Evidence review for Postural Seating

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Background
A request for a review came from Joint Luton and Beds Community Equipment Service for an evidence review on postural seating for young adults with Long term Conditions or medical conditions from birth such as cerebral palsy, epilepsy, challenging behaviour and learning disabilities. The outcome of the review was to provide recommendations on appropriate seating to promote posture and function.

Introduction
Many people spend a large proportion of their day sitting down and continuous efforts have been made over the years to improve seating systems. As technology has advanced, seating systems have been modified to provide maximum safety and comfort. There is a wide choice of seating available on the market, some of which meets postural needs, some pressure-reducing need, while others combine both aspects.

Patient assessment
Matching the right type of chair for an individual client can be difficult as often postural needs can conflict with functional requirements. Therefore, there are a number of components that should be considered when assessing a patient for specialist seating:

- Risk assessment – It is important to assess whether or not the client is at risk of pressure damage and this can be partially achieved by undertaking a risk assessment such as the Waterlow Score. The purpose of a risk assessment tool is to assess patients for their risk of sustaining pressure damage. Although useful, this score alone is not sufficient to assess overall risk for the seated client and therefore additional assessments are also required.

- Skin assessment – pressure damage initially presents as redness, which will always be present in a client who sits as the blood flow will be occluded. It is important to note where the redness exists as this will provide information on how the client is sitting. For example, redness should not be observed over the sacrum if the client is sitting in a good posture.

- Supine evaluation – the supine evaluation will establish what postural changes are present and if these are flexible. Generally, if postural changes are flexible they can be reduced by suitable positioning in the chair, but if fixed, then they must be accommodated.

- Long-term implications – Long term needs of the client must be considered so that equipment provision remains appropriate. This is particularly important for patients with deteriorating conditions such as Duchenne Muscular Dystrophy (DMD) or Multiple Sclerosis whose condition may deteriorate.
quickly and whose transfer requirements may change from assisted transfers to hoisting.

- The client’s environment – this is an important consideration when selecting seating equipment for a client, particularly if a required feature of the chair is that it is transportable.

- Transfers – how the client transfers into and out of a chair is an important factor in the assessment as this will affect the success of the resultant position in the chair.

**Expected outcomes**
Once assessment is complete, goals for seating can be established. The exact goals and their order of priority depends on the needs of the client but generally the chair should provide the client with the following:

- Maximum sitting stability, to increase function, ability and energy
- Reduction of interface pressures by supporting the maximum surface area$^{5,6}$
- Stabilisation of the pelvis, thereby reducing shear forces and friction
- Provision of a symmetrical sitting position (where possible)$^5$
- Comfort
- Promote independent or assisted transfers
- Reduction of postural changes

**Seating Systems for people with special needs**
A functional seating system improves the client’s development and also is helpful for the carer as it helps to reduce their workload. For children and young people with cerebral palsy from an orthopaedic/neurological point of view, the ideal would be to prevent hip and spine deformities and to maintain body positions, which reduce spastic reflux patterns. The expected benefits are better voluntary control, less severe deformity, less surgery and a decrease in the level and cost of daily care$^7$. Positioning options for this group are so severely limited that constant care and appropriate equipment is required to prevent ulceration and maceration.

**Weight-shifting exercises**
The normal activity of sitting consists of a series of frequently changed postures. Each of these postures would be non-functional, uncomfortable and even injurious if it were the only posture available. It is the frequent voluntary change that makes the posture safe, and tolerably comfortable for more than a given period of time$^7$. A study was carried out to assess the impact of weight-shifting exercises on people
with hemiplegia\textsuperscript{8}. The small scale study used 16 subjects with hemiplegia after stroke and 14 healthy subjects. The study stated that those without any physical disability have symmetrical loading at the body support interface in sitting and standing whereas people with spinal cord-injury have asymmetrical loading at the buttock-seat interface. The paralysis of trunk muscles is suggested to be associated with this sitting posture. In subjects with stroke, muscles on the side of the hemiplegia are weaker which is considered to result in asymmetrical presentation of the body's posture. In the study, subjects were assessed for buttock-seat interface loading while in erect sitting using a seat pressure mapping system. Subjects with stroke then practiced one session of weight-shifting exercise followed by a reassessment. The results of the study showed that for subjects, particularly those with right sided hemiplegia, had more load borne at the buttock corresponding to the side of the stroke lesion. It appears however that the weight-shifting exercise did not produce an immediate improvement on the loading asymmetry.

In the absence of any voluntary movement, it is therefore difficult to provide a seating system, which a client can sit safely and comfortably for a number of hours at a time. In the case of a person with cerebral palsy, it is the abnormally high muscle tone around the pelvis and thighs that makes this achievable. When a child or young person has limited postural alignment capability, it is important that the greatest capability is at the head and neck. Arm-propping is typically used to stabilise the upper thorax for effective neck and head control. The seating should bring stability from the pelvis upwards as terminating stability too low will fail to maximise the client's function whereas carrying stability too high will prevent the client from achieving their full voluntary movement capability.

Figure 1 represents a sitting position, which has the most advantages and it is proposed as a 'standard'\textsuperscript{7}. It allows significant weight bearing on the thighs as well as the bottom of the pelvis. It is a cosmetic posture (chest and head upright, facing outward) and is also a functional posture (head in a position to observe and the thorax and shoulders forming a secure base for the neck and arms to move). In this position, the sacrum is tilted anteriorly a moderate amount.
Pelvic Tilt

Tilt-in space systems are increasingly being used by people with neurological or neuromuscular impairments who cannot mobilise. They are used for a variety of reasons including; low sitting tolerance or discomfort, a requirement to rest in the seat and to assist with manual handling. The disadvantage of these systems compared to conventional seating is the purchase cost, size and complexity of equipment. They are generally heavier and less manoeuvrable than standard seating, which may restrict access to transport.

A backwards-tilted sitting position has been suggested to improve head and trunk posture and to reduce the loading under the buttocks or through the spine\textsuperscript{10}. There are however concerns that if the position is tilted back too far then this can limit communication, upper limb function and ability to stand up from the chair\textsuperscript{9}. In contrast, a forward tilted sitting position has also been suggested to maintain lumbar lordosis, decrease posterior pelvic tilt, reduce the effect of tight hamstrings on the position of the pelvis and to position a person within reach of the desk or table.
A systematic review was carried out to determine the effects of a tilted seat position on outcomes for people with neurological or neuromuscular impairment who cannot walk\textsuperscript{10}. Of the 19 studies included in the review, 10 were on young people with cerebral palsy (n=8), neural tube defect (n=1) or unspecified neurological impairment (n=1) and 9 were studies of adults with spinal cord injury (n=8) or multiple sclerosis (n=1). In three of the studies, the seat was tilted anteriorly (by up to 30°), posteriorly (by up to 45°) in thirteen studies and was tilted both ways in three studies.

Results of the studies suggested that a posterior tilt of 20° or more reduces pressures under the pelvis. However, this should be read with caution as overall, there is a lack of quality evidence to support and guide the use of tilted position in seating for people with neurological and neuromuscular impairment. Current evidence is weakened by mixed interventions and confounding factors. No studies were identified on the effects of seat tilt on people with progressive neuromuscular conditions such as Duchenne Muscular Dystrophy, this would be of benefit for these populations as the question of whether to provide a tilt facility on a wheelchair is a common clinical issue.

Conclusions and recommendations
- Seating should be tailored to each individual following a thorough assessment of their need
- The type of seating system will depend on what the expected outcome and goals are for each individual
- Young people with cerebral palsy and other orthopaedic/neurological conditions require seating systems to prevent hip and spine deformities and to maintain body positions, which reduce spastic reflux patterns
- Seating systems that encourage arm-propping are used to stabilise the upper thorax for effective head and neck control
- A backwards or forwards-tilted sitting position may be beneficial to individuals depending on their condition and required outcomes
- All individuals, especially young people who are still developing physically and those with deteriorating conditions require constant assessment to ensure their seating system meets their changing needs.
References