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USENIX & SAGE

**The Advanced Computing Systems Association &
The System Administrators Guild**

if computers had blood, we'd be called doctors

SAs versus MDs, Part I

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The basis for this article is the many and varied analogies that I have seen applying medical terminology to our world of computers. I first distilled these into a paper submitted to the LISA conference – the paper was not accepted (it's tough to get non-technical papers past the panel), but many of the reviewers liked the substance and encouraged me to reformulate it into a *;login:* article. Part one of this article draws parallels between the world of medicine and the world of computers. Part two explores the growth of the American Medical Association (AMA) as a society of medical professionals and compares it to SAGE as a society of computer professionals.

Consider the parallelism between the professions. Computers have a life cycle from construction (birth)[1] through end-of-useful-life (death) all the way to the reclamation of board-level materials (decomposition). In between, both professions deal with upgrades (growth), component failure (illness), and even component replacement (organ transplants). Some of the language is common to both professions: virology, for example. In medical and computer care, it is best to prevent illnesses and other problems, but emergency care is still very important. Traditionally, the bedside manner has been a defining characteristic of "good doctors"; system administrators with people skills as well as technical skills are similarly well regarded and sought after.

Specialization

The field of medicine is highly divided and specialized, but even with this specialization, the general practitioner is still a valued member of the field. We can consider the general internist or family practitioner on the side of the generalists. On the other side, we can consider the specialists: surgeons, pediatricians, ob/gyns, dentists, podiatrists, dermatologists (we can't even begin to list them all in the space provided here).

The levels of ability run from the technical know-how of the radiology technician to the years of training required to get a license as a Doctor of Medicine.

Beyond correcting medical problems and keeping people healthy are lots of other medical endeavors, including research into the nature of life, exploration of disease, discovery of how things work, and even attempts to augment nature with mechanical aids.

System administration is similarly configured. The generalist might go by the jack-of-all-trades moniker "system administrator" or any number of equally vague names. Some specialists note that they administer the network, database, phone system, or a specific type of server or application software. In the same way that you wouldn't ask your eye doctor about having a baby, you won't ask your Notes administrator about problems with your router.

The levels of ability run the gamut from support technician to guru. Currently the field does not license professionals, but that may change as time goes on.

And beyond the bounds of installing and maintaining systems are many other endeavors to research components, create operating systems, discover how things break, and improve the way we build, maintain, and use these systems.

Methods of Care

People's approach to their health care varies. Some people don't get any care, avoiding medical institutions entirely. Some try to take care of themselves (potentially with limited knowledge), and others get advice and products from modern-day snake-oil peddlers. Some find care from well-intentioned but unlicensed suppliers, and some get care from licensed medical professionals.

The medical field attempts to match people's needs with different levels of service. Hospitals provide acute care for those with life-threatening problems; they also provide ambulatory and ancillary care with their specialized environments. Clinics provide preventative and non-acute care for individuals servicing non-office hours, and primary care physicians aim at preventative and non-acute care.

The computer field has its own wrinkles but is remarkably similar. People ignore their PC problems, try to tinker with them themselves, take advice from people and places they have never heard of before, and call in professionals to help. It is similar to the days when doctors were not licensed by the state – any person claiming to have the knowledge can hang a shingle up in front of their barber shop and call themselves a computer support specialist.

Coincidently, system administrators would rather build an environment where problems are recognized early and corrected before they become big problems in the same manner that physicians work to prevent disease. Sysadmins track their activities with sophisticated trouble-ticking tools and employ triage in the field as well as scheduled trips to the back office for reconstructive work. Like doctors, sysadmins use pagers and cell phones to stay "on call" in case emergencies develop that require their efforts.

Training

I'm going to end this section with a discussion of training – again the comparisons are surprisingly consistent. The medical profession has tuned its training methods to include both theoretical and practical experience; SAGE should consider this as it moves forward.

Many sysadmins can trace their roots to a student/mentor or apprentice/master type relationship in their past. No courses existed to provide the required training; learning by watching and doing was the best and only method. In much the same manner, early doctors relied on the apprentice relationship:

"In the days when apprenticeship was the mode of medical education, for example, the apprentice learned what the doctor did and why, observed how he did it, and then went on to practice in that fashion."[2]

Two additional comments in the same book match experiences in the sysadmin realm:

"Everyone who becomes a specialist of any kind prepares in two ways: (1) he reads and attends lectures; and (2) he is influenced by observations of the people already in the field."

"If medicine as a profession and medical education require thought and judgment, unless one understands 'how' and 'why,' one will not necessarily react suitably in complex situations."

These describe the academic versus real-life approaches to training, a common thread in sysadmin training theory; someone may know all of the steps required to perform a

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IF COMPUTERS HAD BLOOD . . . ●

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certain operation yet be clueless in actual situations. If sysadmin lore recalls an approach where the only learning offered was through apprenticeships, and current sysadmin diploma-mills highlight a current approach of learning through bookwork, future success in the field would seem to require both elements.

Martin Kaufman extends this concept further by considering the social factors involved:

"In sum, it can be said that medical education has changed greatly over the years, but the attempt to develop perfection has failed in every period. Indeed, although a change in the focus of medical education itself may have appeared at the time to have been a revolutionary improvement, in retrospect that great advance often brought with it a new set of problems. For instance, although the modern medical student is trained in more ideal physical surroundings and by better professors than his eighteenth-century or nineteenth-century counterpart, he has little of the personal contact that typified the apprenticeship."[3]

Anecdotally, sysadmins know that neither education nor experience alone is a predictor of success as a system administrator. Sysadmins are fond of exchanging stories – of "papered" sysadmins who couldn't find their way out of a paper bag to self-taught sysadmins who lacked the grounding a fundamental education brings. SAGE itself hits on this in the short-topic booklet on job descriptions and education and training:

"Most get their skills through on-the-job training by apprenticing themselves to a more experienced mentor. Although the system of informal education by apprenticeship has been extremely effective in producing skilled systems administrators, it is poorly understood by employers and hiring managers, who tend to focus on credentials to the exclusion of other factors when making personnel decisions."[4]

"Almost all of the instructors who were contacted during the writing of this booklet mentioned the importance of hands-on experience as a component of learning system administration. Several of the instructors also mentioned that it was difficult to provide bona fide hands-on experiences in a classroom or even a laboratory setting."[5]

The medical profession's use of intern and residency programs that began at the end of the nineteenth century[6] may not hold a complete answer to the dilemma faced in the sysadmin world, but it bears consideration for a formal education interspersed with apprenticeship-type work in a real environment.

Where To Next?

By examining the history of American medicine, we continue with a philosophy that sysadmins have kept over the relatively short life of our profession – stealing shamelessly from things that work,[7] and learning from things that don't. In the next segment of this article, we'll look at the growth of the AMA; don't feel bad – it took them decades to develop into the organization that they are today.