0.5-ml, low-dose syringe. These syringes, along with specially constructed needles, minimize the possibility of inadvertently administering incorrect amounts of a drug because of **dead space**, which allows fluid to remain in the syringe and needle after the plunger is pushed completely forward. A minimum of 0.2 ml of solution remains in a standard needle hub; therefore, when very small amounts of two drugs are combined in the syringe, such as mixtures of insulin, the ratio of the two drugs can be altered significantly. Measures that minimize the effect of dead space are (1) when two drugs are combined in the syringe, always draw them up in the same order to maintain a consistent ratio between the drugs, (2) use the same brand of syringe (dead space may vary between brands), and (3) use one-piece syringe units (needle permanently attached to the syringe).

Dead space is also an important factor to consider when injecting medication because flushing the syringe with an air bubble adds an additional amount of medication to the prescribed dose. This can be hazardous when very small amounts of a drug are given. Consequently, flushing is not recommended, especially when less than 1 ml of medication is given. Syringes are calibrated to deliver a prescribed drug dose, and the amount of medication left in the hub and needle is not part of the syringe barrel calibrations. Certain drugs (such as iron dextran and diphtheria and tetanus toxoid) may cause irritation when tracked into the subcutaneous tissue. The Z-track method is recommended for use in infants and children rather than an air bubble. Changing the needle after withdrawing the fluid from the vial is another technique to minimize tracking.

The needle length must be sufficient to penetrate the subcutaneous tissue and deposit the medication into the body of the muscle. The needle gauge should be as small as possible to deliver the fluid safely. Smaller-diameter (25- to 30-gauge) needles cause the least discomfort, but larger gauges are needed for viscous medication and prevention of accidental bending of longer needles.

Determining the Site

Factors to consider when selecting a site for an intramuscular (IM) injection on an infant or child include:

- The amount and character of the medication to be injected