

SYSTEM FOR PROVIDING INTRAVENOUSLY ADMINISTRABLE DRUG FORMULATION

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. Ser. No. 06/642,233 filed Aug. 20, 1984 now abandoned.

FIELD OF THE INVENTION

This invention pertains to a system for (a) formulating a fluid drug formulation, and for (b) delivering the fluid drug formulation intravenously to a host. The system comprises (1) a fluid container of an intravenously administrable fluid, (2) a drug container containing initially a drug or a means for providing a drug, (3) means for conveying fluid from the fluid container to the drug container for forming a fluid drug formulation in the container, and (4) means for intravenously administering the fluid drug formulation to a recipient.

BACKGROUND OF THE INVENTION

The intravenous administration of fluids is an established clinical practice. The clinical practice of administering fluids is used extensively as an integral part of the daily treatment of medical and surgical patients. The fluids administered intravenously usually include aqueous solutions of dextrose, sodium chloride and solutions of various other electrolytes. Generally, the fluids are administered from a container that is suspended above a patient, with the fluid flowing from the container through an administration set and thence to a catheter or a hypodermic needle placed in a blood vessel, usually a vein of a patient.

The administration of fluids intravenously is a valuable and important component of patient care; moreover, the use of intravenous fluids in recent years has expanded beyond its original role of fluid and electrolyte replacement to include serving as the vehicle for the intravenous administration of beneficial drugs, notably those which are desirable to administer by infusion via the intravenous route. For example, presently a beneficial drug is administered intravenously by one of the following procedures: (1) temporarily halting the flow of medical fluid and intravenously administering the drug, followed by resumption of medical fluid into the patient; (2) the drug is added to the fluid in a container and then carried by the flow of fluid to the patient; (3) a drug is introduced into a so-called "piggy-back" container, which is subsequently connected to a primary line through which the drug is administered to a patient, or (4) the drug is administered by a pump that exerts a force on a fluid containing a drug for intravenously administering the fluid containing the drug.

While these delivery techniques are used, they have certain disadvantages associated with their use. For example, they often require reformulation of the drug with the medical fluid by the hospital pharmacist or the nurse, and this frequently requires storing the premixed formulation at a lower temperature to prevent degradation of the formulation. Also, beneficial drugs that are fluid sensitive and require formulation with a fluid at the time of administration presently cannot be administered by these prior art systems. Additionally, the prior art systems often require separate connections for joining into the intravenous line that further complicates intravenous administration, and the use of pumps can pro-

duce pressures that can vary at the delivery site and the pump pressure can give rise to thrombosis.

DISCLOSURE OF THE INVENTION

5 A principle object of this invention is to provide both a novel and useful intravenous delivery system that overcomes the disadvantages associated with the prior art, and which present delivery system is an improved delivery system for intravenous drug administration.

10 Another object of the present invention is to provide an intravenous delivery system comprising means for the in situ, self-formulation of a fluid drug formulation for administering to a patient whose prognosis benefits from intravenous drug administration.

15 Another object of the invention is to provide an intravenous delivery system comprising initially a drug and a means for adding a medical fluid to the drug for forming a fluid drug formulation for administering to a patient at the time it is prepared for optimizing the care of the patient.

20 Another object of this invention is to provide an intravenous delivery system originally containing a drug and a means for automatically constituting a drug formulation in situ by dissolving a given amount of drug in a given volume of a fluid that can be administered at any preselected time to a patient on intravenous therapy.

25 Another object of the present invention is to provide an intravenous delivery system that is self-contained and makes attainable a program of drug administration adapted to a specific need by furnishing a fluid drug formulation formed in situ by mixing a known volume of fluid with from a trace to a saturating amount of a beneficial drug.

30 Another object of the present invention is to provide an intravenous delivery system comprising initially a drug free of fluid to which drug fluid can be added as needed for forming a fluid drug formulation acceptable for intravenous therapy.

35 Another object of the invention is to provide an intravenous delivery system that is easy to manufacture, is inexpensive, is easy to operate, and provides instant drug formulation and delivery to a needy patient.

40 Another object of the invention is to provide an intravenous delivery system that can administer a drug in solution at a controlled and continuous rate to a human for a particular time period, the use of which requires intervention only for initiation and termination of the delivery.

45 Other objects, feature, aspects and advantages of the invention will be more apparent to those versed in the art from the following detailed specification taken in conjunction with the drawing figures and the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are not drawn to scale, but are set forth to illustrate various embodiments of the invention, the drawing figures are as follows:

50 FIG. 1 is a perspective view of an intravenous delivery system provided by the invention comprising a first container of a medical fluid and a second container of drug initially free of medical fluid, with the first container and the second container in communication through a common valve;

65 FIG. 2 is a perspective view of an intravenous delivery system provided by the invention comprising a first container of a medical fluid and a second container of