What do we know about paediatric pressure ulcer risk assessment?

KEY WORDS
- Child
- Infant
- Pressure ulcers
- Risk assessment

This paper highlights the problems associated with pressure ulcers in children. Not only do pressure ulcers have poor outcomes in children, their management is expensive. While there are risk assessment scales for assessing the risk of pressure ulcers in children, little is known about which is the best tool or even if any of these tools are better than unaided clinical judgment.

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Quality and safety are NHS priorities. The Safety Thermometer has a focus on pressure ulcers, falls, catheters and urine infection and venous thromboembolism, so pressure ulcers are considered central to patient safety. There are a small number of studies considering incidence or prevalence of pressure ulcers in children (Baldwin, 2002; Groeneveld et al, 2004; McLane et al, 2004; Dixon and Ratliff, 2005; Schluer et al, 2012; Visscher et al, 2013; Schlüer et al, 2014). These studies show that children have significant numbers of pressure ulcers, though fewer than adults. A systematic review (Kottner et al, 2010) considered a prevalence of about 1% for the more serious pressure ulcers (grades 2–4).

Risk assessment scales have been in use for over 50 years in adults, the earliest being the Norton score (Norton et al, 1962). These are composed of several categories, each of which is thought to be associated with the development of pressure ulcers, e.g. mobility, incontinence, mental state. Each category is added up to give a total score that is typically used to allocate patients to low, medium or high risk groups. Higher-risk patients are then normally given interventions, such as special mattresses and nutritional support, to reduce their risk of developing pressure ulcers.

In adults there is no evidence that employing risk scales has any effect on reducing the number of pressure ulcers (Moore and Cowman, 2014). However, there are few studies where this has been explored (Moore and Cowman, 2014) and a lack of evidence does not necessarily prove them to be ineffective. For example, if a few small studies showed no effect, it could be that the apparent lack of effect is due to low power and a larger study would give a more definitive result. As they are in widespread use, you cannot simply ignore them.

There are at least 12 paediatric pressure ulcer risk assessment scales (Kottner et al, 2013) though some of these are modifications of other scales. For example, there are modifications of the Braden and Waterlow scales for adults and combinations of adult scales (Kottner et al, 2013).

THE MAIN SCALES

Box 1 contains a list of the main scales. The most commonly employed are probably the Braden Q and Glamorgan scales. The Braden Q scale is used in the USA (where it was developed) and many other countries, including Australia. The Glamorgan scale is in use in all four parts of the UK (where it was developed) and Germany, New Zealand, Australia and Saudi Arabia. Risk scales for pressure ulcers are advised in guidelines on prevention of pressure ulcers in children. For example, Healthcare Improvement Scotland advise: 'For neonates, children and young people at risk of pressure ulcers,

Box 1. The main paediatric risk assessment scales (in alphabetical order)

- Braden Q scale
- Burn pressure ulcer skin assessment scale
- Garvin scale
- Glamorgan scale
- Neonatal skin risk assessment for predicting skin breakdown (NRAS) scale

an age appropriate, structured risk assessment tool is used to support clinical judgement.' (Healthcare Improvement Scotland, 2016). The National Institute for Health and Care Excellence (NICE) guidelines [CG179] recommend neonates, infants, children and young people should be assessed using clinical judgement and/or a validated pressure ulcer risk assessment tool (NICE, 2014).

One of the problems with discussing paediatric pressure ulcers is the scant number of research studies. There is sufficient research to give a reasonable estimate of incidence and prevalence. There are many papers describing risk assessment scales and a few validating them, with even fewer comparing different scales. There are no studies found that explore whether risk scales affect incidence.

PREVALENCE AND INCIDENCE

Pressure ulcers occur in children. Certain sub-groups of children have high prevalence and incidence of pressure ulcers, especially the very young and very ill children in paediatric and neonatal intensive care units, in part due to the number of medical devices used on such children (Willock et al, 2016). Neonates are particularly prone to developing pressure ulcers. In a review of studies, a prevalence (excluding grade 1 ulcers) of 0.8% (Kottner et al, 2010) was found in paediatric populations, though much higher incidence and prevalence figures were found in paediatric intensive care units than the general paediatric population. The figures from Kottner et al are robust as they only considered high-quality studies using standardised prevalence methodologies. In a multi-centre study of 412 children in 14 clinics, there was a prevalence of 35%, though these were mostly minor (Schlüer et al, 2012) but there were three grade 3 and two grade 4 pressure ulcers. The higher prevalence found in this study is largely due to reporting of minor ulcers (grade 1); however, severe pressure ulcers occur in children and cause serious problems. While many pressure ulcers are medical device-related in children, in paediatric intensive care units the majority were not (199 non-medical device-related and 27 medical device-related pressure ulcers) (Curley et al, 2003) though in a study of children over one year old, a third developed along external devices (Schlüer et al, 2014) and over half of pressure ulcers were found to be device-related in a quality improvement initiative (Visscher et al, 2013). Risk assessment tools that do not consider such medical devices will probably be ineffective in reducing these ulcers. Pressure ulcers are commonly occipital in children — excluding grade 1 ulcers, 32% were related to the head (Curley et al, 2003) and children were more at risk if they were younger (Groeneveld et al, 2004).

EFFECTS OF PRESSURE ULCERS

Pressure ulcers are in principle avoidable, though there are occasions — for example where a patient is immobile prior to admission when the damage that causes the pressure ulcer has already occurred — where they may not be preventable.

Work on evaluating the effects of risk scales is important from a safeguarding perspective. Clinicians need to ensure they have not neglected to protect the patients from harm. Although severe pressure ulcers are uncommon in children, they can cause significant physical and psychological impact on children and parents. For example, they can cause permanent alopecia (Willock and Maylor, 2004), which may affect the child's body image and any breaks in child's skin by invasive medical devices, incontinence lesions, or other wounds may cause them to be susceptible to infection and in severe cases infected pressure ulcers can lead to osteomyelitis (Willock and Maylor, 2004). Severe pressure ulcers can have very serious consequences including pain, disfigurement, infection and even death due to sepsis. Medical device-related pressure ulcers are often on the face, which can be permanently scarred. Pressure ulcers in children may leave a permanent disability, causing a scar which increases the risk of further pressure ulcers for the rest of their lives and causes pain and psychological damage.

COSTS OF PRESSURE ULCERS

Pressure ulcers are expensive to treat as well as

being painful. In the USA, the treatment cost for an adult of a hospital-acquired grade 4 (most severe) pressure ulcer has been estimated to be over $129,000 (Brem et al, 2010) and there may be other costs, including litigation. Costs increase with ulcer severity because the time to heal is longer and the incidence of complications is higher in more severe cases (Dealey et al, 2012). Dealey et al (2012) went on to give UK figures of treatment from £1,214 (grade 1) to £14,108 (grade 4). The UK figures for adults are much lower but the cost of treatment in the USA is higher than the UK. Even using UK figures, the money (as well as suffering) is significant. Considering patients with similar risk profiles (age, gender, mobility etc), as measured by the Waterlow score, showed the presence of any pressure ulcer increased patient stay in hospital by nearly seven days (Anthony et al, 2004) and this will be higher for severe ulcers. Thus in addition to saving money, reducing pressure ulcers — especially severe ulcers — frees resources. The savings can be substantial, as evidenced in the Department of Health (DH) pressure ulcers productivity calculator. They gave an example for an organisation with 350 pressure ulcers of mostly lower grades per annum could reduce incidence by 25% and save over £0.5 million per annum (DH, 2010).

While the cost of paediatric pressure ulcers has not been specifically calculated in the literature, it is reasonable to assume a pressure ulcer in a child would cost at least as much as for an adult. The rationale for this is that staff cost is the main cost driver of pressure ulcer management in adults and we anticipate that the same applies for children. It may be higher because of associated implications, such as time lost by parents in the workplace due to additional caring responsibilities incurred by the pressure ulcers, additional travel to healthcare appointments, and the fact that a child has a longer expected life span than an older person so healthcare costs that can be attributed to the ulcers could be greater, and possibly the cost of treating psychological effects of the trauma of the pressure ulcers on the developing child, lost schooling and all other generic consequences associated with any long-term condition.

RISK ASSESSMENT SCALES

There have been evaluations of objective tests of skin integrity using physical methods such as thermography, redness indexes, ultrasound and skin elasticity (Andersen and Karlsmark, 2008), but these have been used to assess existing pressure ulcers. Some pilot studies (Bates-Jensen et al, 2007; Bates-Jensen et al, 2008; Bates-Jensen et al, 2009; Guihan et al, 2012; Harrow and Mayrovitz, 2014) have been conducted on sub-epidermal moisture as a measure of the risk of developing pressure ulcers. However, there are no well-powered prospective studies of any of these methods in adults and none in children. The standard method to assess risk of pressure ulcers remains to use a risk assessment scale.

The James Lind Alliance (JLA) is 'a non-profit making initiative … It brings patients, carers and clinicians together … to identify and prioritise the Top 10 uncertainties, or unanswered questions, about the effects of treatments.' The JLA asks 'Is using a pressure ulcer risk rating scale/tool better than clinical judgement in preventing pressure ulcers and is there a best scale?' (James Lind Alliance, 2013). However, few studies (Saleh, 2007; Webster et al, 2011) have considered whether risk scales are any better than clinical judgment and none address those in use in paediatrics.

There are many studies validating these risk assessment scales (in terms of whether they predict risk) but very few that evaluate outcomes (Saleh, 2007; Webster et al, 2011). In adults, there is no study that shows use of a risk assessment scale reduces pressure ulcer incidence. In a recent systematic review of all available studies (Moore and Cowman, 2014), only two studies were included and neither showed any additional benefit of using a risk assessment scale in adults. In both studies, patients cared for by nurses using clinical judgement with no risk assessment scale had an incidence of pressure ulcers that was similar to those cared for by nurses using a risk assessment scale. However, both studies have been criticised in terms of low power to detect any difference in incidence of pressure ulcers (Balzer et al, 2013). Balzer et al further suggested that sample sizes to detect a meaningful difference will be too large to be feasible and propose weaker but more plausible designs employing evidence linkage.

While reviews of adult risk assessment scales have shown no effect of using risk assessment scales, it is not clear whether these results generalise to children, as the aetiology and presentation of pressure ulcers in children is different and so are the risk factors. For example, compared with adults more pressure ulcers occur

in the occiput rather than the sacral area or heels, occur in younger rather than older children, and are more likely to be medical device-related.

Kottner et al (2013) reviewed paediatric pressure ulcer risk assessment scales and stated research was lacking and 'no instrument can be regarded as superior to the others.' Furthermore, they stated 'whether the application of pressure ulcer risk assessment scales reduces the pressure ulcer incidence in paediatric practice is unknown. Maybe clinical judgement is more efficient in evaluating pressure ulcer risk than the application of risk scale scores.' In particular, they identified no studies that investigated the clinical impact (for example incidence) of employing risk assessment scales in children.

Current clinical guidelines in the UK advise using paediatric pressure ulcer risk scales and/or clinical judgement in children's hospitals (NICE, 2014). However, it is not clear which risk scale is best or how clinical judgement is employed. Work is needed now because:

- Children have pressure ulcers. These are painful and costly. They can be severe and cause disfigurement and even death
- Clinical guidelines advise the use of risk scales and/or clinical judgment
- We have no idea which risk scale is best nor if any is better than clinical judgement in this population.

Before a large study can be conducted we need to know it is feasible. For example, parents might not be willing to have their very ill premature babies enrolled in a study. Given that even in adults standard randomized controlled trials (RCTs) are likely to be unfeasible (Balzer et al, 2013) and the incidence is lower in children then some alternative to RCTs may be indicated. A feasibility study to consider these and other practical issues is necessary but none have to date been conducted.

Along with a team of colleagues, the author is planning just such a study. If you work in a paediatric setting and wish to be involved please contact the author (d.anthony@leeds.ac.uk).

CONCLUSION

Pressure ulcers occur in children and can be severe. Risk assessment scales are used in children and have been validated. However, we have no idea whether using them reduces pressure ulcers in children. If the results from adult studies were to be similar in children, there is no reason to suppose they will reduce incidence. However, we just do not know and need to conduct a study to find out. WUK

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