understood, but it is thought that a combination of genetic and environmental factors may be involved. The severity of the symptoms varies from child to child and over time, from mild to severe, with the narrowing of the airways usually being reversible—occurring naturally, or in response to medication (CKS, 2012). At present, asthma is not curable, but it can be controlled so that attacks can be prevented.

Treatment
Treatment for children should be a prescribed inhaler, possibly in the form of a pMDI. Often the child will have a preventer (a pMDI used regularly to prevent symptoms from occurring) and a reliever (a pMDI used when necessary to reduce the symptoms from occurring) and a reliever (a pMDI used regularly to prevent symptoms from occurring). Unfortunately, younger children or those with poor dexterity are often unable to coordinate inhalation with activation of the inhaler, which limits the amount of drug inhaled (Watson 2010; Delgado et al, 2007; Russell and Reynolds, 1997). It is estimated that at least 50% of pMDI users have suboptimal technique and could benefit from using a spacer device (Pearce, 2011; Lavorini et al, 2006). The most detrimental errors are: poor coordination between pMDI actuation and inhalation; and the “cold freon” effect, which may cause some children to stop inhaling when the cold blast of propellant strikes the back of the throat. This greatly reduces drug uptake (Lavorini et al, 2006).

The role of spacers
Spacers are large plastic or metal containers, with a mouthpiece or mask at one end and a hole for the aerosol inhaler at the other. Modern devices are convenient and compact and work at least as well as nebulisers in treating most asthma exacerbations in children and adults (Delgado et al, 2007; Dewar et al, 1999; Parkin et al, 1995). The devices allow the medication to be held in a chamber so the users can receive inhaled medication while taking normal breaths through the mouthpiece. However, poor technique frequently leads to reduced drug delivery (Schultz et al, 2012; Pearce, 2011; Watt et al, 2003; Hindle and Chrystyn 1994).

Kecley (1993) states that compared with dry powder inhalers and pMDIs alone, a pMDI with a spacer device deposits at least 30% more drug in the lungs. Lavorini et al (2006) also documented the benefits of spacers and attributed these to the fact that the user is inhaling from a static volume without necessarily having to coordinate the two actions of breathing and actuation. They concluded that by acting as an aerosol reservoir, the spacer slows the aerosol velocity and increases transit time and distance between the pMDI and the user’s mouth, therefore allowing the particle size to decrease. A result of this smaller particle size is better deposition of the drug in the lungs.

The British Thoracic Society and Scottish Intercollegiate Guidelines Network (BTS/SIGN, 2012) recommend that asthma is managed in children aged 0-5 years by use of a pMDI and a spacer device for the delivery of inhaled steroids. It is also believed that the correct use of a portable spacer could reduce emergency admissions to hospitals, potentially saving the NHS up to £11.5m per year (Health Enterprise East, 2009).

The technique for using a spacer is outlined in Box 1 and key points for health professionals when teaching parents and children are outlined in Box 2.

Although spacers play an important role in helping to deliver asthma medicine to the lungs, their use is not without some risks. When Cohen et al (2012) tested 30 spacers on children, all 30 were contaminated with pathogens including pseudomonas, klebsiella and staphylococcus; four of these patients later contracted pneumonia. After the authors showed the children how to clean the spacers and masks, the incidence of contamination fell to zero (Cohen et al, 2012).

Reducing static
Static electricity accumulates on many polycarbonate and plastic spacers,