Journal of Tissue Viability xxx (2017) 1–15

Contents lists available at ScienceDirect

Journal of Tissue Viability

journal homepage: www.elsevier.com/locate/jtv

Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals

M. Stephens [a, *], C.A. Bartley [b]

[a] School of Health and Society, University of Salford, England, UK
[b] School of Health Sciences, University of Salford, England, UK

ARTICLE INFO

Article history:
Received 23 August 2017
Accepted 4 September 2017

Keywords:
Pressure ulcer
Seating
Guidelines
Adults

ABSTRACT

The aim of the publication was to develop a practical guide for people, carers and health and social care professionals on how the research and evidence base on pressure ulcer prevention and management can be applied to those who remain seated for extended periods of time. This publication was developed at the request of the Tissue Viability Society in order to revise the original seating guidelines from 2008 as evidence and subsequent care has moved forward in relation to this area. Since 2008, the costs for the prevention and management of pressure ulcers have increased significantly and there is limited published advice from health and social care organisations on seating and preventing pressure ulcers. These guidelines have been written for:

- People
- Carers
- Health and Social Care professionals
- Education and training staff
- Independent sector.

Who live or work in primary, secondary, and tertiary settings.

1. Background

'A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear' [1]. Remaining seated for extended periods of time increases the risk of pressure ulcers development over the buttocks, as the soft tissue in this area is squashed between two surfaces: the seat and the bones of the pelvis [2–4]. How long this destruction to the skin takes can often be irrelevant as some pressure ulcers develop quickly and others take longer [5]. The process is dependent on other factors such as health status, disability, ability to change position, and maintaining an upright-seated position without slumping or sliding [5].

A key study [6] found that when sitting naturally only a small amount of pressure for one to two hours could lead to the development of a pressure ulcer as body weight in this position, is redistributed over a smaller area [7] resulting in high pressures in the buttocks [8,9]. This extra pressure upsets the blood flow through the skin starving the area of oxygen and nutrients, and if this goes unrelieved begins to break down, leading to the development of a pressure ulcer.

To help understand the severity of damage to the skin from pressure, an international pressure ulcer staging system is used (Figs. 1–6) [10]. The higher the stage the more severe the pressure ulcer and damage to the skin and underlying tissues.

1.1. Category/stage one (Fig. 1)

A category/stage one pressure ulcer is superficial damage and the affected area of skin appears discoloured (red in people with

* Corresponding author. School of Health and Society, University of Salford, Frederick Road Campus, Salford, Greater Manchester, M6 6PU, England, UK.
E-mail address: m.stephens@salford.ac.uk (M. Stephens).

http://dx.doi.org/10.1016/j.jtv.2017.09.004

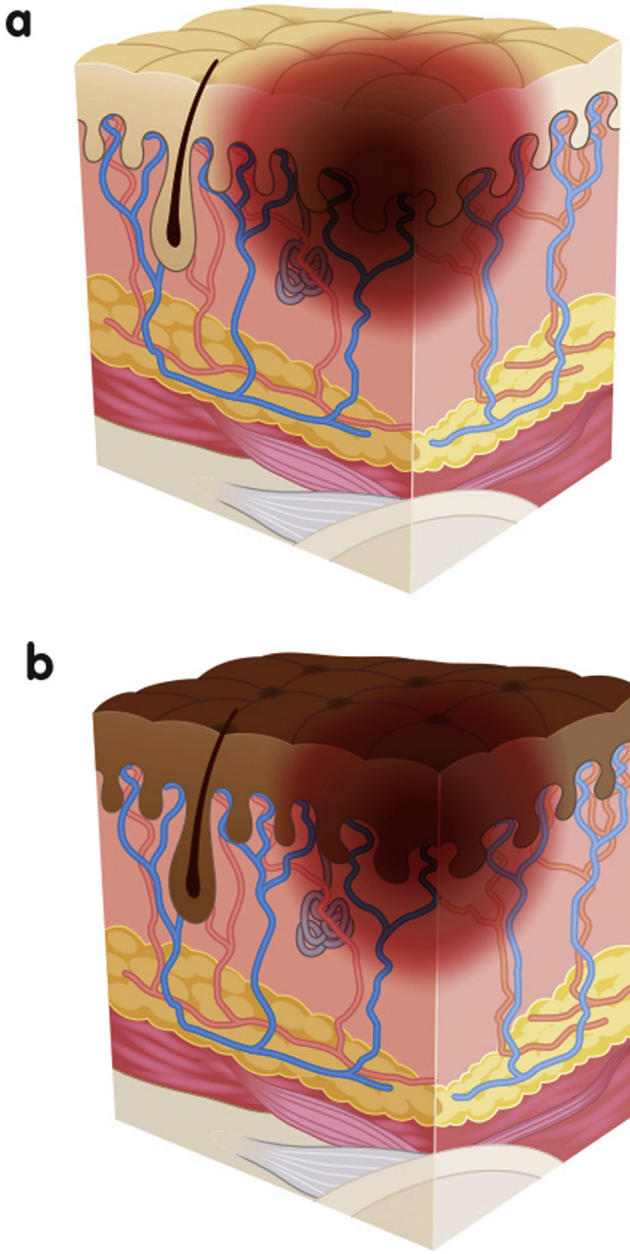

Fig. 1. a Lightly pigmented: non blanchable erythema of intact skin. **b** Darkly pigmented skin: erythema is not always visible.

white skin, and purple/bluish in people with darker skin tones). The skin is not broken, but it may be painful, itchy, and feel warm and squishy, or hard on touching.

1.2. Category/stage two (Fig. 2)

A category/stage two pressure ulcer will look either like an open wound or a blister as the surface of the skin has been damaged.

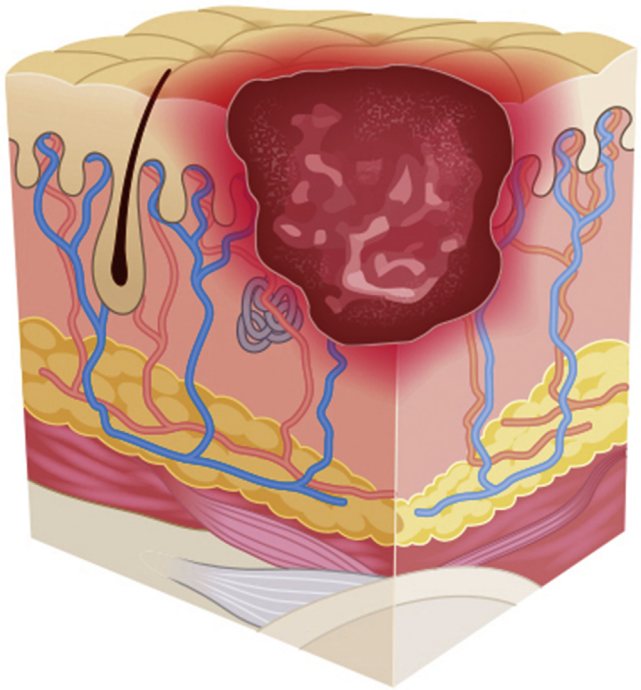

Fig. 2. Partial thickness skin loss with exposed dermis.

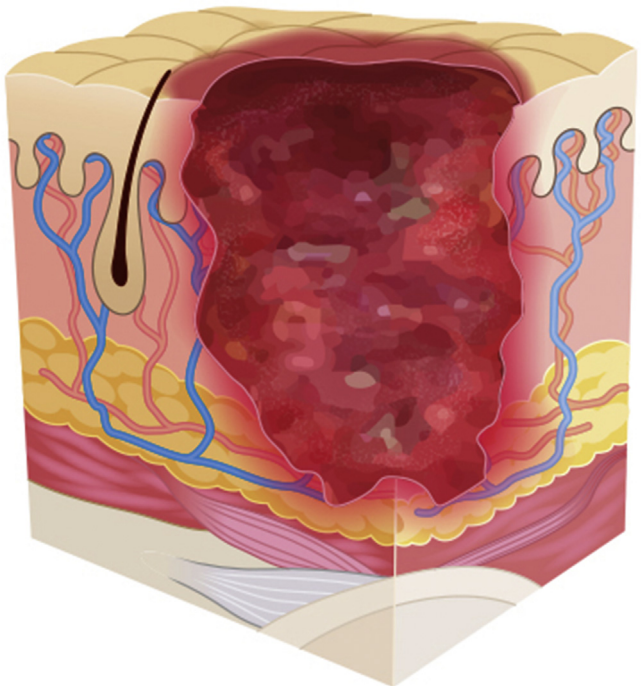

Fig. 3. Full thickness skin loss.

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

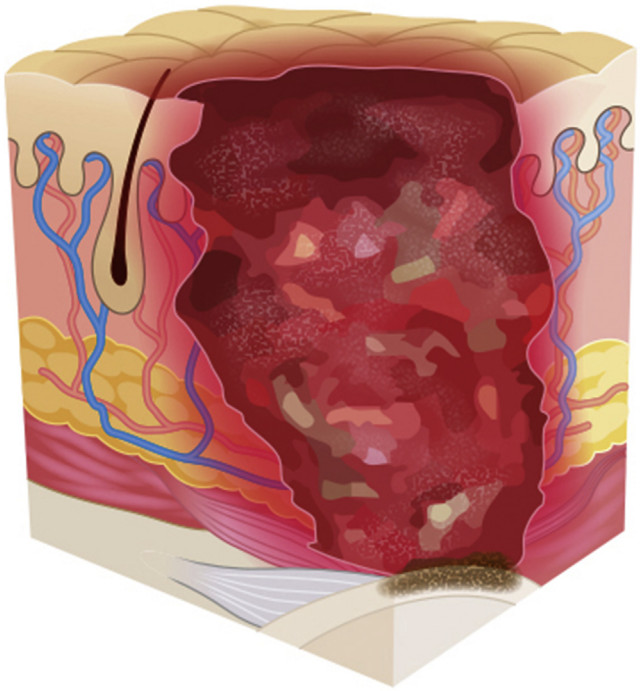

Fig. 4. Full thickness skin and tissue loss insert here.

1.3. Category/stage three (Fig. 3)

A category/stage three pressure ulcer can appear as deep opening of the skin depending where they are on the body. Damage has occurred to both the skin and soft tissues.

1.4. Category/stage four (Fig. 4)

A category/stage four pressure ulcer is the most severe type. Damage has occurred to the skin, soft tissue, and muscle; bone may often be visible. People who develop pressure ulcers of this category can develop life threatening infections.

1.5. Unstageable (Fig. 5)

An unstageable pressure ulcer is one that is covered with dead tissue however the extent of damage cannot be assessed until the dead tissue has been removed by a trained healthcare professional.

A suspected deep tissue injury is where the intact skin looks purple or maroon in colour or may have a blood-filled blister. This is due to damage of the soft tissue and on touching may be painful, firm, mushy, boggy, warm or cool.

⚠ ALERT

If an area of skin has changed colour (white skin to red or dark skin to blue or purple) check the skin.

White skin: lightly press on the red area. It should go white and when you remove your finger it should go red again. This is called the blanch test and is a normal skin reaction.

Dark skin: may not change when you apply touch with a finger, so check for other signs such as colour change, temperature change, swelling or hardness. These should subside within 15 minutes.

If the skin does not react (white skin) or subside (dark skin), seek professional advice.

Link to video for online version for blanch test:
https://www.youtube.com/watch?v=THjmjtDDDoc

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

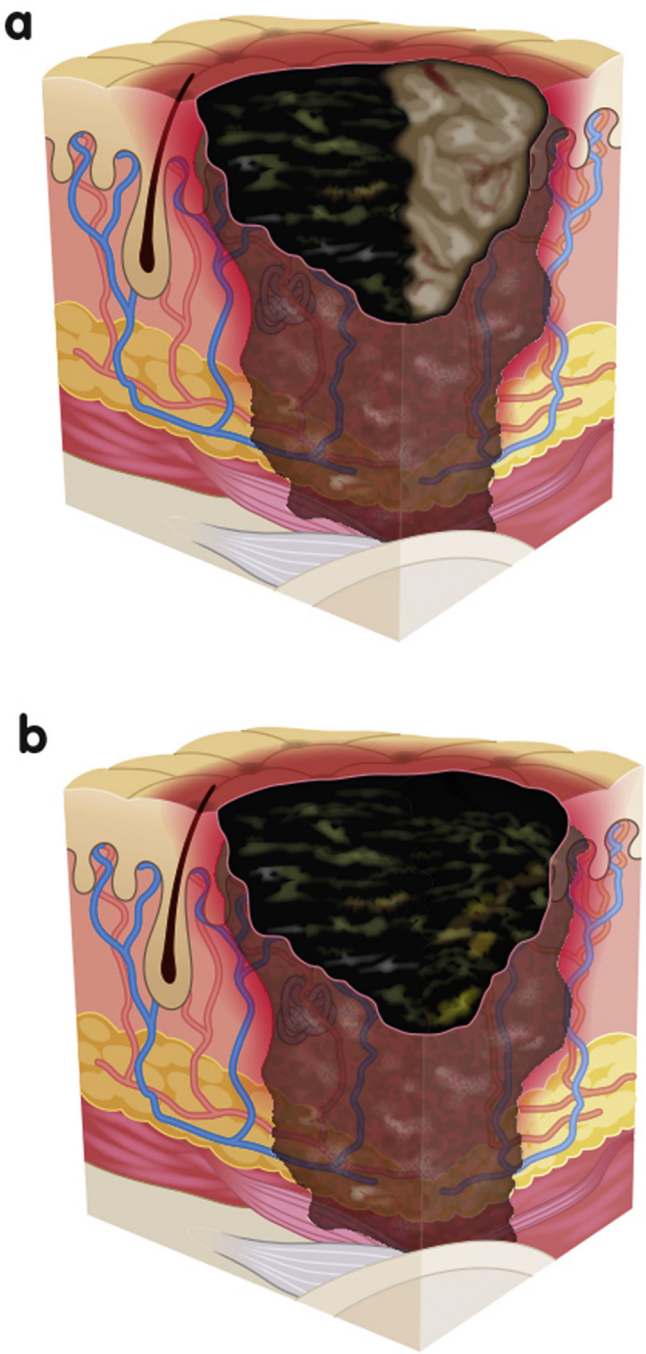

Fig. 5. **a** Slough and eschar insert here. **b** Dark Eschar.

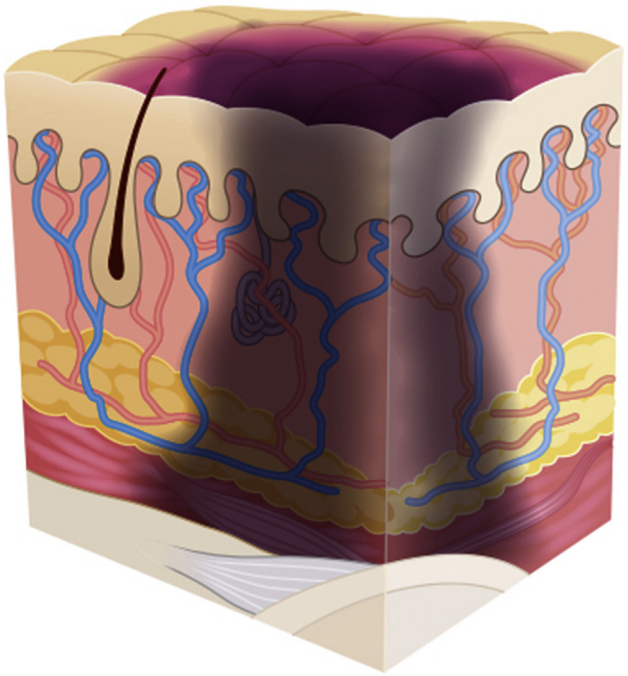

Fig. 6. Deep tissue pressure ulcer: persistent non blanchable deep red, marron or purple discolouration. Suspected deep tissue injury (Fig. 6).

A recent survey in England found that 700,000 people are affected by pressure ulcers each year at a cost to the NHS of more than £3.8 million every day [12]. Pressure ulcers are often associated with people who lie in bed, however research indicates that people who sit for extended periods of time are more at risk of pressure ulcers developing [13].

Even though sitting has been associated with pressure ulcers there is still a lack of evidence-based guidance to help people make informed decisions regarding their day-to-day care in this area [14]. This document has been written to provide guidelines for the prevention and management of pressure ulcers for people who remain seated for extended periods of time. The method used to obtain the evidence to inform this document is shown in appendix i. The guideline is inclusive of all people with short and long-term mobility problems and will not be condition specific as this may exclude certain population groups. Although formal definitions of short and long-term mobility are not available, the International Classification of Functioning, Disability and Health [15] has been considered to provide context in comparison to other literature. The term seated for extended periods of time will be used instead of the long term seated individual as this includes people with short and long-term mobility issues (see Fig. 7).

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

2. Where do pressure ulcers develop when seated? [10]

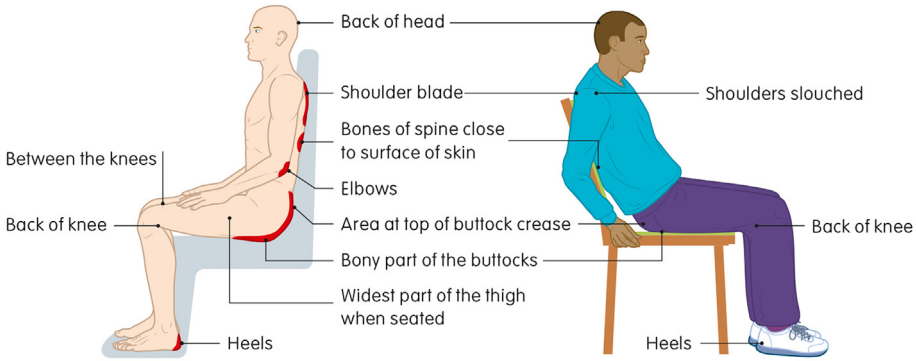

Fig. 7. Areas at risk of pressure ulcer damage when seated and areas at risk of pressure ulcer damage when seated slouched in the chair.

ALERT

Other areas of risk include: palms of the hands from manual wheelchair propulsion, genitals from sitting, and equipment such as catheters, leg bags, belts, and slings that are attached to or placed under people whilst seated.

3. Is there anything that increases a person's risk of developing pressure ulcers?

There are many different factors that can increase a person's risk of developing a pressure ulcer; this can include factors such as (see Fig. 8):

The factors named above are not exhaustive as there are other less common risk factors [10]. There is a useful test to assess risk on the React to Red website [11], this can be used by you, your carers and any health or social care professional who may be attending to your physical care needs (see useful links/resources at the end of the document).

It is important to assess risk factors for pressure ulcer formation for people that are seated, as this will help those providing care to be risk aware and implement care and equipment to reduce that risk. Health and social care professionals may use a risk assessment tool to help identify risk of developing pressure ulcers, so please talk to your health or social care professional about the result [10].

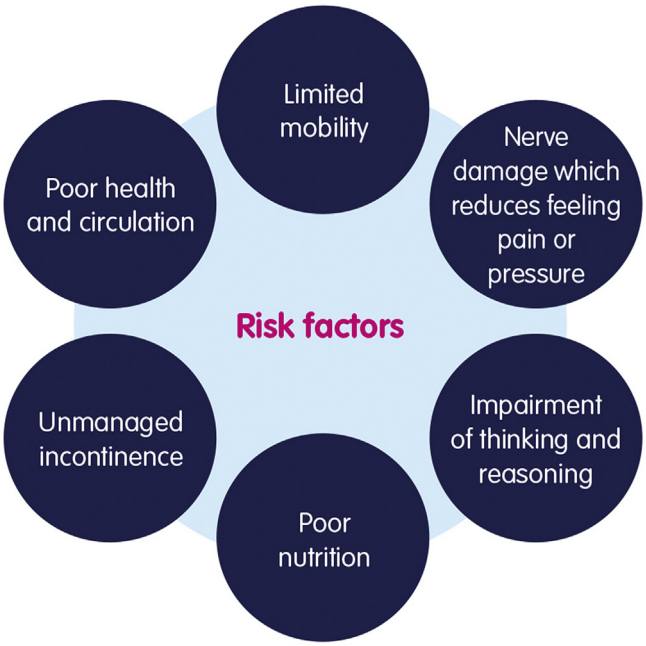

Fig. 8. Risk Factors.

4. What is the best possible seated position and what seat adjustments are required?

Regardless of whether a person has a short or long-term mobility issue, there are essential factors that should be considered which are set out in Table 1 [14,19].

5. What makes an ideal seating assessment?

Seating assessment is complex and requires a trained individual who can carry out a comprehensive, evidence based and person-centred approach [16,18], which should be documented in the person's medical records. A key part of any seating assessment is the requirement to inform and educate the individual, their family and carer about:

- why the chair or cushion may be provided
- how to use and maintain this equipment
- the potential impact of their lifestyle on the prevention/management of pressure ulcers.

This information should be followed up in writing and include

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Table 1
Factors to consider when assessing seating.

Factor	Reasoning
Chair seat width	The width of the seat is important as it can affect a person's posture and pressure areas. If a seat is too narrow it can lead to pressure damage to the hips, buttocks, and the back of knees. If a seat is too wide, the person may feel unsupported which could result in posture and pressure problems with the hips and spine. This may also make it difficult to fix equipment to the seating system such as lap belts, hip and thigh supports. Good practice recommends a minimum of 2.5 cm clearance between the hip and the side of the chair/wheelchair.
Chair seat Height	If a seat is too high, the individual may slide down the seat in order to place their feet on the floor or footplates to support themselves (Fig. 9). This could also lead to pressure damage to the skin around the tailbone area. To check the appropriateness of the height of the seat for an individual make sure they can comfortably place their feet on the floor or foot plate with the ankle ideally in a normal position. Adding extra cushions will affect seat height.
Chair seat depth	If the seat depth is too long, this may cause sliding down in the seat in order to reach the front edge of the seat with the knees. The person is likely to slide forward to place their feet on the footplate or floor, affecting their posture, stability and an increase in pressure on the buttocks. Pressure ulcers may also occur against the back of the knee. If the seat depth is too short pressure is increased at the thighs with a risk of pressure ulcers in the mid-thigh region. Good practice recommends a minimum of 2.5 cm clearance between the edge of the seat and the back of the knees (Fig. 10).
Chair back rest	The backrest provides support and strength to the trunk. If the backrest is too low, it can lead to postural problems, weakened sitting balance and cause incorrect placement of supports for the shoulder/chest increasing the risk of pressure damage. If the backrest is too high, it can affect function such as wheelchair propulsion. Shoulder blade movement can be reduced leading to postural problems in the trunk affecting sitting balance. Back width is usually set by the seat width, but can be different with certain wheelchair/seat back choices. Chest width and the need for trunk supports are important considerations. If the back width is too wide, it may hinder fixing supports and arm function. If the back width is too narrow, it can result in edges/back posts digging into the person's back and insufficient room for supports.
Chair seat to back angle	Not all chairs offer the person a natural sitting position as the backrests are often slightly reclined. This may result in sliding down in the seat and increasing the risk of pressure damage.
Chair arm rests	Armrests provide steadiness in sitting and help the person to transfer safely. *Armrest height* needs to support the bent elbow when seated as well as the possibility of additional equipment such as trays and arm supports. If the armrest is set too high, it can increase pressure on the elbow joint causing pain and discomfort. If the armrest is set too low, it can create postural issues that contribute to pressure damage in the buttocks due to lack of support for the elbows, shoulders and trunk. *Armrest length* varies depending on the amount of support required. If the armrest is too long, it can stop the chair from being positioned under a table. If the armrest is too short, it may result in difficulty with sit-stand transfers and may not support equipment such as lap trays.
Chair leg rests/foot plate	In the best possible seated position, the *length* of the leg rest should be set so that the thigh is supported correctly on the seat with the foot comfortably placed on the footrest or floor. Ankle and foot deformities need to be taken into consideration. If the leg rest length is too long it can cause increased pressure on the buttocks and thighs and may result in the person sliding down in the chair to meet the footplates/floor. If the leg rest length is too short, it can increase pressure on the buttocks, calves and heels, which will be forced against the leg rest hangers. The standard setting of a *footplate* is a 90° angle, however people with fixed postural problems of the ankle will need the footplate adjusted to meet their needs.
Head rest	A headrest is important for people with weak neck muscles and who are unable to hold their head up independently. A headrest can help with breathing and swallowing as well helping the person to maintain eye contact. Care should be taken as pressure can increase at the back of the head causing damage.

⚠ ALERT

Using a footstool will not help reduce swelling (oedema) of the leg(s) and the position puts additional pressure on the tailbone and buttocks increasing the risk of pressure ulcers.[19] They may also impede the sit to stand transfer and mobility.[14] There are many guidelines healthcare professionals refer to when dealing with swelling of the legs and therefore their advice must be sought on what is considered appropriate for your condition and cause of swelling.

any course of action the person will take and potential risks if they differ with current best practice. The following features should be considered in combination with the healthcare professional's clinical judgement, although this is not definitive (Fig. 11):

6. Who might be involved in the seating assessment?

Occupational therapists are often the healthcare professional who will carry out a seating assessment and prescribe equipment. This is often in collaboration with other members of the interprofessional team such as the: Tissue Viability Nurse, Doctor, Physiotherapist or Clinical Engineer [22].

7. What interventions can I expect after a seating assessment?

After a seating assessment is completed, the health care professional may recommend a piece of equipment. Given the wide range of chairs, wheelchairs, and seat cushions available, as well as the wide range of physical conditions for which they may be prescribed; it is not possible to provide specific guidance upon which

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

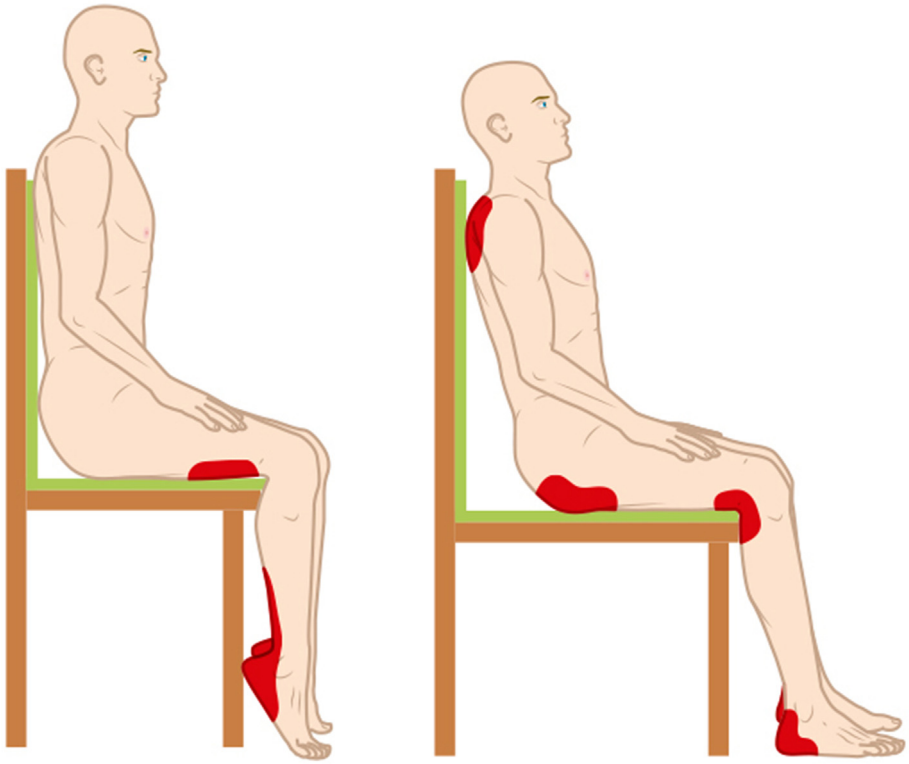

Fig. 9. Seating position too high and low.

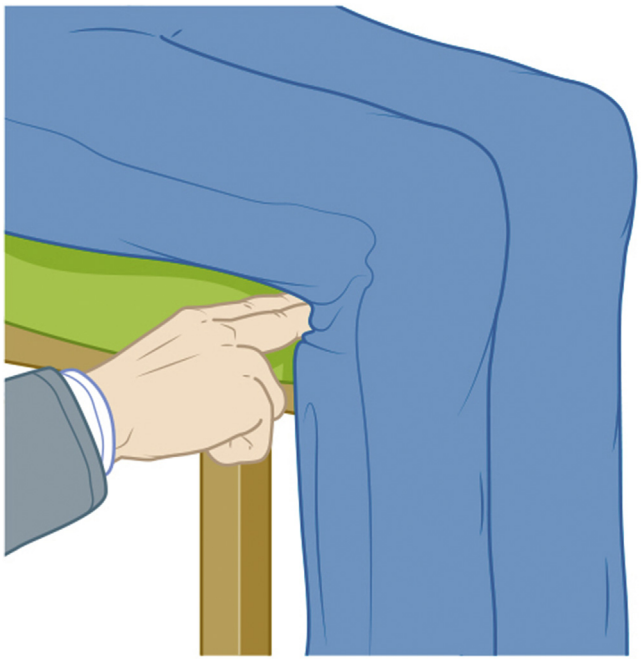

Fig. 10. Seat Depth Clearance.

cushion or chair/wheelchair to provide for each individual with short or long-term mobility problems. However, general guidance suggests that people with seating needs must have the ability to access advice and equipment from wheelchair or community services in a timely manner [23].

Adults who remain seated for longer periods of time need to have regular follow-up of their pressure-redistribution needs, which may lead to a change or replacement of equipment if necessary.

In order for the person to both accept and use the seating equipment there may need to be a trade-off between what the healthcare professional considers the ideal seating should be, and what is manageable for the individual's lifestyle, capabilities and personal preference [16]. This can sometimes involve careful negotiation as the preferences can differ to those of the health professional. Fig. 12 illustrates the priorities for people and health professionals [16]. Equipment abandonment is more likely if this discussion does not take place [20,21].

After an assessment, there may be referrals to other services such as a Tissue Viability Nurse, engineer etc.

8. Cushion and static chair selection

There are many different types of pressure redistributing seating equipment available to help prevent and manage pressure ulcers such as:

- a single cushion to use on a wheelchair or chair
- an integrated cushion into a seating system
- a bespoke custom-made cushion.

There is little research to demonstrate that one cushion is better than another [14,17] and decisions about specific cushions are often based on individual opinions. It is important to consider several factors in cushion prescription such as what the cushion is made of

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

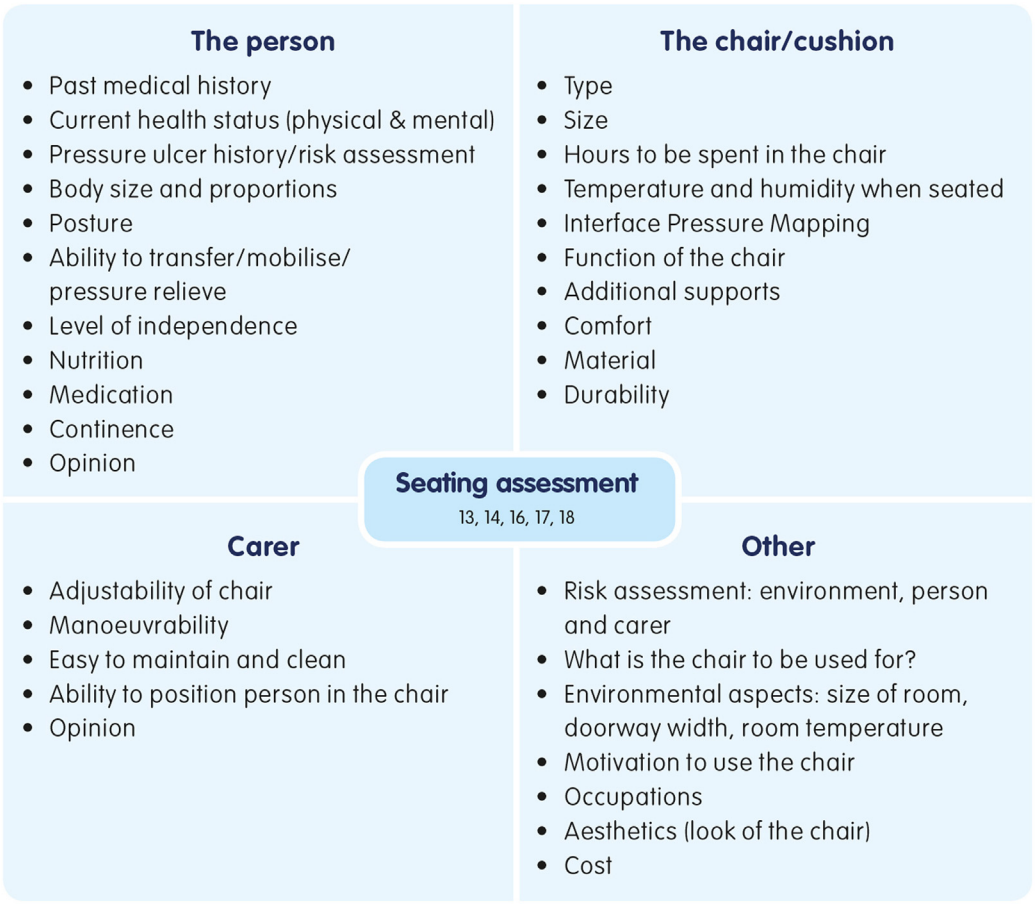

Fig. 11. Key features of a seating assessment.

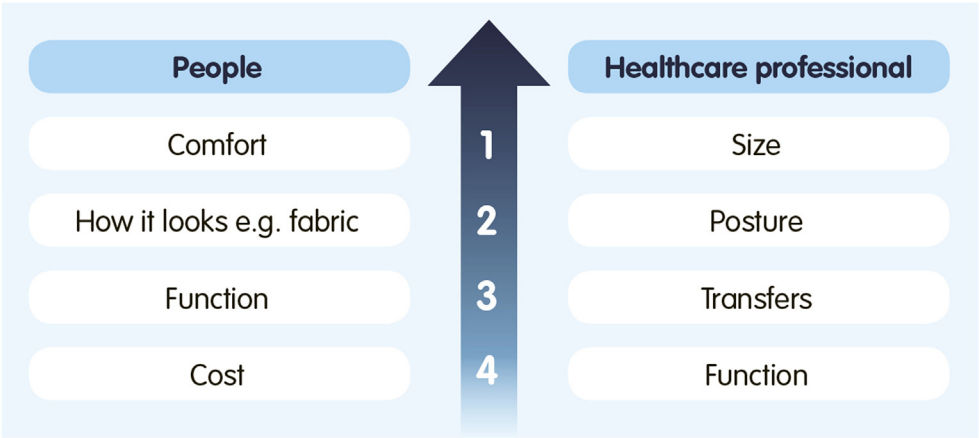

Fig. 12. The differences in opinion of the priority of necessary features of chairs and cushions between healthcare professions and people who remain seated for long periods of time.

and how it performs [2]. Healthcare professionals that assess the properties of the cushion/chair take into account the factors listed in Fig. 9. However particular attention is paid to reducing the pressure exerted on the areas at risk, managing temperature and humidity at the buttocks, and comfort [20–39]. There are advantages and disadvantages to consider with all forms of cushion.

Static cushions/chairs such as those made using foam, gel, air or water are made to decrease the risk of tissue damage by redistributing pressure at the bony points in the pelvic area of the seated individual. Table 2 provides a list of the most commonly used materials used in cushions and chairs, which are currently commercially available in the United Kingdom [20–39].

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Table 2
Advantages and disadvantages of cushions.

Cushion	Advantages	Disadvantages
Polyurethane foam cushions are made of chemical compounds and vary by thickness. The thicker the foam, the more hardwearing it is.	Relatively inexpensive Soft and stable support surface Some have bacterial control within the core of the cushion Quickly warms up and retains heat Sculpted or machine-profiled foam cushions maximise the contact area between the individual and the cushion Easy to use	Lower quality foam cushions may require replacement after 6–12 months' use The cushion may only be suitable for people below a certain weight Poor quality foams may degrade and collapse faster Heat and moisture may build up between the cushion and the buttocks – hot damp skin and soft tissue may be at elevated risk of breakdown during prolonged sitting
Viscoelastic foam cushions are made from polyurethane foam with additional chemicals that increases its thickness and flexibility. They were originally designed for impact absorption. These cushions may be useful to consider in the case of people with short and long term mobility problems who experience pain (for example cancer or arthritis).	Contours to buttocks so in order to increase the area in contact with the cushion so that it reducing pressure. Warms up relatively quickly to enable the buttocks to sink into the cushion which helps to fix the pelvis in the seat. Stable seat support	If stored before use in a cold environment can feel firm until the material warms up Transfers for some people can be affected due to cushion contouring to the shape of the buttocks, making the surface uneven and people feeling stuck. Once the cushions warms up it can become too warm for some.
Gel cushions vary in the thickness of the gel used in their construction. Thicker gels are more solid and can be used on/in some foam cushions. Less thickness gels are more fluid.	Contour to the shape of the buttocks so increasing the area in contact with the cushion so reducing interface pressures Conducts heat away from the skin surface so may feel cool to the user	The movement of low thickness gels may be noticeable to the person and affect their seated balance and ability to transfer from the seat. Low thickness pure gel cushions will leak if punctured.
Air filled cushions are cushions filled with air and are available in varying levels of thickness. They depend upon the amount of air flow into the cushion to be effective.	Lightweight and easy to move Can provide postural support. Air circulation may lessen heat and moisture build-up	Can feel unstable for some people May be difficult to transfer from Person/carer education required to maintain optimum air flow. Regular maintenance required to maintain correct operation Can be punctured
Dynamic seat cushions have a polyurethane/viscoelastic foam base with air sac inserts that regularly inflate and deflate within the cushion every 10–12 mins by the means of an attached pump.	The alternating inflation and deflation of the air sacs changes the pressure points of the pelvic area and stimulates circulation. The frequency and degree of this is automated. Easy to use as operation of the cushion is preset. Some are battery operated.	Some require electricity supply. Batteries require charging. As cushion provides pressure relief, the end user may not be motivated to carry out other self-help repositioning techniques. Costly in comparison to static cushions. People may feel unstable due to inflation and deflation of the cells. Difficulty with transfers if person feels unstable
Watercell technology is water-filled sacs used with viscoelastic foam incorporated into the seat of a chair in order to contour to the shape of the buttocks.	Contours to buttocks so increasing the area in contact with the cushion so reducing pressure. Comfortable.	May leak if punctured. Takes time to warm up.

ALERT

The selection of a cushion should not be solely based on interface pressure measurements (IPM), other factors such as comfort, appearance, feel and look of the cushion, weight limit and portability of equipment are equally as important.[17]

9. Cushion covers

The selection of an appropriate cushion cover can influence seating preference. Cushion covers should be made of a material that:

- Prevents 'hammocking' (the cover does not conform to the shape of the cushion when seated because it is too tightly fitted)
- Enables independent transfers if appropriate for the person
- Allows air exchange to minimise the temperature and moisture between the buttocks and the cushion
- Is easy to clean
- Is removable to allow inspection of the cushion [14].

10. Wheelchairs

People who have difficulties walking may be prescribed a wheelchair. As with all seating equipment, there are many different varieties of wheelchairs which are outside the scope of this document. However, prescription of such equipment should be based on individual assessment [40].

11. Tilt, recline, and elevating leg rests in wheelchairs and static seating

For those who are at risk of pressure ulcers developing, tilt-in-space, recline and elevating leg rests in wheelchairs and chairs are sometimes useful in providing pressure relief [41,42]. In other

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Advantages	• By tilting the position of the chair backwards by 15, 25, or 35 degrees combined with recline can reduce load and increase blood flow to the skin at the buttocks.[43, 44] • Increases trunk and head control. • Improves function for example reaching. • Improves Visual Orientation, Speech, Alertness, Arousal, Respiration, and Eating. • Carer can carry out personal care for example changing incontinence pads.[45]
Disadvantages	• May have a negative effect on breathing and promote muscle spasms for some wheelchair users. • Difficulty with eating and drinking. • The tilt-in-space wheelchair may be incompatible with the wheelchair users' environment, for example the height may prevent the use of tables and desks. • The space required to safely turn and move the wheelchair/chair is increased due to the position of the footplates and push- handles when in its tilted position. • Cost of equipment can be higher than other types of seating.[45]

Fig. 13. Advantages and Disadvantages of tilt in space chairs and wheelchairs [43–45].

⚠ ALERT

Care must be taken with the use of the recline feature on chairs and wheelchairs as when used alone it can lead to sliding in the chair and subsequent risk of pressure ulcer development. This can also happen when the chair is returned to the upright position.[46,47,48]

wheelchairs and chairs, the seat and backrest angles remain fixed as they are tilted backwards with the occupant remaining in the same posture as the seat and back tilt. Fig. 13 illustrates the advantages and disadvantages of tilt in space chairs and wheelchairs. It is important to note that whilst this kind of chair can be advantageous for some in can be detrimental to others. For example, breathing can be improved or worsened with the use of tilt in space depending on the individual's circumstances. Therefore, it is imperative that a holistic assessment is made with a healthcare professional if considering this type of chair [46–48].

12. What self-help suggestions are there to assist in the prevention of pressure ulcers?

The NHS uses a five-step model based on a healthcare innovation from the USA [49], which ties together current best practice in pressure ulcer prevention and includes the following factors:

13. Surface

It is vitally important that the right seating equipment is used as part of a 24-hour posture and pressure management programme. For the surface to work at its best this also means:

- having minimal layers of clothing between the pelvic region and the surface of the cushion
- moving and handling equipment such as slings are not left under the buttocks when transfers have occurred
- catheters and straps from other equipment are not trapped under the buttocks, legs, back, or other sites when seated
- Taking care when positioning incontinence pads and seams of underwear.

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Fig. 14. Sideways lean here https://www.youtube.com/watch?v=FMudH2gyJi8.

14. Skin

Skin inspection should be carried out regularly throughout the day and can be performed by using a mirror or asking others if assistance is needed. Skin inspection should also take into consideration areas where medical equipment may be in contact with the skin too. Skin that is too moist or too dry can increase the risk of pressure ulcers. Healthcare professionals can advise people and carers on moisturisers for dry skin, and how to keep skin dry for those with incontinence or buttocks that easily become sweaty.

Fig. 15. Tilt forward and Full Frontward Lean https://www.youtube.com/watch?v=BdzcYiI-16g.

15. Keep moving

Guidance on repositioning when seated must be given to both carers and people with acute or long-term mobility problems. This intentional movement can be carried out in three main ways (Figs. 14 and 15) [34]. Guidelines suggest performing pressure relief every 30 min lasting 30 s for individuals who can do so independently [34]. For those requiring help, repositioning assistance can be given as advised by a healthcare professional. Advice from the NICE guidelines suggests a person who is at risk of pressure ulcers should not remain seated for longer than two hours or a person who already has an established pressure ulcer should not sit out [22]. In instances like this, you may consider lying on the bed for a short period of time to off load pressure on the areas at risk.

16. Incontinence

For those who have problems with incontinence it is important to seek advice from a healthcare professional as they can advise on the use of appropriate creams, pads, pants and other equipment.

ALERT

Standing frames and wheelchair standing devices

It is commonly known that standing should be part of the twenty-four-hour pressure management routine of people with short or long-term mobility problems. Standing not only offers pressure relief but improves functional reach, independence, vital organ capacity, circulation, and passive range of motion. Standing reduces the occurrence of water infections, abnormal muscle tone, skeletal deformities and enhances wellbeing.[45]

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Incontinence can increase the risk of skin breakdown around the buttocks, top of the buttock crease and tailbone. This can be either a moisture lesion or a pressure ulcer and professional healthcare advice should be sought [10].

17. Nutrition/hydration

To keep skin healthy a well-balanced diet and fluid intake is essential. This involves eating and drinking a variety of foods in the right proportions throughout the day. The NHS Eatwell guide [50] provides further information. If there is a problem with eating and drinking advice can be sought from a variety of professionals such as the doctor, dentist, dietician or speech therapist.

18. Sickness

An extra factor to consider is to be aware when a person becomes generally unwell as this increases their susceptibility to developing pressure ulcers [51]. Sickness can include:

- Vomiting
- Infection (chest, urine, throat)
- Influenza
- Changes in bowel activity (e.g. diarrhoea, constipation)
- Increased alcohol consumption
- Depression
- Changes of routine (long journeys, holidays)
- Family/life changes
- Deterioration in long term condition
- Pain

ALERT

Some people are unable to say when they are not feeling well and the only way to recognise a change is through factors such as discomfort, changes in skin colour (paleness), breathing rate, heart rate, body temperature and non-verbal cues (changes in body movement, facial expression, and posture) may be present.[51]

19. Key seating outcomes for the long-term seated individual

For people with short or long-term mobility issues the assessment and prescription of seating equipment should take into account the persons and carers opinions and address the following outcome measures:

- comfort and postural stability [20,21]
- pressure redistribution
- physiological abilities e.g. breathing, swallowing, digestion [52]
- participation in occupations and activities such as hobbies and daily living tasks
- impact on the person's quality of life [53]
- Communication

Due to the changing needs and expectations of people with long-term mobility issues; a routine review of their seating needs should be completed by a health professional in accordance with best practice. The most recent evidence suggests between three months and three years depending on individual factors such as health status, changing posture and weight loss or gain [17,53,54]. However, this should be sooner if a person develops pressure damage, a routine review can be requested by a carer or person directly, without involving a healthcare professional.

20. Useful resources

20.1. Tissue Viability Society

The TVS is an independent registered charity run by a body of Trustees. Their mission is to disseminate information, promote research and increase awareness of all aspects of good clinical practice in wound prevention and management.

https://tvs.org.uk/

20.2. NHS choices

A NHS website that provides a complete health information service with multiple articles, videos and tools, to help people make the best choices about their health and lifestyle.

http://www.nhs.uk/pages/home.aspx

20.3. React to red

A website devised by Coventry City Council, Coventry and Rugby Clinical Commissioning Group, University Hospital of Coventry and Warwickshire and Coventry and Warwickshire Partnership Trust which provides useful information on pressure ulcers for people, their carers and health and social are professionals.

http://www.reacttoredskin.co.uk/

We have also included a slight adaptation to their risk assessment questionnaire (see Table 3).

If you have answered yes to 3 or more or the questions asked above, you MAY be at risk of pressure ulcers developing. For a complete test consult a health care professional.

20.4. Stop the pressure

The Stop the Pressure website is a resource for health and social care professionals and people to find current information about the risk of developing pressure ulcers.

http://nhs.stopthepressure.co.uk/

20.5. NICE guidelines for the public (cg179)

Internet advice from the National Institute of Health and Care Excellence on the care and support that should be offered to people who use health and care services in regards to pressure ulcers.

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Table 3
React to red risk assessment questionnaire.

Risk factor questions	Tick if this is a risk factor for you
Are you over 65?	
Do you have restricted mobility?	
Do you have problems with managing continence?	
Is your skin dry, clammy, or reddened?	
Are you above or below average weight?	
Has your appetite changed or have you lost weight?	
Are you anaemic?	
Do you have diabetes?	
Have you recently had major surgery?	
Do you smoke?	
Do you have organ failure?	

https://www.nice.org.uk/guidance/cg179

20.6. Public Health England

Internet advice from Public Health England on the care and support that should be offered to people who use health and care services in regards to pressure ulcers.

https://www.gov.uk/government/organisations/public-health-england

20.7. Love Great Skin

A website about the Love Great Skin campaign, produced by Wounds UK on behalf of Midlands and East NHS to raise awareness of pressure ulcers in the care home and nursing home setting.

http://www.lovegreatskin.co.uk/

Stakeholder advisory group members

Professor Dan Bader - Professor of Bio-engineering and Tissue Health, Health Sciences, University of Southampton.

Ria Betteridge - Consultant Nurse Tissue Viability, Oxford University Hospitals NHS Trust.

Nicola Burke - Service User and Member of Service User Group, School of Health Sciences, University Salford.

Chris Cammis – Service User and Member of Service User Group, School of Health Sciences, University Salford.

Tina Chambers - Tissue Viability Consultant, Educator and Advisor Ringwood, Hampshire.

Linda Primmer - Community Tissue Viability Nurse Specialist, NHS Lothian.

Dr. Ray Samuriwo - Lecturer in Adult Nursing, School of Healthcare Sciences, Cardiff University.

Julie Sturges - Tissue Viability Nurse, Buckinghamshire Healthcare NHS Trust.

Roy. Vickers – Academic Librarian, University of Salford.

Jo Webb - Senior Lecturer Occupational Therapy, School of Health Sciences, University of Salford.

Tissue Viability Society trustees

Professor Dan Bader, Dr Una Adderley, Ria Betteridge, Tina Chambers, Linda Primmer, Dr. Ray Samuriwo, Julie Sturges.

Listening event contributors

Dr. Anna Akinshina Lecturer in Physical Chemistry School of Environment & Life Sciences - University of Salford.

Karen Birch Community Occupational Therapist – Oldham Community Health Services.

Kymberly Chilley Student Nurse Mental Health - School of Health and Society University of Salford Figs. 1–6 were redrawn after permission from NPUAP.

Denisse DaSilva Operations Manager Disability Services (Occupational Therapist) – Bury Council.

Brian Donnelly Executive Director - CECOPS CIC.

Michelle Eachus Clinical Nurse Specialist Tissue Viability – Pennine Acute NHS Foundation Trust.

Suzanne Grierson Intern Lecturer – School of Health and Society University of Salford Figs. 1–6 were redrawn after permission from NPUAP.

Vince Hession Service User and Member of School of Health Sciences User and Carer Group - University of Salford.

Jennifer Kearns Student Nurse Mental Health - School of Health and Society University of Salford Figs. 1–6 were redrawn after permission from NPUAP.

Anthony McDonald Occupational Therapist - Halton Borough Council.

Paul Murtough Service User and Member of School of Health Sciences User and Carer Group - University of Salford.

Janette Navesey Community Staff Nurse - Pennine Acute NHS Foundation Trust.

Samantha Prince Student Nurse Mental Health - School of Health and Society University of Salford Figs. 1–6 were redrawn after permission from NPUAP.

Judith Ruddel Wheelchair/Occupational Therapist - North Tees and Hartlepool Foundation Trust.

Catherine Sainter Community Staff Nurse – Pennine Acute NHS Foundation Trust.

Wendy Smith Occupational Therapist – Community Neurology Team, Salford Royal Foundation NHS Trust.

Delphine Wise Student Occupational Therapist, School of Health Sciences, University of Salford.

Lucy Woodall Occupational Therapist – Salford Royal Foundation NHS Trust.

Terminology

Based upon outcomes from stakeholder meetings and a listening event [15] the term ‘pressure ulcer’ instead of ‘pressure sore’ is used throughout this document and is in line with current evidence based literature. The term ‘people’ is used throughout to denote service user/patient which is currently the expressed preferred term by this group of stakeholders.

Permissions

“Figs. 1–6 Used with permission of the National Pressure Ulcer Advisory Panel 22/03/2017”.

“Figs. 7, 9 and 10 Used with permission of the Tissue Viability Society 22/03/2017”.

“Risk assessment questionnaire adapted and kindly reproduced by YourTurn.org.uk 15/03/2017”.

Funding

This work was undertaken as part of a project to update the Tissue Viability Society Guidelines funded by the Tissue Viability Society. However, the views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Tissue Viability Society. No funding bodies had any role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

Conflict of interest

The authors have no conflict of interest: members of the Tissue Viability Society were involved in the stakeholder and peer review process.

Appendices

1. Methodology
2. Glossary of terminology

1. Methodology

A literature search was conducted in May and repeated in September 2016. A PICO framework was used to frame the search question (P = people who remain seated for extended periods of time (acute and long term mobility) I = chairs, wheelchairs and cushions, C = pressure redistribution, comfort, humidity, temp, O = pressure ulcers) using the following key terms, pressure ulcer/ OR bedsore* OR ischial sore* AND decubitus OR pressure sore* OR pressure induced soft tissue damage OR skin break AND (posture/ OR sit* OR seat* OR immobil* OR wheel chair dependent OR sensory impairment OR spinal injury/) AND (gel OR foam OR air OR oil-based OR oil based OR seat) AND cushion. The search was limited to 2006–2016. No other filters were applied. The following databases CINAHL, Pubmed, Cochrane, Google Scholar, were used. Grey literature and hand searching was also conducted, including organisations such as EWMA and EPUAP. The initial search returned 554 citations; after applying inclusion and exclusion criteria (English language, from 2008–2016, seat cushions, chairs, and wheelchairs, pressure redistribution, humidity, comfort) these were abstract screened by the researchers and were reduced to 22 citations used to inform the cushion/chair selection part of the guidelines.

2. Glossary of terms

Table 4
Glossary of terms.

Word used by health professionals	Lay Term	Meaning
Pressure Ulcer	Pressure sore	An injury that breaks down the skin and underlying tissue due to pressure and/or shear forces.
Ischial Tuberosity	Bony bit of the buttock	Bony protrusion which takes the body's weight during sitting
Greater Trochanter	Widest part of the thigh when seated	Greater trochanter is the head of the femur and can be located on palpation at the lateral aspect of the thigh
Sacrum	Area at the top of the buttock crease	The sacrum is a large wedge-shaped vertebra at the inferior end of the spine.
Coccyx	Tailbone	a small, triangular bone located at the bottom of the spine
Popliteal Fossa	Back of the knee	shallow depression located at the back of the knee joint
Bony prominences	Areas where bones are close to the surface	Areas that are under the most pressure and greatest risk for developing pressure ulcers.
Scapula	Shoulder blade	two flat, triangular bones, each forming the back part of a shoulder
Occiput	Back of the head	Back part of the head or skull
Medial aspect of knees	Between the knees	Area between *the medial* epicondyle of the femur and the anteriomedial *aspect* of the tibia.
Short term mobility issue	Short term mobility issue	People who, due to ill health, injury or surgery are unable to mobilise on a temporary basis
Long term mobility issue	Long term mobility issue	People who, due to disability, ill health, injury or surgery are unable to mobilise on a long-term basis
Cognitive ability (capacity)	Thinking and reasoning	The ability to learn, remember, problem-solve, and pay attention.
Informed decision making	Making a decision, having considered all the relevant information	A decision by a person based on choice, which requires the decision to be voluntary and that the person has the capacity for choice
Disability Problems/challenges/ issues	Disability Issues	A condition or function judged to be significantly impaired relative to the usual standard of an individual or group.
Social functioning	Participation in conversation and social activities	Ability to engage in conversation and social activities whilst seated
Adults who remain seated for extended periods of time	Adults who remain seated for extended periods of time	People with a long term mobility issue or disability who are unable to independently mobilise
Patient/service user/client/people	People	Any person who has a mobility issue and requires access to health and social care professionals
Optimal seated posture	Best possible seated posture	Sit in a position where the least strain is placed on supporting muscles and ligaments during movement and activities.
Interface pressures	Interface pressures	The force per unit area that acts vertically between the body and a support surface
Aesthetics	A pleasing appearance that looks and feels nice	The appearance of the equipment used in seating
Occupations	Things that people do	Activities that people do on a daily basis such as work, leisure, activities of daily living
Scoliosis	Curvature of the spine	abnormal, sideways curvature of the spine which can be 's' or 'c' shaped
Kyphosis	Curvature of the spine	Excessive outward curvature of the spine, causing hunching of the back.
Lordosis	Curvature of the spine	excessive inward curvature of the spine
Full frontward lean	Full frontward lean	To lean forward form a sitting position until the chest comes to rest on the knees
Intermediate frontward lean	Tilt forward	To lean forward from a sitting position in order to offload pressure from the ischial tuberosities
Sideways lean	Sideways lean	Lean sideways from a sitting position in order to offload pressure form one buttock
Physiological changes	Physiological changes	Change in a person's blood pressure, pulse, temperature, respiration in response to illness or pain
Static seat/chair	A chair	A specialist piece of equipment used in the 24-hour posture and pressure management of an individual who has short or long term mobility issues

References

[1] National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. In: Haesler Emily, editor. Prevention and treatment of pressure ulcers: quick reference guide. Osborne Park, Australia: Cambridge Media; 2014.
[2] Wounds UK Expert Working Group. International review. Pressure ulcer prevention: pressure, shear, friction and microclimate in context. A consensus

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004

document. London: Wounds International; 2010.
[3] Krouskop TA. A synthesis of the factors that contribute to pressure sore formation. Med Hypothesis 1983;11(2):255–67.
[4] Schubert V, Héraud J. The effects of pressure and shear on skin microcirculation in elderly stroke patients lying in supine or semi-recumbent positions. Age Ageing 1994;23(5):405–10.
[5] Gefen A. How much time does it take to get a pressure ulcer? Integrated evidence from human, animal, and in vitro studies. Ostomy Wound Manag 2008;54(10):26–8. 30-35.
[6] Kosiak M. Etiology and pathology of ischemic ulcers. Arch Phys Med Rehabil 1959;40(2):62–9.
[7] Cook AM, Miller Polgar J. Cook and Hussey's assistive technologies: principles and practice. third ed. London: Mosby; 2007.
[8] Barbanel JC. Pressure management. Prosthetics Orthot Int 1991;15:225–31.
[9] Defloor T, Grypdonck MH. Sitting posture and prevention of pressure ulcers. Appl Nurs Res 1999;12(3):136–42.
[10] European Pressure Ulcer Advisory Panel, National Pressure Ulcer Advisory Panel & the Pan Pacific Pressure Injury Alliance. Prevention and treatment of pressure ulcers: quick reference guide. 2014. Retrieved from, http://www.npuap.org/wp-content/uploads/2014/08/Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-Jan2016.pdf.
[11] Coventry and Rugby Clinical Commissioning Group. React to red. 2016. Retrieved 14/01/17 from, http://www.reacttoredskin.co.uk/.
[12] National Health Service England. NHS safety thermometer national data report 2014-15. 2015. Retrieved from, http://146.255.35.208/images/docs/Safety%20Thermometer%20Report%202015.pdf.
[13] Stockton L, Flynn M. Sitting and pressure ulcers 1: risk factors, self-repositioning and other interventions. Nurs Times 2009;105:24. Retrieved 14/01/17 from, https://www.nursingtimes.net/sitting-and-pressure-ulcers-1-risk-factors-self-repositioning-and-other-interventions/5003005.article.
[14] Stockton L, Gebhardt KS, Clark M. Seating and pressure ulcers: clinical practice guidelines. J Tissue Viability 2009;18(4):98–108.
[15] World Health Organization. How to use the ICF: a practical manual for using the International Classification of Functioning, Disability and Health (ICF). Exposure draft for comment. Geneva: WHO; 2013.
[16] University of Salford and Tissue Viability Society. Findings from the amendment of the tissue viability seating guidelines: listening event. Salford: University of Salford; 2017.
[17] Stockton L, Parker D. Pressure relief behaviour and the prevention of pressure ulcers in wheelchair users in the community. J Tissue Viability 2002;12(3):84–90.
[18] Lukersmith S, Radbron L, Hopman K. Development of clinical guidelines for the prescription of a seated wheelchair, or mobility scooter for people with traumatic brain injury or spinal cord injury. Aust Occup Ther J 2013;60:378–86.
[19] Vowden P, Vowden K. How to guide: effective compression therapy. Wound Essentials 2012;7:1–6.
[20] Crane B, Hobson D. The importance of comfort to wheelchair users - a preliminary study. In: Paper presented at the 18th international seating symposium, March 7-9, 2002, Vancouver, BC, Canada; 2002.
[21] Bartley C, Stephens M. Evaluating the impact of Watercell ® technology on pressure redistribution and comfort/discomfort of adults with limited mobility. J Tissue Viability 2017;26(2):144–9.
[22] National Institute of Health and Care Excellence. Pressure ulcers: prevention and management. 2014. Retrieved 19/01/16 from, http://www.nice.org.uk/guidance/cg179/chapter/1-recommendations.
[23] British Society of Rehabilitation Medicine. Specialised wheelchair seating national clinical guidelines. Report of a multidisciplinary expert group. London: British Society of Rehabilitation Medicine; 2004.
[24] Akins JS, Karg PE, Brienza DM. Interface shear and pressure characteristics of wheelchair seat cushions. J Rehabil Res Dev 2011;48(3):225–34. http://dx.doi.org/10.1682/JRRD.2009.09.0145.
[25] Chamanga E. An evaluation of a novel alternating mattress and cushion technology. Nurs Resid Care 2016;19(4):207–13. http://dx.doi.org/10.12968/nrec.2016.18.4.207.
[26] Crane B, Wininger M, Call E. Orthotic-style off-loading wheelchair seat cushion reduces interface pressure under ischial tuberosities in sacrococcygeal regions. Arch Phys Med Rehabil 2016;97(11):1872–9.
[27] Gil-Agudo A, de La Peña-González AI, del Ama-Espinoda A, Pérez-Rizo E, Crespo-Ruiz B, Pérez-Nombela S. Evaluation of pressure support in user-cushion interface to determine inflated cushion air. Rehabilitacion 2010;44(1):32–9. http://dx.doi.org/10.1016/j.rh.2009.06.001.
[28] Hollington J, Hillman SJ. Can static interface pressure mapping be used to rank pressure distributing cushions for active wheelchair users? J Rehabil Res Dev 2013;50(1):53–60. http://dx.doi.org/10.1682/JRRD.2011.10.0192.
[29] Kim W-J, Chang M. A comparison of the average sitting pressures and symmetry indexes between air-adjustable and foam cushions. J Phys Ther Sci 2013;25(9):1185–7. http://dx.doi.org/10.1589/jpts.25.1185.
[30] Levy A, Kopplin K, Gefen A. An air-cell-based cushion for pressure ulcer protection remarkably reduces tissue stresses in the seated buttocks with respect to foams: finite element studies. J Tissue Viability 2014;23(1):13–23. http://dx.doi.org/10.1016/j.jtv.2013.12.005.
[31] Makhsous M, Lin F, Knaus E, Zeigler M, Rowles D, Gittler M, et al. Promote pressure ulcer healing in individuals with spinal cord injury using an individualized cyclic pressure-relief protocol. Adv Skin Wound Care 2009;22(11):514–21. http://dx.doi.org/10.1097/01.ASW.0000305495.77649.ee. Retrieved from, http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/520/CN-00732520/frame.html.
[32] McInnes E, Jammali-Blasi A, Bell-Syer S, Dumville J, Cullum N. Preventing pressure ulcers—are pressure-redistributing support surfaces effective? A Cochrane systematic review and meta-analysis. Int J Nurs Stud 2012;49(3):345–59. http://dx.doi.org/10.1016/j.ijnurstu.2011.10.014.
[33] Nakagami G, Sanada H, Sugama J. Development and evaluation of a self-regulating alternating pressure air cushion. Disabil Rehabil Assist Technol 2015;10(2):165–9.
[34] Sonenblum SE, Vonk TE, Janssen TW, Sprigle SH. Effects of wheelchair cushions and pressure relief manoeuvres on ischial interface pressure and blood flow in people with spinal cord injury. Arch Phys Med Rehabil 2014;95(7):1350–7. http://dx.doi.org/10.1016/j.apmr.2014.01.007.
[35] Stinson MD, Porter Armstrong AP. Seating and pressure support needs of people with cancer in the cervix or rectum: a case series on the clinical usefulness of pressure mapping assessment. Eur J Cancer Care 2008;17:298–305.
[36] Stockton L, Rithalia SVS. Is dynamic seating a modality worth considering in the prevention of pressure ulcers? J Tissue Viability 2008;17(1):15–21.
[37] Trewartha M, Stiller K. Comparison of the pressure redistribution qualities of two air filled wheelchair cushions for people with spinal cord injuries. Aust Occup Ther J 2011;58(4):287–92.
[38] Vilchis-Aranguren R, Gayol-Mérida D, Quinzaños-Fresnedo J, Pérez-Zavala R, Galíndez-Novoa C. A prospective, longitudinal, descriptive study of the effect of a customized wheelchair cushion on clinical variables, satisfaction, and functionality among patients with spinal cord injury. Ostomy Wound Manag 2015;61(2):26–36.
[39] Williams TA, Leslie GD, Bingham R, Hopkinson M, Brearley L. Optimising seating for patients with impaired mobility in the ICU. The Asia Pacific critical care 2008 congress. Aust Crit Care 2009;22(1). 55–55.
[40] NHS Modernisation Agency. Improving services for wheelchair users and carers – good practice guide: learning from the wheelchair services collaborative. London: DH; 2005.
[41] RESNA. RESNA position on the application of tilt, recline, and elevating legrests for wheelchairs. 2008. Retrieved from, http://www.rstce.pitt.edu/RSTCE_Resources/Resna_Position_on_Tilt_Recline_Elevat_Legrest.pdf.
[42] Stinson MD, Porter-Armstrong A, Eakin P. Seat-interface pressure: a pilot study of the relationship to gender, body mass index, and seating position. Arch Phys Med Rehabil 2003;84(3):405–9.
[43] Jan Y, Jones MA, Rabadi MH, Foreman RD, Thiessen A. Effect of wheelchair tilt-in-space and recline angles on skin perfusion over the ischial tuberosity in people with spinal cord injury. Arch Phys Med Rehabil 2010;91(11):1758–64. http://dx.doi.org/10.1016/j.apmr.2010.07.227.
[44] Jan YK, Crane BA, Liao F, Woods JA, Ennis WJ. Comparison of muscle and skin perfusion over the ischial tuberosities in response to wheelchair tilt-in-space and recline angles in people with spinal cord injury. Arch Phys Med Rehabil 2013;94(10):1990–6. http://dx.doi.org/10.1016/j.apmr.2013.03.027.
[45] Arva J, Paleg G, Lange M, Lieberman J, Schmeler M, Dicianno B, et al. RESNA position on the application of wheelchair standing devices. Rehabilitation Engineering & Assistive Technology Society of North America. Assist Technol 2009;21(3):161–8. Retrieved 14/01/17 from http://www.rstce.pitt.edu/rstce_resources/resna_position_on_tilt_recline_elevat_legrest.pdf.
[46] Hobson DA. Comparative effects of posture on pressure and shear at the body-seat interface. J Rehabil Res Dev 1992;29(4):21–31.
[47] Aissaoui R, Lacoste M, Dansereau J. Analysis of sliding and pressure distribution during a repositioning of persons in a simulator chair. IEEE Trans Neural Syst Rehabil Eng 2001;9(2):215–24.
[48] Gilsdorf P, Patterson R, Fisher S, Appel N. Sitting forces and wheelchair mechanics. J Rehabil Res Develop 1990;27(3):239–46.
[49] Pryor DB, Hendrich A, Henkel RJ, Beckmann JK, Tersigni RK. The clinical transformation of Ascension Health: eliminating preventable injuries and deaths. Jt Comm J Qual Patient Saf 2006;32:299–308.
[50] Public health England. The Eatwell guide. 2016. Retrieved 14/01/17 from: http://www.nhs.uk/Livewell/Goodfood/Pages/the-eatwell-guide.aspx.
[51] Resuscitation Council (UK). Advanced life support. sixth ed. London: Resuscitation Council (UK); 2011.
[52] Kenny S, Gowran RJ. Outcome measures for wheelchair and seating provision: a critical appraisal. Br J Occup Ther 2014;77(2):67–77.
[53] Dolan MJ, Henderson GI. Patient and equipment profile for wheelchair seating clinic provision. Disabil Rehabil Assist Technol 2014;9(2):136–43.
[54] RESNA. Wheelchair service provision guide. 2011. Retrieved 18/01/2017 from http://files.eric.ed.gov/fulltext/ED534426.pdf.

Please cite this article in press as: Stephens M, Bartley CA, Understanding the association between pressure ulcers and sitting in adults what does it mean for me and my carers? Seating guidelines for people, carers and health & social care professionals, Journal of Tissue Viability (2017), http://dx.doi.org/10.1016/j.jtv.2017.09.004