Health problem addressed

Wearable pumps that deliver medication or other solutions to patients intravenously, epidurally, or subcutaneously. They allow patients to walk without the need for an IV pole. They are good for patients who require continuous or repeated infusions; sometimes the patient can use the pump at home. Typical uses include chemotherapy for cancer patients, parenteral nutrition for patients with gastrointestinal disorders, insulin delivery for diabetic patients, analgesics to relieve pain, or antibiotics to treat infections.

Product description

Ambulatory infusion pumps are typically plastic handheld devices consisting of a disposable syringe or a disposable, collapsible bag reservoir; a mechanism for propelling the infusate; a flow-control mechanism; and a means of displaying alarm conditions and/or user prompts. An IV set and tubing connect the pump to the patient. Electronic models are powered by batteries; some include software to help prevent medication errors. Most pumps come with a case or pouch that can be attached to a belt or harness.

Principles of operation

Most ambulatory pumps are microprocessor controlled. Peristaltic pumps successively squeeze and release IV tubing, moving the fluid into the patient catheter. The speed of a stepper motor determines the cycling rate the peristaltic mechanism, thereby controlling the infusion flow. These pumps deliver at flow rates ranging from 0.01 to 999 mL/hr. Syringe-based pumps use a syringe as a drug reservoir, propelling the fluid by forcing the plunger into the syringe barrel. A lead-screw mechanism pushes a threaded block against the plunger. Syringe drivers use spring- or gas-powered mechanisms to provide a relatively constant force to the plunger, creating a constant pressure for fluid delivery.

Operating steps

- Patient’s skin is cleaned using alcohol and the infusion site is fixed with a catheter port connected to the pump.
- The reservoir is filled with the appropriate solution.
- The pump is programmed to deliver a specific volume at a specific rate using a keypad.

Reported problems

Medication errors due to free-flow, patient tampering, or lack of physician supervision; empty reservoirs risk set contamination and clot formation in the catheter; there is also a risk of infusion of air (if the pump has no air-in-line sensor or is defective); skin infection at the injection site can cause mild localized erythema and toxic shock syndrome.