
PREVENTING PRESSURE INJURIES IN SEATED INDIVIDUALS



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Introduction

Any individual who can sit out of bed for any duration will use some form of seating surface. When evaluating an individual's risk of pressure injuries (PIs) and strategies to reduce the risk, it is important to consider their positioning over the full duration of the day. Many individuals will spend substantial time sitting in a chair/wheelchair; therefore, consideration must be given to the performance functions (e.g. immersion, envelopment and shear reduction) of seating surfaces and the individual's ability to reposition.

It is also important to recognize that individuals may regularly sit on other non-medical surfaces, sometimes for extended durations and consideration should be given to the function of these surfaces. This includes (but is not limited to) personal recliners, toilets and shower chairs, travel seats, and chairs used in school/work settings. This is of particular significance for individuals with extended or permanent immobility.

Cushion construction achieves pressure redistribution in one of two methods—immersion/envelopment or redistribution/off-loading. As an individual immerses (sinks) in the support surface, their body mass can be redistributed over a larger area. If the surface also envelops (i.e., conforms to the shape of) the individual, the pressure on the individual's body will be more evenly distributed and less concentrated over bony prominences where PIs typically develop. In some cases (e.g., 'hybrid' cushions) the seating support surface achieves redistribution using both immersion/envelopment and offloading.

As with full body support surfaces (e.g., mattresses and integrated bed systems) standards are available for the safety and performance testing and evaluation of chair/wheelchairs and seating cushions. Immersion, envelopment, pressure redistribution and microclimate modification will vary substantially between devices both within and across categories. Standard tests that quantify performance characteristics have been developed to assist in matching users' need to support surface capabilities by various organizations (e.g. Rehabilitation Engineering and Assistive Technology Society of North America [RESNA], International Standards Organization [ISO] and National Pressure Injury Advisory Panel [NPIAP]). More detailed information about standards is available in the guideline section on *Full Body Support Surfaces for Prevention of Pressure Injuries* and on the International PI Guideline website.

This section of the guideline specifically addresses interventions for reducing PI risk from external pressure and shear that arises in the seated position, while acknowledging that chairs/wheelchairs must

also address posture, stability, mobility, functional performance and other requirements, and that these factors are also integral to PI risk.

Selecting a Seat or Wheelchair

Clinical question: What are the general considerations when selecting or changing a chair/wheelchair for an individual at risk of pressure injuries?

S1: It is good practice to consider the following factors when selecting a chair or wheelchair that meets the individual's needs for pressure redistribution and shear reduction:

- the individual's overall risk of pressure injuries,
- independence, mobility and activity needs,
- body size, shape and weight distribution,
- posture, deformity and asymmetry and its effect on pressure distribution,
- need for enhanced features (e.g. dynamic weight shifting),
- the individual's preferences and care goals.

(Good practice statement)

Supporting information

When an individual is seated, their body weight is generally supported by a relatively small surface area (i.e., buttocks, thighs, feet and sometimes forearms), leading to relatively high interface pressures^{1,2} combined with limited opportunities to redistribute body weight to other anatomical sites. This increases the risk of PIs, particularly at the bony prominences of the ischial tuberosities and sacrum, with prolonged sitting. Additionally, with posterior pelvic tilt in a sitting position there is an increase in shear forces,² which increases PI risk at the sacrum and coccyx.³ As one measure to address these risks, an appropriate chair/ wheelchair must be selected. Individualized assessment and selection of the chair/wheelchair is required to ensure that the individual's unique needs, including but not limited to PI prevention, are addressed.⁴

Seating should be appropriate to the individual's dimensions, range of movement, functional needs and need for postural support. The chair/wheelchair should be compatible with the individual's needs for repositioning (e.g. arm support for pressure redistribution maneuvers and/or dynamic weight shifting functions). Consideration must also be given to personal preferences and goals of care (e.g., comfort, independence, etc.). Some individuals use seating systems and support surfaces for long term and extended use, for example individuals with spinal cord injury (SCI). Prolonged sitting results in a strong predisposition to PI development, particularly in the ischial area. It should be noted that individuals with SCI are at an increased risk of PI due to immobility, decreased sensation and altered pathophysiology that predisposes to skin breakdown.

The design and fitting of the wheelchair itself, along with the ability to be configured and adjusted to the needs of the wheelchair user goes beyond their needs with respect to managing pressure. An appropriate seating system is key to achieving personalized health, safety, and independence goals. However, this guideline only reviews and recommends seating surfaces with respect to PI outcomes. It is important that the entire seating system be prescribed and fitted by a qualified seating professional, and that other resources are used to evaluate and select seating surfaces beyond their impact on reducing PIs.

Implementation considerations

- Consider an individual's posture over a 24-hour period, including where they sleep, sit, stand and walk.⁵ Involve a clinician with specific expertise in seating individuals at risk of PIs^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.), particularly for individuals who spend significant periods of time in seated positions (e.g., full-time independent wheelchair and scooter users).
- Select a chair, seating system or wheelchair based on a seating and wheelchair evaluation and an assessment of the individual's functional ability and needs, including environmental and lifestyle needs, comfort, and personal preferences.^{4,7} This includes assessing the individual's ability to transfer into/out of the chair/wheelchair and ability to weight shift in various seated positions.
- Balance the need for preventing PIs with promotion of mobilization and activity. Some support surfaces or seating positions (e.g., tilt and recline) can reduce mobility and egress from the chair.
- Re-assessment of the individual's needs over time is recommended due to changes in their weight, dimensions, functional ability and other factors that will influence the choice of wheelchair/chair.⁴
- Select appropriately configured equipment that is fitted to the individual's body measurements, functional considerations, and environmental context.^{4,6,7} This includes, but is not limited to:
 - A chair/wheelchair that is sufficiently wide for the individual's girth while still providing postural support and efficient propulsion. Check tissue proximity at the sides/arms to avoid the risk of PIs.
 - Consider the height of the chair/wheelchair arms/footplates. They should provide support, be an appropriate height to enable standing and/or pressure redistribution maneuvers and should not impede egress from the chair.
 - Back supports should be reviewed and prescribed in conjunction with the seating cushion, lateral supports and other supports as needed to ensure the seating system achieves optimal postural support, comfort, function, pressure redistribution and shear management.
- Consider the resources available and potential funding sources. Work with the collaborative care team to access avenues for socioeconomic support.

Additional considerations for individuals in community settings

- Consider the level of assistance the individual requires for repositioning, and the features available on chairs to assist in repositioning (e.g., dynamic weight shifting) and egress from the chair (e.g., riser recliner chairs). Involve a clinician with specific expertise in seating individuals at risk of PIs^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.) who can assess the home environment.
- Consider assessing non-wheelchair users for any increase in time spent sitting during the day or time spent sleeping in a recliner so that appropriate support surfaces can be recommended.

Selecting a Seating Support Surface

Clinical question: Should a pressure redistribution seating support surface/cushion versus a non-pressure redistribution seating surface be used to prevent PI occurrence in individuals?

S2: We recommend using a seating support surface with pressure redistribution properties for individuals at risk of pressure injuries when in a seated position.

(Strong recommendation, moderate certainty of evidence)

Evidence summary

A meta-analysis of five RCTs⁹⁻¹² was performed. It showed that using a seating surface with pressure redistribution characteristics was associated with a non-significant lower rate of PI occurrence (relative risk 0.86, 95% confidence interval (CI) 0.74 to 1.01, $p = 0.06$) compared with non-pressure redistribution seating surfaces. This was a difference of 64 fewer PIs per 1,000 individuals treated [from 118 fewer to 5 more]]. There is moderate confidence that this effect estimate represents a true effect and that a seating

surface with pressure redistribution properties would lead to a reduction in PI occurrence. The evidence was downgraded for risk of bias and indirectness. The studies reported on a range of different pressure redistribution cushions, including contoured foam, a gel cushion, and a skin protection cushion, used in either a wheelchair⁸⁻¹² or seat¹² by older adults in aged care. In all the studies, the comparator was a foam cushion with no pressure redistribution properties. The adverse events appear to be minimal if the cushion is selected, fitted and used according to the manufacturer's guidance. Based on the available evidence and the opinion of the Consumer and Expert Panel Groups and the Guideline Governance Group, using a pressure redistribution cushion is probably acceptable and feasible. However, there are variable costs associated with accessing and fitting a pressure redistribution cushion, and there is no evidence on the cost effectiveness. The Guideline Governance Group made a strong recommendation because the risk of harm in not using a seating support surface with pressure redistribution features for individuals at risk of PIs is very high.

Implementation considerations

- Select a seating pressure redistribution support surface (e.g., seating cushions, back support or other wheelchair support surface or postural support device) based on the individual's dimensions, functional needs, posture and stability, level of sensation and comfort. Involve a clinician with specific expertise in seating individuals at risk of PIs^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.), particularly for individuals who spend significant periods of time in seated positions (e.g., full-time independent wheelchair and scooter users).
- Consider individual allergies or sensitivities to seating materials.
- Consider the resources available and potential funding sources. Work with the collaborative care team to access avenues for socioeconomic support.
- Avoid seating an individual at risk of PIs directly on a seating surface without a cushion.

Cushion properties and features

- Select a pressure redistribution cushion within appropriate weight limitations.
- Consider the shear force reduction properties of the cushion and cover, keeping in mind these may be influenced by the individual's clothing, positioning in the chair/wheelchair and support.¹³
- Consider the heat dissipation properties of the cushion and cover. Select a cushion and cover that permit air exchange to minimize temperature and moisture at the buttock interface. Where possible, select a stretchable/breathable cover that fits loosely on the top surface of the cushion and is capable of conforming to the body contours.

Condition and function of the cushion

- Inspect the pressure redistribution cushion before use to ensure proper functioning. If it is an air cushion, ensure it is inflated to a pressure based on the manufacturer's instructions.¹⁴ If a gel or other fluid-filled cushion, check to ensure it is still working as intended and the fluid has not migrated, frozen, or is no longer "flowing". For foam cushions, check for excessive compression or degradation that can affect the cushion contouring. Check the cushion for bottoming out when the individual is seated, including when they are performing functional tasks. Ensure the cushion is being monitored and inspected as indicated by the manufacturer guidelines.
- Regularly inspect cushions to ensure that they retain pressure redistribution characteristics. Check and follow the manufacturer's recommended timeframe for use before replacement, maintenance and cleaning requirements.
- Evaluate the stability of individuals who are seated on pressure redistribution cushions. Weigh the benefits of off-loading or immersion against the potential for instability and shear based on the construction and operation of the cushion.
- Do not use ring or donut-shaped seating cushions. The edges of these devices create areas of high pressure that may damage tissue, impair circulation and create edema.^{15,16}

Additional considerations for individuals at high risk of pressure injuries

- Assess the relative benefits of using an alternating pressure air (active) cushion for individuals who are seated in a chair/wheelchair for prolonged periods, particularly if they are unable to perform pressure redistribution maneuvers.¹⁷

Additional considerations for individuals using wheelchairs over the long term

- Use a pressure redistribution cushion for individuals who are seated in a chair/wheelchair for prolonged periods, particularly if the individual is unable to perform pressure relieving maneuvers.
- Consider using textiles with low friction coefficients for individuals with or at risk of PIs. See recommendations in *Preventive Skin Care* section of the guideline.
- Advise individuals who spend prolonged periods in a chair/wheelchair to use a pressure redistribution cushion with other seating, for example when traveling (e.g., in motor vehicle, airplane, train, etc.).^{18,19}
- Consider ability to maintain properly the seating supports (e.g., laundering, correct position on sitting surface, proper inflation) and refer for appropriate support.
- Teach full-time wheelchair users to inspect and maintain pressure redistribution cushions and covers according to the manufacturer's information.

Repositioning the Individual in a Seated Position

Pressure and shear forces are important considerations in seated individuals, particularly those who spend extended time sitting out of bed and have a high risk of PIs due to reduced mobility, asymmetrical/unsupported postures, and/or reduced sensory perception, such as individuals with SCI, other neurological conditions, cognitive deficits, and older adults. Consideration should be given to the:

- Time spent in a seated position
- Support surface and features of the chair/wheelchair
- Way in which the individual is positioned and supported
- Strategies to reposition when in a seated position.

Clinical question: Should time sitting out of bed be limited versus unlimited duration sitting out of bed for individuals at risk of PIs who are seated?

S3: We suggest that duration of sitting out of bed should be limited at much as possible for individuals at risk of pressure injuries who cannot reposition themselves while seated.

Clarifiers:

- **Use an appropriate seating support surface in all settings.**
- **Adapt this recommendation to the individual's setting, ability to reposition and tissue tolerance.**
 - **Acute care:** During the initial phases of recovery from injury or debilitating injury, duration of sitting may be more limited.
 - **Rehabilitation:** Sitting times can gradually increase as tissue tolerance and ability to self-reposition improve.
 - **Community:** Long term wheelchair users should individualize seating times balancing tissue tolerance to seating, ability to reposition while seated, lifestyle choices and quality of life.

(Conditional recommendation, very low certainty of evidence)

Evidence summary

One RCT²⁰ showed that limiting sitting out of bed to sessions of two hour duration was associated with a significantly lower rate of PI occurrence (6.7% versus 63%, RR 0.11, 95% CI 0.03 to 0.42, p=0.001) compared with no limitation on the duration of sitting out of bed. This was a difference of 560 fewer PIs per 1,000 individuals treated [from 611 fewer to 365 fewer]. There is very little confidence that this effect

estimate represents a true effect. The evidence was downgraded due to a high risk of bias and imprecision. The study²⁰ was conducted in older adults following orthopedic surgery who were at risk of PIs, and some participants experienced undesirable effects (e.g. chest infection); however, this was generally when the participants spent no time sitting out of bed. No formal indication of resource requirements or cost effectiveness analyses were reported. The Consumer Panel Group noted that for individuals at long term PI risk, limiting time sitting out of bed interfered with ability to engage in work and social life, and a balance was required between psychosocial needs and preventing PIs. **The Guideline Governance Group noted that the most appropriate duration for sitting out of bed is based on an individual assessment. Ability to self-reposition and quality of life are important considerations when determining how long an individual at risk of pressure injuries should spend seated out of bed.**

Implementation considerations

- Refer individuals who spend prolonged periods in a chair/wheelchair to a clinician with specific expertise in seating individuals at risk of PIs^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.).
- Integrate the use of different positions between the bed and the chair/wheelchair. For example, consider the position the individual will be in if they remain in the bed. Sitting in a supported position out of bed may offer reduced PI risk versus sitting with the head of bed at above 30-degrees. Some powered bed systems may offer smooth transitions between lying and sitting with appropriate positioning to reduce pressure and shear. See the guideline section *Repositioning for Preventing Pressure Injuries* for further recommendations.
- Initially, limit time sitting out of bed for individuals in the post-operative period, newly admitted to rehabilitation, first time sitting out of bed after prolonged illness and older adults who cannot reposition to a maximum of two hours/session.²⁰ Time out of bed should be reassessed before increasing based on multifactorial tolerance.
- Encourage individuals who spend time in seated position out of bed to implement weight shifts and pressure relief maneuvers and when available, to use dynamic positioning features of the chair/wheelchair.
- Coordinate the timing of sitting in an upright position with other care needs (e.g., sitting upright during and after bolus enteral feeding).

Seating on other surfaces beyond a chair/wheelchair

- Avoid leaving an individual seated on a bed pan, commode or toilet for longer than necessary. Consider a continence review and management plan to limit the time required sitting on a toileting device.
- Consider the need for a pressure redistribution commode/shower chair.

Assessment

- Regularly evaluate the individual's functional ability, psychosocial needs, quality of life, values and preferences and ability to do what is important to them when developing a seating regimen, particularly for individuals who live with long term pressure injury risk (e.g., individuals with spinal cord injury or other neurological conditions, older adults, etc.).²¹
- Perform regular skin and risk assessments when an individual is seated out of bed to determine the most appropriate duration of seating sessions.

Clinical question: Should more frequent repositioning versus less frequent repositioning be used to prevent PI occurrence in individuals at risk who are seated?

Clinical question: Should weight shifting interventions versus usual care/a comparator intervention be used to prevent pressure injury occurrence in individuals at risk who are seated?

S4: It is good practice to frequently reposition individuals at risk of pressure injuries who are seated out of bed. Teach and encourage independent chair/wheelchair users to reposition as

often as possible by performing pressure redistribution maneuvers and weight shifts that redistribute pressure as much as possible.

(Good practice statement)

Supporting information

The optimal method and frequency of repositioning when seated has not been ascertained through comparative studies. Observational evidence shows that posture declines as time spent in a chair/wheelchair increases in duration.²² Measures of skin and tissue perfusion indicate that the ischemic response can commence after as little as ten minutes in a seated position with a pressure redistribution cushion.²³ Studies have demonstrated that redistributing body weight by performing intermediate or full body leaning or push-ups can increase skin tissue perfusion.^{24,25} These factors are variable between individuals, indicating that an individualized approach is required. Weight shifting can be achieved through repositioning of individual's body weight, or through the use of dynamic features of seating systems/wheelchairs.

Implementation considerations

- Refer individuals who spend prolonged periods in a chair/wheelchair to a clinician with specific expertise in seating individuals at risk of PIs^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.). A collaborative multidisciplinary approach promotes consideration of all the individual's needs.
- Involve the individual and their informal carers in decisions around repositioning frequency.^{26,27} Discuss benefits, risks and strategies to meet the individual's needs.
- Consider the individual's functional ability/performance and lifestyle participation (e.g., employment routines, lifestyle activities, etc.) when developing a seating regimen.²¹
- Consider sensory or cognitive impairments that may impact the individual's ability to self-reposition.

Additional considerations for individuals who can self-reposition

- Encourage integration of self-repositioning into the daily routine where possible,²⁸ for example encouraging incidental movement or natural breaks in activities.
- Assess and monitor individuals who are self-repositioning to ensure their self-repositioning techniques (e.g., pressure redistribution maneuvers, transfers, etc.) effectively offload pressure points and avoid shear and friction.
- Pressure redistribution maneuvers should be individualized according to strength and skill.^{24,29}
- Encourage variation in the type of pressure redistribution maneuvers used.³⁰

Additional considerations for individuals who are independent wheelchair users

- Encourage independent wheelchair users to maintain their functional activity. Functional activities produce weight shifts that unload pressure at the buttocks.³¹
- Consider using interface pressure mapping systems to provide individuals with real time feedback on the need to reposition and the effectiveness of their pressure relieving techniques.³² Independent wheelchair users often over-estimate their repositioning and pressure relieving activity.³³

Clinical question: What are the general considerations when positioning an individual at risk of pressure injuries in a seat?

Clinical question: Should tilt-in-space (dynamic) seating versus non-dynamic seating be used to prevent pressure injury occurrence in individuals at risk who are seated?

S5: It is good practice to position seated individuals in such a way that reduces pressure, shear and friction. This includes:

- selecting a chair or wheelchair that provides support and maintains stability,
- selecting a reclined seated position in which the individual's legs are elevated and supported so the heels are free from the support surface or, if reclining is not appropriate or possible, ensuring that the individual's feet are well-supported, and/or
- using dynamic weight shifting (tilt and recline).

(Good practice statement)

Supporting information

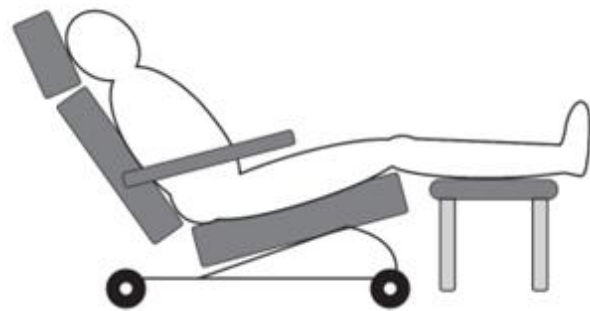
Maintaining proper positioning and postural control is important in avoiding shear and friction.³⁴ There is no direct comparative evidence on the impact of different seating positions (e.g., dynamic seating such as tilt-in-space and rear-tilted), in preventing PI occurrence. Studies have demonstrated that peak interface pressure can be reduced at the ischia, sacrum and back by using a properly adjusted foot support when seated upright,³⁴ and by implementing reclined seating,³⁴⁻³⁷ seat tilting, or a combination of tilt and recline.^{35,38} Studies have also demonstrated that skin perfusion significantly increases when tilt-in-space is combined with a reclined position.³⁸ However, when the pressure is offloaded from these regions, it is redistributed to other pressure points (e.g., the coccyx) and thus requires attention to the time spent in a tilted and/or reclined position.

An example of a pressure redistribution protocol for an individual sitting out of bed^{30,39}

- Perform a pressure redistribution maneuver as often as every 10 minutes
- Adjust frequency based on tolerance and assessment of the skin and tissues
- Perform the pressure redistribution maneuver for at least 30 seconds, increasing to as long as is tolerated
- Use a combination of maneuvers, including:
 - Rear tilt and recline
 - Right and left side lean
 - forward lean
 - standing if tolerated



Supported seating position



Recline and tilt

Implementation considerations

- Select a seated posture and chair/wheelchair that maintains the individual's independence and full range of activities.

- Position the feet directly on the ground or in contact with a footrest at an angle that matches the individual's available range of motion. A correctly adjusted chair/wheelchair and appropriated foot or footrest positioning can assist in maintaining posture and stability.³⁴
- Be aware of the impact of seating on anatomical locations. Sitting in a non-upright position (e.g., slouching) applies greater pressure to the sacrum while an upright seating position applies greater pressure to the ischia.³⁵
- Avoid sitting on medical devices, including manual handling equipment (e.g., transfer sling) unless it is designed for this purpose). Avoid sitting on or non-cushion specific covers, pillowcases, pads and incontinence liners.
- Tilt the seat a minimum of 30-degree to achieve adequate pressure reduction at the ischial tuberosities.^{34,35,37} If 30-degree tilt is not tolerated, small angle changes performed more frequently can be implemented.⁴⁰ Ensure that pressure is appropriately relieved from the heels while avoiding pressure on the Achilles tendon. Consider the recommendations in the guideline section *Preventing Heel Pressure Injuries*.

Additional considerations for individuals who are long term wheelchair users

- Refer individuals who have a change in body dimensions, range of movement, posture and/or physical abilities for a re-assessment by a clinician with specific expertise in seating individuals at risk of Pls^{4,6} (e.g., seating specialist, physiotherapist, physical therapist, occupational therapist, etc.). Regular re-assessment of the fit of the wheelchair and the posture support it provides could improve outcomes.^{22,41}
- Use a combination of tilt and recline to reduce pressure and shear. Using the recline feature in isolation can increase shear forces.^{2,3,40,42} Use tilt-in-space before activating recline.
- Determine appropriate and sustainable pressure redistribution protocols for independent, long-term wheelchair users.
- Assess the clinical needs and benefits of elevated leg rests. Access to recline features is essential when using elevated leg rests to reduce the risk of posterior pelvic tilt, particularly for individuals with limited hamstring range of motion.
- Evaluate the need to offload heels. Offloading heels is not typically required for long term wheelchair users.

Updates

- 17-12-2025 The section was updated to incorporate more implementation considerations for long term wheelchair users. Detailed information about standards was removed, and links to other sections and resources added.

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