

Intravenous therapy

A HANDBOOK FOR PRACTICE

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with 56 illustrations

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Preface

In the United States approximately 10 million patients receive some form of intravenous therapy each year.

In a typical acute care setting one can expect at least 25% of all patients admitted to receive either continuous or intermittent intravenous therapy.

Intravenous therapy has increased drastically over the last 15 years largely because of advances in oncologic pharmacotherapeutics and parenteral hyperalimentation. Other therapies include restoration of lost or depleted body fluid and electrolytes, replacement of blood, provision of nutrition, administration of medications, and maintenance of venous lines, which can be useful during periods of crisis.

The equipment, policies, and procedures regarding intravenous therapy vary widely from hospital to hospital. Specific infection control techniques are required in order to protect the patient from nosocomial infections.

The nurse is the primary deliverer of intravenous therapy and, as such, must adhere to specific legal guidelines.

The major objectives of this work are to:

- Increase the nurse's knowledge of the rationale underlying intravenous therapy and venipuncture
- Assist the nurse in learning to use this knowledge clinically in order to recognize both therapeutic and deleterious effects of intravenous therapy and venipuncture
- Assist the nurse in learning to identify appropriate nursing actions relating to intravenous therapy and venipuncture
- Present the legal aspects of intravenous therapy and venipuncture
- Assist the nurse in learning the pharmacodynamics of intravenous therapy*

*From Delbuono, D., et al.: Teaching pharmacology, *Nurs. Outlook* 19:6, June 1971. Copyright 1971 by the American Journal of Nursing Co.

The focus of this work is on intravenous therapy as it relates to the adult patient. Specific information on the disease entities and drugs mentioned can be found in other texts. The list of references should serve as at least an initial source for searching the literature.

Charlene Coco

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Chapter 1

Factors affecting practice

The registered nurse is the primary deliverer of intravenous therapy. Few courses specific to intravenous therapy are available in schools of nursing. Most schools integrate intravenous therapy training in courses related to surgical nursing, while some schools do not include intravenous therapy in their curricula. As a result, nurses in practice possess varying degrees of knowledge and skill.

Evaluation of the competency of each nurse charged with the responsibility of delivering intravenous therapy is a method of assuring quality care. This can be accomplished through written, oral, and practical examinations.

Areas of competency include an understanding of the functions of the cardiovascular system; fluid, electrolyte, and acid-base balance; pharmacodynamics; and the nurse's ability to use equipment and recognize patient responses.

When necessary, nurses should complete a prescribed course of study related to the theoretical and practical aspects of intravenous therapy. Successful completion of the course is ascertained when the nurse achieves a satisfactory score on written, oral, and practical examinations.

Once competency is realized, specific guidelines for practice should be established and adhered to. These guidelines, or statements of general policy, should comply with each state's nurse practice act, individual hospital policy, and procedure and common practice in each geographical area.

LAWS GOVERNING THE PRACTICE OF NURSING

State nurse practice acts and state boards of nursing govern the practice of nursing. Changes and amendments to laws relating to nursing practice are carried out through the state's legislative system.

State nurse practice acts vary, and as such, the nurse should follow that written in one's own state.

The Louisiana State Nurse Practice Act (1976), as an example of the law, states:

... said practice shall include the supervision and instruction of professional and non-professional personnel associated with nursing functions and may include the performance of such additional acts as are recognized by the nursing profession as proper to the practice of nursing and which are authorized by the board.

Selected nursing functions may be delegated to licensed or unlicensed personnel, unless objected to by the attending physician or dentist and/or the medical staff of the institution.

Delegation of such functions may not necessarily require the personal presence of the delegating registered nurse at the place where such functions are performed, unless such personal presence is necessary to provide patient care of the same quality as provided by the registered nurse.

The Louisiana State Nurses' Association (LSNA, 1977) stated:

... the purpose of the Nurse Practice Act is to protect the public. The Board of Nursing is delegated administrative and implementation functions and is charged with guarding the public welfare. It is therefore proper for the Board of Nursing to issue interpretations and rules and regulations concerning nursing functions performed by nurses or those whom nurses supervise.

LSNA (1977) further stated:

... a licensed practical nurse employed by a hospital must be supervised by a registered nurse. Physicians on the staff of a hospital are not employees and therefore cannot be responsible for the activities of hospital employees. It would be the professional nurse who would be liable for acts of the licensed practical nurse, not the physician.

The medical staff does not establish the policies and procedures for the performance and functions of nurses employed by a hospital. This is done by the nursing service director and hospital administrator in consultation with the professional nursing staff. The staff physicians do not evaluate the competence of nurses employed by the hospital. This evaluation originates with the immediate supervisor of the individual nurse.

The board of directors of a hospital is, of course, ultimately responsible for the performance of all employees. However, members of hospital boards of directors are primarily persons not engaged in the practice of medicine or nursing. They are not, therefore, qualified by experience or education to evaluate technical or professional competence.

The action of professional nurses must be based on individual nurses' understanding of cause and effect. The administration of intravenous fluids or medications is a serious matter. Drugs have an immediate action when injected directly into the circulatory system. The course of study of a practical nurse is not of sufficient depth to provide the knowl-

edge needed to understand the action of drugs administered by this route. A professional nurse would be derelict in her responsibility for the safety of a patient if she allowed a licensed practical to administer drugs intravenously.

The technique of puncturing a vein is not complex. However, the observation of a patient to determine the effect of the drug administered requires substantial specialized knowledge and skill.

When duties other than the most basic are delegated to the licensed practical nurse or to nonlicensed personnel, it is advisable that specialized training in the area and documentation of successful completion of a prescribed course be provided. This would include passing a test based on the course objectives.

Some basic duties related to intravenous therapy are calculating and regulating flow rates, choosing the fluid according to the physician's order, admixing routine and continuous infusions, observing the IV site for infiltration of the fluid into the surrounding tissues, and recording of information such as the type of solution, amount, medication added, and flow rate.

It appears that the quality of care of the patient is diluted when intravenous therapy is delegated to licensed and unlicensed personnel, since the depth of knowledge required in understanding the circulatory system, its compartments, and fluid and electrolyte balance is inadequate. There is far more involved than the mere technical aspects.

Primm (1978) stated:

L.S.N.A. recognizes the dilemma which confronts the profession, the Board of Nursing and the public. In hospitals and nursing homes . . . patients are receiving intravenous fluids and medications which are administered by licensed practical nurses. We know the ideal is not always possible, but as professional nurses, we cannot approve of the performance of dangerous procedures by inadequately prepared persons.

L.S.N.A. believes that the person performing the nursing function of administering intravenous fluids and medications must have a sound background in pharmacology. This background must be based on knowledge of biochemistry and physiology. This preparation cannot be obtained through a short course or on the job training.

If it can be demonstrated that licensed practical nurses, or any health worker functioning under the supervision of the registered nurses, have the preparation to perform this procedure safely, then there is no problem. The welfare of the public will not be in jeopardy.

Until the public can be assured that nursing personnel other than registered nurses can administer intravenous fluids and medications safely, L.S.N.A. believes this must continue to be a function of the registered nurse.

The setting of rules and regulations may make this a legal function but not necessarily a safe procedure. If the need for nursing personnel

other than registered nurses to administer intravenous fluids and medications can be established, more than rules and regulations are needed. This would have implications for change in the educational programs of those involved.

L.S.N.A. recognizes that emergency medical technicians do administer intravenous medications at sites of emergencies. However, these technicians function under the supervision of physicians, not nurses. It is therefore incumbent upon physicians to assure the public that these technicians are practicing safely.*

In essence the nurse has a right and responsibility to refuse to perform a function should she or he feel unqualified or that the function is not safe practice. In addition, the nurse has the right and responsibility to seek training in order that her or his level of knowledge remains in keeping with what is required to perform daily duties.

Following are excerpts regarding the legal responsibilities of the nurse as collected by Gentry (1975):

The nurse maintains individual competence in nursing practice, recognizing and accepting responsibility for individual actions and judgments (both dependent and independent nursing functions). (ANA Code for Professional Nurses)

The nurse will not take or knowingly administer any harmful drug. (Nightingale Pledge)

No person may absolve another of liability. No physician may order a nurse to perform an act and assure her that he will assume full responsibility. The nurse who acts pursuant to such an understanding without an appreciation of the cause and effect of the order she is to execute, renders herself and the patient a disservice. The law is clear that a nurse is required to understand the procedure or technique she is directed to apply. (Lesnik and Anderson, 1962)

The nurse's right to perform any function involving a medical act is conditioned absolutely upon her capacity of understanding to execute the same. Clearly, the nurse is entitled to no consideration in a malpractice case because she alleges that she was ordered to perform that function. No order may contravene the inherent obligation to secure the patient's safety. (Lesnik and Anderson, 1962)

HOSPITAL POLICY

Webster's Dictionary (1968) defines a policy as "a projected program consisting of desired objectives and the means to achieve them." The *American Heritage Dictionary* (1973) states that "policies should be designed in a manner in which decisions are influenced and determined."

A policy related to intravenous therapy should spell out who is to

*From Primm, M.: L.S.N.A. gives views on IV therapy to Board of Nursing, *Pelican News*. 34:1, Spring, 1978.

perform the therapy, what can be administered, age of patient restrictions, when the therapy is to be performed (that is, in some areas intravenous teams provide all services for 12 to 16 hours a day, after which the general nursing staff is responsible), responsibilities of the physician, and responsibilities of the nurse. Only that which is written, approved, and accepted should be performed.

The boxed material is a sample policy taken in part from the Alton Ochsner Medical Foundation, Hospital Division, Department of Nursing Service, New Orleans.

POLICY

Intravenous medications and venipuncture by registered nurses

Registered nurses trained in intravenous techniques may start infusions and transfusions. The nurse may also add blood to an in-progress infusion provided the infusion is first flushed with normal saline. She may also administer intravenous medications via the push method and by venipuncture provided the drug ordered is on the approved list.

The policy regarding venipuncture applies to patients 4 years of age and older.

All nurses trained in intravenous techniques must have documentation of their ability. This documentation is to be carried out by the assigned registered nurse from the staff development department. Documentation follows successful completion of the hospital's prescribed 20-hour course on intravenous techniques.

Hours

Infusions, transfusions, and adding blood: after 9:30 PM on weekdays and after 4:30 PM on weekends and holidays (when no intravenous team nurse is available).

IV push medications and administration of medications by venipuncture whenever ordered by the physician and only when drug ordered is on approved list.

Responsibility of physicians

Infusions, transfusions, and medications to be given by the intravenous route must be ordered by the physician with the following information included: (1) rate of speed for infusions and transfusions or the length of time necessary for administration and (2) dosage of medication, route, and type of needle to be used as indicated. Method of IV administration must be specified, that is, IV by continuous flow, piggyback, or push.

Blood specimens for type and cross matching and type and holds are to be collected by the physician after 4:30 PM except in certain specialty areas where policies vary.

POLICY—cont'd**Responsibility of nurses**

Successful completion of prescribed course in intravenous techniques. Thorough knowledge of drugs on approved list, including cause and effect.

Ability to differentiate between drugs that can and cannot be administered with special monitoring and those that must be administered only in the presence of a physician.

The registered nurse is not permitted to start infusions containing levarterenol bitartrate or metaraminol bitartrate.

The nurse may start an infusion using a No. 19-, 20-, 21-, 22-, 23-, or 25-gauge scalp vein needle.

The nurse may also start infusions using a No. 16-, 18-, or 20-gauge over-the-needle type cannula when ordered by the physician or when pre-operative infusions are started.

IV push medications and medications administered by venipuncture are to be administered using No. 23-, 22-, or 21-gauge needles.

Should an infusion need flushing prior to injecting a medication, as in the case of incompatibilities with drugs and in-progress infusions, the nurse is to follow specific procedure as to the amount and type of solution to use before and after injecting the medication. This extra solution is to be included in the patient's intake record.

If no vein is available, or in doubtful situations, venipuncture becomes the responsibility of the physician.

Insertion of intravenous catheters of the in-the-needle type that exceed 3.5 inches in length is considered beyond the scope of nursing practice. Cutdowns and insertion of subclavian catheters are to be done by the physician.

Drug lists

Each drug administered to a patient via the vascular system is potentially lethal. It is advisable to have a list of drugs approved for administration by the IV push route.

The list serves several purposes including protection for the physician, nurse, and patient.

All drugs on the list should be reviewed and approved as safe when administered as recommended. This narrows the margin for error, since drugs not recommended for intravenous use would be excluded from the list.

Drug lists may be prepared whereby there is a delineation of drugs

that can be administered by nurses in general care areas and intensive care areas. Special monitoring and the presence of a physician will be necessary during the administration of certain drugs.

Listing of drugs allows the nurse to become aware of drugs she or he will be expected to administer. This affords the nurse the opportunity to become expert regarding drug actions, indications and uses, dosages, dilutions and rates of administration, side effects, and antidotes.

The agency's pharmacy and therapeutics committee (P and T committee) should be responsible for preparing the drug list. Additions and deletions to the list should also be its responsibility.

P and T committees are composed of physicians, pharmacists, and nurses. This balance of three important disciplines assures that prior to acceptance or rejection of drugs for intravenous push administration, factors involving chemistry, pharmacology, pathophysiology, clinical efficacy, and patient response will be considered.

The P and T committee member has the opportunity to serve the important functions of educating the staff in the proper selection and use of drugs, monitoring the use of drugs, and collecting, evaluating, and reporting data pertinent to the adverse effects of drugs.

Listing of drugs administered by way of continuous infusion and piggyback may be impractical since the numbers are so great.

Following is an example of a list of drugs approved for IV push administration*:

1. Drugs to be administered by registered nurses in general and intensive care areas:
 - Acetazolamide sodium (Diamox)
 - Amethopterin (Methotrexate)
 - Azathioprine sodium (Imuran)
 - Chlordiazepoxide hydrochloride (Librium)
 - Colchicine
 - Cyclophosphamide (Cytosan)
 - Cytarabine (Cytosar)
 - Dexamethasone sodium phosphate (Decadron)
 - Dextrose (glucose 50%)
 - Diazepam (Valium)
 - Diphenhydramine hydrochloride (Benadryl)
 - Ethacrynic acid (Edecrin)
 - Fluorouracil (5-Fluorouracil)

*Taken in part from Approved Drug List, Alton Ochsner Medical Foundation, Hospital Division, Department of Nursing Service, New Orleans, Louisiana, 1977.

Folinic acid (Leucovorin Calcium)
 Furosemide (Lasix)
 Heparin sodium (Lipo-Hepin)
 Hydralazine hydrochloride (Apresoline)
 Hydrocortisone phosphate
 Hydrocortisone sodium succinate (Solu-Cortef)
 Hydromorphone hydrochloride (Dilaudid)
 Menadiol sodium diphosphate (Synkayvite)
 Menadione sodium bisulfite (Hykinone)
 Meperidine hydrochloride (Demerol)
 Methyldopate hydrochloride (Aldomet)
 Methylprednisolone sodium succinate (Solu-Medrol)
 Morphine sulfate
 Naloxone hydrochloride (Narcan)
 Phenytoin sodium (Dilantin)
 Phytonadione (Aquamephyton)
 Propantheline bromide (Pro-Banthine)
 Sodium bicarbonate

2. Drugs to be administered by registered nurses in intensive care areas (recovery room, intensive care, coronary care, emergency room, nursery, delivery, operating room, dialysis):

Alphaprodine hydrochloride (Nisentil)
 Amobarbital sodium (Amytal Sodium)
 Atropine
 Caffeine sodium benzoate
 Calcium chloride
 Calcium gluconate
 Chlorpromazine hydrochloride (Thorazine)
 Deslanoside (Cedilanid-D)
 Digitoxin
 Digoxin (Lanoxin)
 Doxapram hydrochloride (Dopram)
 Edrophonium chloride (Tensilon)
 Ephedrine
 Epinephrine hydrochloride (Adrenalin Chloride)
 Glucagon
 Glycopyrrolate (Robinul)
 Innovar
 Insulin, regular
 Isoproterenol hydrochloride (Isuprel)
 Levallorphan tartrate (Lorfan)
 Lidocaine hydrochloride (Xylocaine)

Magnesium sulfate
 Methoxamine hydrochloride (Vasoxyl)
 Methylergonovine maleate (Methergine)
 Nalorphine hydrochloride (Nalline)
 Neostigmine methylsulfate (Prostigmin)
 Oxytocin (Pitocin)
 Pancuronium bromide (Pavulon)
 Phenobarbital sodium (Luminal)
 Phentolamine mesylate (Regitine)
 Phenylephrine hydrochloride (Neo-Synephrine)
 Procainamide hydrochloride (Pronestyl)
 Promethazine hydrochloride (Phenergan)
 Propranolol hydrochloride (Inderal)
 Protamine sulfate
 Secobarbital sodium (Seconal)
 Succinylcholine chloride (Anectine)
 Tubocurarine chloride (curare)

Should a physician or group of physicians order drugs not on the list, it is recommended that the nursing staff or physician(s) present the drug to the P and T committee for review.

It is advisable to stay within the limits that have been set. Should any policy become obsolete because of changes in practice, or should a policy be considered unrealistic by the medical or nursing staff, a proposal for change should be presented to the agency's policy and procedure committee. The appropriate lines of authority should be followed in order to effect this process.

PROCEDURES

The *American Heritage Dictionary* (1973) defines a procedure as "a set of established forms for conducting business or public affairs; a series of steps or course of action." *Webster's Dictionary* (1968) defines a procedure as "a particular course of action or a series of steps followed in a regular, orderly, and defined way."

Included among the procedures related to intravenous therapy are intravenous infusion, intravenous push administration of drugs, intravenous piggyback administration of drugs, parenteral hyperalimentation, intralipid therapy, and blood administration. Details for these procedures can be found in subsequent chapters.

Each procedure must be performed as written, but modifications are sometimes necessary. All modifications are based on the individual patient and his or her condition.

Should a procedure become obsolete because of changes in practice,