Pressure Ulcers

19

Dimitri Beeckman, Nele Van Damme, Dorien De Meyer, and Karen Van den Bussche

Abstract

Pressure ulcers are internationally accepted as an important quality indicator and are considered to be a preventable adverse event. Superficial pressure ulcers develop at the level of the skin and may progress downward, whereas deep pressure ulcers arise in muscle layers covering bony prominences and are mainly caused by sustained compression due to pressure and/or shear. A structured risk assessment approach should include the application of a risk assessment scale, combined with a comprehensive skin assessment and clinical judgement (based on knowledge of key risk factors). Prevention of pressure ulcers includes the use of adequate support surfaces (bed and chair), preventive skin care, and systematic repositioning with consideration of the individual's condition.

Learning Objectives

By the end of the chapter, the reader will be able to

- Describe the aetiology and pathophysiology of pressure ulcer development
- Explain the impact of pressure ulcers on patients, carers, organisations, and the society
- Diagnose and classify pressure ulcers
- Recommend effective interventions to prevent pressure ulcers and adapt the interventions to specific patient populations and contexts

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_19) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_19.

D. Beeckman (✉) • N. Van Damme • D. De Meyer • K. Van den Bussche
Skin Integrity Research Group, University Center for Nursing and Midwifery, Department of Public Health, Ghent University, Ghent, Belgium
e-mail: Dimitri.Beeckman@UGent.be; Nele.VanDamme@UGent.be; Dorien.DeMeyer@UGent.be; Karen.VandenBussche@UGent.be

19.1 Definition, Aetiology and Impact

A pressure ulcer is a localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear (Fig. 19.1). A number of contributing or confounding factors are associated with pressure ulcers; the significance of these factors is yet to be elucidated. The development of pressure ulcers is related to a complex interplay of several factors.

Mobility and activity, perfusion, and skin status are independent risk factors. In addition, skin moisture, age, haematological status, nutrition, general health status, body temperature, and immunity are important factors for pressure ulcer development.

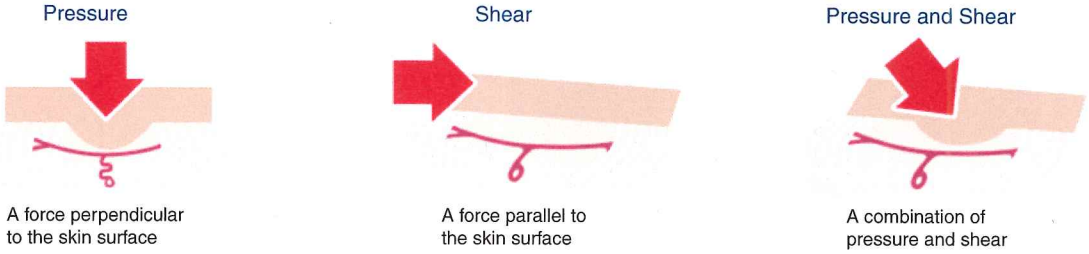
The aetiology of different types of pressure ulcers is not fully understood. Prolonged mechanical loading of soft tissues covering bony prominences, as present when individuals are bedridden or wheelchair bound, is supposed to lead to degeneration of skeletal muscle tissue. This external mechanical load can be a force perpendicular to the skin surface (pressure), a force parallel to the skin surface (shear) or a combination of pressure, and shear.

- Pressure is considered an important aetiological factor and occurs when soft tissues are compressed between bony prominences and contact surfaces for prolonged periods of time.
- Shearing forces result from forces that tend to cause two opposing surfaces to slide and displace against each other.

Also other damage pathways are involved, such as impaired lymphatic drainage, ischaemia/reperfusion injury, and sustained tissue deformation. Stekelenburg et al. (2007) have demonstrated that a 2-h period of compressive loading leads to irreversible damage to the muscle tissue, whereas ischaemic loading results in reversible tissue changes. This implies that large deformation, in conjunction with ischaemia, provides the main trigger for irreversible muscle damage.

Pressure ulcers are internationally recognised as an adverse outcome of the admission to a healthcare facility. They are internationally accepted as key clinical indicators of the quality of care and are considered to be a preventable adverse event. Pressure ulcers have a significant impact on patients, their families, caregivers, and healthcare organisations (Gorecki et al. 2009). Pressure ulcer development is associated with pain, infections, prolonged and expensive hospitalisations, increased risk of death, and reduced health-related quality of life (Demarre et al. 2015, Gorecki et al. 2009).

Unrelieved pressure and shear on bony prominences, skin, and soft tissue lead to the development of pressure ulcers



Pressure and shear lead to:

- Ischaemia
- Tissue reperfusion damage
- Direct cell and tissue deformation
- Impaired lymphatic drainage

The role of microclimate should be further explored

Fig. 19.1 Pressure ulcer development

19.2 Classification and Differential Diagnosis

Pressure ulcers can start superficially or deep within the tissues, depending on the nature of the surface loading and the tissue integrity. Superficial pressure ulcers form within the skin and may progress downward, whereas deep pressure ulcers arise in muscle layers covering bony prominences and are mainly caused by sustained compression of the tissues. The severity of pressure ulcers varies from non-blanchable erythema of the intact skin to tissue destruction involving skin, subcutaneous fat, muscle, and bone.

In the United States, the National Pressure Ulcer Advisory Panel (NPUAP) developed a classification using four stages in 1989. In Europe, this classification system was adopted by the European Pressure Ulcer Advisory Panel (EPUAP) in 1999 with some minor textual changes. From 2009 onwards, NPUAP and EPUAP developed a common international classification system for pressure ulcers. The purpose of the classification system is to standardise record-keeping and provide a common description of pressure ulcer severity for the purposes of clinical practice, audit and research. Table 19.1 presents the 2014 NPUAP/EPUAP classification system.

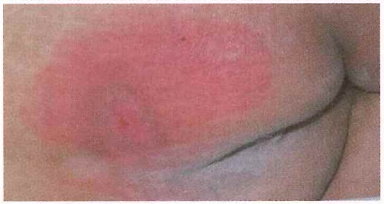
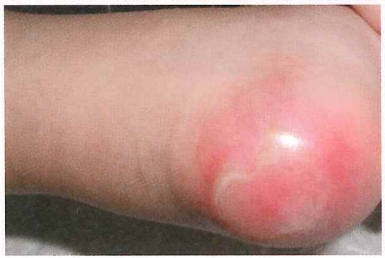
Pressure ulcer prevalence and incidence figures vary by setting, pressure ulcer severity and length of follow-up. National pressure ulcer prevalence surveys revealed a prevalence (Cat. I–IV) of 12.1% in Belgian hospitals and 8.9% in French hospitals. Prevalence rates of 31.4% and 6.4% in nursing homes and 18.1% and 9% in hospitals were found in the Netherlands and Germany, respectively. Prevalence figures in aged care settings vary from 2.8 to 5% in Spanish young-old patients admitted to internal medicine departments, 9% in older Irish long-term care settings (Moore and Cowman 2012), 6 to 14.5% in Swedish hospitals and nursing homes, and 4.1 to 32.2% in US long-term care and nursing homes (Pieper 2012).

Pressure ulcers can be related to incontinence-associated dermatitis (IAD) due to their similar clinical presentations (see Pocket Card). Misclassification has significant implications for prevention, treatment, and reporting and benchmarking on quality of care. Therefore it is important to correctly diagnose pressure ulcers and to differentiate it from other skin lesions that occur in the same areas on the skin.

19.3 How to Prevent Pressure Ulcers?

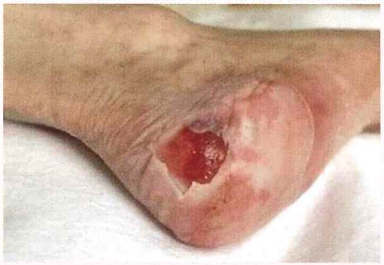
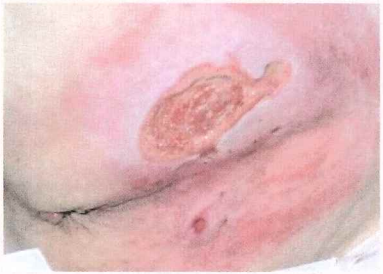
The aim of pressure ulcer prevention is to reduce the duration and/or the amount of pressure and shear. Since preventive measures are expensive and labour intensive, patients with a clear risk of developing pressure ulcers should be identified through a structured risk assessment.

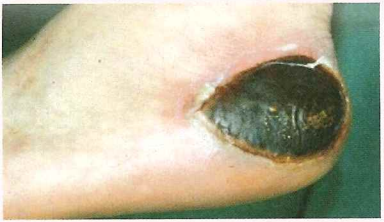
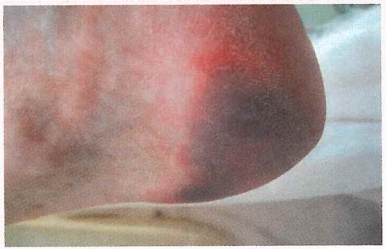
Table 19.1 Pressure Ulcer Classification (NPUAP et al. 2014)

	Category/Stage I Non-blanchable erythema	Intact skin with non-blanchable redness* of a localised area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its colour may differ from the surrounding area. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category/Stage I may be difficult to detect in individuals with dark skin tones. May indicate 'at-risk' individuals (a heralding sign of risk). **Non-blanchable erythema can be detected using the diascopy method (see* Table 19.3).
	Category/Stage II Partial thickness skin loss	Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising.* This category/stage should not be used to describe skin tears, tape burns, incontinence-associated dermatitis, maceration or excoriation. **Bruising indicates suspected deep tissue injury.*

(continued)

Table 19.1 (continued)

	Category/Stage III Full thickness skin loss	Full thickness skin loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunnelling. The depth of a Category/Stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and Category/Stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep Category/Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.
	Category/Stage IV Full thickness tissue loss	Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunnelling. The depth of a Category/Stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g. fascia, tendon or joint capsule) making osteomyelitis possible. Exposed bone/muscle is visible or directly palpable.

	Unstageable: Depth unknown	Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, grey, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar is removed to expose the base of the wound, the true depth, and therefore Category/Stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as 'the body's natural (biological) cover' and should not be removed.
	Suspected deep tissue injury: depth unknown	Purple or maroon localised area of discoloured intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.

The prevention of pressure ulcers comprises:

1. The use of adequate support surfaces (bed and chair) to redistribute pressure/shear and to manage tissue load and microclimate (NICE 2014)
2. Preventive skin care including cleansing the skin and protecting it from exposure to moisture
3. Systematic repositioning of the patient with consideration of the individual's situation (NICE 2014)

A support surface is a specialised device for pressure redistribution designed for the management of tissue loads, microclimate, and/or other therapeutic functions, e.g. mattresses, integrated bed systems, mattress replacement, overlay, seat cushion or seat cushion overlay. Patient repositioning must take into account the condition of the patient and the support surface in use (NICE 2014). Specific devices should be placed to elevate the heel (offload them) as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion. An overview of pressure ulcer risk assessment and prevention interventions is presented in Tables 19.2 and 19.4.

Table 19.2 Overview of pressure ulcer risk assessment and prevention in bed and when seated

Risk assessment

- A structured approach to skin assessment as a part of the risk assessment policy should be used in all healthcare settings.
- A structured approach to risk assessment should include the use of a risk assessment scale, combined with a comprehensive skin assessment and clinical judgement (based on knowledge of key risk factors).
- The use of the transparent disk method to assess non-blanchable erythema is preferable to the finger method.
- Education of professionals should include techniques for identifying blanching response, localised heat, oedema, and induration.

Preventive strategies in bed

- Prevention in bed should focus on the reduction of the amount and/or duration of pressure and shear.
- Pressure ulcer prevention in bed includes the application of an appropriate support surface combined with correct repositioning on a continuing basis.
- The condition of the patient and the specification of the support surface should be considered to determine the frequency and technique for repositioning.
- Repositioning should be undertaken using the 30° tilted side-lying position (alternately right side, back, left side) or the prone position if the patient can tolerate this and if the medical condition allows for it.
- Postures that increase pressure (such as the 90° side-lying position or semi-recumbent position) should be avoided.
- Heels should be free of all pressure permanently.

Preventive strategies when seated

- Prevention when seated should focus on the reduction of the amount and/or duration of pressure and shear.
- The time an individual spends seated in a chair without pressure relief should be limited.
- If sitting back in an armchair, the lower legs should be placed on a footstool or footrest.
- A posture that is acceptable for the individual and minimises the pressure and shear exerted on the skin and soft tissues should be selected.

Table 19.3 Diascopy method to detect non-blanchable erythema

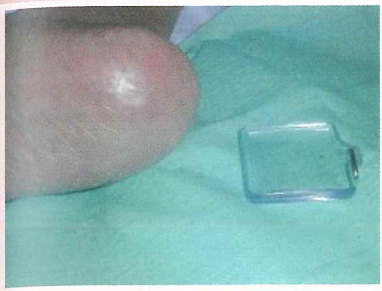
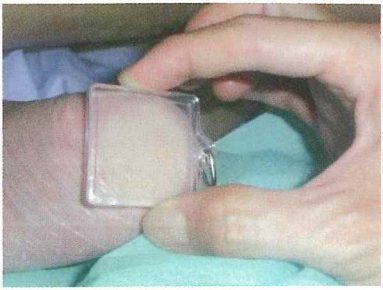
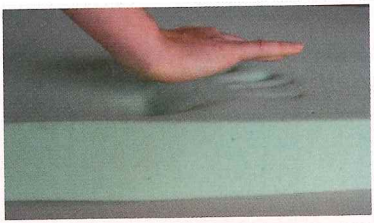
Suspected non-blanchable erythema	Diascopy method using a transparent disk
	

Table 19.4 Devices to offload pressure/shear

Heel offloading	 Wedge-shaped cushion to offload the heel and to redistribute the weight of the leg along the calf without putting pressure on the Achilles tendon	 Pillow used for heel offloading

Support surfaces

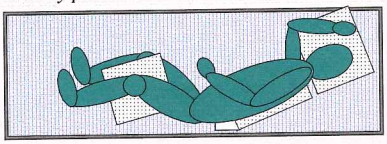


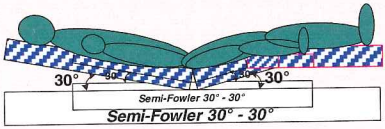
Viscoelastic foam mattress to redistribute pressure/shear over a larger contact area. This is a non-powered (not electrically driven) support surface that reacts to body weight/temperature to change shape and to cause pressure redistribution

Static air mattress to redistribute pressure/shear over a larger contact area. This is a non-powered (not electrically driven) support surface that reacts to body weight and weight shifting to change shape and to cause pressure redistribution

Alternating pressure air mattress to relieve pressure at bony prominences. This is a powered (electrically driven) support surface that uses inflation/deflation of air-filled compartments to offload pressure at bony prominences

Repositioning





Repositioning using the 30° tilted side-lying position (alternately right side, back, left side) or the semi-Fowler 30°–30° position

References

Gorecki C, Brown JM, Nelson EA, Briggs M, Schoonhoven L, Dealey C, et al. Impact of pressure ulcers on quality of life in older patients: a systematic review. J Am Geriatr Soc. 2009;57(7):1175–83.

Demarre L, Verhaeghe S, Annemans L, Van Hecke A, Grypdonck M, Beeckman D. The cost of pressure ulcer prevention and treatment in hospitals and nursing homes in Flanders: a cost-of-illness study. Int J Nurs Stud. 2015;52(7):1166–79.

Moore Z, Cowman S. Pressure ulcer prevalence and prevention practices in care of the older person in the Republic of Ireland. J Clin Nurs. 2012;21(3–4):362–71.

NICE. Pressure ulcers: prevention and management. 2014. nice.org.uk/guidance/cg179.

NPUAP, EPUAP, PPPIA. Prevention and treatment of pressure ulcers: clinical practice guideline. Perth, Australia: Cambridge Media; 2014.

Pieper B. Long term care/nursing home. In: Pieper B, The National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence and implications for the future. 2nd ed. Washington, DC: National Pressure Ulcer Advisory Panel; 2012. p. 65–96.

Stekelenburg A., Strijkers G., Parusel H., Bader D., Nicolay K., Oomens C. (2007). Role of ischemia and deformation in the onset of compression-induced deep tissue injury: MRI-based studies in a rat model. Journal of Applied Physiology, 102(5), 2002–11.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_19.