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The Origins of Informatics

MORRIS F. COLLEN, MD

Abstract This article summarizes the origins of informatics, which is based on the science, engineering, and technology of computer hardware, software, and communications. In just four decades, from the 1950s to the 1990s, computer technology has progressed from slow, first-generation vacuum tubes, through the invention of the transistor and its incorporation into microprocessor chips, and ultimately, to fast, fourth generation very large scale-integrated silicon chips. Programming has undergone a parallel transformation, from cumbersome, first-generation, machine languages to efficient, fourth-generation application-oriented languages. Communication has evolved from simple copper wires to complex fiberoptic cables in computer-linked networks.

The digital computer has profound implications for the development and practice of clinical medicine.

Review

The Practice of Informatics

The increasing importance of computer applications to medicine should generate some curiosity as to the origins and the evolution of informatics—the science, engineering, and technology of computer hardware, software, and communications. Understanding the historical development of informatics technology can help to elucidate the relevance of informatics to medicine. This article briefly summarizes the history of that technology—digital computers, computer programming, and computer communications.

Bruce Blum wrote that “In the early 1940s 'computer' was a job title. A person was given a calculator and a set of formulae and then called a computer.” By the late 1950s, however, when an electronic device carried out the arithmetic functions of addition, subtraction, multiplication, and division, or the logical functions of “and,” “or,” and “not,” the device was called a computer. A digital computer required a central processing unit with a primary or main memory to hold the data being processed, a program of instructions for processing the data, and circuitry to perform arithmetic and logic operations and to control execution of instructions. Peripheral equipment included secondary or auxiliary storage devices (such as magnetic tapes and disks); data-input devices (such as keyboards, card and tape readers, and direct input from secondary storage devices); and data-output devices (such as displays, printers, and plotters), but these peripherals are not described here.

Although the computer central processor had been the basis for most early advances in informatics, it was the computer software—the computer languages, programs, procedures, and documentation—that made the hardware usable for applications. The first computer programs used the lowest level of machine codes for instructions to process data. Higher-level languages soon evolved to more efficiently program increasingly powerful computers and to better meet the requirements of different users. Programming thus evolved from first-generation machine languages to fourth-generation application-oriented languages. By the 1980s, many of the most commonly used programs were commercially available, and most computer users did little programming themselves.

During the same four decades, computer communications moved from copper wires to fiberoptic ca-