A Cyberday in the Life

Citation

Komaroff, Anthony L. 1996. A Cyberday in the Life. JAMA 275, no. 10:753-754.

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:42656558>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

A Cyberday in the Life

At 9 PM Sunday, February 5, 2006, Dr Susan Scott returned home from a weekend of cross-country skiing, tucked her children in bed, sank down on the couch in front of her large-screen three-dimensional information center and home entertainment unit, and spoke into the remote-controlled microphone: "Logon Hospital." Five seconds later the voice synthesizer in her terminal replied, "Welcome to the General Hospital HMO computer system. Identity, please." She pressed her thumb against the fingerprint reader in her handheld keypad, then entered her code to confirm her identity. A priority e-mail message informed her that two of her patients had been admitted.

The admitting diagnosis for Clara Smith, an 82-year-old widow, was congestive heart failure. Susan called up and reviewed the admission notes the resident had dictated into the hospital computer. They indicated that the chest radiograph was equivocal: there was an alveolar process that could represent either heart failure or an infiltrate. She said "Chest x-ray," and the most recent image appeared on the screen: there were perihilar infiltrates, but the infiltrate in the left lung was much more prominent. She thought the image was more suggestive of pneumonia than heart failure and said "Infection findings." The screen filled with selected data: vital signs, including a temperature of 37.7°C; a white blood cell and band counts, slightly elevated; normal rapid serum bacterial antigen and interleukin-6 assays; and pending sputum and blood cultures. "It could be failure," she concluded, "but I'll bet she has pneumonia." She reviewed the medication orders and noted that no antimicrobial agent had been included. She instructed the computer to page the covering resident and convinced him to add an antibiotic.

Mrs Smith had been Susan's patient for 12 years. She reflected on her patient with affection and concern and thought, "She must be scared out of her wits. She doesn't know those young doctors, and she may think they're uncertain about what's going on. I'll give her a call." Activating her home telemedicine video system, Susan dialed Mrs Smith's bedside television. Seeing that her patient seemed to be dozing, she said softly, "Mrs Smith, this is Dr Scott, up here on the television. Are you awake?"

"Oh my goodness, Dr Scott," the patient exclaimed, sitting up with a start. "How wonderful to see you!"

"Evening, Mrs Smith. I've just reviewed all your tests and treatments. We're not sure whether you have heart failure or pneumonia, but we're treating you for both. I'll be in to see you first thing in the morning."

Susan's second patient was 45-year-old Edward Martin, a long-time cigarette smoker with hypertension admitted with chest pain. The initial data indicated that nondiagnostic changes had been present on his electrocardiogram and two of the five myocardial injury proteins were borderline abnormal, but the positron emission scan showed no evidence of focal wall-motion abnormalities. Dr Scott then said "ECG" and the tracing flashed on the screen, showing lateral T-wave inversions. She called up previous ECGs: the T-wave changes were definitely new. Given these data, the patient's risk factors, and answers to five questions on the current illness history, the computer reported that the chest pain algorithm estimated risk of myocardial infarction of 10%. This met the HMO's criteria for admission, which were based on regularly updated data from a consortium of HMOs covering a population of 17 million people. "That estimate has to be low. I won't be surprised if he rules in," Susan predicted to herself. The computer frequently volunteered such probabilities and related advice as to whether a particular action was recommended. She liked to compare her predictions to the computer's and felt that she could often do better. Her HMO allowed

physicians to make the medical decisions about issues like admission, regardless of the computer's "advice," although the HMO tracked deviations from the recommended actions and monitored outcomes. The decisions and patient outcomes of all physicians were tabulated and evaluated by peers.

Susan then turned to her regular electronic mail, which grouped her messages into those from patients and those from colleagues. She looked through her patient mail first. Susan's HMO gave a simple computer to all its members who didn't have one, because making more transactions electronic had been found to improve efficiency and satisfaction. One patient with hypertension whose recent pressures had been consistently higher than the parameters Susan had given him had transmitted five blood pressure measurements. After increasing the dose of one of his antihypertensive medications, Susan clicked on the "Refill" icon, thereby updating her medical record for the patient, sending his pharmacy the refill request attached to her electronic signature, and sending an electronic mail message notifying the patient to increase the dosage and that a refill had been ordered.

Four other patients had sent messages. One patient whose brother had AIDS asked about a gene therapy she had read about on an electronic bulletin board. Susan knew there were no ongoing clinical trials being conducted, and she didn't think there was good evidence other than anecdotal reports supporting such treatment. She called up the Global Infectious Disease Society's (GIDS's) Web Site and found that a recent expert panel agreed with her. In her reply to the patient's e-mail, Susan called gene therapy for AIDS "promising but unproven" and included in her reply a copy of the GIDS's statement on the subject designed for the public. Online lay versions of medical textbooks and electronic bulletin boards meant that patients were better informed than ever before, but the number of questions she received made Susan feel they were a mixed blessing.

The next morning Susan arrived at the hospital a few minutes earlier than usual to round on her two new inpatients before starting her office practice. First, she visited Mr Martin. At the terminal outside his room, she reviewed his most recent vital signs, laboratory data, and ECG studies. Surprisingly, the second set of myocardial injury markers was normal, and his ECG had not changed. Myocardial infarction had been ruled out; her intuition had been wrong.

Susan went into the patient's room and after some pleasantries asked, "Could you tell me what the chest discomfort you had yesterday was like?"

"It started after I finished shoveling snow, and my chest just felt tight, like someone was squeezing me. I couldn't get my breath. I sat down on the curb, and it finally went away."

"How long did it last?"

"I didn't look at my watch, but I'd say about 10 minutes."

This description concerned Susan, particularly in light of the earlier myocardial injury markers and ECG changes. The patient's position on the critical pathway for chest pain was displayed by the computer: the recommended plan was to discharge him if his nuclear exercise test, already scheduled for this morning, was normal. Critical pathways, developed by multidisciplinary teams within the organization, resulted in standardization of much routine care. Susan liked pathways, in part because she felt that the system allowed her more time to talk with patients, which she valued more than the technical side of medicine. She spent 10 more minutes with Mr Martin, joked with him about the stress of having teenage daughters, and emphasized the importance of quitting smoking.

Susan then visited Clara Smith. Blood cultures revealed an as-yet-unidentified gram-positive coccus in clusters. Based on

the hospital's experience with such organisms, the computer suggested that there was a 72% chance that this would turn out to be a true positive, most likely *Staphylococcus aureus*, given recent resistance patterns, and recommended a switch to Stafomax, the antibacterial agent deemed most cost-effective in this clinical situation by the hospital's Pharmacy Committee. After receiving this information at 8 AM, the house staff had made the change. Realizing that her initial hunch was right, that this was infection and not congestive heart failure, she said to the computer, "You're not so smart." Inadvertently, she had left the microphone on, and the computer responded in a polite yet detached voice, "Please restate your request."

Susan examined Mrs Smith and explained about the infection. "I'm really glad you called me so soon after you got sick this time," Susan reinforced. "Remember how ill you became last time, when you waited 2 days? I'm always glad to hear from you."

"I hate to bother you about little things," Mrs Smith replied.

"Some people do call too much, but you're not one of them. If you think it's just something small, call our health telecenter."

The critical pathway for pneumonia in an elderly patient suggested discharge the following day, but Susan felt that Mrs Smith might have to stay longer because she lived alone, and because she had staphylococcal and not pneumococcal pneumonia.

While driving to her office, Susan answered a page using her cellular phone-terminal. Each phone-terminal contained a small screen and keypad that allowed data to be entered directly into the information system via radio signals; it could also be operated by voice, which Susan preferred when driving. The call was from 74-year-old Irving Smith, who was vacationing at a lake-side lodge several hundred kilometers north.

"I fell and now my wrist is killing me and it's all swollen," Mr Smith began.

After hearing this and asking a few more questions, Susan suspected a Colles fracture. "You'll have to go to an emergency care center. What's the ZIP code of your lodge?"

Susan pulled over and used the computer to locate the emergency center nearest the lodge and to verify that the hospital agreed to see out-of-state HMO patients, had appropriate orthopedic coverage, and agreed to her HMO's price structure.

"There's a place 25 kilometers south of you. I'll send them your information and they'll be expecting you."

"Thanks so much, Doctor," said Mr Smith, sounding relieved.

Susan then sent a message to the center authorizing the visit and describing the patient's complaint. She included his medical summary, which contained demographic data, problem list, medications and allergies, and recent laboratory results.

Susan's first office patient was a 24-year-old woman, Helen Jones, who complained of intermittent, increasingly severe headaches of several years' duration and demanded an MRI. Susan chose not to respond to the demand immediately and instead tried to bring out the patient's underlying concern, saying, "You seem very worried about what's causing these headaches."

Ms Jones began to weep and revealed that her grandmother had recently been diagnosed with a brain tumor, metastatic from a primary breast cancer. When the history and physical examination were completed, Susan told her patient that it was very unlikely that she had metastatic breast cancer at her age. The patient was not convinced.

Susan turned to the computer at her desk, entered the patient's characteristics, and then turned back to Ms Jones and said, "Based on your symptoms, the computer says that the chance a brain tumor is causing your headaches is less than one in 10 000." Susan occasionally used the computer's prognostications to reinforce her arguments, and often patients were impressed. Not this time.

"But I could be that one person," retorted Ms Jones.

Susan knew she had an unhappy patient on her hands. "Ms Jones," she began gently, "I know you're concerned about this, but our managed care group has made a policy decision not to pay for MRIs in this clinical situation. I'll give you a medication that I think will help and will see you again in 2 weeks if your headaches aren't improved, or sooner if they get worse."

She entered her order for an analgesic. The screen flashed the message "Drug allergy," and a list of alternative analgesics to which the patient was not allergic appeared on the screen. Susan chose one, and the printer in the wall next to her desk spat out the prescription and a patient education sheet.

After lunch, Susan had a teleconference. The previous week, an abdominal MRI scan performed on one of her patients with a remote history of colon cancer had shown a solitary liver lesion. Its size and MRI characteristics suggested a low but real probability of malignancy. Radiology at her hospital performed percutaneous image-guided biopsies, but the lesion was small and could not be seen on either CT or ultrasound. The local radiologist had suggested the teleconference, with MRI experts from interventional MRI centers from a large nearby city and Japan. The conferees listened while the experts spoke, pointing to various parts of the image, which appeared on each physician's monitor. They agreed that the probability of malignancy was sufficiently high that MR-guided biopsy was indicated and that it could be done safely, with cryoablation using an open magnet if the biopsy revealed a malignancy. With the advent of regionalization of medical procedures, this technique was offered at only eight centers nationally, although preliminary data suggested it had low morbidity. Susan made plans to contact the patient and set up the procedure if the patient consented.

At 5:15, the last patient of the day left Susan's office. Susan answered a few more e-mail messages and then made electronic rounds on her two hospitalized patients. Mr Martin's predischarge exercise test had been inconclusive; he had not been able to exercise for more than 5 minutes because of "poor cooperation." She left Mr Martin a voicemail message at his home—she knew he wasn't good about signing on to e-mail—telling him that the test result was inconclusive and that he might have heart disease even though he had not had a heart attack. Susan then learned that Mrs Smith had walked across her room that afternoon with help, and after talking with the intern Susan agreed to let Mrs Smith go home with a nurse visit that evening.

Susan left the office and stopped to pick up take-out food for the family. While waiting in line, she used her cellular terminal to sign out to the physician on call for her group that night. Her thoughts wandered through the day's events. She had seen two hospitalized patients and 21 patients in the office, answered e-mail messages from four others, and teleconferenced on a complicated case. Her world had changed dramatically in the decade since she'd started practicing. "Were these changes good?" she wondered. There was no doubt that she could now exchange information with patients and colleagues much more efficiently, yet practice was in many ways less personal: She found herself cherishing the infrequent telephone or face-to-face conversations that had once been the only means of communication.

After catching up with her husband and putting her children to bed, Susan thought she might look through a multimedia presentation on solitary liver lesions available from the International Library of Medicine. Or maybe she would just listen to Mozart. It had been a full day.

David W. Bates, MD, MSc
Anthony L. Komaroff, MD
Boston, Mass

We are indebted to Gordon Moore, MD, for encouraging us to write an unpublished essay on which this piece is based, to the Josiah S. Macy, Jr, Foundation, and to Carol Bates, MD, Gil Juperman, MD, PhD, and Eva Rittenberg.