Commentary on G. Octo Barnett’s Report to the Computer Research Study Section

Dr. Barnett’s report is an interesting and very well-written analysis of “the state of the art” of hospital information systems of the day (in 1966). Octo’s many friends will miss the customary “aw shucks” charm of his personal presentations but cannot fail to delight in his carefully stated, wide-ranging views. These cover the many systems and problems he encountered, and (why are we not surprised?) his strong recommendations for improvement. The reader can see immediately that the views—and indeed the wisdom we read here—were wrought of hospital and computer laboratory experience, namely, the Massachusetts General Hospital (MGH) Information Project, not lifted from a lecture or book.

A bit of history: the MGH project was important and unique in several ways. I had the opportunity to site visit it many times, always with admiration and amazement. The work was funded jointly by the National Institutes of Health (NIH) and the American Hospital Association. This may not have been unique, but I know of no other such research funding partnership. The project was undertaken jointly by the distinguished Boston engineering firm Bolt, Beranek and Newman, Inc., along with MGH. Jordan Baruch and Octo Barnett were the Principal Investigators for their organizations. They called their effort “the development of a real-time Time-Shared computer system to be used in storage and retrieval of information in the medical environment.”

In his report, Barnett goes far beyond just the MGH project in summarizing medical computer developments for the NIH Study Section. For the reader who wants an excellent two-volume description of this kind of research, there is nothing to compete with Stacy and Waxman. Who will be the first reader to find the following statement? “The computer system has the storage capacity, computing capacity, and communication capacity to serve approximately 4000 hospital beds using 250 terminals, regardless of the number of hospitals in which they are located.”

Barnett thanked the Study Section on Computers and Biomatics for contributing to his understanding of such problems. This is easy to believe. I joined the Study Section in 1967 and also found this duty to be like a wonderful four-year post-doc!

Even a quick reading of this report suggests that medical informatics or biomedical informatics, as we now call this field, was virtually completely defined by the rather wide range of activities that Barnett noted in 1966. He summarized work in information storage and retrieval, hospital information systems, medical decision making, patient record systems, laboratory and radiology systems, file design, selective dissemination of information, and diagnosis and treatment. It was not possible for him, of course, to include the elements of the Human Genome Project, modern molecular biology, and genome science. These new application areas did not appear at all clearly for another 35 years. Even so, it is obvious to us in 2005 attempting to deal with these revolutionary biomedical advances that the fundamental work from the 1950s, 1960s, and 1970s on file design, time sharing, the principles beneath artificial intelligence, and mathematical modeling is the very basis for our 2005 systems.

Barnett, in his 1966 report, was not primarily addressing the distant future, or the widest possible scope of medical computing. He was presenting to colleagues and funding agencies a way to understand why the implementation of computer-based information systems to patients even in advanced 1966 hospitals was slow. Indeed, one can easily sense that Barnett was more than a little annoyed by the slow pace of progress in this field: “It is frustrating to meet with repeated disappointments when the objectives are superficially so simple,” he said. The reader in 2006 finds it easy to sympathize and to feel annoyance also that sensible developments continue to falter.

Barnett endorses the need for multidisciplinary research and development teams in creating hospital computing systems, including “several groups who would normally not be a part of the hospital environment.” Ironically, this recommendation has reemerged as a key element of NIH’s Roadmap initiatives in 2004–2005. He calls for more long-term federal support for computing teams in the clinical setting. Forty years later, we are seeing the NIH Roadmap initiate (relatively) large and long-term support for National Centers for Biomedical Computing. These are currently firmly science-based conceptually but should enhance if not directly support actual clinical research. Score at least a point for the Gipper!
To be fair, Barnett’s report does include some weaknesses in thinking of the day. I'll note a couple, but I hasten to admit that these were very general mistakes "then" and that we continue to commit many of the same errors of vision "today." First and most important, the report focuses too strongly on failings of the computing hardware. We still do, but our engineering design and manufacturing colleagues keep quietly doing their Moore’s Law thing, and the equipment doubles in capability again and again. The view of 1966 underestimated the fundamental flaws in telecommunication systems. Amazingly, the report shows that we all accepted without much complaint the stunningly awkward systems of the day. Until the Internet, all telecom applications, in medicine or anywhere else, involved point-to-point hardwiring, leased lines, or connections via the teletype network. For the same reason, until the adoption of the Internet, 95% of all Help Desk conversations at the National Library of Medicine were on the topic of setting up telecom parameters. Subsequently, and until widespread adoption of the World Wide Web convention, 95% of requests were about GratefulMed communication settings. The report does not discuss extending the MGH hospital systems to the outpatient clinic and the doctor’s office (even though Octo developed the COSTAR system shortly thereafter), the patient’s home, and the "life-long health record" in no small measure, because the possibility of computer communication to the latter places would have been an unrealistic dream.

Barnett’s report (and most people at the time) even more seriously underestimated the difficulty and unwillingness of people to change from traditional ways of working to adopt new computer-based systems. Even the hardware and the telecom changed faster than the physician’s willingness to use information devices, the medical administrator’s willingness to incorporate new "information-technology (IT)-related" professionals into health management structures, and, of course, the willingness of patients to demand good information systems to record their care. Information technology standards are another present-day topic that was not current in 1966, in spite of MUMPS getting ready to be born. Here, too, our "standards" were unquestioned: gray code, five-bit teletype code, ultimately ASCII characters, and, worst of all, Standard Nomenclature of Diseases and Operations. We did not yet see IT standards as emerging slowly from interactions and agreements among our own professional groups! Well, maybe radiology and pathology (SNOP) were partial exceptions.

The report identifies a number of fault lines that are still with us, and perhaps yawn open even more widely now. He speaks disparagingly of the relationship between academic researchers in medical computing and the computer industry: "we cannot expect a significant contribution from any industrial organization...of a computer system as an operating part of a hospital activity." There certainly was little collegiality between the two groups, but the medical types took whatever help they could find. MGH dealt very closely with the friendly neighborhood computer maker, DEC (Digital Equipment Corporation). Missouri worked happily with IBM, and Utah and Minnesota seemed to find some comfort in Control Data Corporation (CDC). In most cases, it was the operating system that was seen as the manufacturers’ real contribution, sometimes special gear too, but almost never were the companies a source for usable applications code.

So—what about now? Perhaps because of the very fault line that Barnett cited, do we not still have advanced electronic record systems (only at only a few tertiary care medical systems), while commercial vendors offer outdated and outmoded products? Yet, to achieve a national interoperable system, no one doubts that commercial vendors (installers and maintainers) will be essential. This is the same old problem in a new and urgent guise.

A second persisting fault line is also noted in the report, namely, the NIH policy of funding "research" projects to create practical clinical information systems (frequently under the sham stance that these would support further "real" clinical research) and then terminating the funding at the end of the initial grant period. This policy naturally favored failed efforts that could then "reset" to a new grant award. It was miserably destructive of research systems that actually struggled over to the side of incipient practical success. How about 2005? Do we not have essentially the same policy?

There is so much fun in lapsing into a pleasant walk down Memory Lane—nostalgically enjoying some quaint (New England or otherwise) reminders of a simpler age—that I hesitate to acknowledge a counter course. Yet, such a trip also suggests a bit of the Greek tragedy too. For example, Barnett chose to take a strong interest in the physician’s order. He speaks of three years of difficult work on "the Medication cycle (ordering, listing, and charting of medications)." Ultimately, he tells the Study Section, "we at last understand the nature of the problem and we are able to deal with it effectively." The reader can almost hear the Greek chorus at the back of the stage, moaning, "Oh mortal, there will be physicians’ revolts against ordering through terminals. There will be long agonizing published studies of computer physician order entry systems—good systems in good hospitals—that harm patients. There will be commercial systems whose known faults cannot be fixed. Doctor, beware this application!" On the other hand, a good cynical Greek theater goer might warm to the protagonist’s statement "it is very difficult to defend any large-scale hospital information-processing system with the statement that the cost of patient care will be reduced."

In any case, dear reader, welcome to 1966! Enjoy the trip and make up your own mind about the lessons.

References