sought-after visiting professor at leading academic medical centers around the world and a frequent presenter and panel expert at many national and international meetings, and was known for his substantial expertise, enthusiasm, and communication skills. He had extensive and innovative academic and research interests including hospital informatics systems, computerized medical decision-making, and clinical decision support, computerization of critical care, automation of clinical processes, medical informatics education, and public health informatics.[14–18]

Dr. Gardner served 8 years on the American Medical Informatics Association (AMIA) Board of Directors and was AMIA President from 1996 to 1997. In 1997, the U.S. Food and Drug Association (FDA) was thinking of regulating CDS as medical devices. Dr. Gardner is one of the authors and instigators of AMIA's recommendation for a risk-based approach to regulation of clinical software through the use of local software oversight committees to monitor CDS.[19,20] The AMIA proposal was accepted by the FDA and still guides the regulatory approach today. Dr. Gardner was also an influential and a driving force behind the development of the board certification in Clinical Informatics for physicians through the American Board of Preventive Medicine.[21] He served as chair of the Core Content committee, and the resulting document still serves as the study guide for the Clinical Informatics Board Exam. Former Utah governor and subsequent secretary of the Health and Human Services in the U.S. Mike Leavitt attributed his interest in health information technology to numerous conversations he had with

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Dr. Gardner. Mr. Leavitt then supported the creation of the Office of the National Coordinator for health care technology and early efforts that laid the foundation for Health Information Technology for Economic and Clinical Health Act. In 2005, Dr. Gardner was the recipient of the Morris Collen Award, which is the highest award given by the American College of Medical Informatics.[22] He continued to serve on several editorial boards of informatics and clinical journals and in 2006 received the Legacy of Life Award for Scientific Achievement from the Intermountain Health Care Research and Medical Foundation.

Teacher and Mentor

Dr. Gardner was a colleague in Informatics Education in Health care and in 1998 was instrumental in getting the University of Utah as one of the charter members of International Partnership of Health Informatics Education.[16] The other charter members were the University of Amsterdam, Netherlands, Universities in Heidelberg/Heilbronn, Germany, University of Minnesota, US, the University for Health Informatics and Technology Tyrol, Austria and the University of Washington in Seattle, United States. This partnership grew out of the 1996 idea at the University of Amsterdam that teaching programs should be "internationalized" and stimulate students to carry out part of their studies at universities abroad, with the aim to become more aware of the increasingly important international environment.

Moreover, Dr. Gardner was influential in interesting many people in medical informatics along with encouraging graduate students and young colleagues to do good research. No matter how good you thought your manuscript or dissertation was, you knew it would return marked up with his "red pen" that was always in his shirt pocket. Every project proposal or idea would be open to a discussion based on whether it was sound science and the inevitable question "so what?"; meaning how would it improve patient care and how would you prove it? He was raised on a sheep farm and if your explanation was not precise, he would say "you've got to explain that better for an old sheepherder like me." While he combined a tough critique and tireless efforts to get work as precise as possible, he provided constant encouragement and stimulated all to improve their work. He was generous with his time and attention and when timelines got close, he could be seen giving graduate students and colleagues feedback on a manuscript or project at his kitchen table in the evening. He knew how to get people involved and get approval from hospital administrators and said medical informatics is 10% technology and 90% sociology. Colleagues and former students have related on how his contributions have enhanced the scientific and educational rigor of Medical Informatics, how he promoted and expected academic freedom and scholarly debate and understood how engineering could help transform medicine. Dr. Gardner's work is proof of the impact of our field on medicine and we all valued his pragmatic approach and his focus on the fundamentals. Many of his colleagues wonder if there is anyone in the field of Medical Informatics that he did not touch.

In 2005, the annual University of Utah's Dr. Reed M. Gardner Award for Faculty Excellence was established to acknowledge the contributions of faculty members to the Department of Biomedical Informatics and Nursing Informatics. The award was created by students to acknowledge the achievements of faculty members in the areas of teaching, mentoring, and service to the departments. Dr. Gardner will be sorely missed. His legacy in helping to expand the impact of the first department of biomedical informatics in a school of medicine in the United States and his innovation in the field will continue.

This tribute to Dr. Gardner is based on many memories and comments collected from his colleagues and former graduate students.

Multiple Choice Questions

1. Which of Dr. Reed Gardner's contributions still serves as a regulatory approach today?
   a. The methods to develop electronic medical records.
   b. Standards used for pulmonary function testing.
   c. Recommendation for regulation of clinical software through the use of local software oversight committees.
   d. Computerized blood ordering.

   Correct Answer: Option c is the correct answer. This proposal drafted by Dr. Gardner for AMIA was accepted by the U.S. Food and Drug Association and still guides the regulatory approach today.

2. Dr. Reed Gardner's "inevitable question" about a project referred to?
   a. Would the project be worth the time and cost to develop it?
   b. Would it improve patient care and how would you prove it?
   c. Would the project be supported by hospital administration?
   d. Would the project be generalizable?

   Correct Answer: Option b is the correct answer. Dr. Garner's "So what" question referred to could you prove it improved patient care.

Protection of Human and Animal Subjects

This study was performed in compliance with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects.

Conflict of Interest

None declared.

References

1 Pryor TA, Gardner RM, Clayton PD, Warner HR. The HELP system. J Med Syst 1983;7(02):87–102

2 Warner HR, Gardner RM, Toronto AF. Computer-based monitoring of cardiovascular functions in postoperative patients. Circulation 1968;37(4, Suppl):II68–II74
3 Gardner RM, Bond EL, Clark JS. Safety and efficacy of continuous flush systems for arterial and pulmonary artery catheters. Ann Thorac Surg 1977;23(06):534–538
4 Gardner RM. Computerized clinical decision-support in respiratory care. Respir Care 2004;49(04):378–386
5 Cundick RM Jr, Gardner RM. Clinical comparison of pressure-pulse and indicator-dilution cardiac output determination. Circulation 1980;62(02):371–376
6 Gardner RM, Hankinson JL, West BJ. Evaluating commercially available spirometers. Am Rev Respir Dis 1980;121(01): 73–82
7 Gardner RM, West BJ, Pryor TA, et al. Computer-based ICU data acquisition as an aid to clinical decision-making. Crit Care Med 1982;10(12):823–830
8 Patton GA, Gardner RM. Evaluation of picture archiving technology. Crit Care Med 2000;28(04):1231–1232
9 Johnson DS, Ranzenberger J, Herbert RD, Gardner RM, Clemmer TP. A computerized alert program for acutely ill patients. J Nurs Adm 1980;10(06):26–35
10 Gardner RM, Golubjatnikov OK, Laub RM, Jacobson JT, Evans RS. Computer-critiqued blood ordering using the HELP system. Comput Biomed Res 1990;23(06):514–528
11 Dalto JD, Johnson KV, Gardner RM, Spuhler VJ, Egbert L. Medical Information Bus usage for automated IV pump data acquisition: evaluation of usage patterns. Int J Clin Monit Comput 1997;14 (03):151–154
12 Kennelly RJ, Gardner RM. Perspectives on development of IEEE 1073: the Medical Information Bus (MIB) standard. Int J Clin Monit Comput 1997;14(03):143–149
13 Tierney WM, Beck EJ, Gardner RM, et al. Viewpoint: a pragmatic approach to constructing a minimum data set for care of patients with HIV in developing countries. J Am Med Inform Assoc 2006;13 (03):253–260
14 Gardner RM. Clinical Information Systems - From Yesterday to Tomorrow. Yearb Med Inform 2016(Suppl 1):S62–S75
15 Ammenwerth E, Talmon J, Ash JS, et al. Impact of CPOE on mortality rates–contradictory findings, important messages. Methods Inf Med 2006;45(06):586–593
16 Jaspers MW, Gardner RM, Gatewood LC, Haux R, Evans RS. An international summer school on health informatics: a collaborative effort of the Amsterdam Medical Informatics Program and IPhiE–the International Partnership for Health Informatics Education. Int J Med Inform 2007;76(07):538–546
17 Miller RA, Gardner RM, Johnson KB, Hripcsak G. Clinical decision support and electronic prescribing systems: a time for responsible thought and action. J Am Med Inform Assoc 2005;12(04): 403–409
18 Gardner RM. University of Utah Medical Informatics Research and Training Program. Yearb Med Inform 2001;(01):103–111
19 Miller RA, Gardner RM. Summary recommendations for responsible monitoring and regulation of clinical software systems. American Medical Informatics Association, The Computer-based Patient Record Institute, The Medical Library Association, The Association of Academic Health Science Libraries, The American Health Information Management Association, and The American Nurses Association. Ann Intern Med 1997;127(09):842–845
20 Miller RA, Gardner RMAmerican Medical Informatics Association (AMIA), the Computer-based Patient Record Institute (CPRI), the Medical Library Association (MLA), the Association of Academic Health Science Libraries (AAHSL), the American Health Information Management Association (AHIMA), the American Nurses Association. Recommendations for responsible monitoring and regulation of clinical software systems. American Medical Informatics Association, Computer-based Patient Record Institute, Medical Library Association, Association of Academic Health Science Libraries, American Health Information Management Association, American Nurses Association. J Am Med Inform Assoc 1997;4(06):442–457
21 Gardner RM, Overhage JM, Steen EB, et al; AMIA Board of Directors. Core content for the subspecialty of clinical informatics. J Am Med Inform Assoc 2009;16(02):153–157
22 Hales JW. Presentation of the Morris F. Collen Award to Reed McArthur Gardner, PhD. J Am Med Inform Assoc 2006;13(03): 356–359