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ABSTRACT

This paper attempts to put telecommunications into a realistic perspective, provide an overview of selected telecommunication technologies, and examine the impact of telecommunication technologies on nursing education and the preparation of graduates for the 21st century. Trends in nursing practice are outlined in terms of their impact on nursing curriculums and instructional methods; these trends include, among others, the nurse's role as a patient advocate, the growth of alternative health care delivery systems, and ethical dilemmas. The tyranny and promise that telecommunication technologies hold for nursing education are discussed. Four technologies available to provide quality educational services to more nurses in a cost-effective manner are described; these include teleconferencing (audio, video, and computer), television-assisted instruction, computer-aided learning, and interactive video. (46 references) (JDD)

TELECOMMUNICATIONS: A VISION FOR NURSING EDUCATION IN THE SOUTH

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The theme for this annual meeting---*A Vision for Nursing Education in the South*---is most timely. It is timely because changes and trends in nursing practice influence how nursing education in this decade must prepare graduates for the 21st century.

In the past, nursing education influenced the direction of nursing practice. Today, the tables are turned. The increased use of electronic technologies in nursing practice has expanded nursing services and replaced some traditional nursing functions, for example, the clinical measurement of a patient's vital signs is now done by electronic monitors rather than individuals. Consequently, graduates will need to acquire new skills and perform new nursing functions (Lucas, 1990).

Nurse educators are challenged to find more efficient and effective ways of educating graduates. Telecommunication technologies (TCT) may help. Based on this assumption, my mission is three-fold:

1. To put telecommunications into a realistic perspective;

2. To provide an overview of selected telecommunication technologies; and

3. To be provocative and futuristic in my remarks about the impact of telecommunication technologies on nursing education and the preparation of graduates for the next century.

Nurse educators can advance the educational base of nursing through the judicious use of telecommunication technologies.

There are three different ways of looking into the future: as the visionary, as the scientist, and as the researcher of the future. Scanning the distant horizon for the impact of telecommunications (TC) on nursing education helps to reduce shock and guide choices. The end product of any futuristic analysis, however, should be constructive ". . . strategies for coping with coming events" (White, 1981). It has been predicted that this wave will change civilization from the ground up. Families, methods of work, schools, codes of behavior, energy resources, and organizations were predicted to change. Bureaucracies were forecasted to topple; governments would become less complex and more democratic, and give birth to semi-autonomous economies. Working, learning, and recreating at home in urbanoid villages using new telecommunication technologies would become the way of life for many (Alexander, 1990; Howard, 1990; Morris, 1987).

As amateur futurologists, nurse educators need to spend some time speculating on the tyranny and promise of telecommunications. We must avoid being terrified by this "super electronic" revolution and fleeing into the safety of past educational practices. Rather, we need to face this super electronic phase with informed consent, knowing full well its benefits and risks.

The direction for the future of telecommunications in nursing education comes from looking at some of the pressing trends in nursing practice and health care delivery calling for change in nursing education, and looking at the nature of telecommunications in general. Placing telecommunication technologies within this realistic picture will make forecasting its impact on the preparation of graduates for the 21st century more probable and plausible.

Changing Times in Practice

Several general trends in nursing practice indicate a need for change in nursing curriculums and instructional methods (Spitzer & Davivier, 1987). During the 21st century, nursing practice in hospitals and in alternative health care delivery systems will be more technologically sophisticated. Greater responsibility, authority, and accountability for nursing practice will be given to nurses. Increased specialization at all levels of nursing education will be expected. New licensure and titles may emerge. However, the geriatric nurse, the family nurse, the occupational health nurse, and the wellness educator will be in even higher demand. Entrepreneurs, organizers, and leaders within nursing practice will be valued (Simpson, 1987).

Some specific practice trends (Spitzer & Davivier, 1987) that relate to nursing education's preparation of graduates for the 21st century and beyond are:

1. The size and function of hospitals will change. Hospital size will be reduced, while its Intensive Care Unit function will be expanded. Specialized knowledge to care for critically ill and acutely ill in technologically sophisticated treatment centers will be the norm.

2. Alternative health care delivery systems, such as home health and surgicenters will continue to increase in variety, demand, and type of services. Specialized knowledge in the care of the semi-critically ill and the chronically ill in alternative health delivery systems will be mandatory. Also, knowledge to teach and counsel patients in self care and families in caring for the sick and the elderly at home will be essential.

3. The nurse's role as a patient advocate with the political savvy to bring about changes in health policies will be a given.

4. Health care will continue to be big business. Knowledge of the economics of health care is predicted to be standard content in the schools of nursing (Williams, 1987). Nurse administrators must be able to speak the language of business to "cost out" nursing services, to identify products nurses can deliver, and to price those products so as to generate revenue. The cost effectiveness of primary nursing and other delivery models needs to be documented and analyzed for benefits. Staff nurses must be taught cost-conscious nursing practices and how to document accurately the nursing care delivered. Patient education and documentation of its benefits to the consumer must be established. The effectiveness of a nurse's early involvement in discharge planning and in the control and use of resources by nurses and other health care workers must be determined.

   Nurses will be required to demonstrate economic accountability for their practice in relation to patient outcomes (Fry, 1986; Powell, 1987). Nurses for the 21st century will need more knowledge, tools, and skills to give, document, and research the quality and cost of their professional practice. These nurses will need quick and concise information to practice cost-conscious nursing. Telecommunication technologies may help.

5. Ethical dilemmas in health care will mount as issues related to living wills, the duty to die, euthanasia, genetic engineering, the use of robots as caregivers, and the rationing of transplant organs mushroom. Nurses will assume leadership roles on committees and during rounds (Spitzer & Davivier, 1987). The use of telecommunication technologies to collect, analyze, and interpret data on ethical dilemmas in practice could be a boon to honing the critical thinking and decision-making skills of nurses.

Nurse educators can either become victims of change in the practice arena, or they can face the challenges and advance the educational base of nursing through the judicious use of telecommunication technologies. Graduates for the 21st century must develop the abilities needed to function effectively in such roles as: a high tech, but humanistic, caregiver; a master teacher of self-care for patients; a consultant to

family caregivers; an advocate for quality patient care; a politician who is a mover and shaker of health policies; a historian who meticulously records nursing care; an economist who is concerned with the relative worth of nursing care; a researcher who investigates more and better ways to practice nursing; and an ethicist concerned with protecting the human values that are basic to nursing as a profession.

Telecommunications

How can nursing education respond to these challenges from nursing practice? What impact does a school of nursing's curriculum design at undergraduate and graduate levels have on a graduate's practice? How competent are graduates for entry and specialty practice for the year 2000 and beyond? When faced with such questions, nurse educators have a tendency to respond by zealously and obsessively revising the curriculum, rather than looking at the total educational process and finding more effective ways to deliver their logically organized and internally consistent curriculum. Rather than tampering with the curriculum, faculty could explore how telecommunication technologies can be used to enhance the educational process. It is through matching the curriculum with more effective instructional methods that competent, committed, and caring graduates can be prepared more efficiently for the next century.

Nurse educators are expected to deliver educational services to more students in a more realistic, efficient, and effective manner today, not five or ten years from now.

Basically, telecommunications is the use of electronic technologies to transmit information. In literature from Canada, the word "telemedicine" is used to describe the use of electronic means to transmit knowledge about medicine throughout that vast nation and into some foreign countries (Lindsay, et al., 1987). Nursing could claim "telenursing" as its use of telecommunication technology.

Milo (1986), on the other hand, selected the term "telematics" to depict an even broader perspective of the use of electronic technologies to communicate over long distances. She stated that

> . . . telematics consists of the hardware and software of telecommunication technologies (e.g., cable, satellite, digital telephones, and direct broadcast television), computers and video technologies (e.g., multipoint distribution services, low power TV, mobile phone systems), services (e.g., videotext and pay TV), and industries (e.g., electronic mail, publishing and entertainment), all made possible by low unit costs of microcomputers and laser and optical fiber advances.

Combining the practice from Canada with Milo's more comprehensive definition, the Southern Council on Collegiate Education for Nursing could adopt the concept of "telematic nursing," rather than the more narrow "telenursing" to indicate its philosophy and usage of telecommunication technologies to assist in the preparation of graduates for the 21st century.

Telecommunication technologies hold both a tyranny and a promise for nursing education. The *tyranny* is that teaching people through electronic machines may make educators and students machine dependent; inhibit development of interpersonal and critical thinking skills; reduce networking and collaborative potential; and not foster humanism, flexibility, and a broad base for professional judgment and actions. Telecommunication technologies hold the *promise* that they can help nursing education catch up with the fast-paced changes in nursing practice. Changes in nursing practice are demanding that nursing education move and move quickly. These changes are dictating that nursing education deliver educational services to more students in a more realistic, efficient and effective manner *today*, not five or ten years from now.

Changes in nursing practice influence the expectations of nursing education relative to recruitment, retention, and graduation of a sufficient number of competent practitioners for the current decade and the

next century. Telecommunication technologies can help nurse educators to educate more and better graduates, to provide cost-effective career and job development for practitioners, and to re-tool in a more efficient manner the nurse who chooses to re-enter the hi-tech, fast-paced world of nursing practice. Telecommunication technologies can have this impact.

There are, of course, many new and emerging electronic technologies available to nursing education in its quest to provide quality educational services to more nurses in a cost-effective manner. Four technologies are highlighted in this presentation.

Teleconferencing

Teleconferencing ranges from a single switchboard linkage to a single or multiple sites to more complex communications with full video and/or computers involving a cast of thousands (Picot, 1984; Wood et al., 1988; Billings, et al., 1989; Lindsay, et al., 1987; Takacs, 1984; DuGas & Casey, 1987; Limon, et al., 1985; Henderson, 1989; Grunder & Garrett, 1986). This form of telecommunication technology comes in three basic styles: audio, video, and computer.

Audio Teleconferencing

This telecommunication technology uses voice communication over a telephone linkage to teach individuals or groups at remote sites. Its usage for simultaneous participation of learners in a session or an entire course with an expert in the field is a most practical way to share a scarce human resource. It is perhaps one of the more economical and easiest of the telecommunication approaches to establish, arrange, and maintain. Where there are large land masses, limited road systems, diverse cultures, and a distant or rural population in need of access to higher education, this is the technology of choice. This technology is used extensively in Canada and Alaska (Willis, 1989; DuGas & Casey, 1987; Lindsay, et al., 1987; House, et al., 1987). Audio teleconferencing has been used effectively by Canadians on an international level for the transmission of medical knowledge into Kenya and Uganda (House, et al., 1987). In addition to its use in continuing education, it is a cost-effective way for professional organizations to hold meetings involving individuals at several sites.

Audio teleconferencing is a most practical way to share scarce human resources.

Audio teleconferencing uses a linking device called a "bridge," which may be purchased, leased, or rented. There is a dial-out type bridge in which an operator calls each participating site and links each into the conference. Or, there is the dial-in or meet-me type of bridge in which participants call a designated number that places each caller, either automatically or by a bridge operator, into the conference. A typical bridge can link anywhere from 90 to 200 sites. Quality control of the sound is built into the system. A number of products, or services, from audio teleconferencing can generate revenue, e.g., tape recordings or manuscripts of a program; renting out a purchased bridge; consultation on use of the technology.

Audio teleconferencing can be livened up with the transmission of still pictures over telephone lines. This innovation uses what is called a freeze-frame or slow scan technique to produce graphic images, e.g., charts, slides, documents, photographs. While audio teleconferencing is one of the least expensive telecommunication approaches, it is viewed by some as an obsolete technology that is boring to the learner.

Video Teleconferencing

This electronic technology combines the drama and motion of live television with the familiar interaction of the telephone (Limon, et al., 1985). There is the point-to-point form in which two sites are linked with both audio and video signals. It has the advantage of providing immediate interaction--both visual and auditory--among participants. The point-to-point teleconferencing requires one-way video from the

origination site and two-way audio among several sites. This is the most prevalent form in use. Transmissions may be by coaxial cable system, a microwave system, or a dedicated/closed circuit network.

Many challenges have been identified when one chooses to use video teleconferencing as a means of achieving distant education (Limon, et al., 1986; Henderson, 1985; DuGAs & Casey, 1987; Wood, et al., 1988). The logistics in arranging the video conference at the origination site, i.e., classroom, conference space, television studio or laboratory, and the logistics of arranging single or multiple receiving sites in other educational institutions, hospitals, or hotels present a major challenge. Another challenge is having the technical expertise and equipment to produce quality programs and the technical crew at the origination site and receiving sites to handle unexpected electronic breakdowns. A third challenge involves policies, procedures, and contracting. This challenge may involve recruiting a coordinator or liaison person for each receiving site. It may involve other local or national entities to handle registration and establish policies and procedures for awarding credit. And, then there is the challenge of selecting the right content, the right presenters, and the right moderator.

Video teleconferencing provides immediate interaction—both visual and auditory—among participants.

The Associate Degree Nursing program at Ohlone College in Fremont, California, through a grant from the Kellogg Foundation, used video teleconferencing to transmit a five-hour program related to a preceptorship project, another concerned with clinical competence, and a third on evaluation of their video teleconferencing project (Limon, et al., 1985; Henderson, 1985). Since 1982, the baccalaureate program in nursing at the University of Ottawa has offered academic courses from its RN completion program, including one with a clinical component, to students at 10 different centers (DuGas & Casey, 1987). The College of Nursing at the University of North Dakota has used its state's Educational Telephone Network that connects 45 agencies (hospitals, libraries, clinics, universities) located at 30 different sites to teach a health assessment course. A pressure-sensitive blackboard transmits information, while TV monitors with transreceiver and memory capability convert the sound impulses (Hauf & Scott, 1985). The University of Texas Health Sciences Center at Houston is currently offering free conferences beamed to nurses at five hospitals or educational receiving site in the Rio Grande Valley. The topics addressed are management of the nutritional needs of women, assessment and intervention of sexual abuse, legal issues in nursing, and research-based suctioning practices. Video teleconferencing can deliver both basic or continuing education to nurses. It may be a subtle weapon in the recruitment and retention of registered nurses into educational mobility programs.

Although cost is a major concern with the use of this technology and will vary based on the equipment, personnel, and transmission services available, the people factor is most critical. Without committed faculty, motivated participants, competent coordinators at the receiving sites, qualified preceptors for a clinical component, and top-notch technical crews, video teleconferencing will be a disaster.

It is interesting to note that video teleconferencing has changed from transmitting single subject sessions to entire courses. Imagine with me for a moment that the Southern Council on Collegiate Education for Nursing's headquarters in Atlanta would serve as the origination site for video teleconferencing throughout the SREB region. Annual business and program meetings could be beamed to five or more sub-regional centers throughout the South. Although this technology would require an initial investment of money for the Council, think of the time and travel cost savings for individual members and nursing programs. Furthermore, videotapes or manuscripts of program speakers could be marketed nationwide and generate revenue. Nursing education programs, nursing practice settings, and individual nurses would be potential purchasers.

Computer Conferencing

In this telecommunication technology participants meet and transmit messages through computer terminals (Gayne & Natarajam, 1989). An agenda is prepared and participants who have access type in their responses at designated or convenient times. It provides individuals and groups with opportunities to meet,

exchange messages, and react (Picot, 1984). To be effective, however, this technology requires reliable software packages.

The American Council on Education (ACE) fellowship program in higher administration has used this technology. Some 25 to 30 ACE fellows are placed in residencies in higher education administration throughout the nation. During the residency year, the fellows come together for an occasional face-to-face meeting for instructional purposes, but their primary means of communicating and interacting is through computer conferencing. The central headquarters for ACE is the control center. It issues each fellow a password for entry into the fellowship network. Each fellow is expected to communicate through the network at least weekly.

Among the services provided by the network are a calendar of major professional meetings, a central file of scholarly papers on issues and resources in higher education, a means for individuals (fellows and ACE staff) to interact as a group or privately with one party, and opportunities to react and propose solutions to actual administrative problems encountered by fellows at the various sites. The central office also uses the network to expose fellows to intriguing editorials. Fellows also have used the network to collaborate on projects or publications. The cost to fellows for use of the network at less than $10/month is much less expensive than telephoning 25 or 30 colleagues.

Kelley envisions SCCEN as the origination site for video teleconferencing or the control room for the Southern Nursing Education network.

Envision for a moment that the SCCEN headquarters is the control room for the Southern Nursing Education Network. The executive director, executive committee, and other committees could conduct their agendas without ever leaving home. The Council leaders could be anywhere in the country and participate in a meeting as long as they had a password and access to a computer terminal. Statistical data and reports from individual programs could be transmitted with ease to headquarters. Establishment of such a network could provide students and faculty at all levels in nursing with access to scholarly papers on current issues prepared by a rotating panel of experts for a small fee that would also generate revenue for the Council. Consider, too, the potential this technology offers for the delivery of off-campus, outreach, satellite, or distance education for academic and continuing education students. Think, too, of its potential in fostering collaborative research and publications among Council members, faculty, and students. With computer terminals available at so many different locations today, computer teleconferencing is here now and is certainly in our future.

Television Assisted Instruction

Television assisted instruction (TAI) has much in common with video teleconferencing. It may be done live, pre-recorded, or in combination for: classroom instruction, clinical or laboratory demonstrations, nursing rounds, and even examinations. It may be used for the delivery of continuing education for nurses at local and remote sites or for patient and caregiver education in hospital rooms, waiting rooms, or homes (*Birmingham News*, March 18, 1990). Its potential use for direct broadcast into homes through windowsill-size satellite dishes for home study by nursing students or patients' self-care instruction and caregivers' instruction is unlimited (Howard, 1990). It is a more efficient and effective use of faculty instructional time. A class, once produced and recorded on film/videotape, can be stored, retrieved, and reused anywhere from 100 to 400 times. For the learner, television assisted instruction increases access to nursing education, while reducing such barriers to learning as loss of time from work, travel time to a distant school, searching for and the expense of parking, personal safety, and conservation of energy.

However, for the origination site there are multiple factors to consider before adopting this electronic technology. Millonig (1988) suggests the use of the Japanese style of decision-making--invest much time up front in the planning process and the implementation phase will go smoother. Planning involves a series of

events and concerns. It is the rare school of nursing (Indiana University is an exception) that has its own TV studio. For the television assisted instruction planner, the stick-with-it ability of students and the demand for the course are management risks.

Among the questions planners must address are: Is microwave transmission available through a commercial or non-profit organization? Is $30,000 available for a stationary receiving dish? Is money available for air time? Is a satellite uplink, either stationary or mobile--at a cost of $150,000 to $250,000--available? If the mobile unit is the preferred choice, what are the projected costs for maintenance on the vehicle? Can the cost of an uplink be retrieved through rental, institutional partners, or shared sponsorship? Is it more economical to rent a commercial or cable satellite up-link?

What about the cost of air time? Presently, there are two transmission bands: the C-Band with 18 satellites, each having 24 channels, and the KU-Band with 14 satellites, having from 2 to 19 channels. Many of the channels are not in use and others are underused. Yet, air time can be costly. The cost of air time varies with the time of day or night. One commercial station in Alabama proposed an air time charge of $528/hour plus $325/hour for use of their portable satellite up-link. A 2-credit course could cost over $20,000 just to transmit. Microwave transmission through the state's educational television system would be more economical, but available time for beaming programs may be limited from midnight to six a.m. The University of Missouri System uses a two-way interactive television assisted instruction system between the School of Nursing at Kansas City and the School of Nursing at St. Louis to transmit master's level courses. Their air time cost is only $1,500/course.

CRITICAL FACTORS
in Television Assisted Instruction Planning

Determine the availability, accessibility, and negotiability of a state of the art studio or classroom, including a teleprompter.

Identify transmission capabilities and costs.

Calculate production costs.

Determine personnel needs and costs.

Determine the costs of script preparation and production.

Select a course that lends itself to the media.

Obtain administrative support.

Select faculty who are competent, committed, and comfortable with media.

Develop strategies to promote programs.

Anticipate impact on accreditation status.

Establish plans for evaluation.

In a recent article on the use of television assisted instruction with master's students in South Carolina, Boyd and Baker (1987) determined the approach in South Carolina was cost-effective. They used a well established state educational TV network and a statewide instructional TV service. The South Carolina system can reach over 500 sites. They also used the services and resources of the university. For example, access to classrooms, production, negotiation of air time, marketing programs, enrollment of students, mailing course materials, and a toll free telephone line all made implementation of the project a breeze. Over a two-year period, eight faculty taught three different courses and reached 316 graduate students; on campus only 196 students were reached. Comparison of a group of television assisted instruction students with an on-campus group revealed a higher grade point average in the three courses, a higher percentage conducting their thesis research (45 percent vs 50 percent), and a higher graduation rate (10 percent vs 5 percent).

Faculty concerns with television assisted instruction centered primarily on role socialization of students. These can be resolved by arranging increased opportunities for faculty-student and student-student contact. A toll free number helps with student-faculty contact, but face-to-face interaction is even more important. An administrative dilemma, in addition to the ones cited earlier, is the need to reduce the faculty workload while faculty prepare and produce a course for television. Quality productions take quality time. Television

assisted instruction has several positive outcomes: the image and visibility of a nursing program can be broadened, enrollments increased, and television teachers may be sought as consultants.

The State of West Virginia is an excellent example of the role of institutional cooperation in television assisted instruction. With a satellite up-link in place at West Virginia State College and Institute, three other institutions (West Virginia University, Marshall University, Beckley PBS Station) are inter-connected through a microwave system (Dennison, 1989). Down-links were installed at 10 other state colleges. The system uses the Galaxy 2 satellite to broadcast 20 to 35 hours/week. In nursing education, the system has been used for distance learning in a nurse certification course. More recently, an interinstitutional effort is being made among multiple schools of nursing to develop and transmit a unified curriculum for the Bachelor of Science in Nursing degree (Legislative Network of Nurses, 1990).

In Georgia, literacy education is being broadcast to 24 vocational schools by satellite from a Georgia Tech classroom. Between 450 to 500 learners are enrolled, rather than being taught on a one-to-one small group basis (Rankin, 1990).

Another coming event in television assisted instruction is direct broadcast to homes. Signals will be picked up from high-powered, napkin-sized receivers costing around $300 instead of the 8 to 10 foot in diameter dishes that cost around $1,500 (Howard, 1950; Wollenberg, 1990). Some eight companies have been licensed for direct broadcast by the FCC, with each approved to transmit on 16 channels. Another joint venture will offer broadcasts over 100 channels (Goldman & Lendro, 1990).

In Springfield, Massachusetts, interactive TV was tested with 300 cable customers. Similar to interactive video, customers punched buttons to compete with game shows. The system is marketed in Montreal (Alexander, 1990).

Quality productions require quality time. Faculty need a reduced workload while preparing and producing a course for television.

Television assisted instruction started out broadcasting courses, and progressed to degree programs. Videotapes of television assisted instruction classes became a common practice during the 1970s, but expanded during the 1980s to delivery of entire curriculums. (Auburn University has offered a video-based master's program in engineering since 1984, and recently initiated a Master's in Business Administration option [*Birmingham News*, October 9, 1990]). Each class is videotaped and mailed to subscribers the same day. After viewing a tape, students may use a toll free telephone line to interact and seek clarification from an instructor. The cost to the student is $140/quarter hour more than the traditional on campus course. Is this home study possible for nursing education?

Television assisted instruction may have a positive impact on the education of nurses for the next century in terms of distance education, home study, and the marketing of products and services emanating from its use. However, my vision of what is coming is this:

1. There will be regional planning for interstate-interinstitutional collaboration on the delivery of academic programs in nursing through subregional centers.

2. In collaboration with one of the eight companies approved for direct broadcasting to homes, the Southern Council on Collegiate Education for Nursing will coordinate a comprehensive home study program for nurses and patients and their caregivers.

3. Through shared partnerships or sponsorships, the Southern Council on Collegiate Education for Nursing will establish its own communication network, the Southern Nursing Education TV Network or the Nursing and Health Link (with or without Turner Broadcasting or Lifetime Television) to offer regular continuing education for nurses, certification programs,

and health education for the public (*Birmingham News*, March 18, 1990). The program designed for the public will be aired in the waiting rooms of physicians' offices, health departments, and emergency rooms having excessively long waiting periods.

4. Marketing of products produced from the use of television assisted instruction will generate revenues for the Southern Council on Collegiate Education for Nursing.

Computer Aided Learning

"The computer is the knowledge worker's tool. . . . Knowledge is power and the computer is an amplifier of that power" (Feigenbaum & McCorduck, 1984). Computer technology can be a major tool to assist nurses with the delivery of nursing care. Computer aided instruction has invaded nursing education, but is it preparing graduates for the real world of nursing practice? Hudgings (1987) identified three essential components for a computer assisted nursing care delivery system (CANCDS) that should be used in nursing education to teach students if graduates are to be prepared for practice in the 21st century:

1. A nursing process framework in the computer system teaches patient assessment, nursing diagnosis, goals for outcomes, nursing interventions, nursing care plans, and evaluation outcomes. This component would store both patient care and nursing care delivery data to document clinical observations and therapeutics and provide data bases for clinical oriented research.

2. The nursing process framework would be integrated with other real or simulated hospital/health care systems so that access to relevant patient data from other agencies or internal departments could be retrieved readily. Integration of patient data saves time for both patients and personnel and it reduces duplication of effort and the possibility of errors. Also, it provides a more comprehensive data base for nursing and collaborative research.

3. The portability of computer technology offers many options. A hand-held or pocket-sized computer that goes wherever the patient and nurse go would make data entry and retrieval instantaneous. Lucas (1990), in an article on nursing in the 21st century, predicts that patients in the home will be wired to a computer receiving data from implanted body sensors. Analysis of such data may tell the patient to cut back on certain food intakes, call the nurse practitioner, or seek consultation with a cardiologist.

This type of nursing care delivery system will be commonplace in hospitals and alternative health care delivery systems within this decade. Where will graduates learn how to use, evaluate, or even develop such systems? How will the system be modified or improved? Milo (1986) identified a need for a cadre of "mappers." These "super experts" would be responsible for updating nursing computer systems based on feedback from practitioners in the field.

Is it reasonable to expect that each nursing program can afford a real or simulated electronic nursing laboratory that is integrated into a hospital or alternative health care delivery computer system? Is it plausible for each nursing program to have a nurse mapper?

Teaching students to use an integrated nursing care delivery computer system will in the end be a time-saver, making it easier to formulate nursing care plans, set priorities for work tasks, and record patient and nursing care data. It can lead to improvements in the quality of nursing care, for example, automatically generating standard nursing care plans for some common and recurring health problems; planning for earlier discharge; and using more sophisticated measures to assess quality. Its ability to provide more comprehensive and current nursing data bases for clinical decision making and nursing research is invaluable.

Knowing how to use a computer assisted nursing care delivery system can help the graduate for the 21st century be a knowledgeable worker. However, keep in mind, computers tend to teach "digital thinking" (Milo, 1986). They focus on logical, analytic, concrete, linear, goal-oriented, left brain type thinking. Is this type thinking compatible with human interactions that occur in patient care and nursing practice situations? Spontaneous, holistic, visual, intuitive type thinking comes from the right brain. Computer programs have difficulty with holistic or whole brain thinking. The graduate prepared for practice in the 21st century will need to take into account all the factors, influences, and relations in a clinical situation that bear on real and potential health problems faced by patients, their families, and communities. The graduate who is prepared today to function in the next century needs ". . . to have breadth in perspective and range of skills rather than narrowing; tc have flexibility and wide scope of judgment and action, not rigidity" (Milo, 1986). The wise and prudent graduate will understand the limitations of computer assisted instruction and use that technology to expand self knowledge, the profession's knowledge, and patient and caregiver's knowledge. This nurse will also be aware of its limitations in terms of humanness and interpersonal relations.

A computer research laboratory at the University of Washington is looking at new methods of increasing human interaction with the knowledge stored in computers. Through "virtual reality" or cyberspace, programs are being developed to put users into the stored data through 3-D sight, sound, and motion experiences ". . . by generating an image of the user moving inside the computer" (Lalonde, 1990). This is an attempt to make computer experiences more human and action like. The sight, sound, and motion experiences stir up emotions. This "virtual reality" experience through computers would enable nurse administrators to teach a patient with an injured spinal cord to learn how to control a computerized wheel chair with eye movements before attempting an actual trip (Lalonde, 1990).

. . . a pocket-sized computer will replace the stethoscope.

My vision for the future is that computer assisted nursing care delivery systems will be the standard in hospitals and alternative health care delivery systems and taught in schools of nursing. Also, that a pocket-sized computer clipped to the nurse's waistband or belt will replace the stethoscope dangling around the neck. In the field of informatics, a new subspecialty will emerge--nursing information mappers. Nurses, like patients, will be wired to computers that receive data from implanted body sensors and, for a change, nurses will listen to that physiological feedback and take care of their own health.

Interactive Video (IAV)

This electronic technology combines the large storage capacity of knowledge in computers with the drama of video, the concept of mastery learning, and the techniques of programmed instruction and learning branches. However, interactivity is the unique feature of this technology (Battista-Calderone, 1989). This technology has been used successfully to train pilots, by industry to train crane operators, and, in the military, to train tank commanders. In nursing education, it has the advantage of creating seldom seen life-like or life-threatening situations and allowing the student to make choices without endangering a real patient. Its potential for teaching nursing skills for the intensive care unit is relatively untapped. Students may choose the segment to be viewed and receive immediate feedback on decisions made. Correct choices allow the student to progress, while incorrect ones produce opportunities for remediation and retesting. Content must be mastered before the user is permitted to progress. Also, the student controls the pace of learning. This technology is capable of automatically documenting a record of student performance and achievement. This may be a plus for schools of nursing going for initial or continuing accreditation under the National League for Nursing's new student outcome criteria. Moreover, this instructional approach, which can be more "fun" for the student, is accessible whenever the learning resources or laboratory is open and operating. Using the technology provides some time for faculty to pursue other scholarly activities, such as nursing research. Although there may be occasional breakdowns with the equipment, machines do not have the "bad days" a live instructor may experience.

While research on this telecommunication technology is limited, several studies support its effectiveness (Bunderson, 1981; Fishman, 1985; Parkinson & Parkinson, 1989). One study (Bunderson, 1981) that compared it with traditional classroom learning found a learning time savings of 30 percent to 40 percent and student achievement gains of 11 percent to 25 percent. Another study (Fishman, 1985) compared three different methods of teaching and found that interactive video produced the highest level of mastery and retention.

If this technology is so effective, why is it not the telecommunication technology of choice? The answer is cost, which is four times higher than computer assisted instruction or linear video (Battista-Calderone, 1989). An interactive video system requires a personal computer, a monitor, a video player, and an interface to make the computer drive the video player and videodisc, as well as a device to operate the system, such as a computer keyboard, a hand held keyboard or pad, a light pen, or a touch tone screen. In a 1984 article, Bosco cited $3,000 to $10,000 as the cost for a basic system. Courseware for the system is also expensive, for example, $500 to $1,500 for videodisc; videotape is slightly cheaper. Unfortunately, the hardware is not standardized, so what runs on one system will not operate on another without additional hardware. Also, the variety of programs available is limited, with many having been produced by pharmaceutical or medical supply companies interested in promoting their products. Judith Nierenberg (1987) predicts that interactive video will be the instructional technology norm in health care education within 5 to 10 years. By the year 2000, it may be the way entry, certification, and career promotion examinations are administered in nursing.

By the year 2000, interactive video may be the way entry, certification, and career promotion examinations are administered in nursing.

Summary

Telecommunication technologies have many potential uses for preparing graduates at all levels for practice in the 21st century. Among these are: *distance education* for the delivery of academic programs to upgrade or retool the knowledge base of nurses and certification programs; *home study* for nurses, patients, and caregivers; *sharing scarce human resources*, such as faculty; exposing nursing students to *unique field trips* without leaving home base; *conducting nursing and health education* for the general public; rapid entry and retrieval of patient and nursing care *data bases* for improved clinical decision making; administration of course and professional *examinations*; conducting professional *meetings*; collaboration on *research* and scholarly publications; and, who knows, even conducting a *National League for Nursing site visit* for accreditation.

However, further research is needed on telecommunication technology. More studies are needed that: (a) compare students' academic and clinical achievements; (b) determine the impact of each technology on professional role socialization; (c) describe the cost benefits of the various technologies; and (d) identify the influence of telecommunication technology on architectural design or re-design of program facilities.

Adopting telecommunication technology will have an impact on the role of nurse administrators and faculty, on curriculum and instruction, on the instructional facilities, and on nursing research. For the nurse administrator, it will involve creating a climate for the understanding and integration of telecommunication technology into educational programs; obtaining and negotiating the resources and facilities for telecommunication technology; and managing and monitoring the quality and cost of telecommunication program activities. For nurse faculty, the role impact will require reliable knowledge about telecommunication options and the judicious integration of telecommunication technology into curriculum; mastering skills in the use and teaching others how to use telecommunication technology; conducting evaluation and research on telecommunication technology; and a willingness to share expertise of telecommunication technology with others.

Without regional planning, nursing education in the South will evolve into two distinct classes: low tech programs that cannot afford much and high tech programs loaded with "gimmickry."

Telecommunication technologies have laid down roots in nursing education. As a nurse leader you can either nurture those roots to strengthen graduates' learning for the next century, or you can ignore them so they spread uncontrolled like kudzu in the rural South. The choice is yours as an individual and as a representative to the Southern Council on Collegiate Education for Nursing. It would be helpful to the health of nursing education in the South to have a regional plan that nourishes these roots--a plan that identifies the telecommunication resources, expertise, and cost factors in our 15-state area. It would be helpful to have a regional plan that would bring together parties who are interested in the use of telecommunication technologies so they could design futuristic collaborative efforts for the region or subregion. Without regional planning, nursing education in the South will evolve into two distinct classes: low tech programs that cannot afford much, and high tech programs that are so affluent that they are loaded with "gimmickry" (Milo, 1986). Or, the development of a third class is possible--regional tech. The choice is yours as an individual and as a representative to the Southern Council on Collegiate Education for Nursing.

A paper presented at the 1990 annual meeting of the Southern Council on Collegiate Education for Nursing. The Southern Council on Collegiate Education for Nursing (SCCEN), in affiliation with the Southern Regional Education Board (SREB), engages in cooperative planning and activities to strengthen nursing education in colleges and universities in the South. Contact: Eula Aiken, Executive Director (592 Tenth Street, N. W., Atlanta, Georgia 30318-5790).

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