

## Appendix 2

### Paediatric studies involving sodium chloride 0.9% locking protocols

Jacobs et al (2004) Compared positive-pressure needleless connectors using a sodium chloride 0.9% lock, with standard caps utilising a heparin lock in paediatric ICU patients with PICC's, tunnelled and non-tunnelled CVC's in situ. The positive-pressure devices had significantly lower rates of complete catheter occlusion than those with the standard cap. The catheter-related bloodstream infection rate was higher in the positive-pressure device group that used the sodium chloride 0.9% lock, although not statistically significant. The authors suggested that the heparin lock may have had a protective effect for catheter-related bacteraemia.

Schilling et al (2006) studied catheter occlusion and infection rates in children with PICC's, tunnelled and non-tunnelled CVC's in situ in a PICU and CICU setting. Using a prospective, sequential study design, four groups of children were investigated. Group 1 had a standard needleless connector (no internal valve) and heparin lock. Group 2 had a single-valve needleless connector and heparin lock. Group 3 had a positive-pressure-valve needleless connector and heparin lock. Group 4 had a positive-pressure-valve needleless connector (same device as group 3) and used a sodium chloride 0.9% lock. This study found that single-valve and positive-pressure-valve needleless connectors were effective in reducing occlusion rates compared with standard devices. There was a trend towards a greater catheter-related bloodstream infection rate in the positive pressure-valve needleless connector and sodium chloride 0.9% lock group. This was not statistically significant. The authors conclude that sodium chloride 0.9% lock protocols may be associated with an increased infection rate in comparison with heparin lock protocols, as groups 3 and 4 had the same needleless connector.

A further randomised study in paediatric cancer patients with tunnelled CVC's in situ, compared a standard cap and heparin lock performed twice weekly with a positive-pressure-valve cap and sodium chloride 0.9% weekly lock. The results showed significantly more occlusions and higher rates of CVC-related infections in the positive-pressure-valve cap and sodium chloride 0.9% weekly lock group. However, despite these differences the CVC survival rates were comparable (Cesaro et al, 2009).

The 3 studies above indicate that sodium chloride 0.9% lock protocols may be associated with an increased risk of infection. However, as previously mentioned there is other evidence that some that some needleless connectors (negative or positive displacement types) with mechanical valves may also be associated with an increased risk of infection (Marschall et al, 2008, Macklin, 2010, O'Grady et al, 2011, Hadaway, 2011). This raises the question is it the lock solution or the needleless connector design that leads to more infections?