- Cook and Murtagh (2002) made ultrasound measurements of the subcutaneous and muscle layer thickness in 57 children ages 2, 4, 6, and 18 months old. These researchers concluded that a 16-mm needle was sufficient to penetrate the anterolateral thigh muscle if the needle is inserted at a 90-degree angle without pinching the muscle, whereas thigh measurements demonstrated that a 25-mm needle was necessary to penetrate the muscle when a 45-degree injection technique was employed. This study supports the concept of longer needle length and use of a 90-degree angle to fully deposit the medication into the deep muscle (Ogston-Tuck, 2014b).

- In a study by Davenport (2004), needle length proved to be the most significant variable for local reactions in children after injection with 16-mm and 25-mm needles; the 25-mm needle was associated with fewer localized reactions.

- Diggle, Deeks, and Pollard (2006) likewise found that when long needles (25 mm) were used for infant immunizations, localized vaccine reactions were significantly reduced in comparison to the shorter needles (16 mm).

- In a study of diphtheria-tetanus-pertussis (DTP) immunizations administered to infants 7 months old and younger, only 84.6% of injections were administered at the correct site (anterior thigh); an alarming number were given in the dorsogluteal (5.1%) and deltoid (2.6%) muscles (Daly, Johnston, and Chung, 1992).

- The ventrogluteal site is relatively free of important nerves and vascular structures, the site is easily identified by landmarks, and the subcutaneous tissue is thinner in that area (Ogston-Tuck, 2014a).

- The American Academy of Pediatrics (2015) and Centers for Disease Control (2011) recommend that vaccines containing adjuvants such as aluminum (DTaP, hepatitis A and B, diphtheria-tetanus [DT or Td]) be given deep into the muscle to prevent local reactions. For the majority of infants, a 1-inch, 22- to 25-gauge needle can be used. For neonates and preterm infants a  -inch needle is usually sufficient when the needle is inserted at