INTERACTIVE COMPUTER KIOSKS FOR VERTEBRATE IPM—STATUS REPORT

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ABSTRACT: The recent outbreak of raccoon rabies in New York State during a period of unprecedented fiscal constraints presents an emerging organizational dilemma—how to handle increasing demands for services in an environment of diminishing resources. As one response to this need, the New York State Department of Health (DOH) is developing an interactive computer system for integrating public education, professional training and public/professional communication. The basic objective is to enhance consumer access to information regarding rabies, Lyme disease and other public health issues; thereby, forming the basis for prevention. In essence, this effort can be classified as an "educational intervention," the essential component in any successful program of integrated pest management. The system is comprised of networked computer kiosks distributed statewide in convenient locations to maximize public or professional access. Hardware for each kiosk includes a Macintosh computer, modem, and printer. Each kiosk provides a common database via a series of interactive files regarding biological and disease management information, and with various levels of multimedia development (text, audio, animation, and video). In addition, kiosks provide a directory of government regulations, publications and services, including geographically defined data. The user can rapidly gather information from a variety of on-board kiosk resources, and can also electronically mail or fax specific queries to appropriate authorities elsewhere. The system is designed to achieve ultimate flexibility, utility and relevancy while being informative and entertaining.

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INTRODUCTION

Most of us in government are all too familiar with the dilemma of how to handle increasing demands for services in an environment of diminishing resources. For example, our laboratory is a research facility, but with major service responsibilities including: rabies diagnostic services for the entire state (excluding New York City); direct management of rabies-related cases and vertebrate vector problems; and dissemination of information on managing rabies incidents and vertebrate vectors.

Much of the management and information dissemination tasks are repetitive, broad sets of recommendations to individual citizens or to local health personnel – making the bulk of our non-research function that of basic public health education. It was clear, however, that we needed more quantity, consistent quality, and improved delivery in order for our clients to make informed choices and carry out independent preventive and/or remedial measures.

BACKGROUND

Origins of this project began in late 1987 with discussions for developing a computer application to help relieve the ever growing demands of the public for services regarding vertebrate vector problems in New York State. These efforts were further stimulated by a presentation, "Controlling Wildlife Damage: Can Computers Help?" (Lasarow 1988), at the 13th Vertebrate Pest Conference. The latter paper, with a hands-on exercise, demonstrated that computer programs designed to mimic consultation with an expert were practical and affordable. Several proposals were written in 1988 and 1989 to initiate a comprehensive program to increase DOH's education and training interchange with local health authorities and the public, enhance management of zoonosis incidents, and improve data handling. In September 1990, the Wadsworth Center for Laboratories and Research provided start-up funds for the Health Information Project (HIP). Due to a multitude of administrative procedures (establishing budgets, finding and hiring consultants, etc.), we actually began full-time development of HIP only a year ago. More recently, we received support from the Centers for Disease Control to develop Lyme disease educational materials as part of HIP, including: vector identification and biology; distribution of deer ticks and disease; and disease prevention, recognition, and treatment. Much remains to be completed in both the rabies and the Lyme disease topics.

An important motivator for initiating HIP was the growing ominous nature of the mid-Atlantic raccoon rabies epizootic. This outbreak began in West Virginia in 1977 and, during the next decade, proceeded to engulf Virginia, Maryland, Pennsylvania, Delaware and District of Columbia. New Jersey became involved in early 1990.

In May 1990, the raccoon rabies epizootic entered New York State in the central part of the southern tier. The outbreak made major territorial gains over the past year and has begun to enter areas of high human population density. At the end of 1991, the epizootic spanned more than 350 miles, involved 21 counties, and accounted for 70% of all rabies cases statewide. The number of human, pet, and domestic animal expo-sures associated with rabid and suspect-rabid raccoons has been excessive. Spillover cases, those spread from the primary rabies vector to other species, include: gray and red foxes; skunks; opossum; woodchucks; otter; deer; cows; horses; dogs; cats; and coyote. Compounding the effects of raccoon rabies in the southern part of the state has been the simultaneous outbreak of red fox rabies in the northern part, plus a significant number of rabid bats throughout the state. As one might imagine, the rabies diagnostic workload and inquiries and requests for assistance has increased dramatically.

Additional motivation for initiating HIP was more

broadbased, though relevant to zoonoses and other health issues. Today there is an information glut, facts are often divorced from their original context, and learning is becoming increasingly complex as we endeavor to view situations in their larger contexts (Kay 1991). Concomitant shortcomings in knowledge, skills, and attitudes in the public sector, in various professions, and in government agencies often result in mishandling of incidents with significant negative impact on public health. Further, limitations in government funds and personnel reduce our ability to effectively and efficiently respond to service needs, resulting in much of our effort directed only to active problems with little resources remaining for prevention.

In essence, a more comprehensive approach (that is, integrated pest management, or IPM) is needed, for adequately managing vector-borne diseases. IPM is a decision-making process that uses regular monitoring to determine if, what, when, and where interventions are needed, and employs a blend of physical, mechanical, cultural, biological, legal, and educational tactics to keep pest numbers low enough to prevent intolerable medical, economic, or aesthetic damage (Frantz and Davis 1991, Olkowski et al. 1991). All necessary inter-ventions (including supplemental least-toxic chemical controls) are brought to bear with the goal of providing the safest, most environmentally sensitive, economical, and sustainable remedy possible.

In New York State, zoonosis interventions include all necessary tactics, with varying levels of completeness, for a particular case. However, education is the essential IPM component in any successful, sustainable program for managing such public health problems. Many of the aforementioned shortcomings can be prevented or reduced in significance through education—that is access to and successful transfer of information.

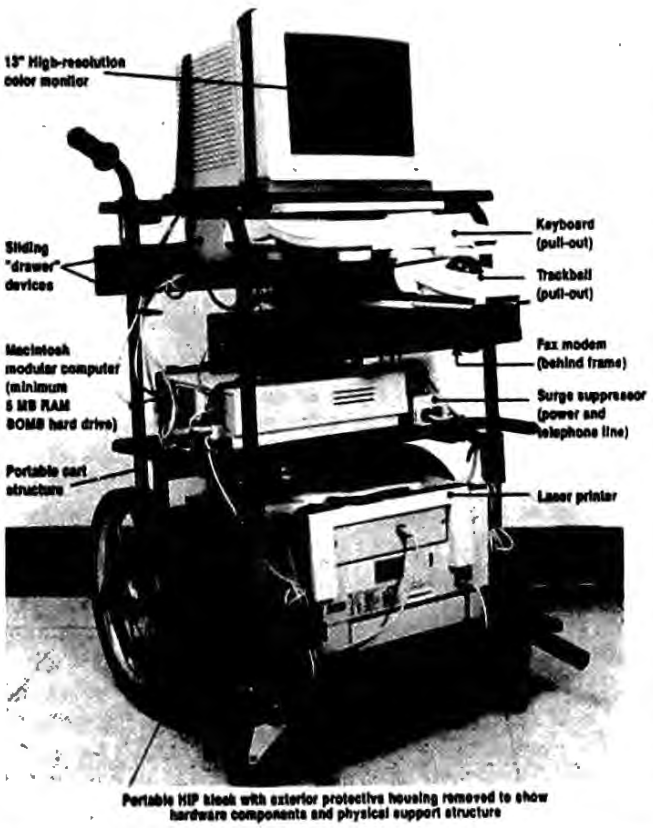

Figure 1. Portable HIP kiosk with exterior protective housing removed to show arrangement of hardware components and the physical support structure.

The raccoon rabies epizootic provides examples of where information is needed to mediate the raccoon/human behavior complex which exacerbates management of the outbreak. These include: people perceive raccoons as cute and cuddly, and want to feed, handle, and take care of them; raccoons are commensal in habits, they live in and about human dwellings; raccoons are very strong, agile, exploratory and adaptive. Thus, as with many pest and nuisance wildlife situations, we are not dealing with simple, "natural" wildlife events; the negative role of people is unfortunate, unnecessary, and largely preventable.

METHODS AND MATERIALS

The Health Information Project (HIP) is a computer-based, statewide system of integrating public health information, professional training, and public/professional communication. Its purpose is to enable users to access comprehensive, accurate, up-to-date information regarding a wide variety of health issues (e.g., rabies, Lyme disease) in New York State. Specific objectives include: to enhance public access to educational programs and information in various health-related databases; increase awareness of available consumer services; enhance communication between the public and local state government; enhance professional training (especially re: public services) by providing timely training materials which are consistent system-wide; and to promote computer literacy. The organizing principal, both in programming and in functionality, is designed to achieve ultimate flexibility, utility, and, most importantly, relevancy to the user. We want users to have the ability to choose what information is personally important to them and in what format they wish to have it delivered.

For the delivery system, HIP will be comprised of networked, interactive computer kiosks—small structures housing a modular Macintosh microcomputer, color monitor, hard disk (for local information storage), modem (for telecommunications linkage to remote information resources via E-mail or fax), and laser printer (for printing out text and graphics for users to take with them). The kiosks are accessible to users at the front where are located the input devices (track ball & keyboard) for users to interact with the computer's information files and to place inquiries with remote resources. For basic security and protection from physical damage, kiosk components will be enclosed in a plywood/laminate shell; Figure 1 shows the prototype kiosk with the exterior shell removed. While modifications can be made for disability access, the current design already meets wheelchair specifications.

Kiosks will be strategically placed in convenient, secure locations where they likely will be utilized. Initial placements will be in public libraries because such locations are: accessible to the general public (all strata of the population); open evenings and weekends; and are well-distributed throughout the state. Later placements will include local health offices and medical facilities (client/patient and health professional access), school libraries, community centers (specific target groups, e.g., the elderly), park information centers (particularly within disease outbreak areas), and state and county fairs.

Some kiosks will be portable as shown with the prototype in Figure 1. These units can be easily moved from community to community; they can provide critical information where and when needed, and will allow wide public exposure that should enhance public awareness and utilization of HIP after we move beyond the prototype phase. Depending on specific needs and hardware availability, some sites could choose to provide stationary HIP kiosks or Macintosh computer workstations containing the HIP application software.

Functional Overview

The computer equipment chosen insulates users from many of the traditional computing technicalities (a common cause of computer phobia) and leaves the user free to explore information content. HIP presentations will deliver multimedia—a combination of text, graphics, animation, video and sound. Such a multisensory environment closely simulates the way learning naturally occurs. Content can be particularly engaging with material to: look at (e.g., diagrams, maps, scanned photographs, 3-D animations, and video—note that video can play directly off the Mac's hard disk without supplemental hardware or software); listen to (e.g., recorded narrations, music, sounds of animals); and read (e.g. scanned newspaper articles, text from DOH publications, excerpts from the State Sanitary Code). We are able to include related information from many diverse sources in presentations that are much stronger than static essays. Overall, the kiosk experience is entertaining as well as informative in order to maximize its public impact.

Instructions for using the kiosks are largely intuitive, but an external small sign of basic instructions will be kept near the keyboard; and an internal, welcome/primer screen will automatically loop through basic instructions when the kiosk is not in use, or the user can select the HELP topic for detailed instructions at any time.

The Macintosh's mode of communicating with people is the pointing interface (sometimes called the graphical or visual interface). HIP's application software (designed by The Philmont Software Mill, Philmont, NY) takes full advan-tage of the pointing interface. Navigation within the kiosk information base is via an interactive controller, an on-screen "tool" (with "buttons" to manipulate) that resembles a remote control for a television or VCR. Interactivity gives us the ability to control movement through the layers of information. Choices are made by moving the cursor via the trackball to an on-screen "button" and "clicking on" the desired item. Clicking on the TOPIC button provides a pull-down menu with the current topic choices of bats, Lyme disease, rabies and raccoons.

Within a topic, information choices are arranged as a series of "selector screens" each with a number of "windoids" from which to choose various subcategories of a topic. For example, in the RACCOONS topic, the first selector screen shows six subcategory choices: 1) Basics, 2) Biology and Behavior, 3) Damage Identification and Disease, 4) Pre-management Considerations, 5) Damage Prevention and Management Techniques, and 6) Resource Materials. These subcategories closely follow the standard arrangement used in Timm (1983) and should be easy for users to follow.

Clicking on a windoid (which then must be followed by clicking the controller's STEP button) can produce other selector screens with choices of more subcategories; or, where additional selector screens are not required, can launch an information sequence (a file containing a few to several cards with text, graphics, animation and/or video formats). Understand that a sequence may be as short or lengthy as necessary, and may be very focused (e.g., selecting traps for capturing raccoons). The STEP buttons on the controller takes one through a sequence forward or backward.

The system of selector screens and sequences allows infinite variety and detail. At anytime the user can go to a different selector screen, or another topic, and other content therein. At each click, the user is provided on-screen feedback (highlight, color change, etc.) to confirm that some choice has been made. Interactively working one's way through various levels of information imparts a degree of ownership of knowledge and further enhances the learning process (Kay 1991).

Though not yet developed, the first selector screen of any topic will provide users a choice of two basic routes to follow, overview or details. "Overview" will provide an autoplay, brief review of all key points of a topic. "Details" will allow users to move through the various layers of information at their own pace and desired degree of detail.

Other functions of the controller include:

FIND/SEARCH—type in a word(s) and click on SEARCH to be automatically taken to where that word(s) occurs in the text of a particular topic.

USER LEVEL—provides pull-down menu for users to make a choice based on a combination of expertise in a topic and reading capability (e.g., beginner/novice; intermediate/standard; advanced—for training and updating DOH field staff and personnel of local health authorities).

PREFERENCES—provides users a choice of language (e.g., English, Spanish, Chinese), time interval regarding AUTOPLAY, level of sound volume, etc.

Content

HIP content is comprised of two unique kinds of information: presentation data—relatively unchanging (static) information that resides on the local kiosk's hard disk or other storage medium; and support data—frequently changing (dynamic) information that is available to users in a live data window. Within support data, variables can be chosen (e.g., regarding year, month, county, and number of zoonosis cases by species. Further, options for displaying support data currently include map or tabular (spreadsheet) formats; and will later include graph and chart formats. Support data can also be utilized to alert users to locations of rabies vaccination clinics, routes to primary health care facilities, and other items of current interest.

Support data are kept up-to-date with regard to official public releases of DOH data (e.g., for rabies data, updates occur monthly). To accomplish this, each kiosk periodically will automatically call up (electronically) a remote, central database, and data updates then will be downloaded to the local kiosk's database for presentation in a standard format. Thus, it is reasonably easy for users to review the distribution and significance of their particular concern(s) at any point in time.

External Queries

When additional information (beyond what is offered at the kiosk) is needed, a user will be able to: type in a

question(s) within a topic; provide a name, return address, phone number or fax number for response by a particular government program area; click an on-screen "SEND MAIL" button; and the mail will then be stored for nighttime batchmail routing over various telecommunication networks to its final destination—usually the personal computer of the appropriate DOH authority for a particular topic. Some routing also will occur via fax since all appropriate authorities are not yet reachable on electronic networks. Responses to users' queries will be sent via mail, fax, or telephone as necessary.

Self-testing, Audit, Evaluation and Central Administration

For any topic, users can elect to be presented with an interactive, short series of questions to test their retention of content. Similarly, users can also elect to provide their opinions on the kiosk, its functionality, how it might be improved, etc. As the user explores information on a kiosk, an audit trail automatically will be maintained and stored at the kiosk. Collected data will include location of kiosk, topics used, and time spent on each.

Data gathered from voluntary self-testing and involuntary monitoring periodically will: be automatically transmitted electronically to the central administration database; where it will be automatically analyzed, and generate a printed report. These data analyses will enable us to effectively: revise the selection of topics; alter topic content; relocate kiosks to ensure utilization; and provide feedback to appropriate policymakers and/or service providers at both state and local levels in order to enhance overall program development and management.

Budget

The cost for developing topic content is difficult to predict since it may involve in-house or outside contracts for production, and depends on length and detail, programming of any special effects (which thereafter are available to any other resident HIP topic), etc. Content information per se, the basis for both presentation data and support data production, remains the responsibility of the particular DOH program area, but will be coordinated and reviewed by appropriate administrative staff regardless of where the actual production occurs. Support data requires tabulating and summarizing data to a standard format for display; this is done by the data processing staff of a particular program area at the same time as their periodic, routine work.

Current hardware costs for a portable HIP kiosk, including the base structure, range from $4,000 to $7,000 per kiosk depending on the particular computer model utilized, but computer hardware prices continue to drop. Both the Macintosh LC and the IIsi will function well for kiosk purposes if supplied with a minimum of 5 megabytes of RAM and 80 megabyte hard drive. Grant funds are paying for development of the HIP application software; there will be no license fee for kiosks used in government-associated facilities throughout the State of New York.

CONCLUDING REMARKS

A prodigious quantity of up-to-date information will be available via the fully functioning system of interactive HIP kiosks characterized by:

1. Attractive presentations
2. Informative and entertaining experience
3. Easy to use interactive format
4. Adaptable to users' needs and constraints
   a. Fast overview or in-depth study of topic content
   b. Presentation adjustable to reading level, subject expertise, language, etc.
   c. Can utilize information at kiosk and can walk away with hardcopy printouts of selected materials
   d. Where information needs are not met by topic contents, can electronically query appropriate government staffpersons
5. Evaluation and audit capability
   a. To ensure that information is being utilized in target areas
   b. Allows adjustment of content to meet users' needs
   c. Enhances coordination of efforts with state and local health authorities
6. Reasonable costs for a full-time, multimedia, interactive, health education utility

In its final form, we hope that the Health Information Project will: meet much of the public's need for standard information regarding vector-related and other health issues; help to meet the more specialized needs of DOH field professionals for regular information updates for their own use and for public outreach activities; and allow DOH program area staff additional time to conduct research and to address the more unusual and difficult incidents which threaten public health.

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