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Developing an Interactive Intravenous Education and Training Program

Abstract

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Intravenous therapy knowledge, skills, and attitudes of nurses within a healthcare organization vary greatly. Primary nursing education programs, responsibility for IV therapy in previous jobs, patient populations, types of therapies provided, and clinical setting are just a few of the factors contributing to these variations. However, administrators usually expect all nurses to function in all areas of clinical practice. The gap between actual and expected knowledge and skills can be extremely wide, especially in IV therapy. Interactive multimedia IV education products provide a way to narrow that gap in a quick and cost-effective manner when appropriate planning processes are used to incorporate them into an educational program.

Intravenous therapy education and training can present unusual challenges in today's healthcare environment. Primary nursing education programs provide limited, or no instruction on IV therapy. A 1988 study of associate degree nursing programs in the United States showed that 42 of 158 (27%) responding schools did not teach venipuncture skills.¹ However, healthcare administrators expect nurses to be fully functioning professionals immediately upon starting their first job.

Nurses will find a variety of approaches to IV therapy as they change employers and clinical settings. A nurse with medical-surgical experience in a hospital with an IV team who goes to work in the homecare environment will find that in the new role, venipuncture, managing complex IV therapy, and educating the patient and family about therapies are routine services he/she is expected to provide.

Even IV nurses frequently find it difficult to remain current on the latest technology, new medications, changes in policies and procedures, and general advances in IV therapy. Regardless of the years of practice, the types of clinical environment, or the specialty of practice, our knowledge base is constantly changing. Thus, innovative ways to continuously increase our knowledge and improve our skill must be used. Florence Nightingale was correct when she said, "Let us never consider ourselves finished nurses. . . we must be learning all our lives."

Changes and challenges also are common to the education and training field. Shifting values and philosophies, improving technology, and confusing terminology can lead to frustration. The term "learning experience" captures the essence of these shifting paradigms as we

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TABLE 1**Purposes and Outcomes of Learning Experiences**

| Program Purpose | Example | Expected Outcome |
|--|--|--|
| Encourage continuous individual growth and development | <ul style="list-style-type: none"> • INS Annual Meeting • CRNI review course | <ul style="list-style-type: none"> • Individual change through presentations and networking • Achieving CRNI status |
| Assist with response to practical problems and issues of adult life Prepare for current and future work opportunities | <ul style="list-style-type: none"> • Seminar on managing the demands of a career and family • Orientation of new employees • Continuing education course on PICCs | <ul style="list-style-type: none"> • Individual change by learning how to organize and prioritize • Individual change through the process of learning to perform in the new organization • Individual change by exposure to new knowledge and skill • Organizational change through adding a new vascular access service |
| Assist organizations in achieving desired results and adapting to change | <ul style="list-style-type: none"> • Training on a new infusion pump • In-house seminar on early assessment of vascular access needs | <ul style="list-style-type: none"> • Organizational change by instituting new equipment or a new way of providing clinical services |
| Provide opportunities to examine community and societal issues | <ul style="list-style-type: none"> • Workshop on diversity • Seminar on changing lifestyles to improve health and prevent disease | <ul style="list-style-type: none"> • Community or society changes by emphasizing the benefits of diversity and improving choices made in nutrition and other activities |

PICC = peripherally inserted central catheter.

explore the process of planning the use of “learning technologies.” The emphasis is on learning, not just education. The broader concept of learning encompasses the cognitive processes of what the learner does in a teaching-learning transaction and the unplanned, incidental learning that is part of everyday life.² Learning technologies can be used to support both avenues.

• PURPOSE AND OUTCOME OF THE LEARNING EXPERIENCE

The learning process begins with appropriate planning. Initially, we must articulate a clear program purpose and desired results or outcome for each learning experience. Each purpose implies some type of individual, organizational, community, or societal change³ (see Table 1).

Terms used for various educational programs should follow the definitions of the leaders in nursing staff development. By using consistent terminology, communication between nursing specialties and organizational departments will become easier and aid in identifying the program purpose and desired outcome. Staff development is a global term encompassing orientation, in-service training, and continuing education for the purpose of promoting the development of personnel within any employment setting.⁴

Orientation is the means by which new staff members are introduced to the philosophy, goals, policies, procedures, role expectations, physical facilities, and special services in a specific work setting. Training or in-service training are learning experiences provided in the work setting designed to assist the staff in performing their assigned jobs in that particular organization. Education or continuing education are planned educational activities intended to build upon the educational and experiential bases of the professional nurse for the enhancement of practice, education, administration, research, or theory development toward the goal of improving the health of the public.⁴

Frequently “in-service” and “continuing education” are used interchangeably, although their meaning is quite different. An example of an in-service would be a brief presentation on the features and benefits of a brand of peripherally inserted central catheters (PICCs) new to the organization. An example of continuing education would be a complete seminar incorporating anatomy, physiology, infection control, patient assessment, PICC insertion techniques, nursing care, and complication management.

• WHO IS THE LEARNER?

An intimate understanding of the learner is required to make the best choices in the planning process (Figure 1).

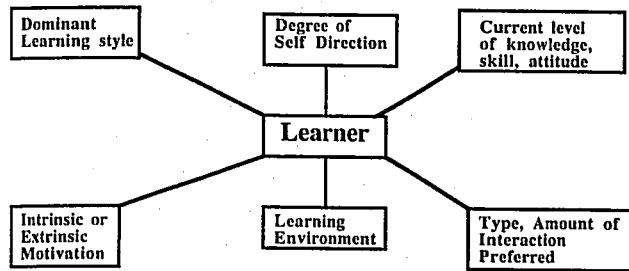


FIGURE 1.

Who is the learner?

The needs assessment reveals the education gap by identifying the differences between current and desired knowledge, skill, and attitudes.

Learning style is an individual's characteristic way of processing information, attitudes toward learning, and behavior in learning experiences. The styles used to remember, perceive, and think differ greatly among adults.⁵ Styles can be categorized in multiple ways; however, common ones include visual, auditory, and kinesthetic ways of learning.

In a typical classroom, the educational process is controlled by the instructor. The alternative is self-directed learning or the self-initiated process of planning and managing one's learning needs.⁶ While self-directed learning is rooted in the principle of autonomy, this process works best for individuals who are best at learning. Learning technologies provide numerous resources for these individuals, although some may feel abandoned when they have a high degree of control.⁷

Knowing the intrinsic and extrinsic factors motivating learners can help the planners tap into those factors. Intrinsic factors include the desire to improve one's job performance or provide better patient care. Extrinsic factors include better pay or career advances.

Learning takes place in many environments, including the classroom, the patient's bedside or home, the break room, the elevator, and the cafeteria. Wherever and whenever the need is recognized, a window of opportunity for learning opens. The motivation to learn and the ability to retain what is learned are heightened during this open window or teachable moment. Rapid application of what was learned will increase the speed of skill acquisition.⁸ When a PICC cannot be inserted into a patient immediately after a PICC course, the effectiveness of the education is greatly diminished.

Finally, interactivity among the learner, the content, other learners, the facilitator, and the delivery method are critical considerations for planners. Active discussions in large and small groups, examining issues, and obtaining information from the experience of others are more appropriate for some learners and subject matter. Some may prefer to rely on reading the information, whereas others depend on interaction with the facilitator.

Previous measurements of education and training activity included the number of learners attending each program or the number of days per year each learner attended a planned program. The focus is shifting from simply transmitting information to improving job performance. This requires a thorough knowledge of how to work with adults in a learning situation (see Table 2).

• THE TECHNOLOGY OF LEARNING

Armed with the knowledge of the program planning process and the differences of adults in a learning situation, we can examine recent advances in technology that enhance the learning process.

Multimedia includes the combined use of movies, slides, music, and lighting for the purpose of education or entertainment. Interactive multimedia combines computer hardware, software, and peripheral equipment to provide a rich mixture of text, graphics, sound, animation, full-motion video, data, and other information.⁹ Learning technology is defined by the American Society for Training and Development as the use of electronic technologies to deliver information and facilitate the development of skills and knowledge.¹⁰ Learning technologies combine a variety of multimedia aids and use various levels of interactivity (Table 3). Examples of IV therapy education products are available in all types of technologies (Table 4).

Learning technologies clearly benefit the adult learner by capitalizing on the principles of adult learning. These technologies put the learner in control of the pace of learning, the length of each session, and when and where the learning will occur. Learning times are decreased by 50%; retention of the information is increased by 80%; and costs are cut in half.⁹

• CHOOSING LEARNING TECHNOLOGY PRODUCTS

Designing and developing interactive multimedia learning technology products requires computer programmers, instructional designers, graphic artists, and subject matter experts.

The quality of the product depends on the active involvement of and skillful interactions among these key individuals. Without careful planning, the capabilities of the technology will overpower the educational purpose of the product.

Issues to be considered before the acquisition of a specific product include the clinical content, instructional design, compatibility of the product with the necessary hardware, availability of that hardware, and integration of and potential conflicts with existing software on the system.

TABLE 2

Working with Adults in a Learning Situation^{3,8}

| Key Points | Examples |
|--|--|
| <ul style="list-style-type: none"> • Adults can be forced to attend a class, but cannot be forced to learn. • When conditions are right, adults become extremely resourceful in learning. | Mandatory training on a new IV pump <ul style="list-style-type: none"> • Create the right conditions by emphasizing patient benefits and frequency of use in clinical practice |
| <ul style="list-style-type: none"> • Teachable moments are windows of opportunity when adults are interested in learning and will likely retain what is learned. | <ul style="list-style-type: none"> • Patient problems with occluded catheters leads nurse to seek information about solving the problem. |
| <ul style="list-style-type: none"> • Adults respond to the idea of personal growth and gain. • Stimulating curiosity, demonstrating usefulness, and ensuring low risk are also motivating factors. | <ul style="list-style-type: none"> • Job skills training such as midline and PICC insertion are applicable beyond the current job. |
| <ul style="list-style-type: none"> • Adults tend to prefer single-concept, single-theory courses focusing on applying concepts to problems relevant to the learner's personal goals. | <ul style="list-style-type: none"> • IV nurse with the goal of improving patient assessment for appropriate choices of vascular access devices |
| <ul style="list-style-type: none"> • Instructors need preprogram assessment to understand the learner's current knowledge, skill, and attitudes. | <ul style="list-style-type: none"> • Nurses with minimal venipuncture experience are not ready to learn insertion of PICC or midline catheters. |
| <ul style="list-style-type: none"> • Programs with the greatest success are designed to integrate new information with what is already known. • The learner can then "construct" meaning that is appropriate for their individual situation. | <ul style="list-style-type: none"> • Nurses familiar with skin problems under IV dressings can receive new information about dressing materials, integrate that with clinical experience, and create better methods of patient care. |
| <ul style="list-style-type: none"> • Instructors must accommodate different learning styles by using multiple instruction strategies. | Some learn dosage calculations by <ul style="list-style-type: none"> • hearing the explanation • seeing someone perform the same calculation • actually performing the calculation. |
| <ul style="list-style-type: none"> • Designers must focus on strategies that move new skills and knowledge from the classroom to the job. | <ul style="list-style-type: none"> • Patient care assigned so that new skills can be used quickly. • Arranging clinical time for practice of new skills. • Job performance aids such as posters, pocket-size tools as reinforcers/reminders |
| <ul style="list-style-type: none"> • Facilitation techniques and interactive teaching strategies are more effective than lecture because the learner is mentally, physically, or emotionally engage in the learning process. | <ul style="list-style-type: none"> • Case studies • Role playing • Small group discussions • Buzz groups |

IV = intravenous; PICC = peripherally inserted central catheter.

To assess the clinical content, consider the following:

1. Is it accurate and up to date?
2. Is it based on published standards and guidelines, such as the *Intravenous Nursing Standards of Practice*, Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Standard, and the Centers for Disease Control (CDC) Guidelines for the Prevention of Intravascular Device-Related Infections?
3. Is it coherent with or in conflict with your current policies and procedures?
4. Is it based on scientific research or empirical data?
5. Is it supported by a thorough bibliography? Does the content require such a reference list?
6. Does the content apply to the patient population (e.g., age-related, such as geriatrics or pediatrics; disease-related, such as oncology or infectious diseases)?

7. Does it apply to the clinical setting (e.g., hospital, homecare, long-term care)?

The quality of the instructional design depends on the initial needs assessment in the early developmental stages of the product.⁷ Questions to consider include:

1. Does it appear that the designers and developers had a thorough understanding of the work, the worker, and the workplace?
2. Were the learners' attitudes toward the content considered? Are the concerns, interests, and priorities of the targeted learner built into the product?
3. What consideration was given to the learner's knowledge, skills, and attitudes toward the use of the technology? What challenges could the learners encounter in using this technology? Are there adequate paper-based instructions to help the learner get started?

TABLE 3

Interactive Multimedia Learning Technologies

| Type of Media | Definition | Advantages/Disadvantages | Uses |
|---|--|--|--|
| Videotape | Most basic form of optical technology | <ul style="list-style-type: none"> • Good way to illustrate actions, procedures • No opportunity for interaction • Due to familiarity with commercial TV, learners demand high quality presentation. | <ul style="list-style-type: none"> • Demonstrate procedures • Supplement traditional classroom presentations • When information or content will remain stable over a long period |
| Computer-assisted instruction | Instructional program on computer hard drive or diskettes (floppy disc); learner interacts with computer for drill and practice, problem solving, or tutorial processes | <ul style="list-style-type: none"> • Process controlled by learner • Can be boring without creative developers • Requires compatibility between disks and computer | <ul style="list-style-type: none"> • When many learners must be brought to the same level of knowledge • When training is needed immediately |
| Interactive videodisc | Video disc read by a laser and controlled by a microprocessor; learners interact with program by using computer keyboard, mouse, touchscreen, or light pen | <ul style="list-style-type: none"> • Large size and format, holds 7 × more information than compact disc • Videodisc computers are expensive | <ul style="list-style-type: none"> • When simulated interactive training activities are needed prior to or instead of hands-on practice • Incorporates psychomotor skills with cognitive information in a nonthreatening way |
| Compact disc-interactive (CD-i) | Compact disc with digitized video, graphics, and audio; CD player connects to a TV monitor | <ul style="list-style-type: none"> • Highly portable • CD players are less expensive than computers • May require special supplier for service • Production time and costs are about the same as CD-ROM | <ul style="list-style-type: none"> • When portability is needed • When lower equipment costs are needed |
| Compact disc, read-only memory (CD-ROM) | Learning programs on compact disc played on computer with CD drives | <ul style="list-style-type: none"> • Must ensure compatibility with the computer • Some limitations with video | <ul style="list-style-type: none"> • Instruction needed at multiple locations, for learners at varying levels of knowledge and experience • When interactive exercises are useful strategies |
| Electronic performance support systems | Electronic job aids providing on-demand <ul style="list-style-type: none"> • task-specific skills training • task-specific information access • expert advice to solve job-performance problems | <ul style="list-style-type: none"> • Learn while you work • No separation between work and learning | <ul style="list-style-type: none"> • To support workers who must make complex decisions while on the job |
| Computer-mediated conferencing delivered via <ul style="list-style-type: none"> • Internet • intranet • Local area network (LAN) | Learning occurs through interaction between learners and facilitators by using the computer as a way to connect them; may be synchronous or asynchronous | <ul style="list-style-type: none"> • Convenience of accessing the system anytime, anywhere • Requires the learner to be comfortable with using the computer • Lack of face-to-face exchanges can leave some learners feeling isolated | <ul style="list-style-type: none"> • When learners are in multiple locations, in differing time zones or have different work schedules. • When team-building among geographically dispersed individuals is necessary |
| Virtual reality | Computer modeling, visualization software, and tactile feedback robotics | <ul style="list-style-type: none"> • Requires a dedicated computer for software • Incorporates critical thinking exercises with tactile sensation • Lack of portability and expense may be difficult for some to use | <ul style="list-style-type: none"> • Teaches novice learners with no exposure to the content • Intended to replace invasive procedures on healthy volunteers |

TABLE 4

Available Interactive Multimedia Infusion Therapy Programs

| Type of Media | Program | Supplier | Contact Information |
|---|---|--|--|
| Videotape | Multiple IV products | Multiple Manufacturers | |
| | Preventing Undernutrition: Dehydration and Invasive Treatment in the Geriatric Patient | Geriatric Video Productions | PO Box 1757 Shavertown, PA 18708-0757 800-621-9181 www.geriatricvideo.com |
| | Basic IV Therapy Implanted Venous Ports Volumes 1 and 2 | Professional Learning Systems, Inc. | 1480 Terrell Mill Road, Suite 885 Marietta, GA 30067 770-578-1568 www.plsysinc.com |
| | Nursing Care of Central Venous Catheters Home TPN: A Nurse's Guide Home TPN: Patient/Caregiver Version Nursing Skills Videotape Series: IV Therapy Series Package | Lippincott Williams & Wilkins Mosby, Inc. | 800-638-3030 www.lrpub.com www.mosby.com |
| Computer-assisted instruction | 1997 Drug Guide for Nurses with Windows Disk | Mosby, Inc. | www.mosby.com |
| | Central Venous Catheters: Implications for Nursing Care | Lippincott Williams & Wilkins | 800-638-3030 www.lrpub.com |
| Interactive videodisc | Intravenous Therapy | FITNE | 5 Depot Street Athens, OH 45701 614-592-2511 www.ev.net/fitne |
| | IV Medication Administration | Lippincott Williams & Wilkins | 800-638-3030 www.lrpub.com |
| Compact disc-interactive | Basic Venipuncture Volume 2-Complications | Professional Learning Systems, Inc. | 1480 Terrell Mill Road, Suite 885 Marietta, GA 30067 770-578-1568 www.plsysinc.com |
| Compact disc, read-only memory (CD-ROM) | Vessels of the Upper Extremities | Becton Dickinson | 800-ALL-MEDIA |
| | Asepsis: Medical and Surgical Techniques Managing an Intravenous Infusion Venipuncture: Initiating Intravenous Therapy Care of Subcutaneous Ports Care of a Central Venous Line Central Venous Pressure Monitoring | Medical Audio Visual Communications Inc., produced by the faculty of nursing at the University of Calgary | Suite 240, 2315 Whirpool St. Niagara Falls, NY 14305 800-757-4868 www.mavc.com |
| Electronic performance support systems | Nursing Bookman, an expandable book with removable book cards: <ul style="list-style-type: none"> • Nursing 97 Drug Handbook • Gahart's Intravenous Medications • Lippincott's Pocket Manual of Nursing Practice | Franklin Electronic Publishers | One Franklin Plaza Burlington, NJ 08016-9839 800-665-5450 |
| Computer-mediated conferencing | Many credit and non-credit college courses | Many colleges and universities | |
| Internet, Web-based classes | On-line Learning: Vascular Access Devices: Making Appropriate Choices | Hadaway & Associates | PO Box 10, Milner, GA 30257 770-358-7861 www.hadawayassociates.com |
| Intranet | Many classes internal to your organization's intranet | | |
| Virtual reality | CathSim Intravenous Training System | HT Medical Systems, Inc. | 6001 Montrose Road, Suite 902 Rockville, MD 20852-4874 301-984-3706 www.ht.com |

4. Is the content organized in an engaging, logical manner? Can the learner choose the preferred path through the content, or is a certain path mandated by the design?
5. Are the outcomes described in the format of learning objectives? Do the outcomes appropriately reflect what the learner will be able to accomplish or perform after using the product, or are they oriented to what the technology will do?
6. Were the chosen instructional strategies appropriate to achieve the objectives? Do these objectives provide a viable way to evaluate the learner's achievement? Four categories of learning objectives include: acquisition of knowledge, enhancement of critical thinking skills, development of psychomotor skills, and changes in attitudes, values, feelings.³
7. Does the potential of the technology match the category of learning objective? Consider the following objective: Perform a successful peripheral venipuncture on a geriatric patient. To accomplish this objective, the learner needs to do the procedure with this type of patient or at least with an anatomical model. However, many technologies could support the learner to achieve an objective stated as "Contrast the differences between performing peripheral venipuncture on a healthy adult patient and a geriatric patient."
8. Does the instructional design reflect realistic clinical situations and patient problems?

The availability and compatibility of the equipment involve the hardware, software, and other peripheral equipment. Before purchasing any product, obtain information about the system required to use that product. Questions to consider include:

1. What type of hardware will be required (computer, compact or laser disc players, televisions)?
2. Is this hardware already available? Will there be a need to purchase, rent, or lease additional hardware to use the product?
3. If a computer is required, will the product be installed onto the computer's hard drive? Is there adequate space on the hard drive? Is the operating system of the computer compatible with this product? Are there any known conflicts between this product and other software that already is on the computer's hard drive? Does the product contain the function of being uninstalled if necessary?
4. Will the product require a facilitator to teach the learner how to use it? How will the facilitator learn to use the product?
5. What technologic support does the product supplier provide? What hours are they available? How do you access them (telephone, fax, electronic mail)?
6. How will the learner gain access to the product (by going to a classroom, by computers on each nursing unit, by a laptop computer traveling with the learner)?

• NEW TOOLS, NEW CHALLENGES

The use of interactive multimedia learning technologies to enhance IV therapy education and training programs will become easier and more available. Instructors frequently use valuable class time to bring all learners to the same knowledge level before progressing to the more in-depth issues. Nurses without exposure to PICC and midline catheters would have a difficult time participating in a discussion about complication prevention and management. By using learning technologies to provide preliminary information, the facilitator can avoid planning instruction for those with the least knowledge and skills and maximize the face-to-face classroom time.

Excessive amounts of content often are forced on learners because they are in class for a finite period of time. The use of learning technology products spreads the learning over longer periods of time, allowing the learner to work at his/her chosen pace. This dramatically improves retention of the information. The learner will be able to transfer the new content to the work environment, applying it immediately for performance improvement.

The challenge is finding products that are learner-centered, instead of content- or instructor-centered. The technology used to deliver the instruction should be transparent, emphasizing the learning, not the fancy bells and whistles. In the future, traditional classrooms with instructor-led presentations will not disappear, but there will be a greater reliance on learning technologies. Learners and education planners should anticipate greater reliance on technology, combining technology with the traditional classroom, and use of multiple technologies. To ensure good learning outcomes, education planners must be knowledgeable of and skillful with the use of learning technologies.

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